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6.1 GENERAL

The current Ontario Provincial Standards, American Water Works Association Standards, Canadian Standards Association, and Ministry of the Environment, Conservation, and Parks (MECP) Guidelines for Drinking Water Systems provide the minimum requirements that must be met. In addition, the following criteria must be included in the Design presented for approval to the **County of Oxford Public Works**. If there is a discrepancy between the County Specifications and the MECP Guidelines, then the **County of Oxford Public Works** shall be contacted to resolve the issue. Any deviation from these specifications must be submitted in writing to the **County of Oxford Public Works** for approval.

In areas of suspected soil contamination or high groundwater, a geotechnical investigation will be required. The cost of required geotechnical testing and placement of suitable material will be the responsibility of the Developer. A soils investigation report shall be submitted to determine the corrosiveness of the native soils including recommendations on cathodic protection methods. The report shall be completed by the Developer's Geotechnical Engineer during the design of the project and the appropriate measures including for corrosion protection are to be incorporated in the contract. The soils investigation report is to be made available to the County for review and comment prior to finalization.

The City of Woodstock and Town of Tillsonburg are Service Providers for The County. Oxford County Design Guidelines are to be followed for all water systems within the County. No alternate guidelines shall be permissible, and all deviations are up to the sole discretion of Oxford County Public Works. The County and its Service Providers shall inspect all commissioning of watermains and service installations on both public and private property in their respective locations. Full-time inspection within the public right-of-ways shall be required by the Developer's Engineer in consultation with the County and its Service Providers. Inspection fees as set out by the County and its Service Providers will apply.

6.1.1 Study Requirements

As part of all submission packages, prior to construction, the Developer shall submit a hydrological study along with a description of how hydrological conditions have been considered and addressed in the watermain design.

The hydrological study should be conducted by a Professional Geoscientist or Professional Engineer licensed to practice in Ontario to determine critical information related to:

- Groundwater Levels
- Hydrostatic Pressures
- Seasonal High Groundwater Table

The methodology of the hydrological study should consider whether the work is a single service retrofit or an installation of a new watermain system. Common methodology suited for conducting a hydrological study are

- Borehole and/or test pits (best suited for retrofits)
- Piezometers (best suited for retrofits and new installations)

In instances where a hydrological study is not feasible, historical data completed within the last 10 years, which has been reviewed by a Professional Geoscientist or Professional Engineer licensed to practice in Ontario, could be used in lieu of the hydrological study at the sole discretion of the **County of Oxford Public Works**.

Where a hydrological study is not feasible and/or historical data is not available, the watermain should be designed with the assumption that the hydrostatic pressure is at the surface grade.

As part of all submission packages, prior to construction, the Developer shall complete a geotechnical investigation along with a description of how geotechnical conditions have been considered and addressed in the wastewater design. The cost of required geotechnical testing and placement of suitable material will be the responsibility of the Developer. A soils investigation report shall be submitted to determine the corrosiveness of the native soils including recommendations on cathodic protection methods.

As part of all submission packages a pre-construction report should be prepared by the Developer's Geotechnical Engineer that includes soil classification, recommendations of structural requirements for pipe and bedding, measures for corrosion protection, and construction methods to be used. The soils investigation report shall be submitted to **Oxford County Public Works** for review and comment, and following this review a finalized version addressing all comments shall be submitted.

The cost of these studies, including investigations and reporting, shall be the responsibility of the Developer. The City of Woodstock and Town of Tillsonburg are Service Providers for The County. Oxford County Design Guidelines are to be followed for all watermain systems within the County. No alternate guidelines shall be permissible, and all deviations are up to the sole discretion of **Oxford County Public Works**. Full-time inspection within the public right-of-ways shall be required by the Developer's Engineer in consultation with the County and its Service Providers. Inspection fees as set out by the County and its Service Providers will apply.

6.2 WATER DISTRIBUTION SYSTEM DESIGN

These standards cover the requirements for the design of water distribution systems.

6.2.1 Watermain Design

All watermains shall be designed in accordance with these standards as well as the other standards referenced in **Section 6**.

The County's water distribution system exists for the purpose of distributing potable water. Private supplies of potable or non-potable water may not be cross connected to the County's water distribution system. The Developer must adhere to By-Law No. 6544-2023 for Cross Connection Control and Backflow Prevention.

All proposed developments shall provide the County with a Functional Servicing Report complete with proposed water and fire flow demands. The report shall include a watermain layout as a PDF, as well as CAD and/or Shapefiles. The Functional Servicing Report will review the development's proposed demands to ensure the proposed layout can meet the criteria noted below. Oxford County will complete a review of the development within the County's water distribution system model to verify the proposed layout, pipe sizing, and identified results is sufficient to service the development within the overall system. All new subdivisions and large-scale developments will require a hydraulic water model developed for their distribution system. Refer to **Section 6.2.2** for more details.

The County's Water Services Division will review and provide commentary on all new development, including water systems on private property as part of the site plan review process.

6.2.1.1 Watermain Classifications

Watermains within the County are classified as follows:

- Distribution Main: Watermain with a nominal diameter of 300mm and smaller.
- Transmission Main: Watermain with a nominal diameter larger than 300mm.

6.2.2 Hydraulic Modeling

6.2.2.1 General

The County has adopted InfoWater Pro as its standard for hydraulic modelling. Other software packages may be used for analysis and reporting, but all model input files provided to the County must be directly readable by InfoWater Pro without modification. The accuracy and readability of the input files are the sole responsibility of the Developer.

The model shall include all watermains 50mm diameter and larger, hydrants, centerline road elevations at nodes, control valves (pressure reducing valves, flow regulating valves, check valves), reservoirs and booster pumping stations.

For phased developments, a hydraulic model incorporating the distribution system for each phase shall be submitted during the application for the first phase of the development. It should be noted that phases will need to match with anticipated requests for conditional approval to be made. Where a submission is made at a later date for a phase which doesn't match a phase considered during the design studies approval process, additional hydraulic modelling will be required at the cost of the Developer and may be subject to additional review fees by the County. The County may require hydraulic modeling analyses beyond the development boundaries in situations where the operation of existing water system facilities such as control valves, reservoirs and pumping stations, are influenced by changing demands in the new development.

The model report shall also include calculations to ensure water quality in the subdivision during each of the phases and ultimate buildout as well as in any temporary or permanent dead-end watermains and specify the installation of automatic flushing devices as required.

As a minimum, the model submission to the County must include a steady state hydraulic analysis for each proposed development phase under the following demand conditions:

- Average day
- Max Day
- Peak hour
- Maximum day plus fire flow

All Hydraulic reports shall include detailed maps/layouts of the watermain system (valves, hydrants, etc.) and shall clearly show the pipe and node numbering.

Extended period simulations are not required unless specifically requested by the **County of Oxford Public Works**.

6.2.2.2 Information Provided by the County

County of Oxford Public Works will provide minimum steady-state pressures at the connection node(s). The designer is cautioned that only the pressures provided by the County will be acceptable for the model. Use of fire flow tests are permitted when requested **by The County's Water Services Division**. These tests may only be used as a reference as they are not representative of design flow conditions. Fire flow tests are not to be older than 2 years. **The County's Water Services Division** may require new fire flow tests to be completed if the area has seen growth since the last tests.

6.2.2.3 Hydraulic Model Input Standards

.1 Units

When inputting data into the model, the following units shall be used with the required accuracy.

Table 6-1 Units and Accuracy

Parameter	Units	Accuracy
Elevation	Metres	x.xx
Length	Metres	x.x
Diameter	Millimetres	X (hard conversion)
Demand	Litres per second	x.xxxx
Tank Diameter	Metres	x.
Tank Volume	Cubic Metres	x.xx
Pressure	Metres (of water)	x.xx
Power	Kilowatts	x.xx
Time	Hours	x.xx

.2 Node Elevations

In meters to geodetic datum. Finished centerline road elevations and / or estimated final grading contours are required.

.3 Node and Link Identification

Nodes and links are to be graphically identified on a map.

.4 Demands

Use average day demands and global demand multipliers for demand patterns.

6.2.2.4 Submission Requirements

Submit electronic versions of the following files in InfoWater Pro or EPANET format:

- The model input file for each design scenario (ADD, MDD, PK HR, Max Day + Fire Flow).
- The map or shape file of the modelled system.

- Submit a report, sealed by a Professional Engineer licensed to practice Engineering in the Province of Ontario, including:
- A summary of the demand scenarios and points of connection to the County system.
- A network map (in colour) for each scenario which identifies node and link numbers.
- Node tables for all scenarios listing node numbers, elevation, demands, and pressures.
- Link tables for all scenarios listing link numbers (with up and downstream nodes indicated), diameters, lengths, roughness, velocities, flows, head losses, and age of water calculations.
- For multi-phase developments, provide model data and summaries for all phases as part of the first phase submission.

Reports containing results that indicate operating parameters outside the acceptable Design Criteria will be automatically rejected without further review and returned to the Owner for correction.

6.2.2.5 Review by the County of Oxford Public Works

County of Oxford Public Works will review the report and advise on the need for any further analysis to be carried out at the Developer's cost. Subsequent submissions with alterations to the original (i.e. changes to street layout, pipe sizes, pumps, elevations, demands, type of development, etc.) will be subject to additional Water/Wastewater System Capacity Assessment/Hydraulic Modelling. Additional fees will apply.

6.2.2.6 Request to Change Settings of Automatic Flushing Devices

The Developer based on partial buildout of a subdivision. This request should be submitted to the **County of Oxford Public Works,** who upon approval will forward it to **Water Operations** for the purpose of making the change to the automatic flushing device settings.

The water distribution system shall have been modelled fully, including for this stage or phase of subdivision buildout, demonstrating the required settings to achieve the necessary water quality.

6.2.3 Design Criteria

6.2.3.1 Design Water Demands

.1 Definitions

Average Day: The total amount of water demanded within one year divided by the number of days within that year.

Maximum Day: The average water demand over the day (midnight to midnight) of highest water demand within one year.

Peak Hour: The highest short-term (1 hour) demand within a system not including fire flow. The peak hour is normally the highest hourly demand on the maximum day.

Domestic: Any non-fire water use.

.2 Domestic Water Demands

Average day domestic residential demand and peaking factors for design shall be as per the MECP Design Guidelines for Drinking-Water Systems.

For Design purposes, the following densities shall be used:

Table 6-2 Design Population Densities

Type of Use	People/ Unit
Low density residential	3 people per unit
Medium density residential	2.4 people per unit
High density residential	1.6 people per unit

.3 Commercial, Institutional and Industrial Water Demands

Non-residential demands and peaking factors can be referenced from the MECP Design Guidelines for Drinking-Water Systems. Institutional and commercial flows should be determined by using historical records, where available. For industrial, when the type of industry is known, discussions should be held with representatives of the industry to determine water requirements. These demands vary greatly with the type of water-using facilities or processes present in the development. For industrial demands the designer shall discuss water requirements with the **County of Oxford Public Works**.

.4 Friction Factors

The following Hazen-Williams "C" values, which include an allowance for age, shall be used for the following materials:

Table 6-3 C-Factor for Materials

Pipe Diameter	C- Factor
PVC/PVCO	150
DI	130
CPP	140
HDPE	140

If the watermain material has not been determined at the time of watermain sizing, a "C" factor of 130 shall be used.

6.2.3.2 Fire Flow Requirements

The Fire Underwriters Survey (FUS) and National Fire Protection Association (NFPA) publishes the most common methods for the calculation of the required fire flow in Ontario. The FUS method is also endorsed by reference in the Ontario Building Code and the Ministry of the Environment, Conservation and Parks (MECP) Design Guidelines for Drinking Water Systems.

Oxford County water systems vary in size, capacity, and complexity. In some cases, systems have not been designed for fire protection.

In systems that are not fire rated, the Developer may require onsite storage for fire protection such as a standpipe or cistern for site plan development to proceed. In this instance the local Fire Department will require input in consultation with Oxford County. All costs associated with this will be the responsibility of the Developer.

In systems designed for fire protection that are unable to achieve the required fire flows for the development, additional onsite storage such as a standpipe or cistern to augment fire flow shall be required for site plan development to proceed. In areas where pressures are below requirements to support fire suppression such as sprinklers, onsite storage and fire pumps to augment these pressures shall be required for site plan development to proceed. All costs associated with these measures will be the responsibility of the Developer. For subdivision developments, booster pump stations may be required to achieve the required fire flows while maintaining optimal pressures. In all instances listed, consultation with Oxford County will be required.

Justification and rationale should be provided on whether the subject site meets or does not meet the required fire flow based on both calculation methods.

.1 Non-Sprinkler Buildings

The applicant must provide:

- NFPA 1 and FUS Calculations (complete with exposure charges) for the Required Fire Flow (RFF) of the proposed building. The Available Fire Flow (AFF) to the subject property, considering hydrant coverage, must be greater than the calculated RFF; or,
- Ontario Building Code (OBC) Method for Fire Flow Calculations

Q = Required water supply in litres

$Q = KVS_{Total}$

.2 Sprinkler Buildings

An applicant must provide:

- an NFPA 13 calculation for the sprinkler demand and hose stream allowance; the calculation must clearly delineate the sprinkler demand from the hose stream allowance; and
- an NFPA 1 and FUS Calculation (complete with flow credits for the sprinkler system and exposure charges) for the Required Fire Flow (RFF) of the proposed building; the calculation must clearly delineate the flow credits for the Sprinkler System and Exposure Adjustment Charge component within the total RFF. As per NFPA1, for a building with an approved fire sprinkler system the fire flow demand (NFPA1) and fire sprinkler demand (NFPA13) shall not be required to be added together.
- The Available Fire Flow (AFF) to a subject property is allocated on a priority basis first for public fire department use for exposure control and secondly for private use for on-site suppression systems. The flow required for Exposure Control must be available from nearby hydrants for public use prior to and independent of any hydrants being made available for private use in accordance with Ontario Building Code requirements; or
- Ontario Building Code (OBC) Method for Fire Flow Calculations

Q = Required water supply in litres

$Q = KVS_{Total}$

In addition to the above, these are the minimum fire flow requirements for development:

- 75 L/s Single Family Dwelling - Detached
- 133 L/s Semi-detached / Townhouse / Row house (based on 2 storeys)
- 159 L/s for Design of new Booster Pump Stations and new pressure zone

Industrial, Commercial, Institutional Development, and multi-residential shall be calculated as required on a case-by-case basis according to requirements of the Ontario Building Code (OBC) and in accordance with the specifications in Oxford County's Engineering Design Guidelines. In the event of a discrepancy between these documents, the more stringent requirements shall apply.

6.2.3.3 Pressure and Flow Requirements

Watermains shall be sized to maintain the greater of:

- Maximum hourly demand at a pressure not less than 275 KPa (40 psi).
- Average day demand at a pressure not less than 310 KPa (45 psi).
- For systems designed for fire flow, maximum day demand plus fire flow at a pressure not less than 140 Kpa (20 psi) at any hydrant lateral or potential fire service connection. Pressure to be taken at the most critical locations. In the urban centers, design must consider the possibility of two simultaneous major fires.
- Maximum residual pressure should not exceed 550 KPa (80 psi) and a minimum residual pressure should not be below 275 kPa (40 psi).

All pressures shall be calculated/determined assuming minimum hydraulic grade line conditions apply. Refer to **Section 6.2.3.7** of this document and confirm with the **County of Oxford Public Works**.

6.2.3.4 Minimum Pipe Sizes/Acceptable Pipe Sizes

The minimum size for watermains shall be 150mm diameter except beyond the last hydrant on cul-de-sacs where smaller diameter pipe shall be used which is designed for domestic and maximum hour demands only. Refer to **Oxford County Standard Drawings**.

In distribution systems where no fire protection exists, pipe sizes of 50mm to 100mm may be acceptable, upon approval from the **County of Oxford Public Works**.

Accepted pipe sizes are 50mm and 100mm (see above), 150mm, 200mm, 250mm, 300mm, 400mm, 450mm, 600mm. For larger pipe sizes (450mm and larger), the designer should consult with the **County of Oxford Public Works**.

HDPE pipe larger than 50mm in diameter is to be used for directional drilling only.

6.2.3.5 Water Quality

Watermains and watermain networks shall be designed so that water shall not remain unused in the watermain for more than three days (72 hours) under average day demand. For phased developments, water quality shall be reviewed under all phasing conditions.

To demonstrate a three-day turnover, the designer shall provide a hydraulic analysis as outlined in **Section 6.2.2** of this document. The hydraulic analysis shall also provide calculations to determine if and where automatic flushing devices are required and determine the appropriate size of the automatic flushing device.

Oxford County and its Service Providers have a primary responsibility to ensure that the minimum chlorine residuals are maintained in the distribution system and therefore reserves the right to require watermain looping and/or automatic flushing devices and/or blow-offs to facilitate the maintenance of the required chlorine residual under the Safe Drinking Water Act.

On private property, where there is a concern that there may be degradation of the water quality (when a three (3) day water turnover cannot be achieved), the County reserves the right to require perimeter isolation (See **Section 6.2.13**). This shall consist of a testable

device (DCVA) on the water service and shall be installed at the property line and at the Owner's expense. In situations where there is a concern with respect to water quality and perimeter isolation is required, designers shall also address water quality on private property. The designer is encouraged to consult with the **County of Oxford Public Works**.

6.2.3.6 Maximum Velocities

The watermain shall be sized so that the maximum velocity in the pipe shall not exceed 1.5 metres per second during maximum hour domestic flow conditions or 4.0 metres per second during fire flow conditions unless otherwise approved by the **County of Oxford Public Works**.

6.2.3.7 Boundary Conditions

For the purposes of hydraulic analysis, the designer shall contact **County of Oxford Public Works** for appropriate boundary conditions. The minimum hydraulic grade lines (HGL) for the various service areas shall be provided.

Hydrant flow testing may be used as a guideline to assist in establishing boundary conditions for new development. These tests must be 3rd party verified from a certified flow testing firm. The use of municipally conducted fire flow testing as a sole reference for design purposes is not permitted

The designer shall assume a reservoir with the appropriate HGL for water supply to the area being designed.

6.2.4 Layout of Watermain

The objective when designing and installing watermain is to have as few fittings or joint deflections as possible while meeting the requirements of the following sections.

6.2.4.1 Watermain Location within Road Allowance

Watermains are to be located in the standard location indicated on the appropriate typical road cross-section in the applicable **Oxford County Standard Drawing**, unless otherwise approved.

On watermain bends, the watermain may deviate from the standard location by up to 1.0m, provided that the deviation is towards, or closer to the street line.

Watermains shall not be located within 3m horizontally of hydro transformers, hydro poles, and light standards, or more as required by applicable Health and Safety Legislation.

Watermains installed in rural areas, easements or trail systems may require ground-mounted signage to indicate the location of a watermain. Designer shall coordinate with Oxford County Public Works to determine if signage is required on a project-by-project basis.

6.2.4.2 Watermain Pipe Depth

On curb and gutter roads, the designer should have an objective depth 1.8m when designing watermain. However, variations to depths of up to 2.2m will be permitted to

address variations in topography and to avoid conflicts with other utilities. Reasoning should be provided for any areas where depth is in excess of 2.2m and such deviations shall be approved in accordance with **Section 6.1**.

On open ditch and rural roads, the minimum depth of watermains shall be the greatest of:

- 2.1m below the road centerline;
- 1.8m below the bottom of the ditch; or
- 1.8m below grade if there is no ditch

On rural roads within the County, the designer should also review the vertical alignment of the road so that, where possible, future road improvements will not result in an unacceptable watermain depth, as defined in this specification.

.1 Pipe Insulation

Thermal Insulation requirements shall be as per **Section 6.3** and **County Standard Drawings**.

Where watermain is required to be laid with less than 1.8m of cover thermal insulation shall be placed to prevent freezing. Material used to insulate mains shall have a minimum compressive strength of 690 kPa. All thermal insulation joints shall be tightly butted together and secured by tape or other means to prevent movement during backfill. Manufacturer specifications shall be provided prior to installation.

Where 600mm diameter or larger storm sewers or culverts cross over or under a watermain, insulation is required unless there is a minimum 1.8m vertical clear separation between the sewer and watermain.

Watermains and services located 500mm or less horizontally from a maintenance hole or catch basin shall also be insulated for a distance of 1m beyond each edge of the structure.

.2 Pre-Insulated Pipe

Pre-insulated watermain pipe may be used as an alternative to the slab-type insulation. This option should be presented in the initial design phase prior to construction for the approval of the **County of Oxford Public Works**. Refer to **Section 6.3** for material requirements.

6.2.4.3 Pipe Offsets/Bends/Deflection

Offsets must be made according to **Oxford County Standard Drawings**. Use of offsets must be indicated on the approved plans or in the case of unforeseen obstructions found after approval by the watermain design, written approval of the designer must be obtained.

If using joint deflection, full lengths of pipe must be used. The maximum joint deflection for various pipe materials shall be half of the pipe manufacturer's specifications. Where it is not possible to lay pipe to the required radius utilizing joint deflection, manufactured pipe bends must be used.

Axial deflection (i.e. Bending of the pipe barrels) is prohibited for PVC pipe. Any change in the direction of the watermain in excess of the pipe joint deflection tolerance shall be

made using an appropriate fitting. Thrust or joint restraint shall be provided as in **Section 6.2.4.7**.

6.2.4.4 Casings and Spacers

Where casings are required for watermain crossing bridges, roadways, railways, rivers, streams, or creeks, casing specifications shall be as set out by the governing authority.

In general, casings shall be steel plate ASTM A139 Grade B welded joint. Casing materials other than steel must be approved by the **County of Oxford Public Works** prior to installation.

Steel casings shall use the following inside diameters and wall thicknesses as listed below. The designer shall ensure that the minimum requirements noted will suit the project-specific parameters.

Table 6-4 Steel Casing I.D. and Wall Thickness

Nominal Pipe Size (mm)	Minimum Casing ID (mm) (I.D.)	Minimum Casing Wall Thickness (mm)
100	315	6.35
150	356	7.94
200	454	7.94
250	546	7.94
300	584	9.53
350	686	9.53
400	762	12.70
450	787	12.70
500	838	12.70
600	991	12.70

Casings shall be filled with clean sand. The use of Cellular Grout is not permitted.

Where watermain is located between proposed residential dwellings, it shall require fusible watermain pipe placed inside a casing. The casing shall extend the entire length of the property with valves placed on the watermain at each end of the casing for isolation purposes. Valves should be located a minimum of 3.0m from each end of the end of the casing. Where casings containing watermain are located within easements between

residences, the casing shall be offset a minimum of 1.0m from the property line to avoid fence posts.

If the watermain material used inside the casing is PVC or Ductile Iron bell and spigot, all pipe bell joints inside the casing shall be restrained using approved restraints. All restraints shall be wrapped with a Petrolatum Coating System. Mechanical joints inside the casing are not permitted. Both ends of the casing shall be covered using an approved wrap-around or pull-on rubber end seal to prevent backfill from entering the casing.

When watermain is placed inside a casing, the watermain shall be supported by spacers using the centered configuration. The size, location, and number of spacers will be as per the manufacturer's recommendation.

6.2.4.5 Termination of Watermains

Watermains shall be terminated opposite street lines or property lines. All watermain terminations to have a 50mm blowoff with a control valve to surface. The 50mm watermain stop shall be tapped into the watermain no further than 0.5m from the cap or plug to release trapped air/pressure from the watermain prior to removal of the cap or plug.

6.2.4.6 Blow-Offs / Automatic Flushing Devices/Addressing Water Quality

The Design of the watermain shall be undertaken to ensure adequate water quality requirements are met. Refer to **Section 6.2.2** for requirements relating to Hydraulic Modelling.

Dead end watermains which are part of an interim phase of a subdivision build-out shall meet water quality requirements by:

- Demonstrating adequate turnover by use; or
- Installing an automatic flushing device.

Where an automatic flushing device is used to maintain water quality, a water meter and pit shall be installed to measure the volume of water discharge. The Owner will be charged for the water used. The designer shall provide calculations which indicate the volume of water to be discharged by the automatic flushing device and the sizing of the automatic flushing device as well as indicate the timer settings to be used. This information shall be clearly indicated on the drawing. The Owner's Contractor shall initially set up the automatic flushing device to the indicated settings. (Prior to Conditional Approval). Subsequent adjustments to the automatic flushing device when the system is operated by the County or its Service Provider shall be made by Water Operations, based on approval of information submitted by the designer.

Where an automatic flushing device is not required to maintain water quality a standard 50mm blow-off as per **Oxford Standard Drawings** will be required to allow flushing to take place.

On a cul-de-sac or similar streets, blow-offs, when required, shall terminate in the boulevard. Blow-offs must be operable without the necessity of excavating. The Developer shall provide calculations during the design phase to **County of Oxford Public Works**, which indicate the volume of water to be discharged by the automatic flushing device and the sizing of the automatic flushing device as well as indicate the timer settings to be used.

Where automatic flushing devices are intended to be used, the following limitations shall apply:

- Automatic flushing devices may not be used to discharge directly to a ditch or to the natural environment as municipal water contains chlorine.
- Devices shall be discharged to a storm sewer which in turn discharges to a storm water management pond where the remaining chlorine can be dissipated before being released or discharged to the natural environment. In any situation where there are large volumes of water potentially being discharged from an automatic flushing device, or where the receiving storm system is a sensitive system, further consultation with the County of Oxford Public Works must take place to confirm if the use of an automatic flushing device is appropriate in the situation.
- Any water discharged from an automatic flushing device must have a free chlorine residual of 0.0 mg/L (i.e. no detectable level of chlorine). Acceptable means of disposal is by discharge into a storm sewer or open environment (drainage ditch). All discharge shall be in accordance with the Sewer Use By-law which governs the discharge to County owned Storm Sewers. Storm sewer discharge limits specified in Area Municipalities' storm sewer Bylaw must also be adhered to. Use of dichlorination basket with sodium thiosulphate pucks is an acceptable solution for dichlorination.
- Temporary connections for automatic flushing devices (150mm) may be made directly to a storm maintenance hole or to a storm catch basin. If into a maintenance hole, the drainage pipe must outlet just above the benching, at the bottom of the structure. To remove the flushing device, the drainage pipe to the storm sewer should be fully grouted and properly bricked and mortared at the catch basin, maintenance hole or storm sewer.
- The last water service on a dead end watermain which is a permanent dead end or a temporary dead end as part of an interim phase or stage of subdivision; shall be located as close as possible to the Termination of Watermain (within 0.5m of the end or tapped into the end cap) regardless of whether there is a manual blow-off or automatic flushing device installed.

6.2.4.7 Thrust Restraint

All watermain repairs and installations shall require mechanical restraints as listed below. A mechanical thrust restraint is required on all fittings, bends, tees, hydrant tees, valves, hydrants, crosses, reducers and plugged or capped dead-ends. Thrust restraint shall be in accordance with **Oxford County Standard Drawings** and meet the material requirements in **Section 6.3**.

Mechanical thrust restraint is required in areas of Engineered fill. In areas of Engineered fill an additional restrained length of pipe shall apply to the requirements listed below.

Prior to construction all thrust restraint design shall be submitted to the **County of Oxford Public Works** for review. The results should be shown on the contract drawings along with the type of restraint to be used.

The following are minimum requirements with respect to thrust restraint:

- All fittings, bends, tees, hydrant tees, valves, crosses, reducers 100mm up to and including 250mm shall be restrained to the pipe along with a minimum of 3 full pipe length joints (18m) measured from each side of appurtenance.

- All 300mm up to and including 400mm fittings, bends, tees, hydrant tees, valves, crosses, reducers shall be restrained to the pipe along with a minimum of 4 full pipe length joints (24m) measured from each side of appurtenance.
- Plugged or capped dead ends 100mm up to and including 250mm shall be restrained to the pipe along with a minimum of 3 full pipe length joints (18m) measured from the end of pipe.
- Plugged or capped dead ends 300mm up to 400mm shall be restrained to the pipe along with a minimum of 4 full pipe length joints (24m) measured from the end of pipe.
- All 400mm plugged or capped dead ends shall be restrained to the pipe along with a minimum of 5 full pipe length joints (30m) measured from the end of pipe.

In addition to manufacturer's specifications and where possible full lengths of pipe shall be placed each way from all fittings to the lengths listed above. Any joints encountered in the restrained lengths listed above from fittings, bends, tees, hydrant tees, valves, hydrants, crosses, reducers and plugged or capped ends shall be restrained.

Where fittings, bends, tees, hydrant tees, valves, crosses, or reducers are connected or adjacent to existing infrastructure, joints on the existing system shall also be restrained to the lengths listed above.

Pipe larger than 400mm shall be restrained as per the pipe manufacturer's recommendations, but shall also include the requirements above at a minimum. Shop Drawings submitted by the pipe manufacturer shall include:

- Letter of Compliance
- Pipe design calculations
- Summary of fittings and method of restraint
- Installation Guide
- Tabulated Layout Drawings indicating restrained lengths for fittings and valves stamped and signed by a Professional Engineer licensed to practice Engineering in the Province of Ontario

On vertical offsets due to conflicting utilities such as sewers, the pipe shall be backfilled before the watermain is pressurized. **County of Oxford Public Works** reserves the right to specify the use of mechanical restraint and/or concrete thrust blocks.

6.2.4.8 Watermain and Other Utilities Separation

Designers should refer to Ontario Ministry of the Environment, Conservation, and Parks (MECP) Guidelines for the Design of Water Distribution Systems (latest revision) and the Ontario Plumbing Code (latest revision) regarding the location of watermains and water services relative to sewers and to the Public Utilities Act of Ontario regarding the location of watermains relative to other utilities.

A Subsurface Utility Engineering (SUE) investigation shall be completed and paid for by the Developer for the complete project area including test pits at critical crossing locations or as requested by the **County of Oxford Public Works**. SUE investigations shall be provided based on **ASCE 38-02** Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.

Encroachment of utilities, structures, sewers and/or any utility appurtenances, which may impact the watermain, the integrity of its bedding, and/or structural capabilities, shall have design considerations applied to adequately protect the watermain and the utilities.

It is preferable that utility crossings be at a 90-degree angle to reduce the supporting lengths required during construction.

.1 Parallel Installations of Watermains and Sewers

Sewers and watermains located parallel to each other should be constructed in separate trenches maintaining the maximum practical horizontal separation. Separation of watermains and sewers shall be in accordance with **MECP F-6-1** Procedure to Govern Separation of Sewers and Watermains.

.2 Crossings of Watermains and Sewers

Separation of crossing watermains and sewers shall be in accordance with **MECP F-6-1** Procedure to Govern Separation of Sewers and Watermains.

If the watermain is less than 1.8 metres below grade at the crossing, the watermain shall be insulated in accordance with **Oxford Standard Drawings**.

6.2.4.9 Looping of Watermain/Supply Redundancy

Water distribution systems shall be designed to avoid dead end pipes wherever practical. Dead end pipes shall meet the requirements in **Section 6.2.4.6**.

Watermains on dead end streets where the watermain length would exceed 150m shall be looped, where possible. Water distribution systems shall be designed so that no more than 40 units with individual water services and meters shall be serviced without looped connections to existing or proposed streets. If the looped watermain is connected to a dead-end watermain, a line valve must be installed on the dead-end watermain at the connection point to permit isolation of supplies.

On new streets where lots are serviced without looping, the watermain design shall provide a minimum fire flow based on the type of buildings (i.e. residential, industrial, commercial, or institutional).

Where looping or supply redundancy is proposed to be achieved from two watermains/supply sources, the hydraulic modelling must include scenarios whereby each water supply source would be a single source of supply, and the watermains shall be sized accordingly.

For requirements for looping for private property, see **Section 6.2.7.5**.

6.2.5 Line Valves

6.2.5.1 Location and Spacing of Watermain Valves

.1 Residential Developments

For watermains servicing residential developments, valves shall be located so that any section of watermain serving up to a maximum of 60 residential water services can be isolated by operating not more than four valves. The phasing of

development should be considered, and valving should be logical (i.e. at intersections). In residential areas, valves shall be spaced no more than 250m apart.

.2 High Density Residential, Commercial and Industrial Developments

For watermains servicing high density residential, industrial, and commercial areas, valves shall be located to be no more than 150m apart.

.3 Transmission and Sub-Transmission Watermains

Watermains larger than 400mm should have valves at 400m intervals and at all road crossings. Tracer wire test stations for locating purposes shall be installed a maximum 500m after each valve. Tracer wire test stations to be located a maximum of 500m apart.

The **County of Oxford Public Works** may permit larger spacings on a project-specific basis.

Valves on 400mm diameter watermains do not require chambers unless valves are placed in locations where check valves with bypasses are installed, or butterfly valves are used. Valves on watermains larger than 400mm require chambers complete with bypass piping, and chambers shall be sized accordingly. Valve chambers shall have a 300mm deep sump pit for drainage purposes.

.4 Intersections of Watermains

Valves shall be located at all intersections. At cross intersections a minimum of 3 valves shall be installed and a minimum of 2 valves shall be installed at tee intersections. The valve locations shall be on the extension of the street line. If necessary, adjustments in the field can be made to avoid curbs or other obstructions that may interfere with valve placement.

At intersections where smaller watermains connect to larger transmission or sub-transmission watermains, each smaller watermain shall be valved with an isolation valve whereas the larger watermain shall be valved as required above.

.5 Valves for Looped Services/ Private Watermains

Valves shall be installed on looped services or private watermains to isolate buildings or groups of buildings so that no more than 80 individual water services or apartment complex containing 300 dwelling units, or more are on any one valved section. The Developer shall install a valve on the street watermain between connections to a looped private watermain if there is not an existing valve, at no expense to the County.

.6 Crossings of Watermain, Rivers, Railways, Controlled Access Highways, Bridges

Watermains crossing rivers, railways, controlled access highways and between residential dwellings shall be valved on each side of the crossing.

.7 Hydrant Laterals

Valves shall be located on all hydrant laterals according to **Oxford County Standard Drawings**.

.8 Location of Valves at Intersections with Roundabouts

Water valves may be placed within the raised roundabout island where possible. However, if placement of the valves creates a potential conflict with the curb & gutter of the island, then the valves are to be placed in the boulevard clear of the curb and gutter of the approaching streets.

.9 Valve Boxes and Extensions Rods Required

All valves shall be provided with valve boxes. Valve extension rods shall be as detailed in the **Oxford County Standard Drawings**.

6.2.5.2 Valve Locations - Phasing of Subdivision Developments

Valves shall be located to meet the requirements of **Section 6.2.5.1**. The location and quantity of valves shall be taken into consideration to reduce shutdowns and inconvenience to customers during the construction of additional phases. Valves may be installed on a temporary basis and relocated to accomplish this.

6.2.5.3 Sizing of Valves

Valves shall be sized to be the same size as the watermain on which the valve is installed. Downsizing valves to one size smaller than the main is not permitted.

6.2.6 Fire Hydrants and Fire Department Connections

All fire hydrants situated within the road allowance are the sole property of Oxford County and shall be operated only by Oxford County and its Service Providers. The operation, connection and use of hydrants are regulated under By-Law No. 6544-2023.

Fire hydrants and valves shall be installed in accordance with **Oxford County Standard Drawings**.

For more information on required fire flows refer to **Section 6.2.3.2**.

6.2.6.1 Fire Hydrants and Fire Department Connections

All new public hydrants shall be flow tested and colour coded in accordance with the requirements of NFPA 61. Colour coding is for the purpose of indicating available fire flows at 20psi residual pressure. Colour coding shall be by means of placing reflective markers on each of the two 65mm hydrant outlets. In new subdivisions and site plans, the designer shall create a table on the drawings for fire hydrants and their colour coding marker.

Fire hydrant extensions as required for deeper bury are to be obtained from the fire hydrant manufacturers. A maximum of one 300mm extension is permitted per hydrant.

Hydrants shall be plugged when installed in areas of high groundwater. Plugs to be installed by manufacturer. Hydrants with plugged drains must be clearly marked and pumped dry after each use.

Upon completion of each phase of development, the County of Oxford requires that all fire hydrants be flow tested. Records of field test data must be submitted prior to commencement of the maintenance period. Testing will be completed in the presence of a licensed operator from the County or the County of Oxford's service provider. It is

understood that as phasing of developments progress, hydrant flow rates may change (i.e. dead ends to looped connections). These locations shall be re-evaluated in the presence of the County or its Service Provider.

It is the responsibility of the Contractor or Developer to confirm hydrant flow rates of all hydrants in the development prior to final acceptance. All costs associated with testing will be the responsibility of the Contractor or Developer.

Table 6-5 Hydrant Class Specifications

Class	Rated Capacity	Colour (NFPA 61)
Class AA	5700 L/min or greater	Light Blue
Class A	3800-5699 L/min	Green
Class B	1900-3799 L/min	Orange
Class C	1900 L/min or less	Red

6.2.6.2 Location/Spacing of Hydrants on Public Streets

The maximum allowable hydrant spacing is 180m in single family residential areas and 90m in commercial, industrial, institutional, and multi-family residential areas.

A hydrant shall be located at all intersections, where possible. Hydrants shall be installed at a minimum of 1.5m from the edge of driveways in residential areas, and 2.5m away from driveways in industrial, commercial, and institutional areas. Minimum clearance from sidewalks to hydrants is 0.6m. Hydrants located in residential areas shall be located on a common lot line.

Hydrants shall be placed in the road boulevard in accordance with the applicable typical cross-section provided in the applicable **Oxford County Standard Drawing**. Hydrants shall be a minimum of 1.5m away from other underground utilities.

Where possible, hydrants should be located at the high point of the watermain. The County reserves the right to request additional hydrants if necessary.

The location of hydrants on private property is subject to the requirements and approval of the **Area Municipality Fire Department** in accordance with the Ontario Building Code.

6.2.6.3 Location of Hydrants to Sprinkler or Standpipe Systems

For use with sprinkler or standpipe systems the hydrant must be located not more than 45m from the Fire Department connection.

6.2.6.4 Hydrants on Dead-end Streets

Hydrants shall be located on dead end streets in accordance with **Oxford Standard Drawings**.

6.2.6.5 Addition or Relocation of Hydrants

Regardless of hydrant location shown on accepted subdivision plans, additional hydrants may be required, or existing hydrants may have to be relocated due to circumstances unknown at the time of plan acceptance such as the position of a structure, Fire Department connection, driveway or landscaping feature.

Such an addition and/or relocation shall be requested when the County approves the service plan and must be done at the expense of the Developer or, if the subdivision has been assumed, at the expense of the Owner of the property for which the additional or relocated hydrant is required.

6.2.6.6 Hydrants on Private Property

Hydrants shall be located on private property where required to meet spacing requirements in accordance with the Ontario Building Code, subject to the approval of the **County of Oxford Public Works**.

Fire hydrants shall be installed such that they are readily accessible to the fire department. For average conditions, fire hydrants shall be placed at least 12.2m from the buildings being protected, in accordance with NFPA 24.

Fire hydrants shall be located at a minimum distance of 3.0m from a fence or other such obstruction.

Fire hydrants shall not be placed near retaining walls where there is danger of frost through the wall, in accordance with NFPA 24.

Where municipal water is not available, and an on-site water supply is utilized for firefighting purposes, a fire hydrant shall not be installed, but instead a standpipe connection shall be provided.

The cost for the supply and installation of hydrants located on private property must be paid by the property Owner.

All private hydrants should be painted red and are the responsibility of the Owner.

6.2.6.7 Hydrants for Fire Department Connections

Follow the requirements set out in the Ontario Building Code.

6.2.6.8 Protection of Hydrants

If the placement of a hydrant on public or private property is such that it will be susceptible to damage by vehicular traffic, bollards are to be installed, at the Owner's cost, in sufficient number to protect the hydrant. Minimum spacing between any bollard and a hydrant shall be 1.0 metre, and bollards shall be a minimum of 1.0 metre in height. Bollards shall be painted hydrant yellow. Bollard construction to be steel with concrete fill.

6.2.6.9 Illegal Connection and Operation of Hydrants

The illegal connection and/or operation of any municipal fire hydrant will result in fines as set out in the **Oxford County By-Laws**.

6.2.7 Water Services, Fire Services and Private Watermains

For the design and materials requirements for all water service pipe and fire service mains on private property, the Ontario Building Code shall apply. It should be noted that water quality requirements are not addressed in the Ontario Building Code. Where there is a concern that there may be a degradation of water quality in the private servicing that has the potential to enter the municipal water supply system, the **County of Oxford Public Works** reserves the right to require premises isolation. Premises isolation shall consist of appropriate backflow prevention measures (Refer to **Section 6.2.13**) and shall be installed at the property line at the Owner's expense. The Developer must adhere to By-Law No. 6544-2023 for Cross Connection Control and Backflow Prevention.

The Owner will be responsible for water service sizing. The **County of Oxford Public Works** shall be consulted for available pressures and flows at the watermain under design conditions given in **Section 6.2.3.3**. If the results of hydrant flow tests are to be used, **County of Oxford Public Works** shall be consulted for necessary adjustments since flow tests are not usually done at design conditions.

On private property, adequate water required for fire protection shall be determined in accordance with the Ontario Building Code. Fire flow and hydraulic calculations shall be reviewed by the **County of Oxford Public Works**.

It is a requirement to provide fire flow information (i.e. hydrants on private property and fire sprinkler requirements) in conjunction with site plan submissions for water servicing to determine the correct water service sizing.

Both the main stop and curb stop shall be shown on site plan submissions and service record sheets.

6.2.7.1 Service Size for Single Family Residential Homes

The minimum service size for single family residential homes shall be 25mm. It is recommended that the Owner adjust the water service sizing based on flow requirements for water services to single family homes which are estate lots, larger homes, have deep setbacks, are at the ends of cul-de-sacs, are in areas of lower pressure, or where automatic lawn sprinkler systems or fire sprinkler systems are to be used.

As required by the Ontario Building Code on private property, the minimum size for fire service mains and water service pipes, combined with fire service mains, shall be 150mm, in accordance with NFPA 24. For mains that do not supply hydrants, sizes smaller than 150mm may be used, subject to:

- The main supplies only automatic sprinkler systems, open sprinkler systems, water spray fixed systems, foam systems or Class II standpipe systems.
- Hydraulic calculations show that the main will supply the total demand at the appropriate pressure. Systems that are not hydraulically calculated shall have a main at least as large as the riser.

.1 <u>Accepted Water Services Sizes</u>

Acceptable water service sizes are 25mm, 32mm, 38mm, 50mm, 100mm, 150mm, 200mm, 250mm, and 300mm diameter.

6.2.7.2 Individual Booster Pumps

In some areas of the County, pressures within the existing system may be less than the minimum pressures under **Section 6.2.3.3** or due to the height of building**.** In these cases, the use of an internal booster pump and/or pressure tanks may be required, see section 6.5.1 for residential pump model recommendations. The sizing, design and installation of an individual booster pump would be the responsibility of the Owner. Any private booster pump would be the responsibility of the Owner upon completion. Information on system pressures at points of supply should be obtained from the **County of Oxford Public Works**.

6.2.7.3 Individual Pressure Reducing Valves

In some areas of the County, pressures within the existing system may be more than the maximum pressures under **Section 6.2.3.3**. In these cases, the use of an internal pressure reducing valve (PRV) may be required. This would be the responsibility of the Owner upon completion. Information on system pressures at points of supply should be obtained from the **County of Oxford Public Works.**

6.2.7.4 General Requirements - Water Services

Water service shall mean the pipe, fittings and shut off valve that convey potable water from a connection on a watermain or private watermain to the meter location.

Water services larger than 25 mm diameter must be hydraulically modelled for sizing based on required demand as supplied by the Owner, Developer, or Contractor.

.1 Water Services to Residential Dwelling Units (Detached, Semi-detached, Townhouses, Row-housing)

Each dwelling unit in a detached, semi-detached, townhouse or row house block, must be serviced with a separate water service connected to a watermain or private watermain with shutoffs placed on the property line.

- Water Services must front the dwelling unit including on private sites connecting to a private watermain
- No trees, shrubs, landscaping, garbage containers, compost devices, or other obstructions shall be located on top of or near the water services
- The curb stop shall remain clearly visible and unobstructed.
- The development agreement and condo declaration shall specify: All defects to the private watermain, or beyond the curbstop, shall be repaired by the Owner of the premises. Should the County become aware of any such defect, and upon written notification to the Owner, the said defect is not repaired, within seven days of the date of the notification, then the County may turn off the water supply to the Premises. If the County is ordered under statutory authority to restore the water supply, then the County may repair the defective service extension, private main and meter pit and charge the cost to the Owner and collect such cost according to law, and until paid, such cost shall remain a lien on such Premises, and may also be collected in the like manner as taxes. The Owner shall be held responsible for the cost of restoration.

.2 Water Services to Commercial/Industrial Malls

Each structure in a commercial or industrial mall shall have one water service connected to a watermain or private watermain. Units in such a mall may have an individual water service connected to a watermain or private watermain outside the unit.

.3 Water Services to Swimming Pools/ Lawn Sprinkler Systems

Swimming pool facilities and lawn sprinkler systems must be serviced by connecting to the metered side of a water service that is within a heated structure.

Connections to lawn sprinkler systems are to have backflow prevention devices in accordance with CAN CSA B64 and are subject to the approval of **the County of Oxford Public Works.** Direct Pool Makeup Water Connections are to have backflow prevention devices in accordance with CAN CSA B64 and are subject to the approval of **the County of Oxford Public Works.**

All fixtures are required adhere to By-Law No. 6544-2023 for Cross Connection Control and Backflow Prevention.

.4 Water Services to Other Structures

Unless otherwise approved in writing by **the County of Oxford Public Works**, all structures not covered in the sections above, including commercial, industrial and institutional facilities, shall have one water service connected to a watermain or private watermain.

.5 Water Services to Ancillary Buildings:

Where a secondary dwelling unit is added in an ancillary building on the same property and where the municipal water service is adequately sized to provide water servicing to the single-family home and the ancillary unit, the water servicing to the ancillary secondary dwelling unit may be branching from the water line as above downstream of the water meter, complete with a shut of valve.

Where a secondary dwelling unit is added in an ancillary building on the same property and where the municipal water service is not adequately sized to provide water servicing or the single-family home and the ancillary unit, or where the water service material is lead, a new water service from the municipal water main to the ancillary unit will be required, at the Developer's cost. The new water service shall have a shut off valve and meter pit installed, located 300mm from the property line on the City right-of-way.

.6 County to Designate Watermain to Provide Service

When there are two watermains on a road allowance, the water service shall be laid from the structure to the watermain which, in the opinion of the **County of Oxford Public Works**, provides adequate flow and/or pressure.

Water services shall not be tapped off transmission watermains 600mm and larger where an alternate source is available.

.7 Water Services to Residential Apartment Buildings (5 dwelling units or more)

Apartment buildings (5 dwelling units or more) shall have one metered water service connected to a watermain or private watermain.

.8 Water Services to Residential Dwelling Units in Townhouse/Condominium Blocks

Each dwelling unit in a private block must be serviced with a separate water service connected to a watermain or private watermain. Water services must front the dwelling unit they service unless otherwise approved in writing by the **County of Oxford Public Works** (refer to **Section 6.2.7.4.2**.

Where it is proposed that servicing of individual dwelling units is not in accordance with the standard above, bulk metering of the site at the point(s) where the water service enters the property will be required. Individual metering of dwelling units by Oxford County will not be provided in this circumstance.

.9 Water Services to Multi-Family Residential Buildings

This section will describe the requirements for individually servicing/metering new or converted multi-family (4 residential units or less) residential buildings. This may include but is not limited to the following configurations:

1. An existing single-family home that has been converted to a multi-family residence such as a duplex, triplex or fourplex. The newly created units may have several different layouts such as side by side, upstairs/downstairs units, front/back, etc.
   - In this case, the building must be supplied by a water service pipe from the municipal watermain in the street to the property line that is adequately sized for the intended use of the building. The minimum water service size is 25mm for the building.
   - Oxford County allows one water service pipe from the municipal watermain to the property line with a shut off valve located on the property line of the County right-of-way. Once the water service pipe crosses the property line it can be branched off into 2-4 separate water services, one for each new customer. A meter chamber will have to be installed which will house a single Oxford County water meter. Individual metering of dwelling units by Oxford County will not be provided in this circumstance. Each branch shall have a shut-off valve located after the meter chamber on private property. From this point the water service pipes will enter the building and be connected to the building plumbing system.
2. Newly constructed building purpose built as a multi- family residence (duplex, triplex, or fourplex).
   - As described above, a single meter will be monitored by Oxford County, individual metering will not be provided in this circumstance.
3. Other multi-family (that may or not be stacked) residential condominium or rental units that cannot be serviced as described in the previous sections (**Sections 6.2.7.4.1 to 6.2.7.4.7**).
   - As described above, a single meter will be monitored by Oxford County, individual metering will not be provided in this circumstance. Regardless of the configuration of the building, it is important to understand that each metered water service consists of a water service pipe, an isolation valve and a water meter. The meter chamber is to be located in the front of the residential units being serviced and it must be accessible for maintenance.

.10 Decommissioning of Existing Water Services

Disconnection of existing water services of any size shall include removal of the valve box and valve rod and capping of any pipe to be abandoned at the watermain unless an alternate location is approved by **The County of Oxford Public Works** or its Service Providers. Where the watermain that the service was connected to

remains in service, a 20mm main stop shall be added at the connection location for pressure relief. The cost of this will be the responsibility of the Developer / Owner.

6.2.7.5 Looped Water Servicing Requirements

A looped water service connected to a public or private watermain or watermains must be installed for the following scenarios:

- When one water service will not supply the required flow for domestic use and fire protection.
- For an apartment complex containing one or more structures and more than 300 dwelling units.
- For a townhouse, condominium or similar complex having more than 80 units with individual water services and meters.
- For buildings over 84m in height, two water service connections will be required in accordance with the OBC. These two water services shall be able to be isolated from each other by a valve in the municipal water distribution system.

The looped water servicing must be installed to service the private development from two sources. If the looped watermain is connected to one public watermain, an isolating splitter valve must be installed in the public watermain to permit isolation of supplies, at no cost to the County.

Where a private water system is connected to the municipal water system by two or more connections, the municipal water system shall be protected by perimeter isolation of the private system. This shall mean the installation of a testable device at the property line in accordance with **Section 6.2.13**. These devices shall be owned and maintained by the Owner.

6.2.7.6 Material Type

Material type shall be an approved material type as indicated in **Section 6.3** to the property line. On private property, material for water service pipes and fire service mains shall comply with Part 7 of the Ontario Building Code.

6.2.7.7 Location and Layout of Water Services

Water services connected to a private watermain are subject to the same requirements as water services connected to a public watermain.

.1 Single Family and Semi-Detached Lots:

The standard residential water service will be located as per **Figure 4.01** and **4.02** in the **Oxford County Standard Drawings**.

Please see **Section 6.3** for more details.

.2 Street Townhouse Blocks.

Figure 4.01 in the **Oxford County Standard Drawings** shall apply where space permits. Approval for deviations will be given on a case-by-case basis.

The water service pipe must be installed at right angles to the watermain and in a straight line from the watermain to the water meter.

.3 Water Service Pipe Depth

Water services shall have no less than 1.8m and no more than 1.9m of cover from final surface grade. Variations from this cover may be made only if approved by the **County of Oxford Public Works**. If a minimum cover of 1.8m cannot be achieved due to underground obstructions or changes in surface grade, thermal insulation must be used. Refer to **Section 6.3** and **Oxford County Standard Drawings**. No water service shall have a ground cover less than 1.0m deep from ground surface to the top of pipe.

The Owner must ensure that water services and private watermains are located so that “berm” or “mound” type landscaping will not cause excessive cover over water services.

In areas of reconstruction new watermain and services shall be installed at a minimum depth of 1.8m to the Property Line. It may be necessary to transition from the new depth to the existing depth beyond the property line, which shall be taken into consideration during design.

.4 Crossings of Existing Utilities

Water services crossing sewers or utility obstructions require a minimum of 500mm of clearance under and a minimum of 150mm over an obstruction. Insulation may be required at crossings as noted in **Section 6.2.4.2.1**.

Water services passing under Etobicoke style storm sewers wrapped in clear stone and geotextile shall require a casing or carrier pipe minimum 0.5m below storm sewer outside of the geotextile wrapping. Conduit will be centered under the storm sewer and extend a minimum of 1.2m beyond the extents of the sewer. Conduit shall be minimum 50mm ID. Length will vary depending on size of storm sewer. Material shall be HDPE or PVC. Ends of pipe shall be sealed to prevent backfill from entering the casing / conduit. Conduits placed under storm sewer shall be indicated on plan / profile drawings and as-built drawings.

6.2.7.8 Approved Deviations in Location of Water Services

Deviations from the requirements of the previous section may be approved by the **County of Oxford Public Works** for the following conditions:

.1 Cul-de-sacs, Street Curves and Bends

On cul-de-sac streets and on street curves and bends the water service stubs may be installed at angles other than 90 degrees to the watermain and will not necessarily go through the midpoint of the lot frontage. The water service must be in a straight line from the watermain to the meter.

.2 Water Service Cannot be Located in the Typical Location

Where the water service cannot be located in line with the center of the lot, the water service stub may be installed at any point on the front of the lot. It must still be installed at a right angle to the watermain and in a straight line from the

watermain to the meter and must maintain the appropriate separation distances from other utilities.

.3 Water Service Cannot Extend in a Straight Line from the Watermain to the Water Meter

Under the scenarios provided above, if the water service stub has been installed on the lot frontage but the water service cannot be in a straight line from watermain to water meter then the water service extension may be installed in a straight line from the curb stop to the meter provided the meter is inside the front wall of the structure.

.4 Water Meter to be Located at the Side of a Structure

Where the water service entrance must be located at the side of a structure, the water service stub must be located on the front of the lot such that the water service extension can be installed in a straight line from the watermain to a point outside the structure adjacent to the meter. Such a water service shall be a minimum of 1.5m from the structure and centered within a minimum 3.0m wide clear space.

.5 Cold Cellar on Front of Building

Where there exists a cold cellar on the front of the building and the water service stub has been installed in the standard location on the lot frontage, the water service extension may be installed under the porch or cold cellar in a straight line from the watermain to inside the first heated wall. A maximum distance of 2 metres of water service pipe may be located under the porch or cold cellar floor slab. The water service shall be continuous between the curb stop and the water meter, with no coupling permitted. The water meter shall not be located within the cold cellar as this is subject to freezing.

6.2.7.9 Nonconforming Installation of Water Service or Private Watermain

.1 Water Service does not Conform with Location Requirements

If the water service stub is to be extended and it is found that the water service will not conform to the above location requirements in **Sections 6.2.7.7 and 6.2.7.8**, the water service stub shall be disconnected from the watermain and a new stub installed which will conform to the requirements, at no cost to the County.

.2 Water Service or Private Watermain not in Accordance with Specifications or with Approved Service Drawing

If a water service stub, a water service or a private watermain is installed that is not in accordance with these design guidelines or with the service drawing approved by the County, such installation will be required to be removed and relocated to conform with the design guidelines or approved drawings.

.3 Existing Water Service to Relocated, Rebuilt or Replaced Structures

If an existing water service cannot conform to the above location requirements, or is of lead or other unsuitable material, a new water service must be installed which will conform to the requirements of this Section. If a Demolition Permit was issued for an existing structure on the lot, then the existing water service must be abandoned at the watermain and a new water service installed to service the structure.

.4 Relocation to be at Owner or Contractor's Expense

All relocation work required in the above Sections shall be at the expense of the Owner or Contractor. The Owner will be responsible, upon approval of the demolition permit, to cut and cap the existing water service(s) at the watermain to Oxford County standards and at no cost to Oxford County.

6.2.7.10 Fire Service Design

The determination of fire service requirements and the sizing of supply piping shall be the responsibility of the Owner. If a domestic water service is combined with a fire supply service, the Owner is responsible to ensure that the supply pipe is large enough to carry the combined demand. Design and installation of sprinkler and standpipe systems and their supply services shall conform to the requirements of the Ontario Building Code and the Fire Code. The design of the Fire Services must be approved by the County.

The Owner should obtain flow and pressure information in surrounding areas of the water distribution system from the **County of Oxford Public Works**. If the flows and pressures required are in excess of the minimum design standards given in **Section 6.2.3.3** and in excess of the actual capacity of the system the Owner shall install booster pumps and/or storage to satisfy the required demand.

Where there is a concern that there may be a degradation of water quality in the private servicing that has the potential to enter the municipal water supply system, **Oxford County Public Works** reserves the right to require premise isolation. Premise isolation shall consist of appropriate backflow prevention measures to the risk posed (i.e. check valve) and shall be installed at the property line at the Owner's expense. The Owner shall consult with **Oxford County Public Works** to ascertain the necessary requirements for the site.

Minimum Requirements:

- If the distance from the property line to any fire hydrant results in more than one cubic meter of stagnated water volume, a single check valve must be installed 1.0m inside of property line.
- If the distance from the property line to the building's fire suppression system results in one (1) cubic meters of stagnated water volume, a single check valve must be installed 1.0m inside of property line. This is in addition to the requirements inside the building as per the Ontario Building Code and the County's Backflow Prevention By-Law 6544-2023.

.1 Separated Water and Fire Services

Only one service shall be taken from the watermain. Domestic service must be tapped off the fire service outside the building with separate shut-off valves, in accordance with **Oxford County Standard Drawing**.

Sprinkler and standpipe services may be combined. The Owner is advised to consult with the Insurance Underwriter before combining these services.

.2 Combined Water and Fire Services

A domestic water service may be combined with a sprinkler or standpipe service or with a combined sprinkler/standpipe service. The Owner is advised to consult

with the Insurance Underwriter before combining these services. The Owner/designer is advised that water quality should be considered; domestic water demands may not achieve a sufficient turnover rate (see 7.3.5) to prevent poor water quality.

6.2.7.11 Water Service Size or Location Not Determined

Where water service stub size and/or location for any block cannot be determined prior to street construction, the **County of Oxford Public Works** will not approve installation of the water service stub.

6.2.7.12 Water Service Valves

All new water services, including replacements, shall be equipped with a new main stop and a curb stop in accordance with **Oxford County Standard Drawings** unless otherwise directed by the County or its Service Provider. The curb stop shall be provided with a service box and operating rod.

.1 Location of Water Service Valves up to 50mm Diameter

On water services of 50mm diameter and smaller, a main stop shall be installed at the watermain, and a curb stop shall be installed at the property line in accordance with **Figure 4.01** and **4.02** in the **Oxford County Standard Drawings**.

.2 Location of Valves for Water Services 100mm Diameter and Larger

For water services of 100mm diameter and larger, water service valves shall be placed in the location approved by the **County of Oxford Public Works** and in accordance with **Oxford County Standard Drawing.**

Where the watermain cannot be closed off for the water service connection, a tapping sleeve and valve will be required at the watermain. It should be noted that size on size taps (e.g. 150mm x 150mm tap) is not permitted and a tee will have to be cut in.

Where the watermain can be closed and a tee cut into it, or where a new watermain is being installed, a valve shall be installed 0.3m from and on the street side of the property line.

The requirement to use a tapping sleeve and valve or to cut in a tee to make the service connection will be made at the discretion of the **County of Oxford Public Works**.

.3 Valves for Building Complexes

In building complexes such as town housing developments or shopping plazas, where individual services are connected to a larger common service, a valve shall be placed on each individual service where it joins the common service. Valves must be easily accessible for operation and must be in accordance with drawings approved by the **County of Oxford Public Works**. Sectionalizing valves on the common service may also be required.

.4 Valves for Water Services to be Connected to a Private Watermain

Water services to structures in a complex that are to be connected to a private watermain shall have the curb stop or valve placed 3 metres from the face of the

structure. If this distance locates the curb stop in the paved portion of the complex, a deviation in the curb box location may be approved by the **County of Oxford Public Works**.

.5 Locates for Curb Stops or Valves

The layout for water services must be such that the curb stop, or valve can be easily found by referring to two directional dimensions to locate the curb stop or valve at 90 degrees to the building or structure face.

.6 Water Service Control Valves Not to be Covered

The Owner shall ensure that water service control valves are not obstructed in any way, including by structures or by “mound” or “berm” type landscaping.

6.2.7.13 Water Service Entrances

Water services of all sizes shall enter through the building wall or under the wall footing into a heated area, leaving sufficient pipe and working space for meter installation.

A length of between 0.3 and 0.45 metres shall be exposed above the finished floor. The pipe shall enter the building not less than 0.15m and not more than 0.3m from the wall.

6.2.7.14 Protection from Contamination

Connections to the municipal potable water system shall be designed and installed so that non-potable water or substances that may render the water non-potable cannot enter the system. This shall be in accordance with the requirements of the Ontario Building Code, Part 7 Plumbing.

.1 Backflow Prevention Devices Required on Water Services in High Elevation Areas of the County

In some high elevation areas of the County, the Owner may be required to install a check valve on the water service to prevent backflow into the watermain in the event of a loss of pressure in the system.

The Owner will be responsible for the supply, installation and maintenance of all check valves and protective devices, at no cost to the County. Refer to **Section 6.2.13** for additional information on Backflow Prevention.

6.2.7.15 Electrical Grounding

.1 New Installations

Electrical systems of all new developments shall not be grounded to the water system. Refer to Ontario Hydro Electrical Safety Code (Section 10) for grounding requirements.

.2 Upgrade of Existing Plant

Where an existing watermain is replaced or upgraded, the grounding of electrical systems to the water service may not be adequate. It will be the Owner’s responsibility to ensure grounding is adequate after the watermain is installed.

6.2.8 Water Meters

6.2.8.1 General Requirements

The costs of water servicing in Oxford County shall be in accordance with the County Water/Wastewater Schedule of Rates and Charges currently in effect.

Refer to **Sections 6.2.7.7 and 6.2.7.8** for acceptable servicing configurations. All domestic services shall be metered.

Fire services are not metered except for sprinkler systems located in individually metered dwelling units.

6.2.8.2 Supply of Water Meters and Water Meter Remote Read Registers and Meter Strainers for Services 150mm and Larger

The County or its Service Provider will supply all water consumption meters that are used for billing. The Developer shall install the meter, and the County will maintain the meter post installation.

One County Meter will be placed in each single family residential, multi-family residential, commercial, industrial and institutional building. Generally, this means one meter per individual property except for apartment condominiums which will only have one meter. Water meters up to 20mm in size will be supplied by the County and subject to the fees and charges outlined in By-Law No. 4889-2007 for each property. Accompanying all water meters will be an Electronic Radio Transmitter (ERT) device used for collecting water usage data. The ERT Device will be installed as per **Oxford County Standard Drawings.**

Secondary meters may be purchased from the County for the convenience of the Owner, as in apartment houses or multiplex units, at the Owner's request and expense. All secondary meters will be installed in a manner so that all water supplied passes through the County meter prior to passing through the secondary meter. Secondary meters will not be read, billed separately, or maintained by the County.

Strainers for 75mm and larger installations where required shall be supplied by the Developer/Owner.

The installation of the water meter shall be completed by a licensed plumber at the Owner's expense. The ERT device will be installed by the County or its Service Provider.

6.2.8.3 Location of Water Meter

The water meter shall be installed on the water service immediately inside the point of entry of the water service into the building (see **Section 6.2.7.13**). Any variation from this location must be approved in writing by the **County of Oxford Public Works**.

The Owner shall provide sufficient space for installation and maintenance of the meter. The water meter must be accessible for reading and maintenance and must be protected from freezing and other damage. In accordance with **Section 6.2.7.8.5,** water meters shall not be installed within a cold cellar. The use of meter pits or chambers for meters at property line shall be at the direction of **Oxford County Public Works**.

The meter or piping shall be no closer than 1 metre to any electrical panel or above or below any electrical panel unless provided with a meter enclosure as outlined in **Section 6.2.8.3.1**.

.1 Water Meter Enclosures

Water meters may be installed in electrical rooms provided a shield is installed between the water meter and any electrical panel located within one metre. The shield must be of metal construction (or approved alternative) and affixed securely to the wall and must be of sufficient width to isolate the water meter from the electrical panel. It must not impede the maintenance of the water meter.

.2 Meter Pits

Meter pits will be allowed only with the approval of the **County of Oxford Public Works** when no other suitable location is feasible. Meter pit design and installation must be submitted for approval as per **Section 6.2.7.4**. All costs associated with the supply and installation of the meter pit will be the responsibility of the Owner. Water meters in pits shall be in accordance with **Oxford County Standard Drawing**.

6.2.8.4 Installation of Water Meters

Water meters up to 50mm in size shall be installed in accordance with **Oxford County Standard Drawings**.

Water meters larger than 50mm in size shall be installed in accordance with AWWA C700, C701 or C702.

.1 Water Meter Valving

All new and replacement installations shall require a valve on each side of the meter for isolation purposes. The Owner must supply and install the outlet and inlet valving and any bypass valve (when required) for all sizes of meters. The Owner will be responsible for maintaining and keeping the meter inlet and outlet valving operational and in good working order.

Meter setting valves are currently only in meter pits. Valves must open counterclockwise.

.2 Meter Strainers

Should the Owner wish to install a meter they shall consult with the designer regarding the dimensions of supports required for the meter and strainer. Strainers are not supplied by the County or their service providers; this would be at the Developer/Owners expense.

.3 Water Meter-by-pass Required

For Industrial, Commercial, and Institutional properties where the meter is 75mm or larger, a lockable bypass for this meter must be installed. For Industrial, Commercial, and Institutional properties with meters smaller than 75mm, a lockable by-pass will be installed where the customer cannot tolerate a shut-down of the water service during business hours. Bypass valves shall be closed and sealed for use by the County only.

Meter bypasses shall be installed according to **Oxford County Standard Drawing**.

6.2.8.5 Meter Sizing

The size of meters will generally be one size smaller than the water service. The size of the meter must be negotiated with the **County of Oxford Public Works** in accordance with the flow requirements. Developer/Owner to consult with **County of Oxford Public Works** with proposed flow requirements to size meter.

6.2.8.6 Water Meter Purchasing

Contact your local municipality to purchase the water meter and ERT device

6.2.9 Blow-Offs and Swab Launches

When dead end mains are encountered, a fire hydrant or blow-off is required near this dead end. The blow-off must be designed in such a manner as to convey the water to a suitable drain and must be operable without the need for excavating. Stop and Drain type valves are permitted. Blow offs or Swab launches shall be installed with 150mm thick 19mm clear stone bedding.

Blow-offs or swab launches installed in “hard surface” (asphalt or concrete) areas will require 300mm thick granular “A” bedding compacted mechanically in two 150mm thick lifts.

Blow-offs will be 50mm diameter for mains up to and including 200mm diameter. Blow-offs will be 100mm diameter and use the swab launch detail for 250mm and 300mm mains.

In areas that do not have fire hydrants, permanent swab launches will be installed for swabbing and flushing. Blow-offs and swab launches to be installed as per **Oxford County Standard Drawings**.

6.2.10 Corrosion Protection

.1 Petrolatum Coating System

All surfaces of fittings, flanged connections, nuts, bolts, tie rods, clamps, valves, sleeves, Victaulic-style couplings, joint restraints, etc., shall be protected using petrolatum materials. For application requirements refer to **Section 6.3**.

.2 Cathodic Protection for PVC Watermain

The size and type of anodes shall be determined through the Geotechnical report. Refer to **Section 6.3** for applications and minimum anode sizing requirements. Anode locations shall be clearly shown on the Construction and as-built drawings. In addition, a tabular listing of the stations at which the anodes are to be installed shall be provided.

Valves or appurtenances that are epoxy coated do not require this procedure.

Refer to **Section 6.3** for requirements.

6.2.11 Easements

Easements are required for any County owned watermain which is located on privately-owned property. An easement is required to ensure that the municipal services and utilities crossing the site can be properly installed and maintained by the County or the County of Oxford's service provider.

The minimum width of easement shall be 6.0m for a single watermain only buried at a standard depth. When the easement is 6.0m, the watermain will be installed 2.0m from one side of the easement to provide an adequate working area to access and repair infrastructure placed within the easement. Where there is more than one utility, adequate width of easement and separation of utilities for both construction and future access and maintenance shall be provided.

Where a watermain is installed on an easement which is located on private property or between private properties which have or may have building(s) located on them presently or in the future, the watermain shall be installed in a casing. Refer to **Section 6.2.4.4 Casings and Spacers**.

6.2.12 Instrumentation

Instrumentation and control equipment which will become the property of or be under the operation of the County must meet all design and installation standards outlined in the County's SCADA Standard's, including the following: PLC Programming Standards, SCADA Alarm Standards, Control Panel Standards, HMI Standards, and Process Control Narratives (PCNs). All PCNs shall be approved by the **County SCADA Technician**.

6.2.13 Backflow Prevention

A backflow prevention device shall be required for all industrial, commercial, and institutional developments as well as select multi-residential developments. Such a device will be installed by the Developer, Contractor, or property Owner at their expense. These devices shall be as per AWWA standards and approved by the **County of Oxford Public Works**. The property Owner shall comply with the requirements of **By-Law No. 6544-2023**. Refer to www.oxfordcounty.ca/backflow for additional information.

In the City of Woodstock all residential services shall require the installation of a dual-check backflow preventor. Installation shall be as per **Oxford County Standard Drawings**.

6.3 WATER DISTRIBUTION SYSTEM CONSTRUCTION

Supply and installation of water systems shall be in accordance with the current Ontario Provincial Standard Specifications (Municipal) and Ontario Provincial Standard Drawings as amended herein.

6.3.1 Approved Products and Product Approval Process

All products proposed for use on water system construction projects in Oxford County shall be submitted to the **County of Oxford Public Works** in writing and approved prior to use.

The County and its Service Providers reserve the right to select any product or material they deem suitable for the application and may provide an AWWA standard and/or other specifications and conditions for the use of such products or materials. Products or materials installed without the approval shall be removed and replaced with an approved replacement at no expense to the County.

Manufacturers, distributers, Contractors, designers, and other parties may request that products be considered as an approved equivalent to the products listed herein. A typical product approval submission shall include but not be limited to the following:

- Detailed product data sheet including materials and material properties, performance specifications, and any relevant standards (AWWA, ASTM, ISO, CSA, etc.)
- A list of sizes, classes, etc. with detailed dimension information
- Detailed installation guide
- Safety Data Sheet
- Material warranty information
- References for use on past projects
- Other information as may be requested by **County of Oxford Public Works** or to demonstrate equivalency to the products specified herein

Review and acceptance of an equivalent product is at the sole discretion of **County of Oxford Public Works**.

The Designer reserves the right to exclude the use of one or more of the acceptable products noted herein within their design where the use of these the approved materials listed herein is not acceptable due to project-specific constraints. Modifications may be listed in the Contract Drawings and/or Specifications.

6.3.2 Watermain Materials & Installation Notes

6.3.2.1 General Requirements and Reference Specifications

All waterworks materials used in the construction, repair, and operation of the drinking water system that come into contact with water shall meet all current applicable standards set by the American Water Works Association (“AWWA”), Canadian Standards Association (“CSA”), the American National Standards Institute (“ANSI”) safety criteria standards, American Society for Testing and Materials (ASTM), NSF/14, NSF/60 and NSF/61.

The Contractor will get approval for all materials selection from the **County of Oxford Public Works** prior to delivery to the site.

6.3.2.2 Transition in Pipe Material

Materials shall remain consistent throughout a project unless approved by the **County of Oxford Public Works**. Approval will only be provided under abnormal special circumstances.

Transition from one pipe material to another must be made at a valve or branch. Where PVC pipe is used, a tracer wire must be provided along the entire pipe and terminated within the valve box.

6.3.2.3 Pipe, Fittings, Tracer Wire and Spacers

Acceptable watermain pipe, fittings, tracer wire, and spacer materials shall be as outlined below. Joint lubricants shall be as supplied by the pipe manufacturer and approved by the County of Oxford Public Works.

.1 Ductile Iron (DI)

Piping shall be Ductile Iron Cement Mortar Lined CL 52 as per AWWA C104, C150 and C151.

Fittings shall be mechanical joint only per AWWA C110, C111, C150 and C153.

Fittings shall have the pressure rating, nominal diameter, manufacturer name, and AWWA standard cast on them.

Fittings shall be either fusion bonded epoxy coated (inside and out) to NSF-61 or Ductile Iron mechanical joint with cement lining. All Ductile Iron fittings, mechanical joints, and restraints are to be protected using a petrolatum corrosion protection system. Refer to **Section 6.3.8**.

All pipe and fittings shall come capped from the factory to prevent contaminants. Any damage to the epoxy coating shall be repaired using epoxy paint suitable to the application (NSF-61, buried application).

Self-restrained fittings (RCT Flex-Tite or approved alternate) are permissible in place of mechanical joints provided they are rated for at least 350 psi.

Copper strips, wedges, or other devices to provide electrical continuity shall be provided by the pipe manufacturer.

Installation of ductile iron pipe and mechanical joint fittings shall conform strictly to the manufacturer's instructions.

.2 Polyvinyl Chloride (PVC) and Molecularly Oriented PVC (PVCO)

Joints shall be SBR rubber gasket push-on type. For PVC water main and fittings located within petroleum hydrocarbon and/or chlorinated solvent contaminated soils, gaskets shall be made of oil-resistant Buna-N (Nitrile) rubber. If the Contractor suspects there may be contaminated soil in the field, the Contractor shall immediately notify the Contract Administrator and Project Manager.

All PVC pipe and PVC fittings shall be blue in colour.

Molecular Oriented PVC pipe (PVCO) is an accepted material however this material may only be used in new subdivisions and new development areas. This material is not permitted for use in the reconstruction of existing areas. The use of this material will be reviewed on a case-by-case basis. For construction of watermain 400mm and greater, Submittals by the pipe manufacturer in the form of a Construction Report will include the following:

- Letter of Compliance including date of manufacture (pipe manufactured more than 24 months prior to delivery to the project site at no expense to Oxford County)
- Summary of fittings and specials
- Restrained length calculations and drawings signed and stamped by a Professional Engineer licensed to practice Engineering in the Province of Ontario.
- Installation Manual
- Copy of CSA Certification and NSF 61 Certification

The following PVC and PVCO pipes are permitted for use on County projects:

- AWWA C900, CSA B137.3 – Class 235 DR 18 (complete with tracer wire) 100mm through 1500mm diameter colour coded blue.
- PVCO AWWA C909, CSA B137.3 – Class 235 C.I.O.D. (complete with tracer wire) 100mm through 300mm diameter colour coded blue.

PVC push-on fittings are permitted with the exception of service tees and main valves. All PVC fittings less than or equal to 300mm shall be injection-molded as per AWWA C907 and CSA B137.2, colour coded blue. Larger fittings utilizing AWWA C900 pipe standards are also permitted. All push-on fittings shall require mechanical restraint. Refer to **Section 6.3.8** for corrosion protection requirements.

The use of fabricated fittings will not be permitted unless approved in writing by the **County of Oxford Public Works.**

Ductile Iron fittings used in PVC watermain systems shall be cement mortar lined mechanical joint only as per AWWA C110, C150 and C153. All fittings, mechanical joints, and restraints are to be protected using a petrolatum corrosion protection system. Refer to **Section 6.3.8**.

All Ductile Iron fittings in PVC watermain systems shall require cathodic protection as listed in **Section 6.3.8.2**.

.3 High Density Polyethylene (HDPE)

HDPE pipe is to be used for directional drilling or casing pipe only unless approved in writing by the **County of Oxford Public Works**. HDPE pipe shall be used for all directional drilling in the County.

All HDPE pipes shall be Ductile Iron Pipe Size (DIPS) unless approved in writing by the **County of Oxford Public Works**. In the design phase, inside diameters must be considered to ensure flow characteristics are similar to the design nominal pipe size. HDPE watermain less than 100mm dia. shall be copper tubing size (C.T.S.).

HDPE shall be as per AWWA C901 and C906, DR 11, PE 3408/3608 DIPS with a blue stripe on side (complete with tracer wire).

Fittings shall be butt fusion or mechanical joint only as per AWWA Specifications C110, C153 and C906. Class 304 Stainless steel stiffeners are required at all mechanical joints. Push-on fittings are not permitted.

.4 Concrete Pressure Pipe (CPP)

Concrete Pressure Pipe and fittings 600mm and greater as per AWWA C301 (L) (min. Class 16) or C303 (min. Class 150). Pipe design to be completed by the manufacturer. Shop Drawings and design calculations for the watermain shall be stamped by a Professional Engineer licensed to practice Engineering in the Province of Ontario, working for the manufacturer.

The Contractor shall submit the following:

- Certified Shop Drawings
- Affidavit of Compliance
- Design calculations
- Details of specials and fittings
- Details of materials and methods of welding
- Rubber Gasket Material Test Reports
- Steel Test Reports
- Restraint Length Calculations Stamped by a Professional Engineer licensed to practice Engineering in the Province of Ontario (for watermains greater than 300mm diameter)
- Aggregate samples
- Tabulated Layout Schedule

.5 Pre-Insulated Pipe

The watermain pipe shall consist of a factory-applied rigid polyurethane foam minimum 50mm thick and an outer protective jacket. The outer protective jacket shall consist of a tape wrap polyethylene with UV inhibitor, or a factory applied extruded black HDPE copolymer with UV inhibitor. Pre-insulated pipe shall be Urecon or approved equal and shall be installed in strict conformity with the manufacturer's recommendations.

.6 Tracer Wire and Connectors

Tracer wire is required for all watermain and water service installations. The use of thermoplastic High Heat-resistant Nylon coated wire (THHN) in place of tracer wire is not permitted.

Tracer wire for direct bury shall be Solid #12 AWG (0.0808" diameter), 21% conductivity, high strength (HS), copper-clad hard drawn high carbon steel (CCS) tracer wire, 30 mil. HDPE insulation jacket complying with ASTM-D-1248, minimum break load 452 lbs, 30-volt rating, blue in colour.

Tracer wire for directional boring shall be four Solid #12 AWG (0.0808" diameter), 21% conductivity, extra high strength (EHS), copper-clad hard drawn high carbon steel (CCS) tracer wire, 45 mil. HDPE insulation jacket complying with ASTM-D-1248, minimum break load 1150 lbs, 30-volt rating, blue in colour. Tracer wire connected to existing cast iron or ductile iron pipe shall be properly connected with a thermite weld or approved equivalent. Welds will be completely sealed with a mastic type sealer. The mastic shall be TC mastic or approved equal.

At each inline valve a single tracer wire must be brought up outside the valve box to the top of the box and inside the box through a drilled hole complete with rubber grommet. Tracer wire will attach to the mainline wire with approved connectors only. Splices of any other nature will not be permitted and will result in the total replacement of the mainline

tracer wire. The length of tracer wire inside the valve box shall be +/-500mm and coiled to not interfere with valve operation. Tracer wire to be installed as per the **Oxford County Standard Drawings**.

Tracer wires on water services shall extend from the main to the curb stop. Where metallic curb stops and main stops are used, thaw nut connectors shall be provided on the curb stop and main stop. Where a thaw nut connector is not provided at the curb stop or main stop, the tracer wire shall attach to the mainline wire with approved connectors only and at the curb stop be brought up to 150mm below grade and secured to the valve box with Denso Petrolatum tape or approved equal. A 5.5 kg zinc anode shall be provided at the curb stop.

Test stations shall be Copperhead Snakepit CD14*TP or approved equal. The maximum distance between stations shall be 500m.

Tracer wire at hydrant locations shall be installed to each hydrant valve. The tracer wire shall attach to the mainline tracer wire by means of an approved connector. Tracer wire shall be placed along the hydrant lead, up the outside of the hydrant valve box where it will enter the inside of the valve box through a rubber grommet. A coil of 0.6m of tracer wire shall be left inside the valve box.

All connections or repairs in the tracer wire system shall be made using a copper split-bolt connector with DRYCONN Direct Bury Waterproof Split-Bolt Housing (Aqua), DRYCONN 3-Way Direct Bury Waterproof connector (DB Lug Aqua), Pro-Line TracerLock (TL-LUG-SS) Connector, SnakeBite Locking Connector (LSC1230), or approved equal. Tracer wires at ends of rolls, repairs, or water services 100mm diameter or larger shall have sufficient slack to be knotted together prior to placement of connector. All connections shall be wrapped with petrolatum tape and compressed tightly by hand around wire and connector.

At the end of non-metallic services and mains a 5.5 kg zinc anode must be installed at the end of the tracer wire or the wire brought up to a test station. Non-metallic curbstops will require an approved connector to attach to the mainline tracer wire. No splices of the mainline tracer wire are permitted. Tracer wire connections to be installed as per **Oxford County Standard Drawings**.

At the ends of capped watermain, a minimum of 2 m of tracer wire shall be extended beyond the end of the pipe, coiled and secured for future connection. The end of the tracer wire shall be spliced to a 5.5kg zinc anode and is to be buried at the same elevation as the watermain.

Tracer wire continuity testing shall be conducted following installation and prior to final restoration demonstrating the conductivity/traceability to the satisfaction of the County or its Service Provider.

.7 Casing Spacers

When watermain is placed inside a casing, the watermain shall be supported by spacers using the centered configuration. The size, location, and number of spacers will be as per the manufacturer's recommendation.

Approved Casing Spacers are as follows:

- CCI #304 Stainless Steel (CSS8 and CSS12 models)
- PSI Ranger II
- Cascade #304 Stainless Steel (CCS, CCS-ER, CCS-JR, CCS-ES models)

6.3.2.4 Pre-Cast Valve Chambers

All chambers are to be precast, complying in all respects with the design requirements of OPSS 441 and OPSD 1101 chambers, including concrete materials and joint waterproofing. Manufacturer's design drawings, calculations, and certification shall be submitted at least 10 working days prior to commencing work. Certification shall be marked on units.

Shop drawings for precast chambers will include all details and be reviewed and stamped by a Professional Engineer licensed to practice Engineering in the Province of Ontario retained by the Contractor.

All chambers are to be designed to counteract full buoyancy forces as if the groundwater level is at the ground surface. All buried external surfaces of the chambers are to be waterproofed as specified herein.

All chambers are to be fitted with frost straps in accordance with OPSD 701.100. Each strap shall run continuously from the bottom slab to the top section.

Pipe supports are to be adequately sized to support the valves, pipes and appurtenances that will be supplied by the Contractor. The supports will be reinforced concrete or manufactured stainless steel supports (minimum grade 304) and tied to the base with properly sized dowels.

Units shall be constructed in accordance with details indicated, plumb and true to alignment and grade. Complete units as pipe laying progresses.

Precast concrete base shall be set on a minimum of 75mm granular bedding compacted to 95 % Standard Proctor Maximum Dry Density (SPMDD) or as indicated on Contract Drawings.

Each joint shall be watertight with approved rubber ring gaskets. Clean surplus mortar and joint compounds from interior surfaces of unit.

All lifting holes shall be filled with non-shrink grout. Floor of chamber will be sloped to sump pit at 1 in 20. Depth of sump to be 300mm.

The Contractor will get approval for chamber selection from the **County of Oxford Public Works** prior to supplying the material to the site.

6.3.2.5 Chamber Piping and Fittings

The piping, valves and fittings to be incorporated into the chambers will comply in general with all requirements of the buried watermain, with the additional requirements below.

1. The Contractor shall submit shop drawings for review of all chamber piping, fittings, and valves, clearly showing all proposed materials, dimensions, and details of thrust restraint (thrust blocks not permitted). Piping and fittings of all diameters shall meet the applicable AWWA standards.

2. All chamber piping and fittings 400mm or larger shall be Ductile Iron, Class 52 pipe, or approved equivalent, of the same rating as the main. All exposed metal surfaces not otherwise coated with approved AWWA epoxy coatings will receive corrosion protection as described in **Section 6.3.8**.
3. Vent piping and fittings shall be stainless steel, manufactured from type 304L stainless steel produced from parent metal conforming to ASTM A240 and AWWA Manual M11 (pressure limit 1035 kPa). All vents shall have a minimum of two bands of 50mm wide high reflective yellow tape.
4. Tracer wire within the chambers shall be secured to the inside wall and shall be accessible from the surface.
5. All other materials which are not specifically described herein or noted on the Contract Drawings but required for the completion of the work (such as couplings, gaskets, jointing materials, fasteners, other accessories) shall be as selected by the Contractor, subject to approval of the **County of Oxford Public Works**.

6.3.2.6 Gate Valves and Rods

Gate valves shall be manufactured to AWWA C509 or C515 Specifications. Valves shall be ductile iron. Tapping valves and sleeves must be approved by the **County of Oxford Public Works**.

The number of turns to operate the valve shall be 3 times the valve diameter in inches plus 2 to 3 turns. Valves with number of turns in excess of this will not be permitted.

All gate valves and tapping valves must be Ductile Iron, resilient seat, epoxy coated gate valves with non-rising stem (NRS).

400mm gate valves do not require chambers unless valves are placed in locations where bypasses are installed.

Valve boxes as supplied by Canada Valve, Mueller Ltd. or approved equal will be acceptable. All boxes shall be screw type.

Valve rods shall be manufactured as per **Oxford County Standard Drawings**.

Valves must be mechanical joint and must open Counter-Clockwise.

Notwithstanding the above, all valves, including hydrant valves connected to the City of Woodstock water system, shall open Clockwise.

6.3.2.7 Combination Air / Vacuum Valves

Air release/vacuum relief valves should be installed at high points on distribution and transmission watermains where air can accumulate. Automatic air release valves should not be used in situations where flooding of the access hole or chamber may occur. Air release/vacuum valves shall conform to AWWA C512.

Air valves shall be combination air valve with cast iron or plastic boot and cover, stainless steel internal parts, class 125 flange inlet boot rated to 1378kPa W06, 0 to 1034kPa working pressure. Seat to be bronze with Buna-N seat. Under Ground Air Valve Systems must be approved by the **County of Oxford Public Works**. Air / Vacuum valves for direct bury to be installed as per **County Standard Drawings 6.18** and **6.19**. The Contractor shall submit shop drawings for review of all piping, fittings, and valves, clearly showing all

proposed materials, dimensions and locations. The final number and location of these valves will be reviewed by the **County of Oxford Public Works** prior to construction. Piping and fittings of all diameters shall meet the applicable AWWA standards.

The exterior surface of valve body shall be epoxy coated. Adequate support shall be provided for the valve. Valves shall be Valmatic, Apco, ARI, or approved equal.

6.3.2.8 Waterproofing of Chambers and Maintenance Holes

Waterproofing membrane shall be supplied and installed on all exterior concrete surfaces of the watermain chambers, including the edges of the base slab, up to within 300mm of the cover elevation.

The membrane shall be applied over a prime or tack coat and hand rolled to assure positive adhesion. Compatible elastomeric mastic shall be applied to seal horizontal and vertical terminations, as a flashing and to form corner fillets.

Openings in walls or roof slabs for piping, valve boxes or access chimneys shall be sealed with two layers of membrane material and mastic to provide a tight seal.

Waterproofing membrane shall be Sealtight Mel-Rol waterproofing system as manufactured by W.R. Meadows or approved equal.

6.3.2.9 Service Material

The County will accept cross-linked polyethylene (PEX) or raised temperature polyethylene (PE-RT) potable water service tubing. PEX and PE-RT water service tubing may not be installed within petroleum hydrocarbon and/or chlorinated solvent contaminated soils.

Polyethylene (HDPE) plastic pressure pipe is approved for use on a site-specific basis only as directed by **Oxford County Public Works**.

Polyethylene plastic pressure pipe shall be according to OPSS.MUNI 1842, AWWA C906, CSA B137.1 and supplied from a plant approved by an organization accredited by the Standards Council of Canada. The pipe shall be manufactured with blue colour stripes indicating potable water. Pipe connecting to AWWA C800 compression joint valves and fittings shall be installed using stainless steel support liners inside pipe at each joint according to manufacturer's specifications.

PEX, PE-RT, and HDPE service material shall be colour coded in solid blue or blue striped.

Copper service material is not permitted in new construction. Services larger than 50mm shall be designed in accordance with the applicable standards for watermains.

All existing copper service material connected to PVC watermain that has been exposed and not replaced during construction shall require cathodic protection as per **Section 6.3.8.2**. All services shall be a minimum of 25mm diameter and require a tracer wire. All service material shall conform to NSF 61.

PEX service material 25mm to 50mm shall be pressure rated to a minimum of 1103 kPa (160 psi). Pipe shall be manufactured using the high-pressure peroxide (Engel) method of cross linking in accordance with AWWA C904, ASTM D3350 and a minimum degree of

cross-linking of 80% in accordance with ASTM D2765, Method B. Pipe to have a co-extruded UV Shield made from UV resistant high-density polyethylene, colour blue. Pipe to be certified to standards ASTM F876, F877, F2023, CSA B137.5, and NSF 14 and 61. Pipe connecting to AWWA C800 compression joint valves and fittings shall be installed using stainless steel support liners inside pipe at each joint according to manufacturer's specifications.

PE-RT service material 25mm to 50mm shall be pressure rated to a minimum of 1379 kPa (200 psi). The pipe shall be in accordance with CTS cNSFus-pw CSA B137.12 AWWA C-901 CL5 ASTM F2769, NSF 14, and NSF 61. The pipe shall be blue. Pipe connecting to AWWA C800 compression joint valves and fittings shall be installed using stainless steel support liners inside pipe at each joint according to manufacturer's specifications.

All main stops shall be Lead-Free Brass, full port style, and conform to AWWA C800 and NSF 61.

Acceptable fittings shall be Ball Valve style. All fittings used on non-metallic service lines shall be manufactured to accommodate tracer wire. Acceptable fittings for tracer wire are Mueller 110 compression for electrical thaw connection or approved equal.

Service Saddle Bands shall be double bolt type 304 Stainless Steel of minimum 20-gauge thickness. Approved service saddles for PVC watermain are, Smith-Blair 372, Romac 304, 305 and 306, Robar 2600 or approved equal.

6.3.2.10 Curb Stops

All curb stops shall be Lead-Free Brass, full port style, and conform to AWWA C800 and NSF 61. Curb stops shall operate at 150 psi. Megatite composite style curb stops or approved equal may also be used.

Table 4-6 Curb Stops

Size	Curb Stops	
	General Description	Copper Connections
25mm	Ball Valve	Compression
38mm	Ball Valve	Compression
50mm	Ball Valve	Compression

All fittings used on non-metallic service lines shall be manufactured to accommodate tracer wire. Acceptable fittings for tracer wire are Mueller 110 compression for electrical thaw connection or approved equal.

Curb stops shall be installed with electrical thaw nuts on the private side facing away from the watermain. Inverted Key type curb stops and "Stop and Drain" types are not permitted.

6.3.2.11 Curb Boxes

All curb boxes shall be manufactured with metallic composition. All curb boxes must be able to be located using a magnetic locating device. Curb box length to be manufactured to accommodate the service's depth of bury. Operating rod to have modified top to enable use of same key as used on the A726 box with stainless steel operation rods and connecting pins.

Table 4-7 Curb Boxes

Curb Boxes	
25mm to 50mm services	20mm hexagon head plugs

6.3.2.12 Fittings

All fittings shall be Lead-Free Brass and conform to AWWA C800 and NSF 61. All fittings used on non-metallic service lines shall be manufactured to accommodate tracer wire where required.

6.3.2.13 Mechanical Restraint

All restraint devices shall be approved by the County or its Service Provider prior to installation.

Restraint devices for PVC, Ductile Iron, and HDPE pressure pipe of all sizes shall be manufactured of high strength ductile iron, ASTM A536, grade 65-45-12, and shall incorporate a series of machined serrations on the inside diameter to provide contact to the pipe and support the pipe wall.

Tie rods and clamp assemblies shall be wrapped in Denso paste and tape (to manufacturer specifications). Tie rods, washers and connecting bolts are to be a minimum of 19mm (3/4"). Connecting bolts shall be of high strength, stainless steel type 304, AWWA C111/A21.11. All mechanical restraints shall have corrosion protection as per **Section 6.3.8**.

Restraint devices shall meet or exceed the requirements of ASTM 1674 and Uni-B-13-92 recommended performance specification for joint restraint devices for use on PVC pipe and shall be FM approved. Notarized original certification shall be included with submittal documents.

.1 Restraint devices for PVC/PVCO

Joint restraints for PVC pipe and fittings shall be either serrated ring or wedge action type as manufactured by Uniflange, EBAA, Star, Sigma, Romac or approved equal. Restraints for Molecular Oriented PVC pipe (PVCO) shall be as per the pipe manufacturer's recommendation. It should be noted that Romac "grip ring" restraints are not permitted for use with PVCO pipe.

.2 Restraint devices for Ductile Iron

Joint restraints for Ductile Iron pipe and fittings shall be either serrated ring or wedge action type as manufactured by Uniflange, EBAA, Star, Sigma, Romac or approved equal.

.3 Restraint devices for HDPE

Restraint devices shall be designed to resist pull out forces based on the maximum working pressure rating of the pipe. Forces experienced due to expansion and contraction of the pipe require special consideration.

Internal pipe wall stiffeners must be used when restraining HDPE. The stiffeners must be sized to encompass the entire bearing length of the restraint device. Pipe systems must be Engineered to prevent movement causing the fitting to slide or rotate on the pipe.

Joint restraints for HDPE pipe and fittings shall be either serrated ring or wedge action type as manufactured by EBAA, Star, Sigma, or approved equal.

6.3.2.14 Hydrants

Fire hydrants shall be Canada Valve (Darling), Century, MacIvity M67, East Jordan Iron Works Watermaster 5CD250, AVK Series 2780 or approved equal.

Fire hydrant extensions as required for deeper bury are to be obtained from the fire hydrant manufacturers. A maximum of one 300mm extension is permitted per hydrant.

Fire hydrants shall have a chrome yellow high gloss exterior paint over quick dry red oxide primer.

Hydrants shall be installed a minimum of 1.5m from the edge of a driveway and from any other physical obstruction which could interfere with the operation of the fire hydrant.

Public hydrants shall have the body and bonnet painted yellow with colour coded reflector rings in accordance with the National Fire Protection Association (NFPA) 291 colour coding based on flow testing.

Private hydrants shall have the body and bonnet painted red with bonnet and caps painted in accordance with the National Fire Protection Association (NFPA) 291 colour coding based on flow testing.

All hydrants shall have a brass-to-brass seat and open Counter-clockwise. All hydrants shall be equipped with a 100mm STORZ pumper connection (cap painted black) and two (2) 63.5mm hose connections 180° apart.

Hydrants shall be plugged when installed in areas of high groundwater. Plugs to be installed by manufacturer. Hydrants with plugged drains must be clearly marked and pumped dry after each use.

All hydrants attached to the City of Woodstock Water System shall be plugged and open Clockwise.

6.3.2.15 Automatic Flushing Devices

An Eclipse 9800 Automatic Flusher or approved equal shall be used for all Automatic Flushing Devices. Contractor to ensure the automatic flushing device size as well as timer settings follow the design specifications.

6.3.2.16 Granular Material

As per OPSS.MUNI 1010.

6.3.2.17 Testing

Supply test certificates in accordance with the appropriate specification, for the following materials:

- Pipe
- Valves
- Fittings
- Hydrants

6.3.2.18 Delivery

Materials found to be defective in manufacture or damaged in handling after delivery, shall be replaced. Materials found to be damaged upon installation shall be replaced, which will include the costs of furnishing of material and labour required for the replacement.

All pipes up to and including 600mm diameter shall be delivered to the Work Area with end covers. End covers shall be factory installed on both ends with a tamper evident seal. Components shall adhere sufficiently to withstand the stresses caused during shipment.

6.3.2.19 Handling

Load and unload materials so as to avoid shock or damage. The lining and coating of pipes shall not be damaged.

Extra precautions and care must be taken at temperatures below freezing to eliminate the possibility of impact damage to the pipe.

6.3.2.20 Storage

Place materials in a safe storage area. Keep interiors of pipes and fittings clean.

6.3.2.21 Non-Shrinkable Concrete Fill

Non-shrinkable concrete fill shall be produced using 25kg/m^3 portland cement and aggregates in accordance with CSA A23.1. The following requirements shall also apply:

- Slump 150mm to 200mm
- 28-day strength of 0.4MPa
- 24-hour strength - at least 0.07MPa

6.3.3 Installation of Watermains by Open Cut

6.3.3.1 General

The Contractor shall, unless specified otherwise furnish all material, equipment, tools, and labour necessary to complete the installations. The installation of watermain shall be as per AWWA Standards and Specifications and OPSS 401, 404, 441, 517, 1010, and Ontario Health and Safety Association OHSA Reg. 213/91 with the following exceptions/amendments.

Contractors shall give the County or its Service Provider a minimum of 48 hours notice prior to commencing construction. A licensed operator or inspector from the County or its Service Provider shall be present for all watermain construction.

In areas of reconstruction where existing metallic watermain is being replaced with PVC or HDPE, the property Owner should be advised that the grounding of electrical systems to the water service may not be adequate. It will be the property Owner's responsibility to ensure adequate grounding after reconstruction is complete.

In areas of construction where watermain or services are to be located in existing road surfaces or through driveways and entrances, the existing pavement, curbs, sidewalks and driveways shall be saw-cut in clean straight lines to minimize over-break prior to construction. All concrete and asphalt driveways, curbs, and sidewalks shall be restored to existing or better conditions within construction limits. Interlocking brick driveways shall be carefully disassembled to proposed construction limits and reassembled to existing or better conditions. If the property Owner cannot agree to the methods and materials required to reinstate all concrete, asphalt, and interlocking brick driveways, curbs, and sidewalks to existing or better conditions the County or its service provider will undertake a quotation for reinstatement to the construction limits according to existing materials. Based on the quotation the property Owner may receive monetary compensation to pursue other alternatives. Prior to receiving compensation, the property Owner will sign an agreement with the County or its Service Provider acknowledging acceptance.

6.3.3.2 Tracer Wire

All non-metallic direct bury watermain and services shall require tracer wire. Verification of conductivity of the tracer wire shall be performed upon completion of rough grading and prior to placement of base coat asphalt on all streets before substantial completion of the project. An additional locate shall be performed prior to expiration of the warranty period before final acceptance.

A locate or conductivity test with the new tracer wire shall be performed by the Contractor and completed in the presence of a licensed water operator from the County or its Service Provider. The tracer wire shall be installed in such a manner as to be able to trace all components without loss or deterioration of signal or without the signal migrating off of the tracer wire. This test shall be conducted using the industry standard low frequency (512 Hz) line tracing equipment. If it is not continuous from valve to valve, the Contractor shall at his own expense replace or repair the wire. If a dispute arises as to the ability to trace all components, an independent 3rd party may be required to resolve the dispute and will be done at the Contractor's expense. Continuity testing in lieu of actual line tracing shall not be accepted.

6.3.3.3 Line and Grade

Contractors shall provide stakes to indicate the line and grade of the watermain as well as the location of fittings, bends, tees, valves, hydrants, crosses, reducers and plugged or capped dead-ends in accordance with the approved drawings before beginning any work. Line and grade stakes shall be marked and placed a minimum of 20 metres to a maximum of 50 metres apart.

Mains shall be laid and maintained to the required grades and locations with all valves, fittings, hydrants, etc. to be plumb and in accordance with the drawing locations. Deviations will not be permitted unless approved by the County or its Service Provider.

The Contractor shall be considered an “Excavator” and comply with the Ontario Underground Infrastructure Notification System Act. Contractors shall obtain locates prior to excavation and carry out exploratory excavations where necessary to establish or discover the location and elevation of existing pipes, conduits or other buried objects.

6.3.3.4 Frozen Ground

Do not place material on frozen ground. Should the bottom of the trench become frozen remove and replace the frozen material with bedding material compacted to 100 percent Standard Proctor Density.

6.3.3.5 Excavation and Trench Preparation

All excavations and trenching operations shall comply with the associated provisions of the Construction Projects Regulation (O. Reg 213/91).

Trenches shall be provided so that pipe can be laid with the proper alignment and depth so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground at all points.

Where trench excavations are not kept within the design limits of the pipe, the **County of Oxford Public Works** may order sheathing and shoring, and/or a heavier class of pipe, and/or use of a higher class of bedding.

Where the subgrade in its natural state is inadequate to support the pipe and a means of addressing this is not provided in the Contract, the Contractor shall immediately notify the Designer and the **County of Oxford Public Works** to confirm what design modifications may be required.

The subgrade shall be removed where it has been adversely changed by construction operations or cannot adequately support the pipe. Where poor soil conditions exist, the excavated material will be replaced with crushed stone or other approved material as directed by the **County of Oxford Public Works**.

6.3.3.6 Dewatering

Always maintain the excavation free of water. The discharge of water from excavations into sanitary sewers is strictly prohibited unless a permit is obtained from the County and discharge is in accordance with the Sewer Use Bylaw currently in effect. The cost for cleanup of the sewer or other affected areas will be the responsibility of the Contractor or Developer.

6.3.3.7 Lowering & Laying

Before lowering and while suspended, the pipe shall be inspected for defects. Proper implements, tools and facilities as required by the **County of Oxford Public Works** shall be provided by the Contractor. All materials shall be lowered into the trenches by suitable means.

The interior of the pipe shall be inspected and completely cleaned of all sand or foreign materials before placing in the line. No foreign materials are to be placed in the pipe during its laying.

The inside of the bell and the outside of the spigot shall be brushed and free from all oil, grease or dirt before jointing. Precautions must be taken to prevent dirt from entering the joint space. At all times when pipe laying is not in progress, the open ends of the pipe shall be closed by water-tight plugs or other means approved by the Inspector. This must be adhered to during the noon hour as well as overnight. The trench shall be kept dry and free from water.

No pipe shall be laid in water except by permission of the Designer. No water shall be allowed to run through installations during construction. If trench flooding occurs that enters the main, contact the Inspector and/ or the Designer to determine the course of action for disinfection.

Cutting of the pipe for inserting valves, fittings or closure pieces shall be done in a neat manner without damage to the pipe or lining and so as to leave a smooth end at right angles to the axis of the pipe.

Pipe shall be laid with the bell ends facing in the direction of laying. Deviation from this shall only be permitted with the approval of the **County of Oxford Public Works**.

At grades above 10 percent, laying shall start at the bottom with the bell ends facing upward. Where deflection in the line laying is required, either in the vertical or horizontal plane, the deflection may be made at the joints with the maximum deflections not exceeding half of the pipe manufacturer's specifications. Axial deflection (i.e. Bending of the pipe barrels) is prohibited for PVC pipe. If the opinion of the Inspector, the deflection is excessive they will order the job stopped. The **County of Oxford Public Works** or its Service Provider, if deemed necessary, will direct the Contractor to install special fittings in order to provide the necessary deflection.

Thrust restraints shall be installed as noted in **Section 6.2.4.7** of the Design Guidelines and as indicated by the manufacturer. Offset locations and details shall be shown on Construction and As-Constructed Plans.

When the new main shall cross existing utilities, or where an existing watermain will be undermined during laying operations, the **County of Oxford Public Works** may order the installation of support beams. Support beams shall be approved by the **County of Oxford Public Works** prior to placement. The removal or replacement of an undermined section of the existing watermain or sewer may also be required. The Contractor shall submit proposed methodology for the support and/or replacement for the approval of the **County of Oxford Public Works**.

In all cases where pipe is laid on backfilled material, the backfill shall consist of granular material compacted in maximum 150mm layers to a minimum of 95 percent Standard Proctor density. Pipe must not be laid on blocks.

No pipe shall be laid until the preceding pipe joint has been compacted and the pipe carefully embedded and secured in place.

All pipe and fittings shall be installed strictly in accordance with the manufacturer's instructions. At least two copies of the manufacturer's manual of instructions shall be kept on the job site; one copy in the possession of the foreman, the other with the pipe layers.

Installations shall be kept thoroughly clean during the progress of the work and until the completion and final acceptance thereof.

The Contractor shall supply all fittings to complete the installation to the lines and grades shown on the Contract Drawings.

Where vertical or horizontal curves are shown, the pipeline shall not deviate more than 300mm from line, or more than 75mm from grade.

6.3.3.8 Bedding

For the purpose of this specification all materials placed between the trench bottom and 300mm over the top of the pipe shall be considered as bedding. Bedding around the watermain and services may be granular material or clean screened sand. The use of native material for bedding is not permitted.

Granular materials greater than 19mm in size shall not be used for pipe bedding. Granular material shall be compacted to a minimum of 95 percent Standard Proctor Density.

Bedding material shall be placed full width of trench. Compact material around the pipe with hand tampers properly shaped to ensure full compaction below the haunches. Do not use mechanical tampers over the top of pipe where cover is less than 300mm.

The depth of trench excavations shall be sufficient to allow for the bedding required below the pipe invert.

6.3.3.9 Backfilling

Backfill shall be considered as starting from 300mm over top of the pipe. All materials below this point shall be considered as bedding.

If the **County of Oxford Public Works** decides that the site selected excavation material either wholly or partially, is not suitable for backfill, then suitable imported material shall be provided of a type approved by the **County of Oxford Public Works**.

Backfill trenches from the top of the pipe bedding to the underside of surface restoration with site selected excavated material. Provide backfill free of roots, organic material and stone larger than 250mm.

Backfill material shall be placed in lifts not exceeding 300mm and compacted to a minimum 95 percent Standard Proctor Density.

Backfilling on a public road allowance, or in an area that is to be designated as a public road allowance, shall be done in accordance with the requirements of the **County of Oxford Public Works** or other road authority.

Backfill on all County Road allowances in the travelled portion of the roadway shall be granular material as set out in the Ontario Provincial Standards.

Installation of material will be as directed by the **County of Oxford Public Works** or other road authority.

The Inspector may order the trench to be bedded by hand from the bottom of the trench to the centre line of the pipe with sand, placed in layers of 75mm and compacted by

vibratory equipment. Bedding material shall be deposited on each side of the pipe simultaneously.

From the centre line of the pipe, fittings, and appurtenances to a depth of 300mm above the top of the pipe, trenches shall be backfilled by machine or by methods approved by the Inspector. The type of backfill material used shall be sand, gravel or approved excavated material.

The Contractor shall use special care in placing and compacting this portion of the backfill so as to avoid damaging or moving the pipe.

No frozen material shall be used for backfilling nor shall backfilling be carried out where material in the trench is frozen.

The surface shall be restored so that all pavement, sidewalks, curbs, gutters, shrubbery, fences, poles, sod and other property and surface structures removed or disturbed during the work shall be restored to a condition at least equal to that before the work began.

6.3.3.10 Compaction Test

The **County of Oxford Public Works** may order compaction tests by an independent testing company. Tests will be arranged for by the County or its Service Provider.

When tests show that the compaction does not meet the specified requirement, the Contractor will carry out further compaction in a manner directed by the **County of Oxford Public Works** and pay for further testing to establish proof of the specified compaction.

For backfill compaction, tests will be performed in accordance with the testing company's recommendations.

Co-operate with the **County of Oxford Public Works** and testing company by scheduling the placing and compaction of backfill so that tests can be progressively taken.

6.3.4 Installation of Watermains by Directional Drilling

6.3.4.1 General

The Contractor shall, unless specified otherwise, furnish all material, equipment, tools, and labour necessary to complete the installations. The installation of watermain shall be as per AWWA Standards and Specifications and OPSS.MUNI 401, 404, 450, 517, 1010, and Ontario Health and Safety Association OHSA Reg. 213/91 with the following exceptions/amendments.

Contractors shall give the County or its Service Provider a minimum of 48 hours notice prior to commencing construction. A licensed operator from the County or its Service Provider shall be present for all watermain commissioning. Full-time inspection within the public right-of-ways shall be required by Developers consultants in consultation with the County and its Service Providers.

In areas of reconstruction where existing metallic watermain is being replaced with HDPE, the property Owner should be advised that the grounding of electrical systems to the water

service may not be adequate. It will be the property Owner responsibility to ensure adequate grounding after reconstruction is complete.

In areas of construction where watermain or services are located in existing road surfaces or through driveways and entrances, the existing pavement, curbs, sidewalks and driveways shall be saw-cut in clean straight lines to minimize over-break prior to construction. All concrete and asphalt driveways, curbs, and sidewalks shall be restored to existing or better conditions within construction limits. Interlocking brick driveways shall be carefully disassembled to proposed construction limits and reassembled to existing or better conditions. If the property Owner cannot agree to the methods and materials required to reinstate all concrete and asphalt driveways, curbs, and sidewalks to existing or better conditions the County or its service provider will undertake a quotation for reinstatement to the construction limits according to existing materials. Based on the quotation the property Owner may receive monetary compensation to pursue other alternatives. Prior to receiving compensation, the property Owner will sign an agreement with the County or its Service Provider acknowledging acceptance.

6.3.4.2 Definitions

Directional drilling is defined as trenchless installation of pipes pulled through a drilled and reamed hole.

A pilot hole is drilled under and across the surface area that cannot be disturbed along a predetermined horizontal and vertical design profile. Direction and elevation are controlled by a steering mechanism in the drill string just behind the cutting head.

Reaming is enlargement of pilot hole to a suitable size to allow for the installation of the pipe.

6.3.4.3 Submission and Design Requirements Submissions

Submit shop drawings showing all equipment and plans required to complete the pipe installation by direction boring. This information shall include:

- Directional boring equipment and specifications;
- Sequence of operation;
- Location of entry and exit points;
- Location and positioning of the working area and individual plant items such as drilling equipment, slurry holding tanks, power generation units, slurry recovery units, pumps, pipe fabrication areas, etc;
- Location and disposal site for cuttings;
- Diameter of pilot hole, and number and size of pre-reams/back-reams'
- Pulling force and method to continuously monitor it;
- Dewatering plan;
- Slurry management plan; and
- Contingency plan for emergency situations including frac-out.

.1 <u>Design Requirements</u>

Procedures, materials and water management plan to be acceptable to the Ministry of the Environment, Conservation, and Parks (MECP), Ministry of Natural Resources and Forestry (MNRF), local Conservation Authority, and the other public agencies having jurisdiction over the project.

All plant, personnel, and construction activity must be contained within working areas or easement limits shown on the Contract Drawings.

.2 Record Drawing Requirements

Record drawings shall be provided following pipe installation. Record drawings shall include the following details:

- Horizontal (plan) location of installed pipe tied to known reference points.
- Profile of the installed pipe with elevations.
- Location of all joints and flanged connections tied to known reference.
- Subsurface ground conditions encountered (soil, clay, rock, etc.)

Record drawings shall be provided in both a PDF and 3D CAD format compatible with the latest version of Autodesk Civil3D.

6.3.4.4 Equipment

The drilling equipment shall be suitable for installation of the pipe size and length required. The boring equipment shall consist of, at minimum: the drilling rig, cutting and steering head, drill stems, power and control equipment, mixing tanks for drilling fluids and a slurry recovery system.

The steering system shall include a probe situated behind the cutting head that can interface with an above ground portable computer control console. The probe shall be able to indicate the orientation of the steering and cutting tool.

The cutting tool shall be steerable from the above ground computer control console so that any deviation from the design alignment can be corrected as boring progresses.

The drilling equipment shall be capable of being retractable and reset to a different horizontal alignment should obstacles such as boulders, tree roots, etc. be encountered. The Contractor shall not change the vertical alignment without the approval of the **County of Oxford Public Works**.

A surface probe shall be provided that can detect the location and depth of the cutting tool/steering system. The surface probe shall be used to confirm that the pipe alignment is within the easement and at the location identified.

6.3.4.5 Construction

.1 General

The Contractor shall provide all necessary equipment, drilling fluids, and power to perform the work specified.

.2 Utility Locating

The Contractor shall be considered an “Excavator” and comply with the Ontario Underground Infrastructure Notification System Act. Contractors shall obtain locates prior to excavation and carry out exploratory excavations where necessary to establish or discover the location and elevation of existing pipes, conduits or other buried objects.

.3 Dewatering

The proposed dewatering method for the entry and exit pits and all excavations shall not be modified without written consent from the **County of Oxford Public Works**.

All water extracted during any dewatering process shall be diverted through a filter system or settling ponds/basins to ensure minimum sediment transport (as per OPSS 518). The filter system or ponds/basins shall be located so as not to interfere with normal construction activity and the public use of such areas.

The discharge of water from excavations into sanitary sewers is strictly prohibited unless a permit is obtained from the County and discharge is in accordance with the Sewer Use Bylaw currently in effect. The cost for cleanup of the sewer or other affected areas will be the responsibility of the Contractor or Developer.

.4 Line and Grade

Line and grade control will be maintained to the locations and elevations on the Contract Drawings. Variations in grade will not be acceptable.

The control system must be capable of maintaining line and grade to ± 100mm over the total distance between the ground entry and exit points.

.5 Soil Transportation System

The directional boring system shall have a slurry system designed to enable excavated soil removal. The slurry system shall have a system of screens and desilting/sedimentation tanks to separate the soil from the slurry.

The drilling fluids may be transported to the drill rig for reuse. Disposal of the slurry onsite or into drainage systems will not be permitted.

.6 Entry and Exit Points

The Contractor shall review site conditions and assess entry and exit points. Assessment shall take the following items into consideration:

- Entry and exit angles to facilitate boring equipment and allow for pulling pipe into reamed hole.
- Setbacks or open cut excavation requirements at entry and exit points to provide the pipe profile and construction of appurtenances as indicated on the Contract Drawings.
- Location of other surface features (e.g. adjacent structures, walkways, fences, poles, trees, etc.)
- Location of other underground features (e.g. utilities, foundations, etc.)
- Protection of water courses against the transport of excavated or other materials into receiving waters.

.7 Pipe Installation

Only High-density Polyethylene (HDPE) pipe shall be used for HDD. The pipe shall not be laid to a radius greater than that recommended by the pipe manufacturer.

Once the pilot bore has been completed, the successfully tested pipe shall then be installed in the reamed hole.

The Contractor shall ensure by use of shear couplings or other means that the amount of tension applied does not exceed the tensile capacity of the pipe during the pipe installation process.

The Contractor shall allow sufficient time for the longitudinal stresses in the HDPE to dissipate before the pipe is cut for connection.

The installed pipe shall be cut to the length and at elevations detailed in the Contract Drawings. The ends of HDPE pipe shall be prepared for butt fused flanged connections. All joints shall be restrained. Use of concrete thrust blocks for restraint shall not be permitted.

.8 Tracer Wire

When Directional Drilling is used for watermain installation, four (4) tracer wires will be installed simultaneously. The subsequent wires will be used as a backup if the other tracer wire is broken during installation. Refer to **Section 6.3.2.3** for material requirements. Tracer wire shall be installed along the top of the pipe and bound at 6-metre intervals. The wire must be installed between each valve and/or the end of the watermain.

.9 Testing and Commissioning

Refer to **Section 6.3.9**.

.10 Disposal of Materials

Surplus excavated material and slurry shall be disposed off-site. The Contractor shall make his own arrangements for off-site disposal and for carrying out soil tests to ensure that disposal is consistent with MOE guidelines, policies and regulations.

6.3.5 Temporary Watermain and Services

Temporary watermain and services shall be in accordance with OPSS.MUNI 493 with the following exceptions/amendments.

When service interruption is likely to be greater than 24 hours for 2 or more residential units and/or buildings, temporary watermain must be installed. Each home or business shall have its own temporary water service connection. Shared services shall not be permitted. An approved back-flow preventer device shall be installed at the point of connection. The backflow preventer shall be placed above ground level with the excavation backfilled.

Prior to construction the Contractor shall submit a written detailed procedure outlining methods, materials, connection points to existing mains, connections to supply customers, and disinfection process for approval by the **County of Oxford Public Works**. A drawing showing the proposed layout of the temporary water supply system indicating connection points to the existing watermain must also accompany the submission. Contractors shall notify the County or its Service Provider in writing a minimum of 48 hours in advance of their intention to connect to existing watermain. It will be the responsibility of the Contractor to maintain temporary watermain and services in a safe operating condition at all times.

All open excavations shall be partially backfilled and fenced off.

When a hydrant is removed from service, a temporary hydrant may be required. Temporary hydrants will be installed with the necessary valves and fittings and shall be installed where existing hydrants have been removed or where spacing permits. Hydrants out of service will be bagged and clearly marked with a “HYDRANT OUT OF SERVICE” tag.

Closed loop temporary systems (i.e. hydrant to hydrant) will not be permitted. Each dead-end branch shall have either a blowoff or service connection to facilitate flushing and sampling of the temporary watermain.

Temporary watermain shall be a minimum of 50mm diameter Aquamine high impact, ASTM PVC 1120, D 2241, DR 17, 1720 kPa, or approved equal. The diameter of the temporary watermain shall be based on the number of services in the affected area. This main shall be certified for potable water use as per NSF 14 and 61.

Service piping shall be a minimum of 19mm inside diameter KuriTec Series K6136 reinforced PVC flexible connection or approved equal. Service piping shall be certified for potable water use as per NSF 61. Customer connections to external hose bibs shall require a brass wye fitting with dual shut-offs.

Prior to customer connection, all temporary watermain and temporary service piping shall be tested and disinfected. Testing of the temporary watermain and services will be at system pressure. Once testing of the temporary watermain is complete with no leakage, service piping shall be connected to the temporary watermain. There shall be no leakage in service piping.

Services shall be plugged, capped, or valved off at the end of the service pipe once flushing has been completed. Temporary watermain and services shall then be disinfected by removing plugs, caps, or opening valves to flow super-chlorinated water for the disinfection process. Plugs and caps shall be replaced, and valves closed once the disinfection process has begun. Taping ends of service piping is not permitted. All piping, hoses, valves, plugs, caps, and fittings for all connections shall be the responsibility of the Contractor. Flushing, swabbing, disinfecting and commissioning of the temporary system shall meet the requirements of **Section 6.3.9**.

All temporary services connected to external hose bibs shall be made using a brass wye connector for sampling and to ensure external water use by the customer. Connection via existing curbstop or external hose bib. Control valve handles for individual services to be removed once commissioned. Handles to be retained by Contractor and County for operation and maintenance issues.

When a replaced section of watermain is restored to service, the Contractor shall remove any corresponding temporary pipe and house service connection and shall leave the street, sidewalk and adjacent property in a neat and orderly condition.

6.3.6 Watermain Connections

6.3.6.1 Connections to Existing Mains & Jointing Watermain & Fittings

All chemicals and materials used in the operation of the drinking water system that come into contact with water within the system shall meet all applicable standards set by AWWA, ANSI, as well as the safety criteria standards under NSF60 and NSF61.

Contractors shall notify the County or its Service Provider in writing a minimum of 48 hours in advance of their intention to connect to existing watermain. Contractors shall locate and make connections to existing watermain as shown on the Contract Drawings in the presence of a licensed operator from the County or its Service Provider.

The method of connecting shall be determined by the **County of Oxford Public Works**. Where connections are to be made to concrete or steel mains, the installation will be such as to bare all coatings and materials in a proper manner. The Contractor shall submit a program for this work which shall be approved by the **County of Oxford Public Works** before work commences.

Contractors shall not operate existing valves. Contractors shall notify any existing customers of shutdowns at least 48 hours in advance of the disruption. Notices and customer lists of the affected area will be supplied by the County or its Service Provider.

The jointing of pipe shall be made in accordance with the manufacturer's instructions and the applicable AWWA standards.

No substitution of accessories will be permitted and only lubricants as supplied by the manufacturer will be permitted.

Extreme care shall be taken to prevent contamination of the existing watermain and new closure fittings. All new piping and appurtenances placed in the connection of the new main and existing waterworks system must be disinfected with a 1% solution of sodium hypochlorite or equivalent method, conforming with AWWA C651. All connections to existing watermain shall be 6 m in length or less. Connection requirements longer than 6 m shall be flushed, pressure tested and disinfected as per **Section 6.3.9**.

On straight lengths, no lateral deviation in excess of 150mm will be tolerated and on straight grades no grade deviation in excess of 75mm will be tolerated.

6.3.6.2 Valves, Hydrants & Fittings

Valves, valve boxes and hydrants shall be installed plumb at all locations. The valve box will be installed on every valve in such a manner that no shock or stress shall be transmitted to the valve. The box shall be centered and plumb over the operating nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed.

Valve extension rods shall be installed according to **Oxford County Standard Drawings.**

Bends, crosses, tees and other fittings shall be installed where shown. Mechanical thrust restraint is required. Mechanical restraints to be installed as per **Section 6.2.4.7** of the Design Guidelines and in accordance with the Manufacturer’s specifications.

Prior to installation hydrants should be cycled to full open and full closed positions to ensure no internal damage or breakage has occurred during shipping and handling.

Hydrants shall be installed according to D1828-1-1993. Hydrants shall be set with the barrel vertical, outlets parallel to the roadway and at a depth suitable for the finished grade

at the hydrant location. Temporary extension pieces may be necessary. Hydrants shall be installed using mechanical restraints.

Hydrants shall be set on concrete blocking, as shown on OPSD 1105.010. The excavation around the hydrant shall be filled to a minimum of 150mm above the hydrant drain, with at least 0.50 cubic metres of 19mm clean crushed stone, free from fine material, which shall be covered with filter cloth before backfilling. Hydrants shall not be backfilled before being inspected by the **County of Oxford Public Works or Service Provider**.

Cast iron plugs or caps shall be installed on all dead-ends with the dead-end being equipped with a suitable blow-off.

Hydrants installed in areas of high-water table may require drain outlets to be plugged to prevent contamination. Hydrants with plugged drains must be clearly marked and pumped dry after each use.

The illegal connection and operation of any municipal fire hydrant will result in fines as set out in the most recent version of Oxford County's Water/Wastewater Bylaw.

6.3.7 Service Installation

6.3.7.1 Connecting Services to Mains

Contractors shall give the County or its Service Provider a minimum of 48 hours notice prior to connecting services. A licensed Operator from the County or its Service Provider shall be present for all connections.

All new water services 100mm diameter and larger on private property must be tested and disinfected in accordance with **Section 6.3.9**. Private services will not be connected unless testing and sampling has been completed. A licensed operator from the County or its Service Provider shall be present for the testing and sampling procedure. The installation of services shall be as per applicable OPSS, OPSD and AWWA standards with the following exceptions/amendments.

Direct tapping of services to PVC watermain is not permitted. Water service connection main stops connected to Ductile Iron is permitted with an approved saddle only. Main stops shall be tapped into the main at a 10 to 20-degree angle. All service connections shall be tapped in with the main under working pressure.

One continuous piece of service pipe shall run from the watermain to the curb stop and service box at the street line. Splicing of service lines is not permitted.

Curb stops shall be installed with electrical thaw nuts on the private side facing away from the watermain.

Services of 25mm shall be installed as per **Oxford County Standard Drawings**. Services of 32mm, 38mm and 50mm in diameter shall be installed as per **Oxford County Standard Drawings**. The use of Copper for service material is not permitted. No couplings are permitted between the main stop and curb stop.

Services of 100mm diameter and larger shall be connected by either cutting out a section of the main and installing a tee with a cut-in sleeve or by using a tapping sleeve and valve. The type of connection will be determined by the County or its Service Provider.

Stainless Steel Double bolt saddles shall be used on all services for Ductile Iron pipe from 25mm to 50mm diameter. Saddles shall be full circumference wide band with stainless steel band, nuts, bolts.

Stainless Steel Double bolt saddles shall be used on all services for PVC watermain from 25mm to 50mm diameter. Saddles for PVC pipe shall be full circumference wide band with stainless steel band, nuts, bolts, and outlet.

The County or its Service Provider will inspect all connections unless otherwise agreed in writing. The Contractor will install service connections in subdivisions or new developments.

All tapping machines and other required equipment to be used onsite shall be satisfactory to the County or its Service Provider.

When connections are to be made to mains other than cast iron or ductile iron, they shall be done under special instructions from the **County of Oxford Public Works**.

Curb boxes shall be installed vertically, flush with finished grade, and located on the property lines. If extensions are required only threaded couplers shall be used. Set-screw type extensions are not permitted.

Cathodic Protection for services shall be installed in accordance with **Section 6.3.8.2**.

Services located 500mm or less horizontally from a MH or CB requires minimum 50mm thick insulation to 1.0m each side of structure.

The County or its Service Provider shall require a minimum of 48 hours notice prior to placement of finished grade materials surrounding the curb stop. Curb stops shall be inspected and raised to the level of finished grade. All service boxes located in concrete, asphalt, or interlocking brick surfaces shall have a 100mm inside diameter PVC pipe 300mm in length placed around the cap and flush with the surface. After placement of final grade material, the curb stop shall be flush with the surface and in a fully accessible and operable state.

Blue painted stakes 50mm x 100mm shall be placed during trench restoration to mark the termination of the water service. These stakes shall extend from service invert to a minimum of 600mm above finished grade.

Landscaping Trees are not permitted to be planted in a public right of way where the tree's trunk will interfere with the operation of the curbstop. The trees drip line at maturity shall not extend over the water service of a residence.

A record of service location must be produced for the As-Constructed drawings and provided digitally to the County.

Water services are to be located on these drawings by showing proper plan view locations which includes any bends and sweeps between the connection at the watermain, and the right-of-way,

tie-in or curb stop. Depth below existing ground and invert elevation shall be indicated on the service locate sheet drawing.

All services shall require extensions from the curb stop to a minimum of 600mm above finished grade. These tail pieces will be used for testing and air relief purposes only. Material used for tail pieces shall be PEX, PE 3408/3608 Series 200 CTS, or approved equal and shall conform to AWWA C901.

Upon completion of testing, service tails will be capped and fastened to marker posts.

The illegal connection and operation of any municipal water service will result in fines as set out in the most recent version of Oxford County's Water/Wastewater Bylaw.

6.3.8 Corrosion Protection and Insulation

6.3.8.1 Petrolatum Coating System

Material requirements shall be as per AWWA C217, CSA Z245.30-14, and be ISO 9001 and ISO 14001 compliant. The installation of the petrolatum coating system shall be in strict conformity with AWWA C217 with the following exceptions/ amendments.

- All surfaces of fittings, flanged connections, nuts, bolts, tie rods, clamps, valves, sleeves, Victaulic couplings, joint restraints, etc., shall be protected using petrolatum materials. Prior to application all surfaces shall be free of dirt, grease, oil, paint, or foreign materials. The minimum acceptable application of a petrolatum coating system is a two-step process consisting of a primer and petrolatum tape. Where voids or other surface irregularities are encountered, filler material is required where the tape will not come into full contact with surfaces. Placement of petrolatum tape only is not acceptable.
- All surfaces of pipes, valves, fittings, and appurtenances in valve chambers shall be coated using petrolatum materials. Valves or appurtenances that are epoxy coated do not require this procedure.
- Petrolatum coatings shall be Denso or approved equivalent. After final inspection of the applied coating system any defects in the application process shall be repaired at the Contractor's expense.

6.3.8.2 Cathodic Protection for PVC Watermain

The size and type of anodes shall be determined through the Geotechnical report. The list below indicates the minimum anode requirements. Anode locations shall be clearly shown on the Construction and as-built drawings. In addition, a tabular listing of the stations at which the anodes are to be installed shall be provided.

Sacrificial anodes shall be installed at all ductile iron, cast iron pipe fittings, joint restraints, copper water service lines, and attached to tracer wire at the ends of watermain. At the ends of watermain the tracer wire shall be spliced to the wire of a 5.5 kg zinc anode and is to be buried at the same elevation as the watermain.

In areas of reconstruction where new non-metallic services are connected to existing metallic services at property line, anodes shall be connected to the existing metallic service pipe behind the curb stop on private property. Where existing metallic water

service materials other than copper are encountered on private property, the Owner should be advised of replacement.

In subdivisions that have undeveloped lots with existing copper service lines on municipal property, an anode shall be installed on the copper service line during the connection inspection.

Anodes shall be installed as per OPSS.MUNI 442, OPSD 1109.010, OPSD 1109.011, and OPSD 1109.012. Attaching anodes to restraint nuts or gland pack nuts is not permitted. Anode wires shall be TWU or RWU-90 insulation with AWG#1/0 – 19 strand copper wire rated for underground direct bury applications.

Valves or appurtenances that are epoxy coated do not require this procedure. Connections to fittings, and joint restraints will be done using a thermite weld and coated with mastic. Anodes attached to copper services will be done using a silicon bronze ground clamp attached to the service pipe. The clamped connection shall be wrapped with petrolatum tape and compressed by hand around the connection. Installation shall be as per the manufacturer's specifications and recommendations.

.1 Minimum Anode Sizing

The Minimum anode sizes used shall be in accordance with the table below.

Table 4-8 Minimum Anode Sizing

New Installations of Fittings, Joint Restraints, and Services	**Zinc – ASTM B418 Type II**
Fittings and joint restraints	11kg Z-24-48
Water Services 38mm and larger	11kg Z-24-48
Water Services under 38mm	5.5kg Z-12-24

Existing metallic watermain, services, or connection between cast iron / ductile iron	**Magnesium – ASTM B843 Type M-1C**

watermains and PVC Pipe	
Fittings and joint restraints	14kg M-32-22
Water Services 38mm and larger	14kg M-32-22
Water Services under 38mm	7.7kg M-17-20

6.3.8.3 Thermal Insulation

Material used to thermally insulate mains and services shall have a minimum compressive strength of 690kPa. Approved material is STYROFOAM HI 100 BRAND by Dow Chemical or approved equal. Installation as per **Oxford County Standard Drawings**.

6.3.9 Swabbing, Flushing, Disinfecting and Bacteriological Testing of Watermains

6.3.9.1 Testing General

The Contractor shall give the County or its Service Provider a minimum of 48 hours' notice prior to testing. A licensed operator from the County or its Service Provider shall be present for the testing procedure and is required to fill out and submit the Watermain Inspection Report. Submission of Form F035 Watermain Inspection Report is required as final acceptance of the testing procedure. Testing shall be conducted as per OPSS and AWWA requirements with the following exceptions/amendments.

- The Contractor shall test all watermain, in such lengths or sections as directed by the **County of Oxford Public Works**. The Contractor shall provide all labour, water, pumps, gauges, caps, stoppers, air release cocks, pipe work and other apparatus required to complete the tests.
- The Contractor shall supply the **County of Oxford Public Works** with the pressure gauges intended to be used prior to the first test in order that they may be checked for accuracy. All equipment used by the Contractor in carrying out the testing shall be approved by the **County of Oxford Public Works**.
- Under no circumstances will the test lengths be permitted to exceed 600 m unless approved by the **County of Oxford Public Works**.
- Pipe crossings on bridges, under rivers, creeks, railway tracks, Provincial roads, and other right-of-ways shall be tested separately.

6.3.9.2 Commissioning Plan

The Contractor shall be responsible for submitting a Testing and Commissioning Plan for the work. The plan shall include:

- A detailed overview of their approach to each phase of the testing and commissioning process.
- A drawing showing the proposed sampling points.
- A schedule showing the phasing of testing and commissioning, separated by section if the new watermain will be commissioned in parts.
- A complete list of parts and materials to be used in commissioning indicating manufacturer, material type, certifications, etc.
- The SDS for all chemicals being used.
- Proof of NSF 60 compliance for all chemicals coming into contact with potable water.
- A copy of the County's standard form for watermain commissioning (template to be provided by **County of Oxford Public Works**.

6.3.9.3 Initial Flushing and Swabbing

Prior to testing and disinfection, and under the supervision of the County or its Service Provider, all dirt and foreign matter in the system shall be removed. Pipelines shall be cleaned by flushing and swabbing.

.1 Flushing

After watermain construction is complete initial flushing will be conducted on all branches of watermain until all visible foreign matter has been removed. All new and rehabilitated watermains shall be flushed and swabbed after the water services have been tapped.

.2 Swabbing

Once flushing is complete swabs may be inserted into all branches of watermain, or, as directed by the County or its Service Providers. The placement of swabs during construction is not permitted unless authorized by the County or its Service Providers. Swabbing will be completed prior to pressure and leakage testing.

The swab diameter shall be 1.25 times the outside diameter for pipes up to and including 300mm and 1.50 times the outside pipe diameters for pipes greater than 300mm. Each branch of the new mains will be swabbed using three sequentially numbered swabs. The velocity of the swabs shall not be less than 0.76 m/sec.

Swabbing shall be repeated until 2 consecutive clean swabs (no discolouration of swab) and the discharge water is clear and approved by Water Operations representatives. Any potential changes to swabbing process shall be at the discretion of the Water Operations Representatives.

6.3.9.4 Test Pressure

Test pressure shall be 1035 kpa (150 psi). This will be measured at the highest elevation in the test section. The test section shall be filled slowly with water and all air shall be removed from the pipeline. A period of 24 hours for absorption should be allowed before starting the test. The test section shall be subjected to the specified continuous test pressure for 2 hours. Hydrostatic pressure and hydrostatic leakage tests may be conducted either simultaneously or separately.

Hydrostatic testing of new watermain and appurtenances (fire hydrants and laterals, etc.) including water services to the curb box shall be done on new subdivision watermain

infrastructure. Services can be dry tapped and included in testing. All other hydrostatic testing of new watermain replacements shall include the testing of all appurtenances including the installed service saddle 25mm main stops only. All services over 25mm shall be tested to the curb box.

Hydrostatic testing of reconstructed watermain and appurtenances (fire hydrants and laterals, etc.) shall be conducted in the same manner as new watermain. New services, including main stops and curb boxes shall also be tested provided they are not connected to existing services.

In areas where watermain has been rehabilitated with structural or cement mortar lining, pressure testing to 1035 kPa (150 psi) is not required. Rehabilitated watermain shall be tested at system pressure.

A visual inspection is required for all fittings, valves, and connection points where entry into the piping has occurred, prior to backfilling, to verify there is no leakage.

Testing and inspection will be completed to the satisfaction of the County or its Service Provider.

6.3.9.5 Blocking & Blanking

Once the Contractor is ready to test a section of the pipeline, the Contractor shall check that all relevant open ends are capped off and that all bends, tees, crosses, etc. are adequately restrained to safely withstand the test pressure.

6.3.9.6 Air Release Taps

The Contractor may be directed by the **County of Oxford Public Works** to excavate certain portions of the pipeline in order to provide taps for the release of air without additional payment. New water services may be used to release air provided they have temporary service material connected to the curbstop and placed to the surface of the ground

Air release taps shall be installed at all high points to accomplish this before the test pressure is applied.

6.3.9.7 Filling Pipe

The section of the pipeline to be tested shall be slowly filled with water obtained by the Contractor at his own expense from a source approved by the **County of Oxford Public Works**. The Contractor shall ensure that all air has been removed from the section of the pipeline to be tested.

6.3.9.8 Leakage Test

The test section shall be subjected to the specified continuous test pressure for two hours. The Contractor shall provide the **County of Oxford Public Works** with the necessary equipment for measuring the exact quantity of water added in order to maintain the test pressure throughout the duration of the test.

The County or its Service Provider shall calculate the allowable leakage for testing purposes. Allowable leakage for Polyethylene shall be as per OPSS 441.07.24.

If any section under test discloses a leakage greater than that allowed, the Contractor shall locate and repair the defective area or areas at their own expense.

6.3.9.9 Disinfection

.1 General

After the conclusion of flushing, swabbing, pressure and leakage tests to the complete satisfaction of the **County of Oxford Public Works**, the Contractor shall disinfect the newly constructed or rehabilitated water system including all sumps and chambers that are intended to hold potable water as per the MECP Watermain Disinfection Procedure, AWWA C651 Disinfecting Water Mains, NSF 60, and NSF 61.

All watermain shall be disinfected according to Ontario's "Watermain Disinfection Procedure". All water services 100mm and greater shall be disinfected according to Ontario's "Watermain Disinfection Procedure". The "Procedure for Disinfection of Drinking Water in Ontario" as adopted by reference by Ontario Regulation 170/03 under the Safe Drinking Water Act.

The two acceptable methods for disinfection are:

- A known quantity of water and a known quantity of Chlorine mixed in an approved tanker truck to achieve the required concentration of chlorine. This mixture will then be used to fill the new water main.
- A modified continuous feed method. This will be a known flow of water in the new water main injected with a known flow of chlorine to achieve the required concentration of chlorine.

The method, materials, quantities, and equipment to be used will be submitted to the **County of Oxford Public Works** for approval before the construction starts. Equipment used should be specific to testing and disinfecting and not used for any other purposes.

The Contractor shall complete the disinfection within ten days of being directed to do so. The Contractor shall give the County or its Service Provider a minimum of 48 hours written notice prior to disinfecting. A licensed operator from the County or its Service Provider shall be present for the disinfecting procedure.

.2 Contractor Supplied Materials

The Contractor shall supply all labour, water, materials, chemicals, flushing taps, disinfecting agents, etc. necessary to complete the disinfection and final flushing of the system to the satisfaction of the **County of Oxford Public Works**.

.3 Point of Application

The new watermain shall be kept isolated from the existing waterworks system using a physical separation until satisfactory bacteriological testing has been completed and accepted by the County or its Service Provider. Water required to fill the new main for hydrostatic pressure testing, disinfection and flushing may be supplied through a temporary connection between the existing water system and the new main. Temporary connections shall be as per **Oxford County Standard Drawings**.

The temporary connection shall include an appropriate testable reduced pressure zone (RPZ) check valve assembly used only above ground along with isolation valves located on each side of the device.

The County or its Service Provider will require the Contractor to provide written certification of the backflow prevention device's operation in accordance with CAN/Canadian Standards Association-B64 Series Manual each time the device is installed. See also **Bylaw 6544-2023**. The backflow prevention device shall be isolated from the new main during the hydrostatic pressure test by placing the isolation valves in the "closed" position.

It will be necessary to re-establish the connection after completion of the hydrostatic pressure test to disinfect and flush out the chlorinated water prior to the final connection of the new or rehabilitated main to the existing system.

.4 Disinfection Procedure

Chlorination methods for disinfecting newly constructed watermains shall be as per AWWA C651. Minimum contact times, initial chlorine concentrations, and maximum allowable decreases in chlorine concentration shall be as per the MECP Watermain Disinfection Procedure, as amended below.

Water entering the system shall be controlled to flow slowly during the application of the chlorine solution. The use of Dole valves may be required.

The County or its Service Provider shall record the duration of disinfection, as well as the initial dose and remaining residual at the end of the contact time.

6.3.9.10 Final Flushing

After disinfection, heavily chlorinated water should not remain in prolonged contact with the pipe.

In order to prevent damage to the pipelining or to prevent corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main, fittings, valves, hydrants, blow-offs, branches and all service tails.

It is unacceptable to allow heavily chlorinated water to remain in a main over a weekend or a 48-hour period.

Dechlorination of water shall be as per AWWA C655. The environment to which the chlorinated water is to be discharged shall be inspected prior to final flushing. All chlorinated water used for testing, flushing, and disinfecting watermains shall be disposed of safely. Any discharge of chlorinated water that will cause damage to the environment, including aquatic and terrestrial species, shall require a neutralizing chemical to be applied to thoroughly neutralize the residual chlorine.

When necessary, Federal, Provincial, and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water. Chlorinated water may not be discharged to any water body.

Discharge of heavily chlorinated water into sanitary sewers is not permitted. Acceptable means of disposal is by discharge into a storm sewer or open environment (drainage ditch) with a free chlorine residual of 0.0 mg/L (i.e. no detectable level of chlorine). The concentration of chlorine in the water leaving the main will be approved by a certified operator from the County or its Service Provider on site. When discharging into the open environment or storm sewer, it will be the responsibility of the Contractor to ensure the effectiveness of the dechlorinating process.

The Contractor shall provide a written plan for the dechlorinating process which will be submitted to the County or its Service Provider for final approval prior to discharge.

6.3.9.11 Sampling Requirements

After final flushing and before the new watermain is approved for connection to the existing water system, two sets of water samples shall be taken at least 24 hours apart. Samples shall be collected every 350 metres, from the end of the line, and from each branch. For watermains less than 350 metres, two sets of samples shall be collected at a minimum of two locations.

The free chlorine residual must be between 0.50 mg/L to 1.50 mg/L.

Only a certified municipal operator or person designated by the Municipality (OWRA Reg. 128/04) shall collect bacteriological samples. Testing of initial samples as described above will be paid for by the County. Contractors shall contact the County for information regarding current approved laboratory services.

All water samples are to be analyzed at a laboratory that is accredited and licensed to perform microbiology tests on regulated municipal drinking water. If additional samples are required, they will be done at the Contractor's expense.

The results should be emailed to water_analytical@oxfordcounty.ca directly from the laboratory or may also be faxed directly to the County at 519-421-4711. For sampling performed in the City of Woodstock or the Town of Tillsonburg results should be forwarded to the Water Operations Manager at these locations.

Samples will be taken by an operator employed by the County or its Service Provider who will also provide the sample container, complete the appropriate paperwork (chain of custody) for samples going to the laboratory and seal the container or sample bottles.

The requested tests, free chlorine residual, time the sample was taken, location and the operator's name must be on the chain of custody. Samples submitted without appropriate paperwork (i.e. chain of custody) will be rejected by the testing laboratory and not analyzed.

Contractors will arrange for delivery of samples to the lab if a pick-up cannot be conveniently arranged.

Samples should be transported in a container with ice or cold packs to maintain a temperature between 4 °C and 10 °C, until delivered to the laboratory. Samples must be received at the laboratory within the holding time required for the type of sample. Samples taken from water mains isolated from the municipal consumers are identified as NR (not regulated under Reg. 170/03).

The minimum acceptable requirements for bacteriological tests are:

- E. coli 0 colonies per 100 ml
- Total coliform 0 colonies per 100 ml

If background bacteria are reported, the result shall not be accepted above 200 colonies per 100 ml. If an HPC (heterotrophic plate count) is analyzed, the result shall not be accepted above 500 colonies per 1 ml.

6.3.9.12 Commissioning of New Main

Contractors shall complete a New Watermain Inspection Report and submit to **Oxford County Public Works**.

Contractors must provide a method of dewatering to protect the new and existing watermain from contamination with foreign material or groundwater during the final connection. Should contamination occur, the entire cost of disinfecting the mains will be at the Contractor's expense.

One method of dewatering is to provide a crushed stone sump in the trench and sufficient pumps to control the water being drained from the main, assuring no backflow into the pipes from the trench.

All new piping and appurtenances placed in the connection of the new main and existing waterworks system must be disinfected with a 1% solution of sodium hypochlorite or equivalent method.

When all of the initial tests, including the bacteriological samples are satisfactory, approval from the County or its Service Provider must be obtained prior to connecting the main to the existing water system. Contractors shall give the County or its Service Provider a minimum of 48 hours' notice prior to connecting.

A licensed operator from the County or its Service Provider must be present on site during the removal of the temporary connection and until the connection to the existing waterworks has been completed.

6.3.9.13 Testing and Commissioning of Relined Watermains

In general, Swabbing, Flushing, Disinfecting and Bacteriological Testing of Relined Watermains shall follow the same procedures as listed above for new watermains, with some modifications. All relined segments of watermain shall remain isolated from the distribution system until testing and disinfection is complete.

The test pressure for relined watermains shall be at the existing system static pressure for a duration of 1 hour. Pressure testing shall not take place against existing "in place" valves.

The locations of any joints, fittings, repairs, and connection points in the relined system shall remain open for visual inspection for leakage until the pressure test is complete. This shall include any repairs to existing water services where they were necessary as a result of the relining process. Failure to do so will result in the excavation of any or all of these areas for visual inspection at the Contractor's expense.

6.3.9.14 Contractor's Liability

The Contractor shall be liable for all damage to equipment, property, persons, etc. caused by or as a result of the pressure and leakage tests performed and the flushing, disinfection, and cleansing of the system, pipeline, and accessories.

6.3.9.15 Removal of Equipment

Upon completion of the testing and disinfection of each section, the Contractor shall remove all ancillary equipment and plug all holes left by the air release taps in a manner satisfactory to the **County of Oxford Public Works**.

6.3.9.16 Defects in Pipework

The Contractor shall, at their own expense, carry out all remedial work necessary to rectify any defects revealed in watermain, pipelines and pipe work.

6.4 BULK WATER FILL STATIONS

Bulk water fill stations are intended to provide a reliable means of supplying water in large quantities for construction or commercial activities.

6.4.1 Site Layout

A bulk water facility shall be equipped with a minimum 3.0m wide paved asphalt apron around the bulk loading panel.

6.4.2 Process Design

Bulk water stations are part of the County's water distribution system and must be designed to prevent freezing of water lines and avoid the possibility of cross-contamination with the County's water system.

Provide an electrical/control panel complete with an automatic card reader system to control and monitor the operation of the bulk water system. The card reader and control system shall be utilized to quantify water takings for billing purposes. The card reader and control system must be designed in complete consultation with County staff to ensure compatibility and integration with the County's billing system.

Provide a flow meter, online pressure indicator transmitter and testable reduced pressure principle backflow preventer assembly on the main line. Design should consider adequate sampling ports and means for draining water.

Provide positive drainage around the bulk loading station to direct spillage and stormwater away from the station. Site design shall include provision for drive-through tanker circulation with no requirement to reverse direction or backup. Sufficient space should be provided for queuing of at least one tanker truck waiting to fill without impacting local traffic or blocking the street.

Site selection for new bulk loading stations shall be in consultation with the County and local community stakeholders to ensure public acceptance prior to design.

6.5 WATER CISTERNS BACKFLOW/METERING

On site water cisterns connected to municipal water are discouraged, however should one be permissible by **Oxford County Public Works** they are to be designed and constructed with a backflow protective device and a flow meter to account for water within the cistern. The Owner will be responsible for the supply, installation and maintenance of all check valves and protective devices and water metering, at no cost to the County.

Refer to **Section 6.2.13** for additional information on Backflow Prevention. Refer to **Section 6.2.8** for additional information on Water Metering.

6.6 WATER BOOSTER PUMPING STATIONS

Booster Pumping Stations refer to pumping stations in which intake lines are directly connected to the pressurized water main and are designed to increase pressure and maintain water transmission within a distribution system. Booster Pumping Stations shall be designed where pressures are below 310 kPa (45 psi) to provide pressure augmentation within a zone of the system. Refer to **Section 6.2.7.2** for Individual Booster Pumps to augment pressures for a small number of individual residences.

Refer to **Section 8** for general facility design requirements.

6.6.1 Design Criteria

The design criteria for the booster pumping station shall consider analysis of the following conditions:

- Peak flows – Required flowrates when water demand is at its highest.
- Night/low flows – Required flowrates when water demand is at its lowest.
- Fire flows – Sporadic occurrences and therefore must be added to the maximum daily flowrate, if applicable.

The Proponent shall provide the required domestic and fire flow demands and submit the data to the County. The County will review the submission using the approved water model which integrates the County's specified pressure bands. The County will reaffirm the booster station size and pumping requirements which must form the basis of facility design by the Proponent.

6.6.2 Pump System Design

The pumping station shall be designed such that the maximum daily demand can be met with the largest pump out of service. For pumping stations without adequate floating storage, additional pumping capacity should be considered for situations in which the largest unit is out of service.

The pumping station shall be designed with consideration for future capacity expansion. Adequate spacing and connections should be provided for installation of additional pumps, while still allowing for sufficient spacing for equipment servicing. Evaluate the anticipated range of flows and evaluate alternative pump types and sizes to achieve an efficient system design. Provide VFD-operated pumps for all booster pumping stations. Pump start and stop ramp times shall be confirmed through transient analysis.

6.6.3 Considerations for Low Flow Operation

During low flow periods, consider use of jockey pumps and/or pressure tanks to minimize pump cycling.

6.6.4 Piping, Valving, and Instrumentation

All piping shall be provided with isolations valve(s) to permit isolation/removal of pump(s) or major equipment for maintenance work without impacting the integrity or operational capacity of the pumping station itself.

All valves shall be located with ease of access considerations to allow for operation and future maintenance.

All pipes shall be colour coded to comply with the latest edition of the MECP Standards for Pipe Identification in Water and Wastewater Treatment Plants in Ontario. Arrows labeling the direction of flow within the pipe shall be provided.

6.6.5 Surge Relief

Surge relief devices shall be used to prevent equipment damage from water hammer/pressure surge events. Surge relief valves shall discharge water to a safe, controlled location that can accommodate high pressure and sudden flow events without causing flooding, contamination, or operational hazards. Recycling of surge water can be implemented to minimize water losses and in environmentally sensitive areas but should consider water age limits within the system. Wasting of surge water can be implemented where recycling is not viable, but the discharge water must comply with local environmental and stormwater regulations.

The surge relief system should be integrated with SCADA for alarms and monitoring.

6.6.6 Standby Power

Standby power is required to ensure uninterrupted water service during power outages. The pumping station design shall include full standby power capable of covering the station's capacity including essential auxiliaries. The requirement and sizing of standby power should be assessed for each facility based on service criticality and other system factors. The criteria for assessing the need for standby power at a booster pumping station includes:

- If the booster pumping station is the sole source of supply for a pressure zone without adequate reserve storage.
- If the booster pumping station is critical for fire protection or public health and safety.
- If no alternative water supply or storage is available to meet water demands during potential outages.

Refer to **Section 8.11.7** of the facility guidelines for further requirements.

6.6.7 Equipment Servicing

The pumping station should be designed with spacing around pumps, piping, and equipment in compliance with O. Reg 332/12: Building Code (or latest version). Lifting devices, including crane-ways, hoist beams, eyebolts or other appropriate devices should be considered in the design to

allow for maintenance or removal of pumps, motors, valves or other heavy equipment. The lifting devices should have a rated capacity greater than the heaviest equipment unit, including an appropriate safety margin. The station should be designed with floor, roof and door opening considerations to accommodate removal of large equipment.

6.7 WATER STORAGE

The design guidelines as provided herein are for the design of new or rehabilitation of existing reservoirs and tanks. All materials used in the design, alteration and operation of the drinking water system that come into contact with water within the system shall meet all applicable standards set by both the American Water Works Association ("AWWA") and the American National Standards Institute ("ANSI") safety criteria standards NSF International (NSF) NSF 61 and NSF 372.

Refer to **Section 8** for general facility design requirements.

6.7.1 Design

For new reservoirs, provide a minimum of two cells with the ability to isolate any one of the reservoir's cells. Isolation of one cell shall not impact the minimum required contact time (CT) value at the maximum flow rate. For expansion of existing reservoirs, design new cell(s) capable of being isolated from existing cell(s) for repair and or cleaning, or, to float independently on the water supply distribution system.

All inlet, outlet and piping within the storage tanks or reservoir cells shall be designed to allow the circulation of fresh potable water within the reservoir cells. All necessary piping and valving shall be provided to allow for the bypassing of any storage to be taken off-line for maintenance work. All valves should have ease of access for future maintenance.

To ensure an adequate chlorine level in the storage tank the design of static mixing system may be required. Static mixing system is preferred over baffling system.

All pipes inside the valve house shall be colour coded to comply with the latest edition of the MECP Standard for Pipe Identification in Water and Wastewater Treatment Plants in Ontario. Provide arrows indicating the direction of flow.

Reservoirs and storage tanks shall be designed to meet the following criteria:

- Construct with 316 Stainless Steel Piping, Schedule 10S at minimum.
- Position inlet/outlet pipes to promote fresh water circulation and minimize dead spots.
- Ensure full depth is available for operation.
- Install butterfly valves and piping to isolate reservoir cells for maintenance or construction without shutting down the entire reservoir.
- Provide isolation valves and piping for pumps.
- Reservoir and piping are to be designed to allow future expansions with minimal disruptions to continued use of the existing storage volume.
- Equip the reservoir's inlet valve chamber with a sump pump, in addition to a standby sump pump, each with check valves for drainage where gravity drain is not possible.

- Connect pumps and washdown pump to the reservoir's fill line.
- Install 40mm Stainless Steel washdown piping up the concrete pedestal, complete with valves and camlocks at each end, and a 50mm FIP x FIP valve with a 40mm camlock on inlet piping.
- Provide vents for each cell, protecting them from dust, dirt, insects, and vandalism. Ensure vents remain open at all times to allow air flow in and out of the reservoir cells.
- Ensure free air passage between cells using wall cutouts or pipe inserts above the maximum top water level and overflow line.

The water storage systems design shall follow additional criteria outlined in MECP Design Guidelines for Drinking-Water Systems.

- Valves: Piping diameter shall be considered when selecting valve types. For piping with a diameter of 100mm or greater, gate valves are the preferred selection. For piping with a diameter under 100mm, ball valves are the preferred selection. AWWA C504 butterfly valves (short body flanged with handwheel) may be used at non-critical locations.
- Spare piping shall be provided for future well connections/expansions.
- Install separate inlet and outlet lines to the tank with Swingflex check valves on each.
- Include a removable flared silt stop.
- Install a stainless steel ladder inside the bowl (submerged) with a landing.
- Provide GFCI receptacles, with enclosures suitable for wet/damp environments, at each landing in the access tube and at the roof hatch landing, mounted clear of the ladder travel way. Arrange receptacles to support confined space ventilation and temporary lighting for maintenance purposes.
- Install obstruction lights at the highest point on the exterior of the elevated tank. Where icing is likely to occur, install metal grating or protective ice shields over each light in a manner to ensure unobstructed view of at least one light approaching from any direction. Backup bulbs and a fail indicator shall be provided at the tank base, inside the pedestal or adjacent to electrical/SCADA panel.
- The elevated tank shall have one (1) access hatch framed at least 100mm above the surface of the roof at the opening. The access hatch shall have a watertight cover overlapping the framed opening and extending down around the frame at least 50mm, hinged on one side with a locking device. All other access ways shall be bolted and gasketed.
- Construct a concrete pad (1.5m x 2.0m) at exterior doorways exiting the valvehouse at the base of the tower, sloped away from the tower.
- Provide an isolation valve for the elevated tank located in an accessible valve chamber. Install a tee on the distribution main side of the isolation valve with a 150mm AWWA C502 dry barrel hydrant and a dedicated gate valve on the hydrant lead.
- Provide dual grounding wires to the bowl.
- Install kick-plates around all safety railings.
- Include DBI-Sala anchors and mounting bases for rescue equipment (SRLs, Rolgliss, etc.) on top of the bowl and at the landing.
- Extend the catwalk across the entire pedestal.
- Install six (6) LED lights at least 30m away from the pedestal.
- Install LED lights outside of doors (entrance ways) with switches located inside.
- Provide a genset hookup and ATS for power outages (distribution panel with manual 120/240V transfer may be used, e.g., Federal Pioneer - Service Entrance Generator Panel).

- Install separate low and high-level alarms from the pressure switch.
- Include RPU power source fail and RPU watchdog alarm.
- Install Damar DMP and FMC Keyscan security system.
- Include a temperature transducer on the tower outlet.
- Install a magmeter on inlet/outlet piping.
- Provide heat trace on inlet/outlet riser piping with a fail indicator.
- Include a recirculation pump if required.
- Install a 12mm boss for rechlorination on inlet piping and a 12mm boss for dechlorination on discharge piping.

A separate instrumentation and control system shall be provided exclusively for this function to alarm and warn of an overflow. When the water level reaches the high-high level (HHL) condition, the instrumentation and control system shall activate the reservoir high-high level (HHL) overflow alarm condition to the operator through the SCADA system.

Provide one ultrasonic level sensor in each reservoir cell or storage tank. Control of the inlet valve and monitoring of the reservoir water level shall be through duty ultrasonic level sensor. The selection of the duty transmitter shall be done by the Operator through the SCADA system.

Provide reservoir with overflow piping capable of discharging the designed maximum inflow of water to the reservoir. Design overflow capacity from each cell shall be designed for the firm capacity of the upstream station. Design drain to permit discharge of water in a controlled manner to the site drainage system and/or storage lagoons sized for a two (2) hour pumping duration from the largest upstream pump. Provide perimeter drainage system.

Where available, information on required capacity will be provided by the County for the design and construction of the reservoir.

6.7.2 Re-Chlorination system

Where specified, design and provide the required chlorination system at the reservoir with the following operating characteristics:

- The rechlorination system shall be based on the application of sodium hypochlorite for disinfection.
- Provide a minimum of two metering pumps sized for maximum day requirement if the system is pumping from the reservoir into an open system and sized for peak hourly demand if the system is pumping from the reservoir into a closed system.
- The rechlorination system shall be sized to provide an increase to the total chlorine residual of up to 1.0mg/L at the maximum outflow of water out of the reservoir.
- The liquid sodium hypochlorite shall be injected into the common outlet pipe through an injection quill by a metering pump and shall be controlled by station PLC via the chlorine residual analyzer. Isolation valves shall be provided so that the analyzer can sample water from the reservoir outlet pipe only. The chlorination system shall only operate when the water is flowing out of the reservoir.
- Isolate sodium hypochlorite tank(s) in a separate containment area. Volume of containment area is to be 110% of the total volume of hypochlorite tank(s). A sump complete with on-grade fiber grate cover must be installed to accommodate the storage tank and at least one 205L drum delivery. Double wall chemical containment is an

acceptable alternative for small chlorination facilities. Separate ventilation should also be supplied to keep sodium hypochlorite fumes out of the rest of the facility.

- Flood alarm field instrumentation detection system within the containment area to be provided to detect leakage of sodium hypochlorite from tank(s). Connect flood alarm instrumentation to SCADA system.
- The sealed sodium hypochlorite tank(s) shall be vented to the exterior of the building

Separate ventilation should also be supplied to keep sodium hypochlorite fumes out of the rest of the facility.

6.7.3 Emergency Eyewash, Facewash and/or Safety Shower

Emergency eye/ facewash and/or safety shower stations to be provide as per the requirements of ANSI Z 358.1-2014 (or latest edition) in the vicinity of any chemicals that would irritate the eyes/skin and close to the metering pump(s) and analyzers room. An appropriate emergency Eyewash, Facewash and and/or Safety Shower where a worker is required to work with, or is likely to be exposed to, a hazardous biological or chemical agent that could cause injury to the eye or skin. Provide tempered water to the eye/ facewash and safety shower stations as per the ANSI Z 358.1 requirements. If the length between the safety stations and the hot water heater is more than 30m, the water temperature shall be maintained by either recirculation, or a self-regulating heat tracing system.

Eye / face was stations to be equipped with dust covers. Connect the safety showers to the sanitary drainage system based on section 7 of the Ontario building code.

6.7.4 Site Access Road and Security

The access road shall be fenced off with 1.8m high galvanized steel chain link fence and as per OPSD 972.130 and OPSD 972.132. Secure and lockable gates should be provided at all access points.

Exposed surfaces such as access hatches, doors, etc. shall be designed to be vandal resistant. Ensure that all ventilation louvers to the reservoir are properly secured to prevent entry of foreign material. All hatches to be lockable and keyed to the County's lock system.

The exterior of the facility shall be provided with Light-Emitting Diode (LED) lighting and lamps suitable for horizontal, base up or base down operation. Lights shall be automatically turned on or off by motion sensors or light sensors and shall be capable of being manually turned on or off from a designated central location.

All exterior access such as the facility doors and reservoir roof access shall be provided with intrusion alarm detection device in consultation with The County of Oxford Public Works.

Internal valve boxes shall be cast in place concrete with a lockable stainless-steel cover. Ensure that the stainless-steel cover is designed to prevent water from entering into the reservoir from the valve box.

Refer **Section 8.6** for further building security requirements.

6.7.5 Architectural

Design reservoir with Valve House in front with access door and retaining walls.

The reservoir shall be architecturally designed to ensure that the exterior complements with its surrounding environment. The exterior material and or finishes shall be designed to require minimal maintenance (i.e. steel roof). It shall be provided with sufficient entrances as per Ontario Building Code and to be without any windows. All openings in the exterior walls shall be equipped with insect screens and vandal-proof louvers.

All roof drains shall have a dome protection. Drains inside the valve house shall have easily accessible traps.

Raised roof access hatches shall be fabricated of aluminum frame with insulated cover and watertight. It shall be provided with a snap lock with a retractable handle for topside hardware, and padlock eyelets.

Floor layout shall allow for an easy access to all equipment inside the Valve House. Floor areas shall be sealed with a waterproofing coating and shall have a slip resistant finish. Interior finish shall require minimum maintenance. Walls above the grade shall be weatherproofed and walls below the grade shall be waterproofed. Do not use unbreathable painting for interior surfaces of Valve House.

All electrical equipment including control panel shall be located on the main floor. Interior lighting shall be wall-mounted LED light fixtures, and readily accessible for replacement and maintenance purposes.

An internal access port from the valve chamber to the reservoir shall be provided and shall be Type 316L stainless steel. Rescue davit to County specifications should be located adjacent to the access port as per County specifications.

Landscaping shall complement the surrounding environment. Where possible select plant species that are native to the project site. Consideration shall be made to select species that require minimal maintenance or watering.

Facility doors shall open in the direction of egress travel, especially for rooms containing high-hazard contents. The doors for high hazard containing rooms shall be equipped with panic bars or other suitable exiting devices.

6.7.6 Structural

The design of the reservoir roof shall be based on a cast-in-place concrete structure with a membrane overlay. The roof to be covered by earth for insulation to sufficient depth to sustain growth of grass and landscape planting, consistent with minimizing structural needs to carry the load. Where necessary, supplement earth insulation with additional insulating material to prevent freezing of reservoir’s ceiling during the wintertime.

Provide access and ventilation shafts, two for each cell.

All water retaining structures to be designed to ACI 350 (R).

Concrete housekeeping pads, elevating the electrical equipment above the level of the floor, shall be provided to help prevent water damage. The housekeeping pads shall be sized appropriately for the equipment footprint to ensure a stable surface.

6.7.7 Mechanical

Provide valve boxes on top of the reservoir for all isolation valves.

The overflow pipe shall be terminated with a duckbill type backflow preventor.

Hardware inside the reservoir, ladders, handrails, etc. shall be stainless steel Type316L or FRP.

All piping shall be 316 stainless steel schedule 10S.

6.7.8 Heating, Ventilation and Dehumidification

Provide heating system for Valve House to maintain the temperature at minimum 15°C.

Dehumidification should be provided where excess moisture may cause safety hazards or damage to equipment.

6.7.9 Instrumentation and Control

Instrumentation and Control processes and devices shall be installed in compliance with the County's SCADA Standards. The County's SCADA standards include the following: PLC Programming, HMI, Control Pannel, PCN, and SCADA Alarm Standards. Process Control Narratives (PCNs) shall be reviewed and approved by the **County SCADA Technician**.

Provide a backup level sensing probe which will detect the water level at the overflow water level condition and activate the high high level (HHL) overflow alarm condition on the applicable SCADA system.

As a minimum the following should be connected to the SCADA system for monitoring and control:

- Reservoir cell duty selection
- Water level transmitter
- Flow direction (filling or discharging) detection
- Chlorine residual
- Chlorine metering pumps running status
- Chlorine metering pumps speed
- Chlorine metering pumps duty selection, manual or automatic mode (where required)
- Chlorine residual set point, manually set by operator
- Reservoir inlet/outlet control valve
- Inlet flowmeter
- Inlet pressure transmitter
- Discharge flowmeter
- Discharge pressure transmitter

- Pump status
- Power monitoring of MCC
- Standby generator status (where applicable)

6.7.10 Alarms

The following alarm points shall be monitored at the reservoir by the SCADA System:

- Fire Alarms
- Smoke Alarm
- Low ambient air temperature in sodium hypochlorite metering and analyzer room
- Flooding of containment area
- Flooding of the building
- Security intrusion Alarms
- Generator and ATS Alarming

6.8 WATER TREATMENT PLANTS

The design of the Water Treatment Plant and its components shall be in accordance with the Safe Drinking Water Act, associated regulations, and the latest version of the MECP Design Guidelines for Drinking-Water Systems. Consultation with Oxford County Public Works shall be required during the entire design phase for any water treatment plant.

Refer to **Section 8** for general facility design requirements.

6.8.1 Alternative Technologies

Where a change in the treatment technology is suggested/required, a Life Cycle Cost analysis and efficiency comparison between the existing and proposed technology must be completed to determine if it is an applicable replacement.

6.8.2 Site Security

Water treatment facilities shall be designed to deter vandalism and inhibit unauthorized access. A multi-layered approach should be utilized that integrates physical barriers, electronic surveillance, access-control technologies, and lighting.

A physical barrier consisting of a 1.8m (minimum) high chain-link fence, with specifications aligning with OPSD 972.130 and OPSD 972.132, shall enclose the perimeter of the facility. For vehicle access a swing or sliding gate, rated to withstand a low-speed vehicular impact shall be used. All exterior doors, hatches, and roof openings shall be designed with consideration of NFPA 730: Guide for Premises Security. Exterior doors shall be lockable and tamper-proof with ANSI Grade 1 hardware.

The facility exterior shall be provided with high pressure sodium vapour light fixtures (vandal and tamper resistant) or suitable LED alternatives. The lighting shall be equipped with high power factor ballast and lamps suitable for horizontal, base up or base down operation. Lights shall be automatically turned on or off by motion sensors or light sensors and shall be capable of being manually turned on or off from a designated central location.

Refer to **Section 8.6** for further security requirements.

6.8.3 Plant Layout

Maximize the site's ultimate capacity in planning the layout. Design of expansion works should be carried out to permit the orderly and economical construction of the facility with minimal disruption of the existing facility. Space for any future expansion shall be considered in determining the overall layout.

6.8.4 UV Disinfection

The UV disinfection train (if required) shall include a minimum of one standby unit at the peak hydraulic loading rate and be sized for seasonal flow rates. Selection of the UV system shall consider the total life cycle cost of the unit.

6.8.5 Primary Disinfection

The disinfection process shall be designed and operated to achieve the target log removal/inactivation credits stipulated in the Municipal Drinking Water License (MDWL) and incorporate a multi-barrier disinfection approach. The chosen method for primary disinfection shall include appropriate on-line detection and monitoring systems, complete with appropriate chemical handling and storage.

Provisions for continuous monitoring of primary disinfection must be provided under the current regulations. On-line free chlorine residual analyzers must include a minimum of one standby (spare) analyzer.

Additional requirements for water treatment plant as follows:

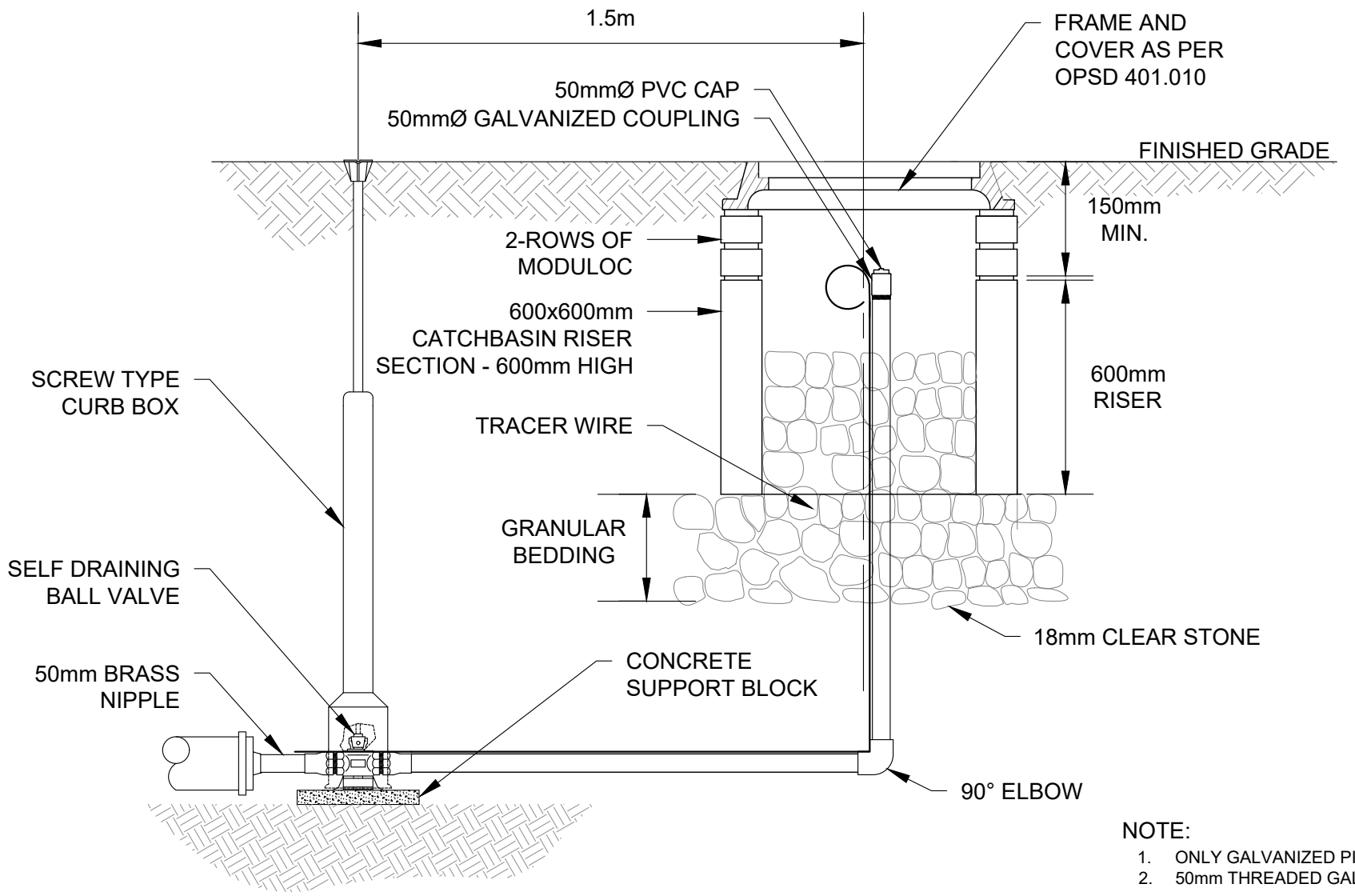
- Insulation: Install R30 roofing insulation and R20 wall insulation to ensure energy efficiency.
- Piping: Utilize 316 stainless steel, Schedule 10 piping for durability and corrosion resistance.
- Valves: Use gate valves for piping with a diameter of 100mm or greater. Use ball valves for piping under 100mm in diameter. AWWA C504 butterfly valves (short body flanged with handwheel) may be used at non-critical locations.
- Spare Piping: Provide piping to facilitate future wells and potential expansions.
- Isolation Valve: Install an outside station isolation valve with a tee'd off hydrant and valve for emergency access.
- Rescue Equipment: Include DBI-Sala anchors and mounting bases for rescue equipment.
- Power Backup: Provide a permanent genset and automatic transfer switch (ATS) for power outages.

- Alarms: Install separate low and high-level float alarms for the reservoir.
- Include RPU power source fail and RPU watchdog alarm for system reliability.
- Security: Implement a Damar DMP and FMC Keyscan security system for enhanced security.
- Flow Measurement: Install magnetic flow meters for all process control needs and on well and distribution piping for accurate flow measurement.
- Natural Lighting: Incorporate glass blocks or skylights in the roof to provide natural lighting.
- Roofing: Use steel roofing exclusively for durability.
- Aesthetics: Add different architectural block lines around the building to enhance its appearance.

6.8.6 Pressure Filters for Iron, Manganese and/or Arsenic Removal

For pressure filters and UV systems, install dual or triple filters for most sites. Equip all automated valves with Rotork actuators, avoiding the use of rate of flow valves on filter inlets. Design the system with dual-celled treated water reservoirs and include a backwash holding tank with redundant waste pumps. Additionally, provide a large garage door or a removable wall section to facilitate the replacement of filter tanks.

Residual Management is required for pressure filters for iron, manganese and/or arsenic removal. The waste sludge from the pre-treatment process and wastewater from the filter backwash drain are directed to the backwash equalization tank. Overflow piping is required to direct excess flow to the sanitary collection system or emergency storage (lined tank or pond).



NOTE:

1. ONLY GALVANIZED PIPE TO BE USED.
2. 50mm THREADED GALVANIZED RISER

OXFORD COUNTY STANDARD DRAWING

50mm BLOW OFF
MAINTENANCE HOLE COVER

REV#: 3

08/2025

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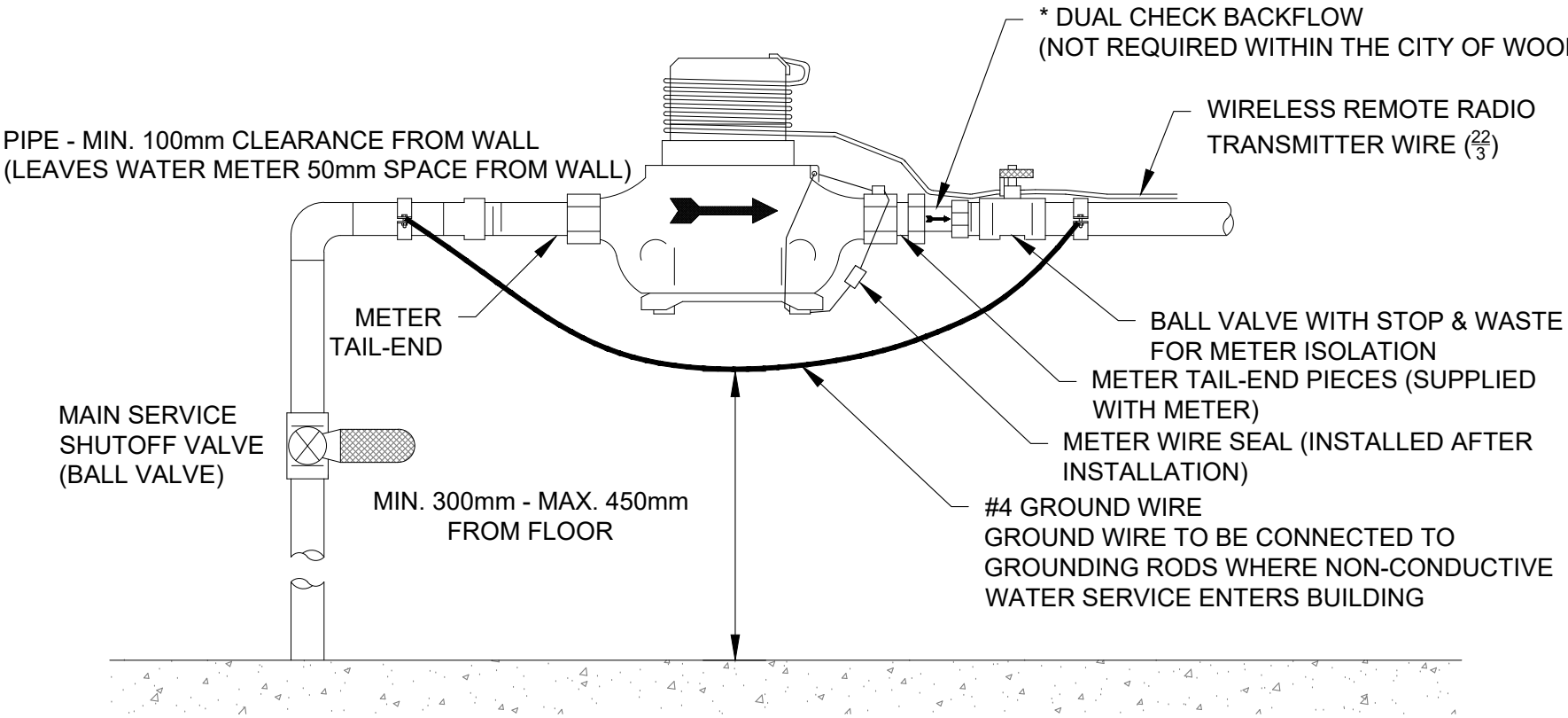
FIG. 6.01

PREVIOUSLY: D1803-1-2013



* CITY OF WOODSTOCK REQUIREMENT

OXFORD COUNTY STANDARD DRAWING

5/8" - 1" WATERMETER w/ VALVES ON BOTH SIDES - RESIDENTIAL & COMMERCIAL

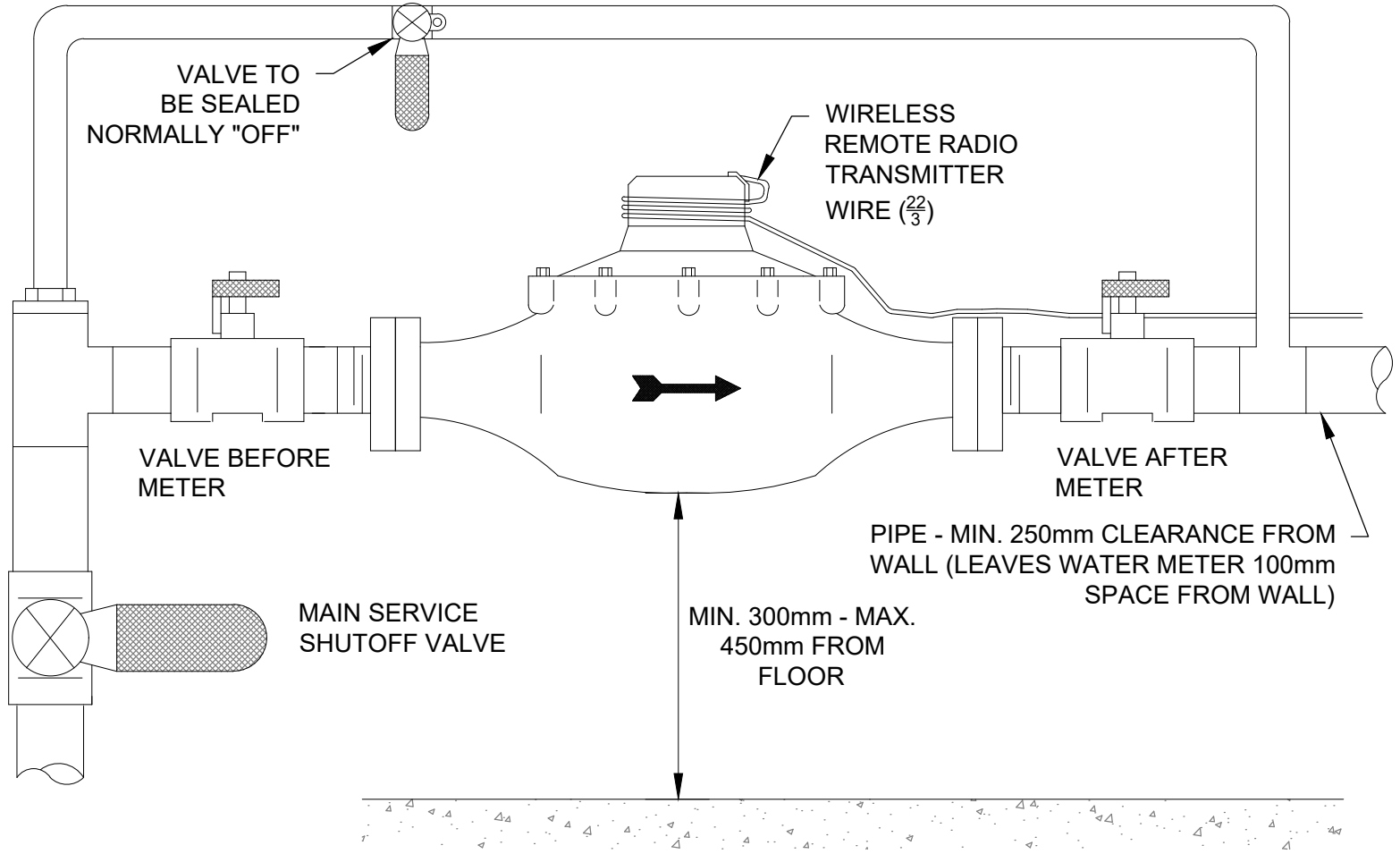
REV#: 3

08/2025

FIG. 6.02

PREVIOUSLY: D1807-1-2004

THIS VALVE TO BE SEALED BY THE COUNTY
OF OXFORD PUBLIC WORKS OR THE
COUNTY OF OXFORD SERVICE PROVIDER



OXFORD COUNTY STANDARD DRAWING

1" TO 2" WATERMETER w/ BY-PASS RESIDENTIAL & COMMERCIAL

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FIG. 6.03

PREVIOUSLY: D1811-1-2004

1.

1.1. IF GROUND COVER IS LESS THAN 1.0m LOWER WATERMAIN TO 1.8m.

1.2. IF GROUND COVER IS 1.0m - 1.3m USE 75mm THICK INSULATION.

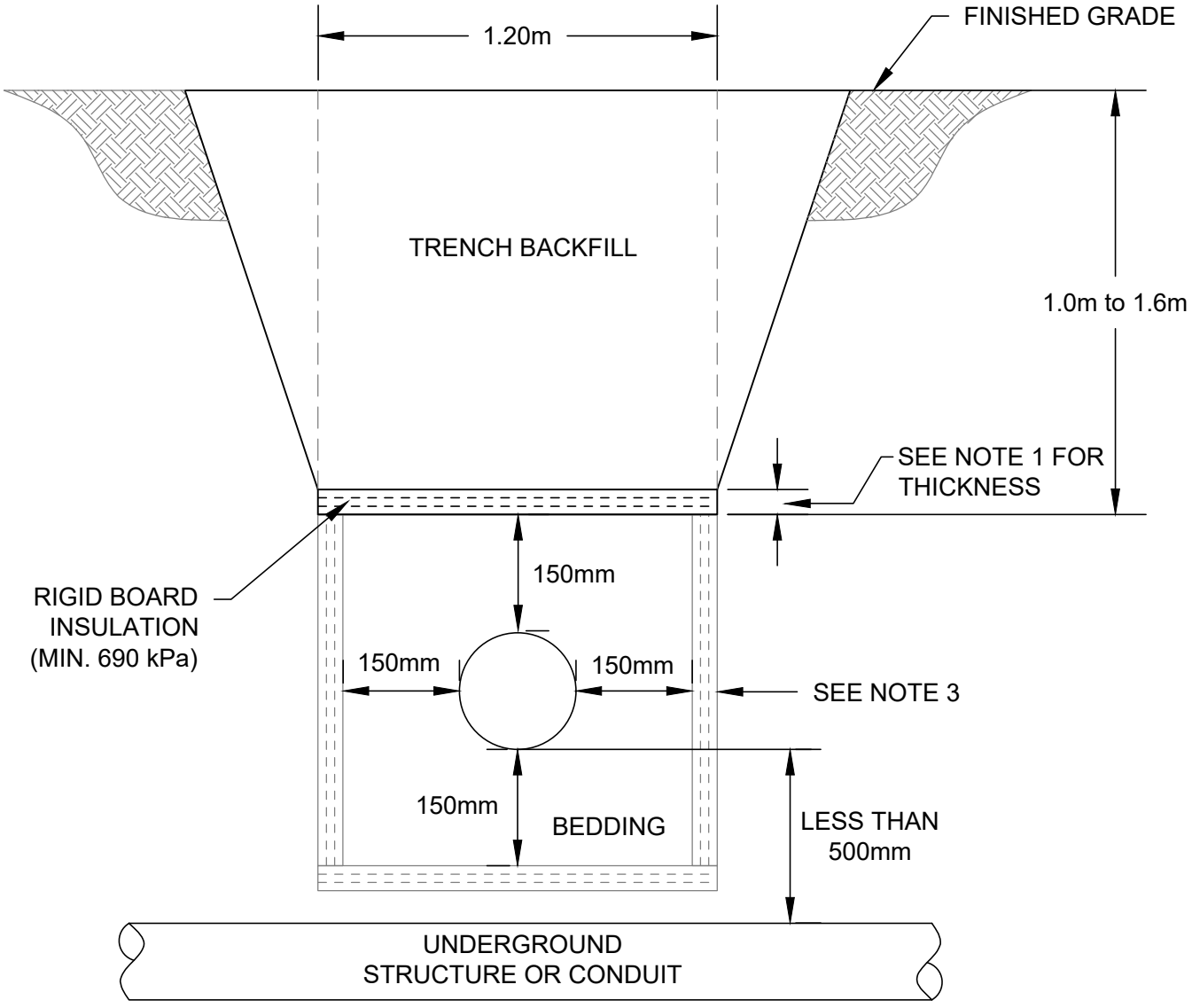
1.3. IF GROUND COVER IS 1.3m - 1.6m USE 50mm THICK INSULATION.

2. INSULATION REQUIREMENTS 1.6m - 1.8m WILL DEPEND ON SITE CONDITIONS AND AT THE DIRECTION OF OXFORD COUNTY OR ITS SERVICE PROVIDER.

3. FOR CROSSING OR UNDERGROUND STRUCTURES OR CONDUIT A "FROST BOX" IS REQUIRED.

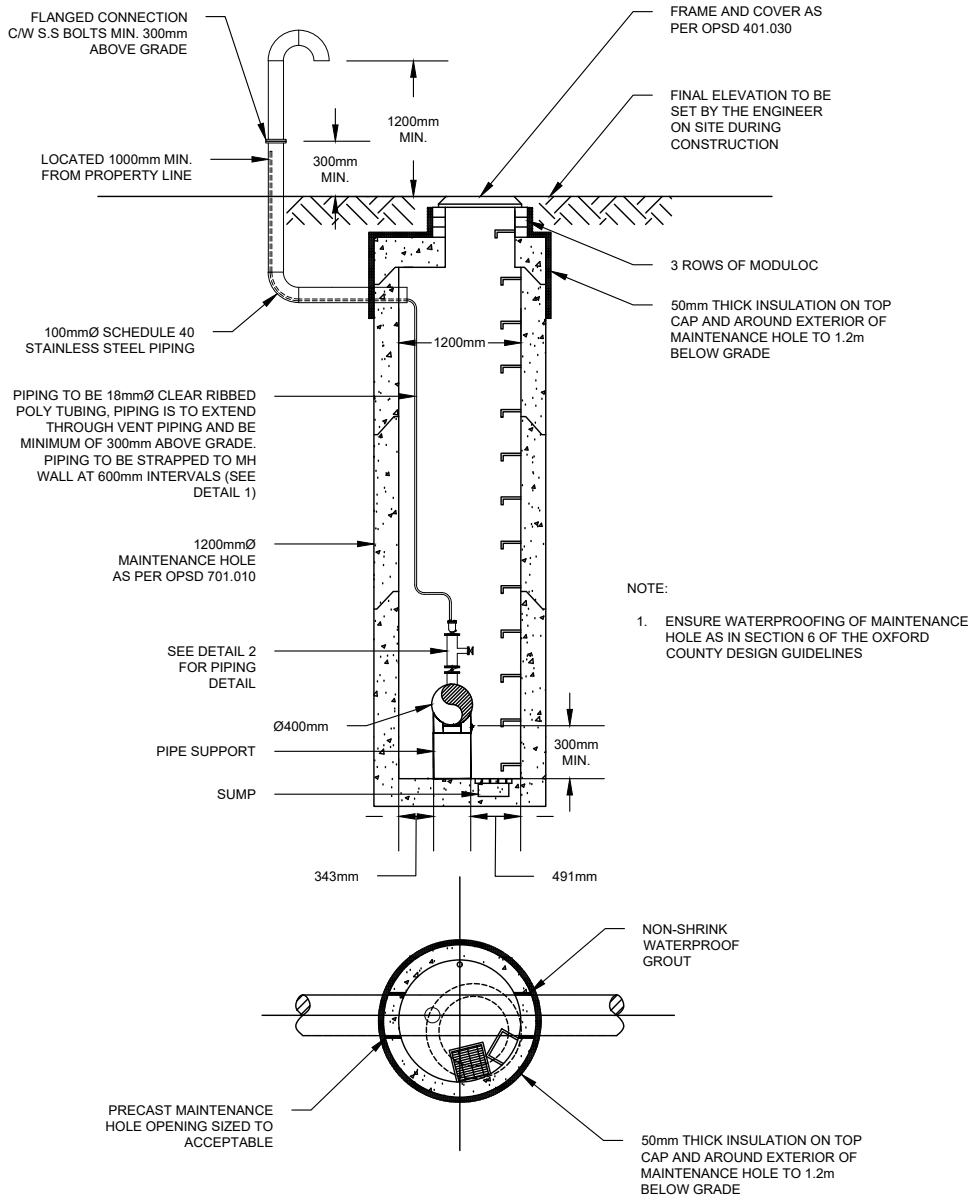
4. FOR WATERMAIN AND SERVICES LOCATED 500mm OR LESS HORIZONTALLY ADJACENT TO MAINTENANCE HOLES OR CATCHBASIN REQUIRES A MINIMUM 50mm INSULATION IS REQUIRED.

5. INSULATION IS REQUIRED ON ALL NEW OR RECONSTRUCTED WATER SERVICES IF ADEQUATE COVER AS LISTED ABOVE CANNOT BE ACHIEVED.



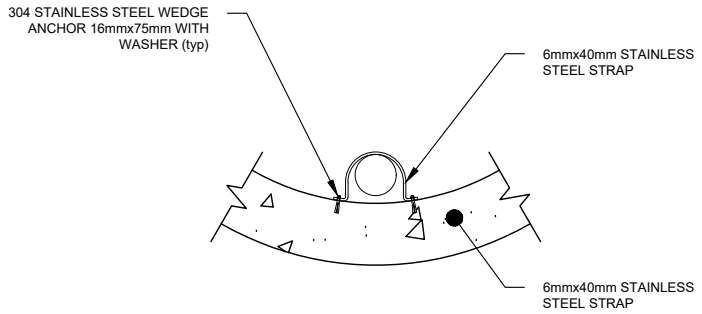
OXFORD COUNTY STANDARD DRAWING	REV#: 1	OxfordCounty Growing stronger together
RIGID BOARD INSULATION-SLAB TYPE FOR WATERMAIN AND SERVICES/LOW PRESSURE SANITARY SERVICES	08/2025	FIG. 6.04

PREVIOUSLY: D1812-1-2007



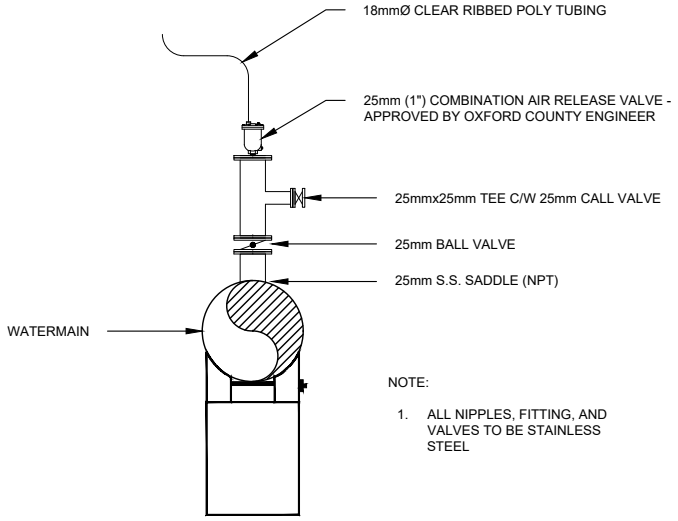
NOTE:

1. ENSURE WATERPROOFING OF MAINTENANCE HOLE AS IN SECTION 6 OF THE OXFORD COUNTY DESIGN GUIDELINES



1 FASTENER DETAIL

Scale: N.T.S.



NOTE:

1. ALL NIPPLES, FITTING, AND VALVES TO BE STAINLESS STEEL

2 25mm AIR RELEASE VALVE DETAIL

Scale: N.T.S.

OXFORD COUNTY STANDARD DRAWING

25mm AIR RELEASE CHAMBER

REV#: 1

08/2025

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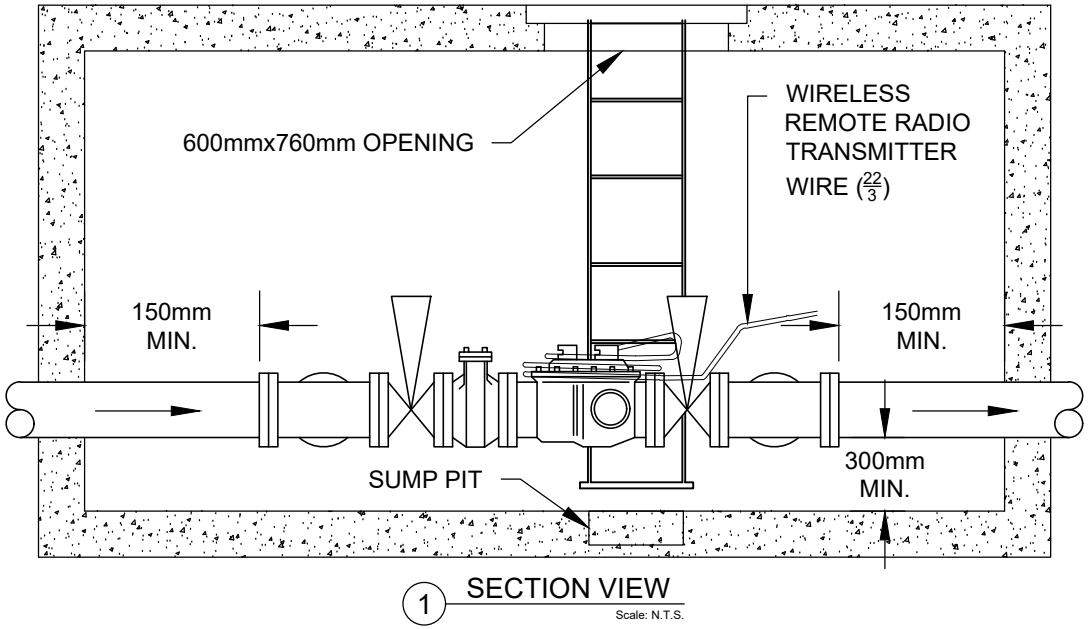
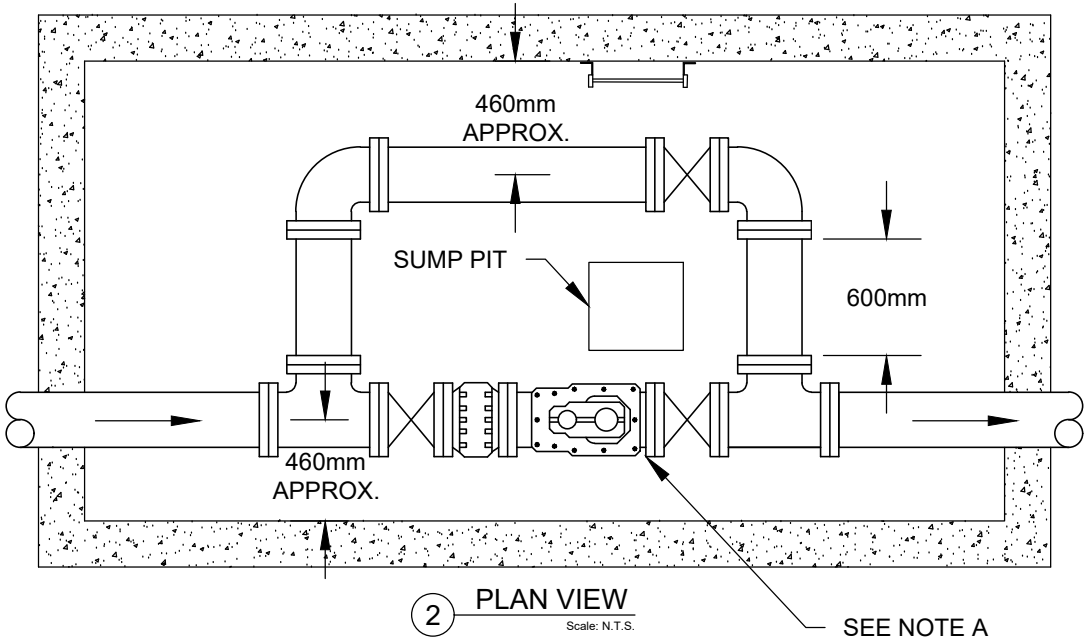
FIG. 6.05

PREVIOUSLY: D1814-1-2021



1 SECTION VIEW
Scale: N.T.S.



2 PLAN VIEW
Scale: N.T.S.

GENERAL NOTES:

1. MINIMUM SIZE PIT IS: 1.83m HIGH
   3.05m LONG
   1.83m WIDE
2. VALVING, BYPASS AND MANHOLE TO BE SUPPLIED BY CUSTOMER
3. INQUIRIES MAY BE DIRECTED TO THE WATER DISTRIBUTION SUPERVISOR.
4. THE COUNTY OF OXFORD REQUIRES SHUT-OFF VALVES ON BOTH SIDE OF ALL WATER METERS
5. METERS SHOULD BE INSTALLED IN A LOCATION NO MORE THAN 450mm FROM THE FLOOR AND IN AN OPEN POSITION FOR EASE OF READING AND MAINTENANCE

NOTE A:

1. APPROVED WATER PROOF METER
2. FIRE FLOW STRAINER
3. UNIFLANGE CONNECTION ON VICTAULIC COUPLER SPACER IN LINE WITH METER/STRAINER REQUIRED (MIN. 200mm)
4. REDUCER MAY BE INSTALLED OUTSIDE CHAMBER

OXFORD COUNTY STANDARD DRAWING

TYPICAL WATERMETER IN CHAMBER

REV#: 2

08/2025

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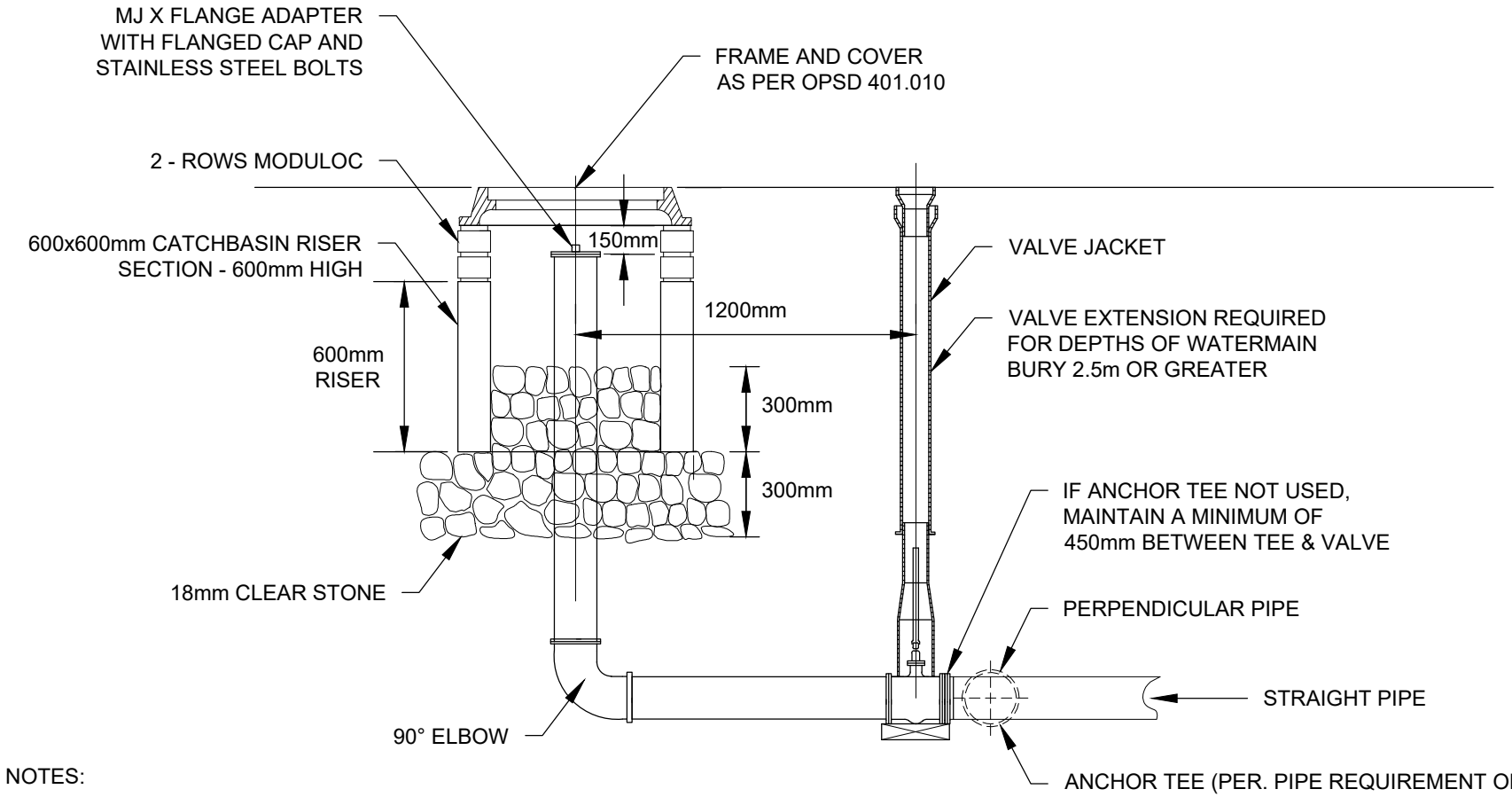
FIG. 6.06

PREVIOUSLY: D1818-1-2005



NOTES:

1. ALL FITTINGS WILL BE MOUNTED USING MECHANICAL JOINTS AND WILL BE RESTRAINED USING UNI-FLANGED RESTRAINTS OR APPROVED ALTERNATIVE AT ALL THRUST RESTRAINT LOCATIONS.
2. THIS DETAIL IS APPLICABLE FOR 100mmØ to 200mmØ LAUNCH SIZE.
3. SWAB LAUNCHES 250mm AND LARGER SHALL BE AS DIRECTED BY OXFORD COUNTY.

MAIN SIZE	LAUNCH SIZE	TEE TYPE
100mm	100mm	STANDARD
150mm	150mm	ANCHOR
200mm	150mm	ANCHOR

OXFORD COUNTY STANDARD DRAWING

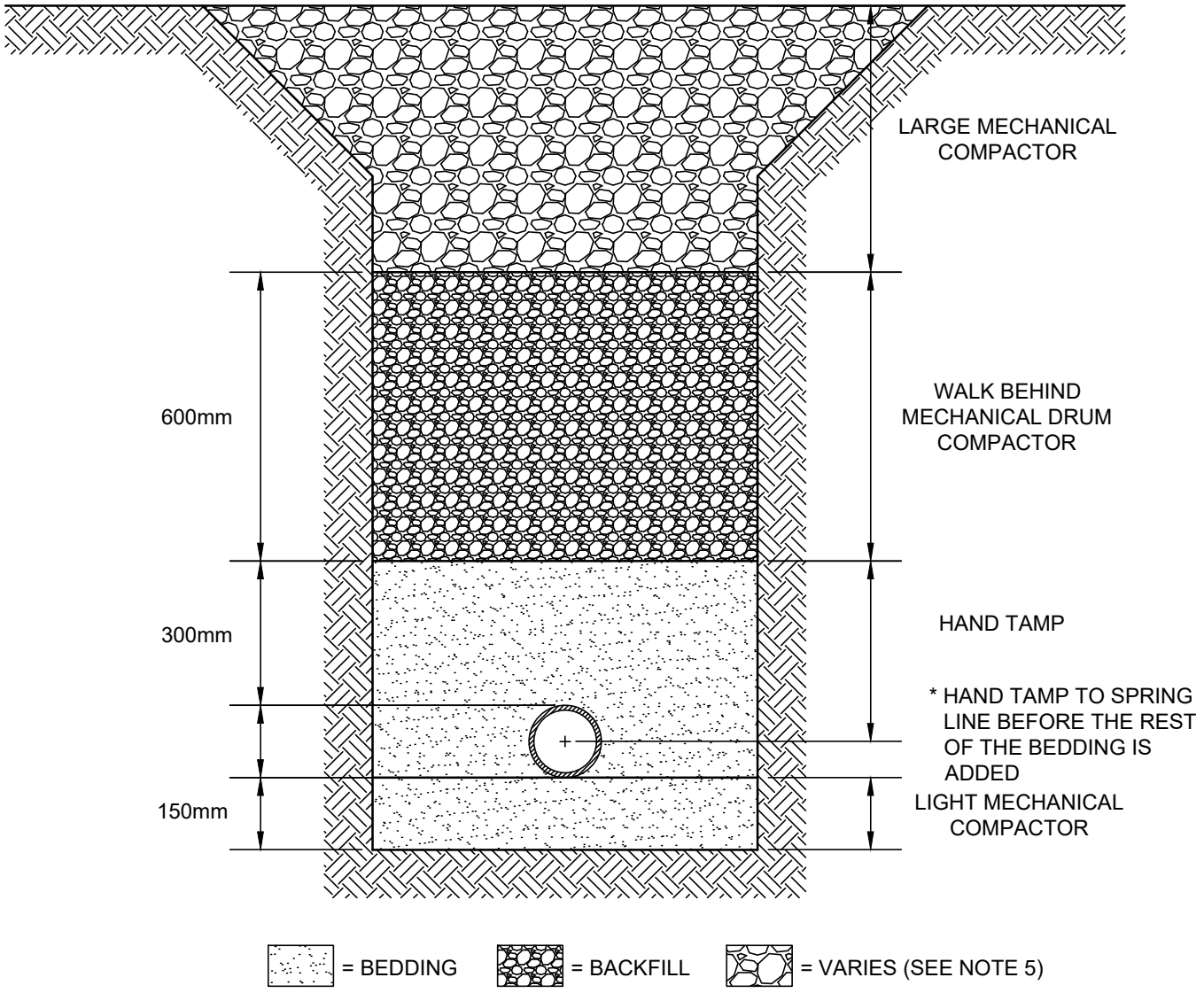
100mm TO 200mm SWAB LAUNCHER DETAIL

REV#: 3

08/2025

FIG. 6.07

PREVIOUSLY: D1822-1-2005



NOTES:

1. THE TRENCH CONFIGURATION WILL DEPEND ON SOIL CONDITIONS AS PER OPSD 802.010
2. THE BEDDING MATERIAL SHALL BE PLACED AND COMPACTED TO A DEPTH OF 150mm BEFORE THE PIPE IS PLACED IN THE TRENCH. THE REMAINDER OF THE BEDDING MATERIAL SHALL BE PLACED AND TAMPED IN 150mm LAYERS TO 300mm ABOVE THE TOP OF PIPE.
3. THE BEDDING MATERIAL WILL BE APPROVED BEDDING SAND OR GRANULAR WITH NO PARTICLES OVER 19mm.
4. THE BACK FILL MATERIAL ABOVE THE BEDDING WILL BE EITHER APPROVED NATIVE MATERIAL OR APPROVED GRANULAR MATERIAL THAT WILL ACHIEVE THE EXPECTED 100% STANDARD PROCTOR DENSITY.
5. CONTACT LOCAL AUTHORITIES FOR ROAD/SUBGRADE/ASPHALT REQUIREMENTS.

OXFORD COUNTY STANDARD DRAWING

BEDDING FOR WATERMAINS

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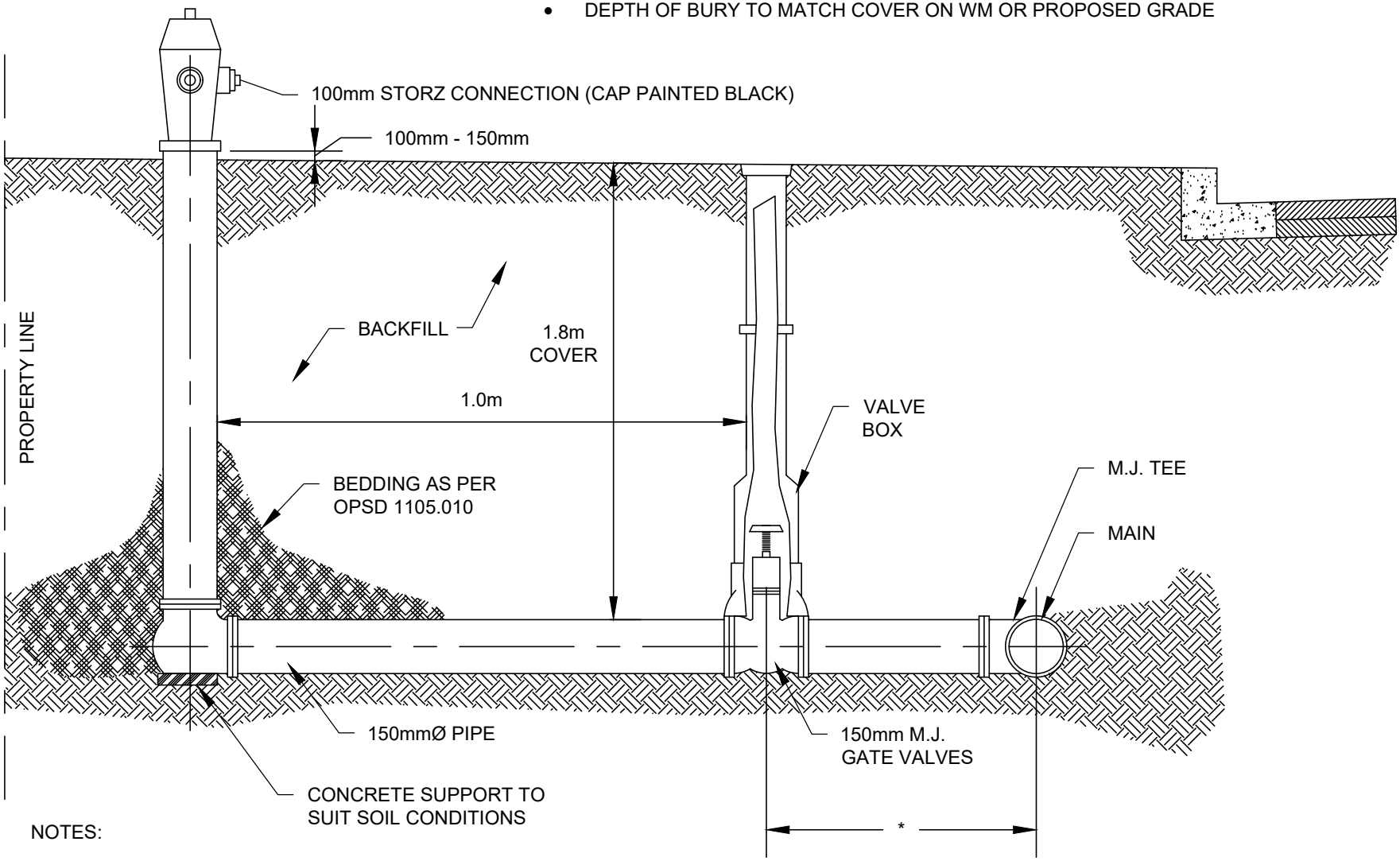
FIG. 6.08

PREVIOUSLY: D1824-1-2007

* DIMENSION ARE AREA SPECIFIC

CANADA VALVE (DARLING), CENTURY, MACIVITY M67, EAST JORDAN WATERMASTER 5CD250 SERIES 2780 OR APPROVED EQUAL

- CHROME YELLOW FOR PUBLIC HYDRANTS, CHROME RED FOR PRIVATE
- DEPTH OF BURY TO MATCH COVER ON WM OR PROPOSED GRADE



NOTES:

1. HYDRANTS TO BE LOCATED AT COMMON LOT LINES.
2. USE MECHANICAL RESTRAINTS WHERE POSSIBLE.
3. ALL MECHANICAL JOINTS TO BE PRIMED AND WRAPPED WITH DENSO TAPE.
4. TRACER WIRE TO BE LOPPED INSIDE OF VALVE BOX AND RETURNED TO WATERMAIN.

OXFORD COUNTY STANDARD DRAWING

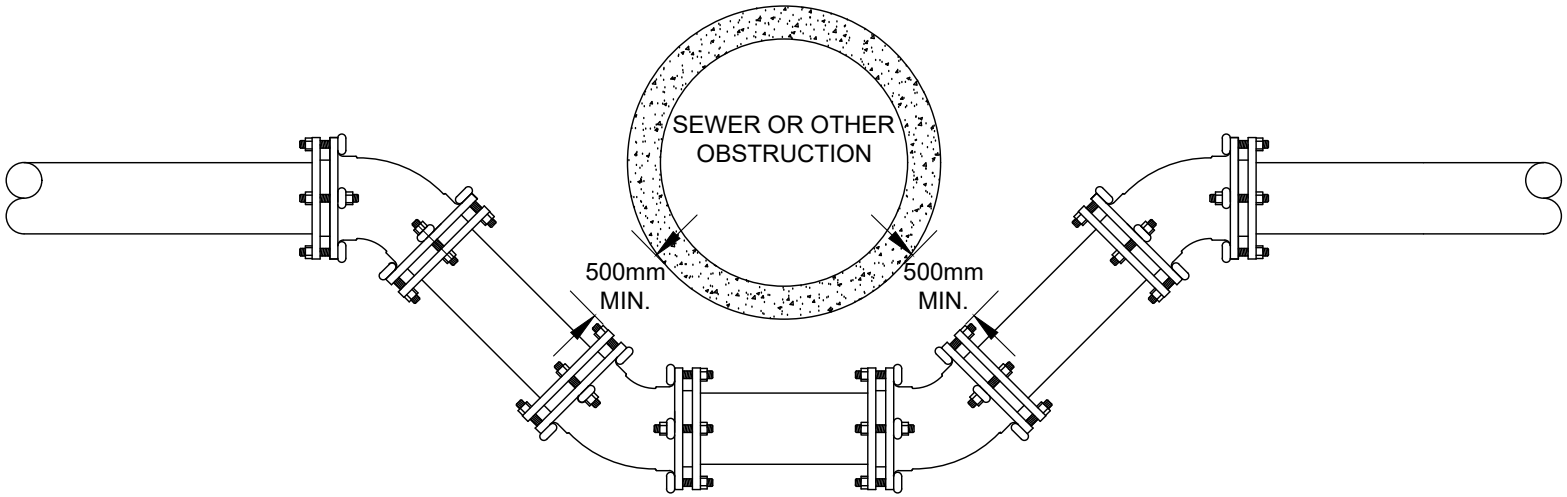
FIRE HYDRANT & VALVE INSTALLATION

REV#: 5

08/2025

FIG. 6.09

PREVIOUSLY: D1828-1-1993



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS SHOWN OTHERWISE.
2. THIS DETAIL TO BE USED FOR OFFSET ON 100, 150, & 200mmØ MAINS. OFFSETS ON LARGER MAINS REQUIRE INDIVIDUAL APPROVAL BY THE WATER DISTRIBUTION SUPERVISOR.
3. IF OFFSET IS INSTALLED IN HORIZONTAL OR INVERTED POSITION, MINIMUM COVER TO BE DECIDED BY ENGINEER.
4. INSULATION MAY BE REQUIRED, REFER TO FIG. 6.04.
5. RESTRAINTS AS LISTED IN OXFORD COUNTY DESIGN GUIDELINES OR AS PER MANUFACTURERS RECOMMENDATIONS. THE STRICTER OF THE REQUIREMENTS SHALL APPLY.

OXFORD COUNTY STANDARD DRAWING

PIPE OFFSET
INSTALLATION - UNDER

REV#: 3

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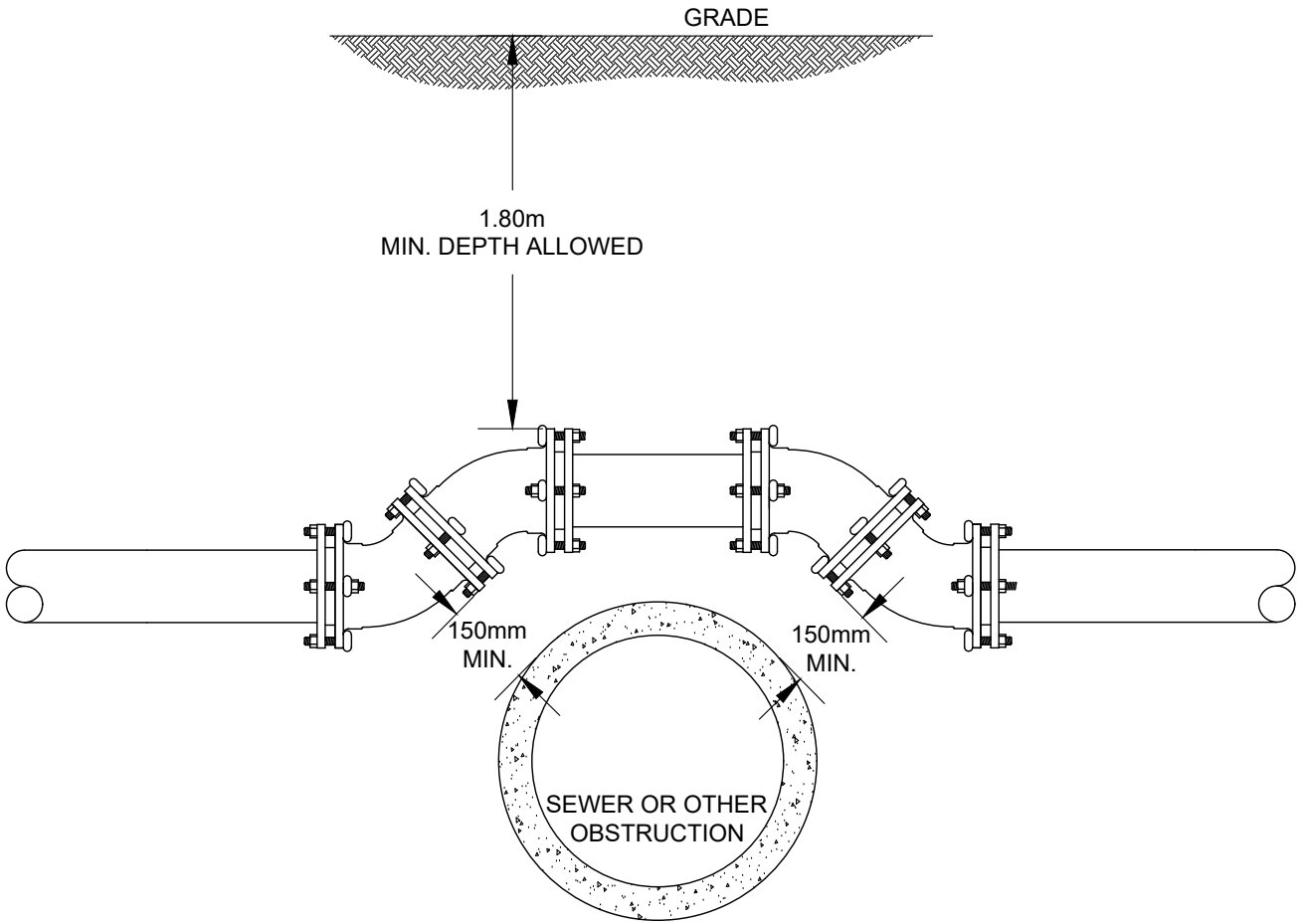
Oxford County
Growing stronger together

FIG. 6.10

PREVIOUSLY: D1832-1-1993



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS SHOWN OTHERWISE.
2. THIS DETAIL TO BE USED FOR OFFSET ON 100, 150, & 200mmØ MAINS. OFFSETS ON LARGER MAINS REQUIRE INDIVIDUAL APPROVAL BY THE WATER DISTRIBUTION SUPERVISOR.
3. IF OFFSET IS INSTALLED IN HORIZONTAL OR INVERTED POSITION, MINIMUM COVER TO BE DECIDED BY ENGINEER.
4. DEPENDING ON BURIED DEPTH OR WHEN CROSSING STORM SEWERS WITH A SEPARATION OF 500mm OR LESS INSULATION SHALL BE REQUIRED. REFER TO FIG. 6.04.
5. RESTRAINTS AS LISTED IN OXFORD COUNTY DESIGN GUIDELINES OR AS PER MANUFACTURERS RECOMMENDATIONS. THE STRICTER OF THE REQUIREMENTS SHALL APPLY.

OXFORD COUNTY STANDARD DRAWING

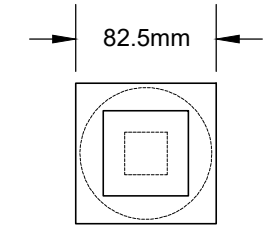
REV#: 3

08/2025

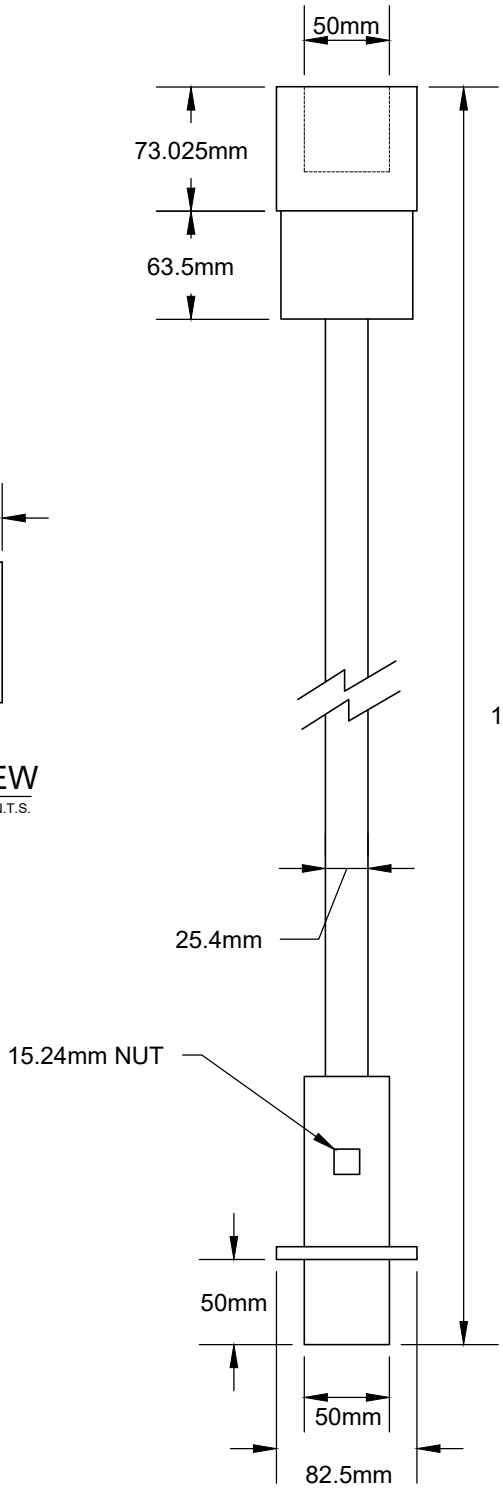
PIPE OFFSET
INSTALLATION - OVER

FIG. 6.11

PREVIOUSLY: D1833-1-1993



1 PLAN VIEW
Scale: N.T.S.



2 SECTION VIEW
Scale: N.T.S.

NOTE:

1. VALVE EXTENSION REQUIRED FOR DEPTHS OF WATERMAIN BURY 2.5m OR GREATER

OXFORD COUNTY STANDARD DRAWING

STANDARD VALVE ROD EXTENSION PIECE FOR 100mm & LARGER VALVES

REV#: 1

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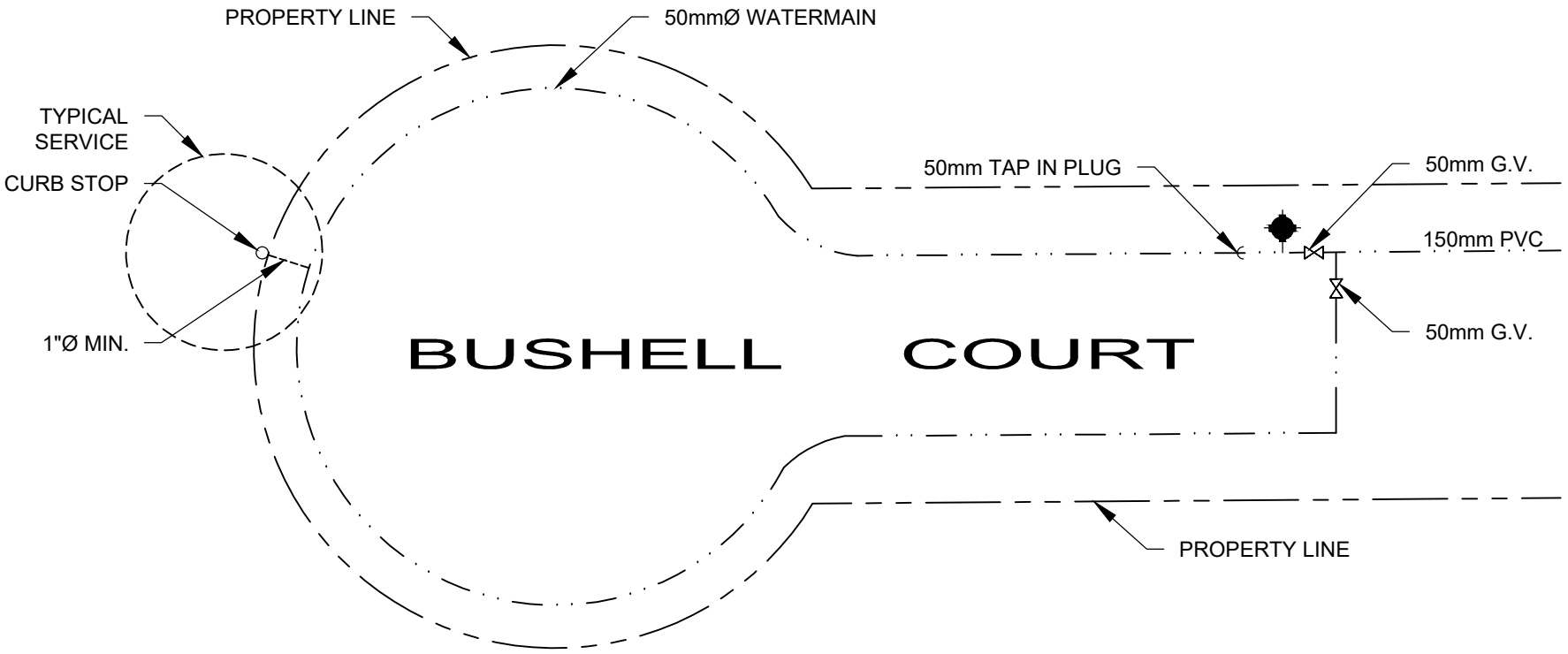
FIG. 6.12

PREVIOUSLY: D1834-1-1993



NOTES:

1. MINIMUM SERVICE SIZE IS 25mm.
2. MAXIMUM OF 7 SERVICES OFF OF 50mmØ.
3. ALL FITTINGS SHALL BE BRASS COMPRESSION, COPPER TUBING SIZE.
4. RESTRAIN JOINTS WHERE REQUIRED.
5. MATERIAL SHALL BE PEX OR P.E. SERIES 200.
6. ALL NON-METALLIC PIPE SHALL REQUIRE STAINLESS STEEL INSERTS.
7. TRACER WIRE TO BE INSTALLED AS PER OXFORD COUNTY DESIGN GUIDELINES AND SUPPLEMENT SPECIFICATIONS.

OXFORD COUNTY STANDARD DRAWING

50mm WATERMAIN DETAIL FOR CUL-DE-SAC

REV#: 4

08/2025

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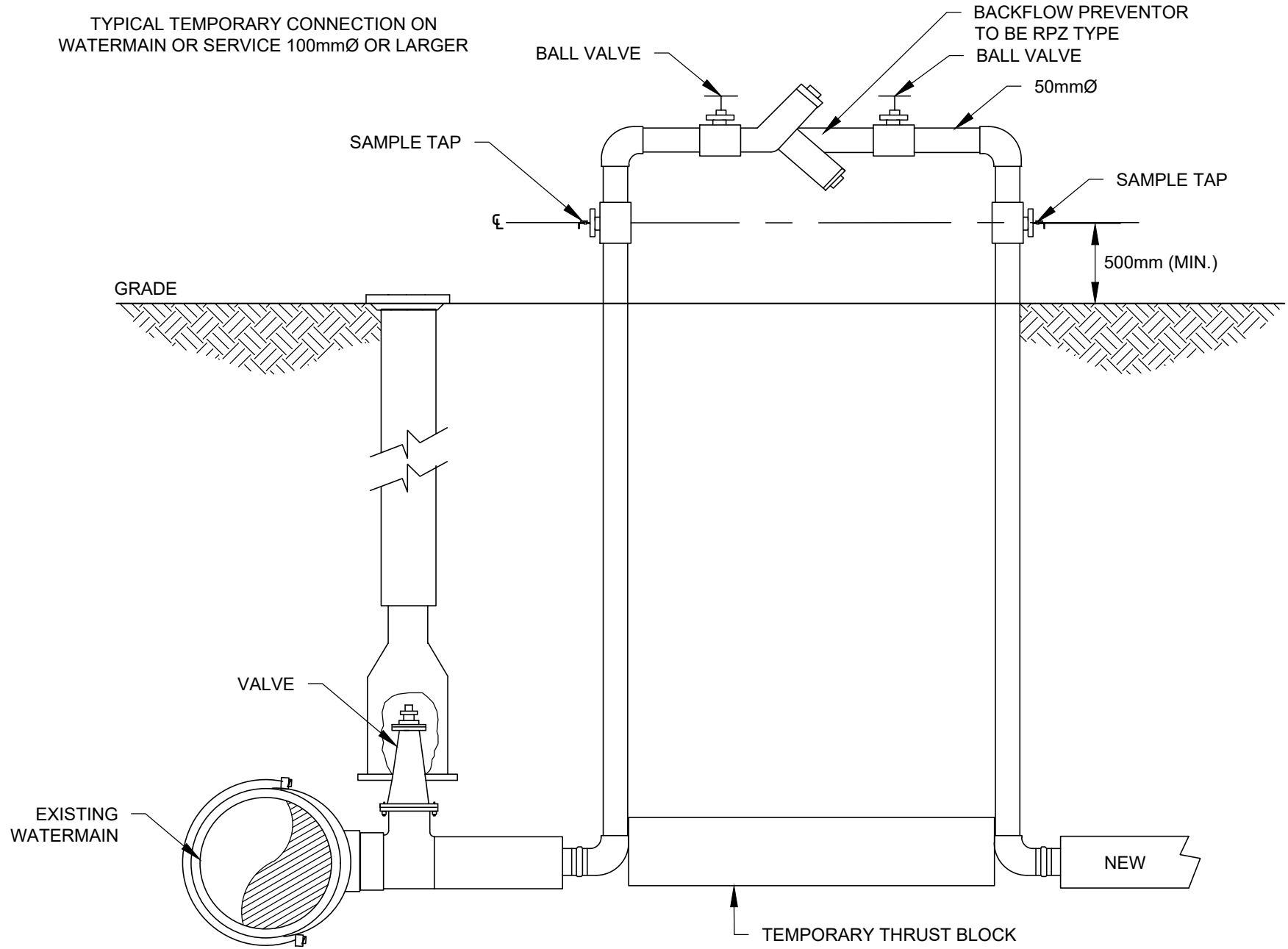
FIG. 6.13

PREVIOUSLY: D1835-1-2006

TYPICAL TEMPORARY CONNECTION ON
WATERMAIN OR SERVICE 100mmØ OR LARGER



OXFORD COUNTY STANDARD DRAWING

BACK FLOW PREVENTOR
EXISTING TO NEW WATERMAIN

REV#: 3

08/2025

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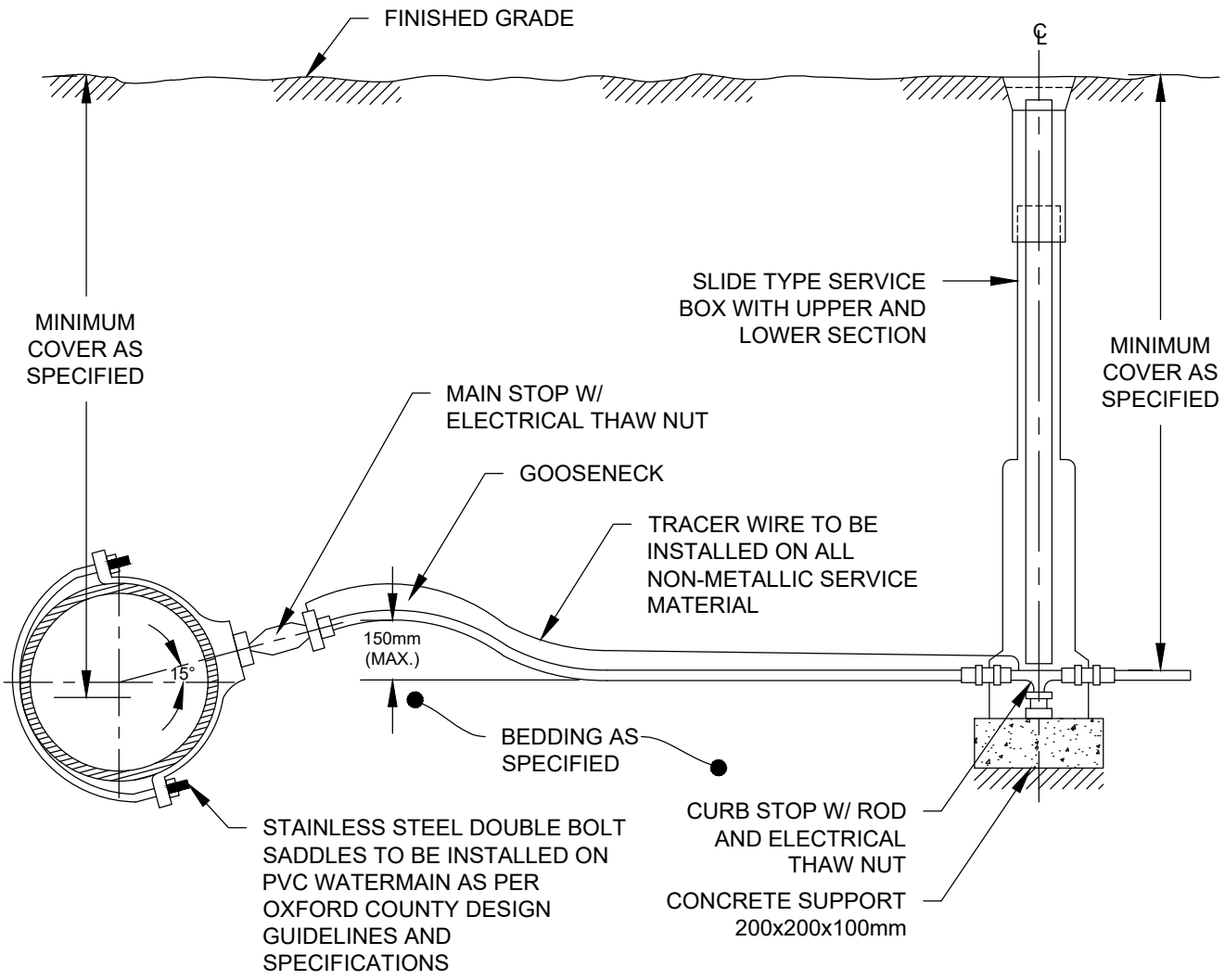
Growing stronger together

FIG. 6.14

PREVIOUSLY: D1836-1-2006



NOTES:

1. NON-METALLIC SERVICE SHALL BE MINIMUM 25mmØ.
2. FOR PLASTIC SERVICE PIPES, INSTALL MAIN STOP AT 15° ABOVE HORIZONTAL WITH A MINIMUM 1.2m LONG GOOSENECK.
3. SERVICE CONNECTIONS TO PVC OR DI WATERMAINS TO BE MADE USING STAINLESS STEEL DOUBLE BOLT SERVICE SADDLE. HDPE PIPE MUST USE FUSION TYPE SADDLES AS APPROVED BY PIPE MANUFACTURER OR APPROVED STAINLESS SADDLES WITH CUPPED WASHERS.
4. MAIN STOPS AND CURBSTOPS SHALL HAVE ELECTRICAL THAW NUT AND MATERIAL TO BE NO-LEAD BRASS, MEGATITE, OR APPROVED EQUAL. IF MEGATITE IS USED, SPLICING WITH AN APPROVED CONNECTOR IS REQUIRED.
5. ALL WATER SERVICES TO BE INSTALLED 90° TO THE LONGITUDINAL AXIS OF THE WATERMAIN.
6. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.
7. ALL NON-METALLIC SERVICES REQUIRE TRACER WIRE TO BE INSTALLED AS SHOWN ABOVE.
8. SERVICE MATERIALS AS PER OXFORD COUNTY DESIGN GUIDELINES AND SPECIFICATIONS.

OXFORD COUNTY STANDARD DRAWING

WATER SERVICE CONNECTION 25mm DIAMETER

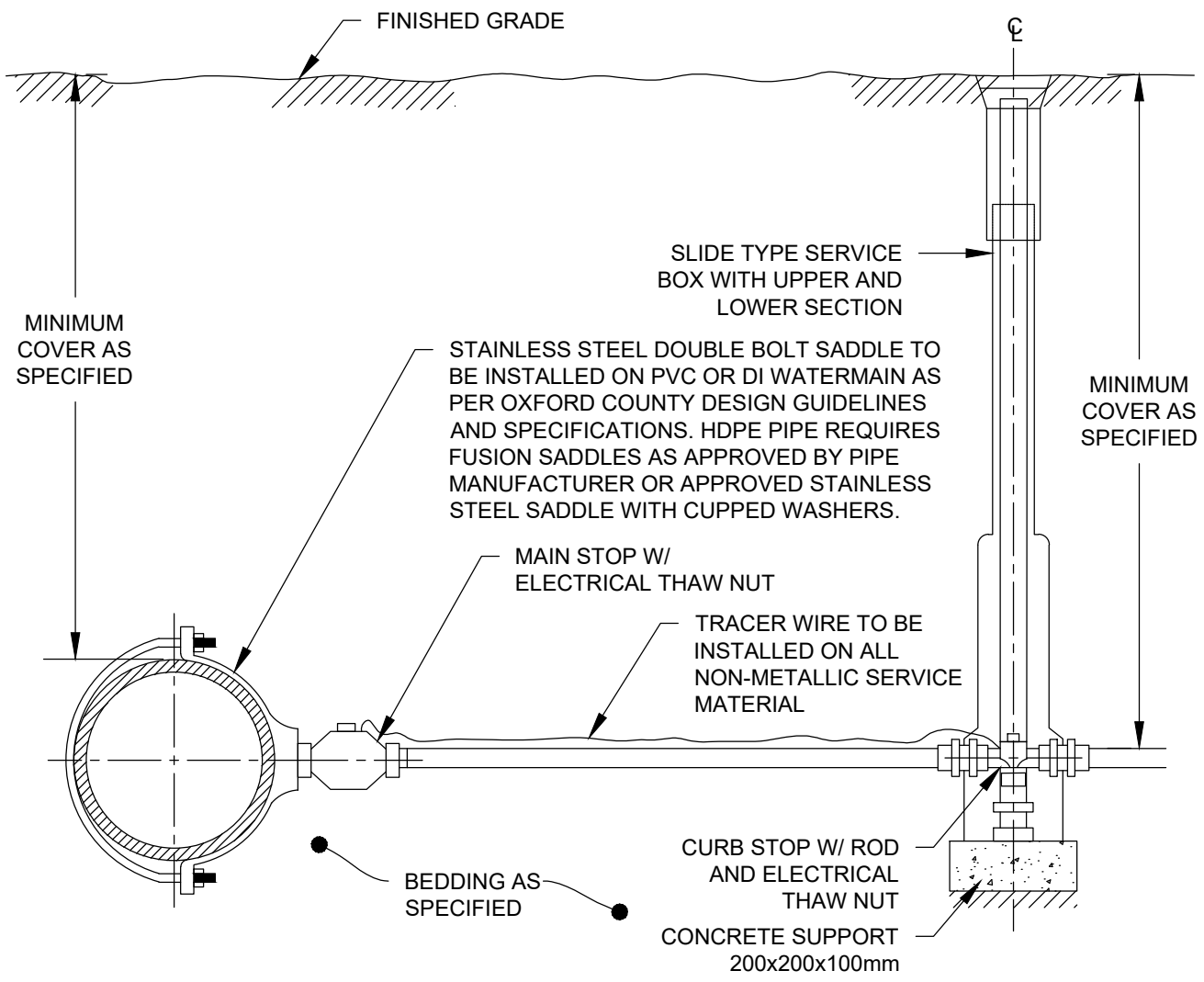
REV#: 1

08/2025

OxfordCounty
Growing stronger together

FIG. 6.15

PREVIOUSLY: D1838-1-2007

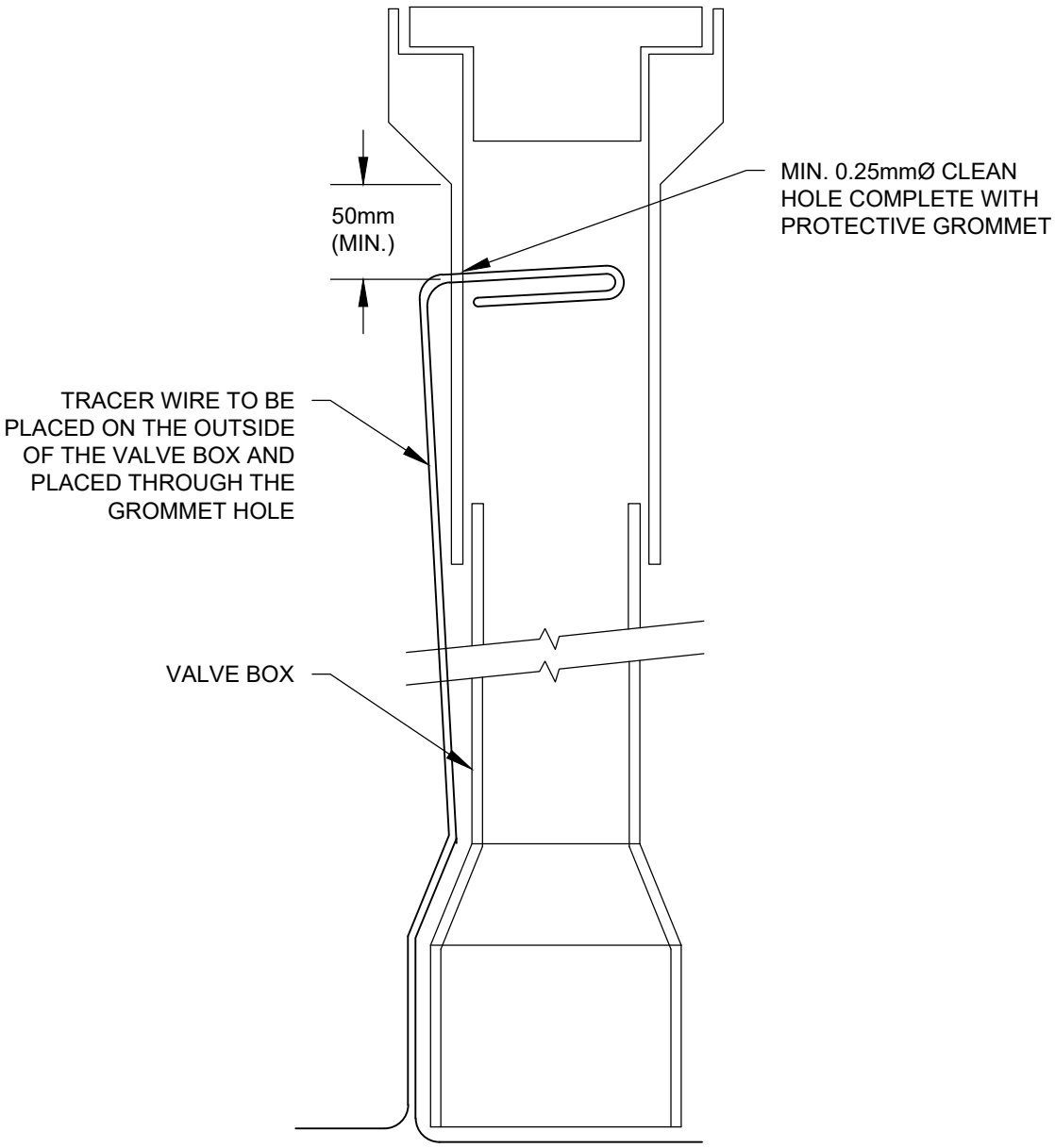


NOTES:

1. SERVICE MATERIAL AS PER OXFORD COUNTY DESIGN GUIDELINES AND SPECIFICATIONS.
2. SERVICE PIPE BETWEEN MAIN STOP AND CURB STOP SHALL BE CONTINUOUS WITH NO COUPLINGS.
3. ALL WATER SERVICES TO BE INSTALLED 90° TO THE LONGITUDINAL AXIS OF THE WATERMAIN.
4. ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SHOWN.
5. MAIN STOPS AND CURB STOPS SHALL HAVE ELECTRICAL THAW NUTS TO ACCOMMODATE TRACER WIRE. MATERIAL SHALL BE NO-LEAD BRASS, MEGATITE, OR APPROVED EQUAL. IF MEGATITE IS USED, APPROVED CONNECTOR SHALL BE USED TO SPLICE INTO THE MAIN LINE WIRE AND BROUGHT UP TO SERVICE AT THE CURB BOX.
6. NON-METALLIC SERVICES REQUIRE TRACER WIRE TO BE INSTALLED AS SHOWN ABOVE.

OXFORD COUNTY STANDARD DRAWING	REV#: 1	OxfordCounty Growing stronger together
WATER SERVICE CONNECTION 32mm, 38mm & 50mm SIZES	08/2025	FIG. 6.16

PREVIOUSLY: D1839-1-2007

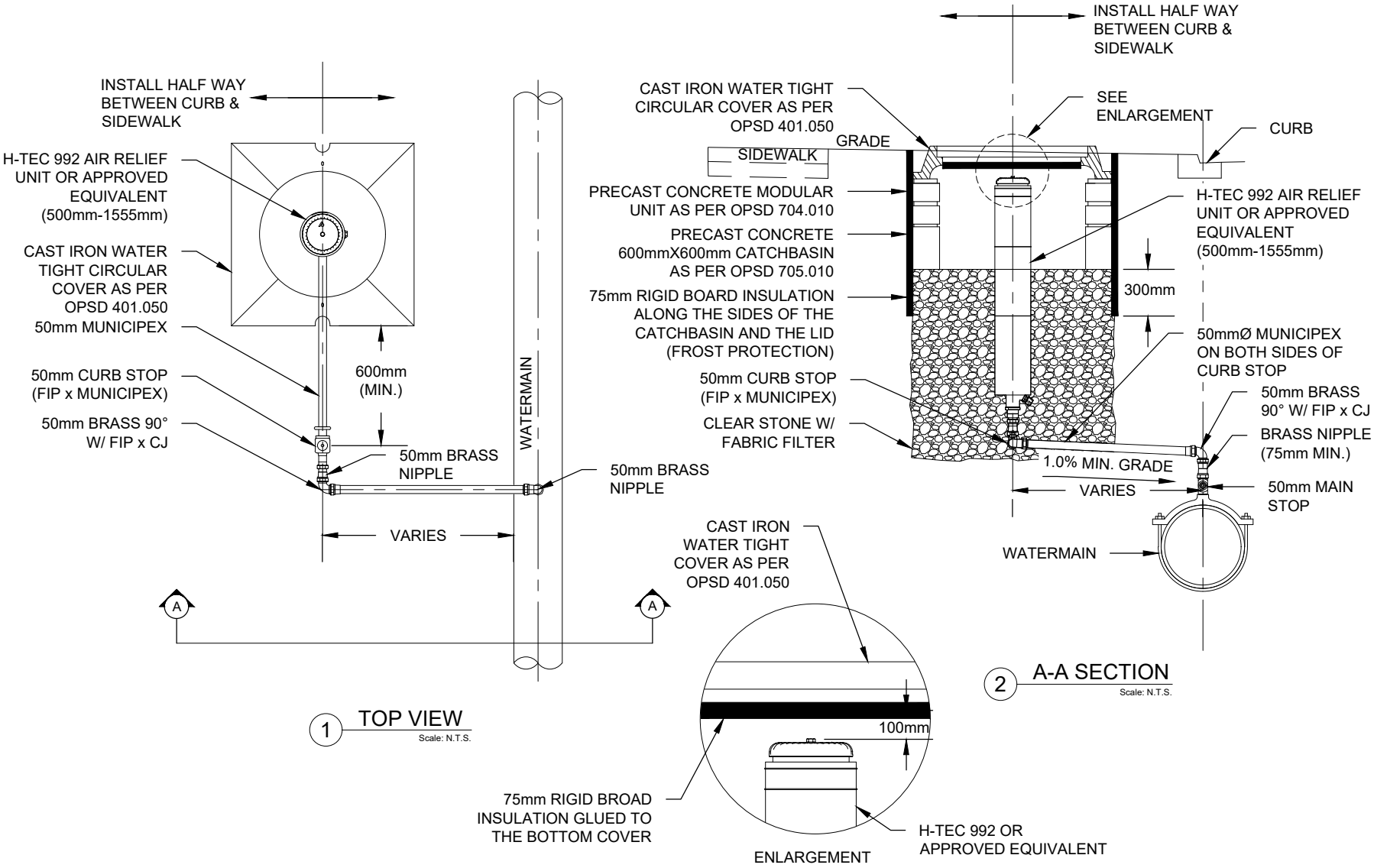


NOTES:

1. TRACER WIRE TO VALVE BOX WILL BE A SINGLE WIRE CONNECTED TO MAINLINE TRACER WIRE WITH APPROVED CONNECTOR AND AS PER OXFORD COUNTY DESIGN GUIDELINES AND SUPPLEMENT SPECIFICATIONS.
2. TRACER WIRE - #12 AWG SOLID CCS TRACING WIRE AS PER OXFORD COUNTY DESIGN GUIDELINES AND SUPPLEMENT SPECIFICATIONS.
3. TRACER WIRE SHOULD BE PLACED ON THE OUTSIDE OF ALL VALVES BOXES AND EXTENDED INTO THE VALVE BOX BY APPROX. ±500mm THROUGH HOLE 50mm BELOW THE BOTTOM OF THE COVER BELL. TRACER WIRE SHALL BE COILED INSIDE THE VALVE BOX SO AS NOT TO INTERFERE WITH VALVE OPERATION.

OXFORD COUNTY STANDARD DRAWING	REV#: 2	OxfordCounty Growing stronger together
TRACER WIRE VALVE BOX INSTALLATION	08/2025	FIG. 6.17

PREVIOUSLY: D1849-1-2009



OXFORD COUNTY STANDARD DRAWING

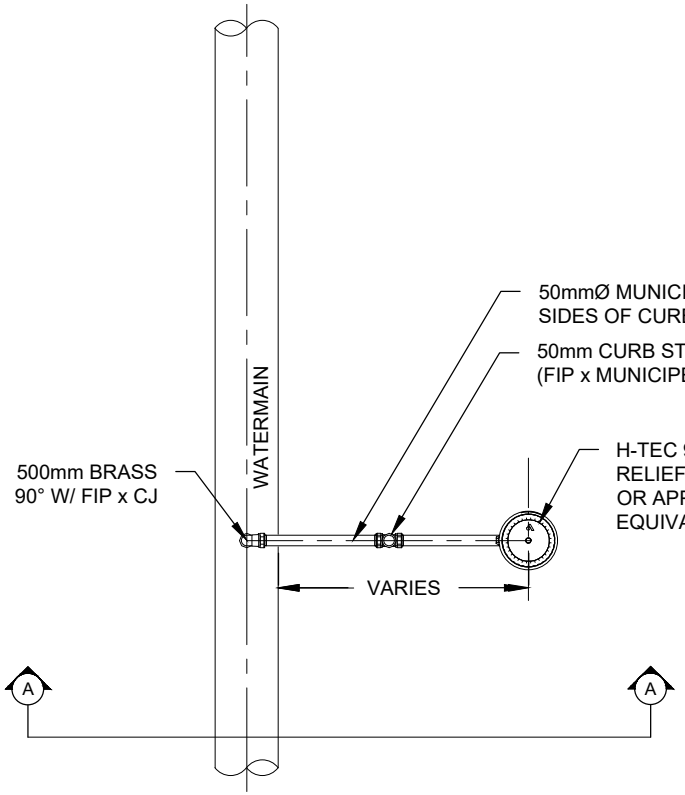
DIRECT BURY AIR RELEASE w/ OPSD 704.010 CATCHBASIN

REV#: 2

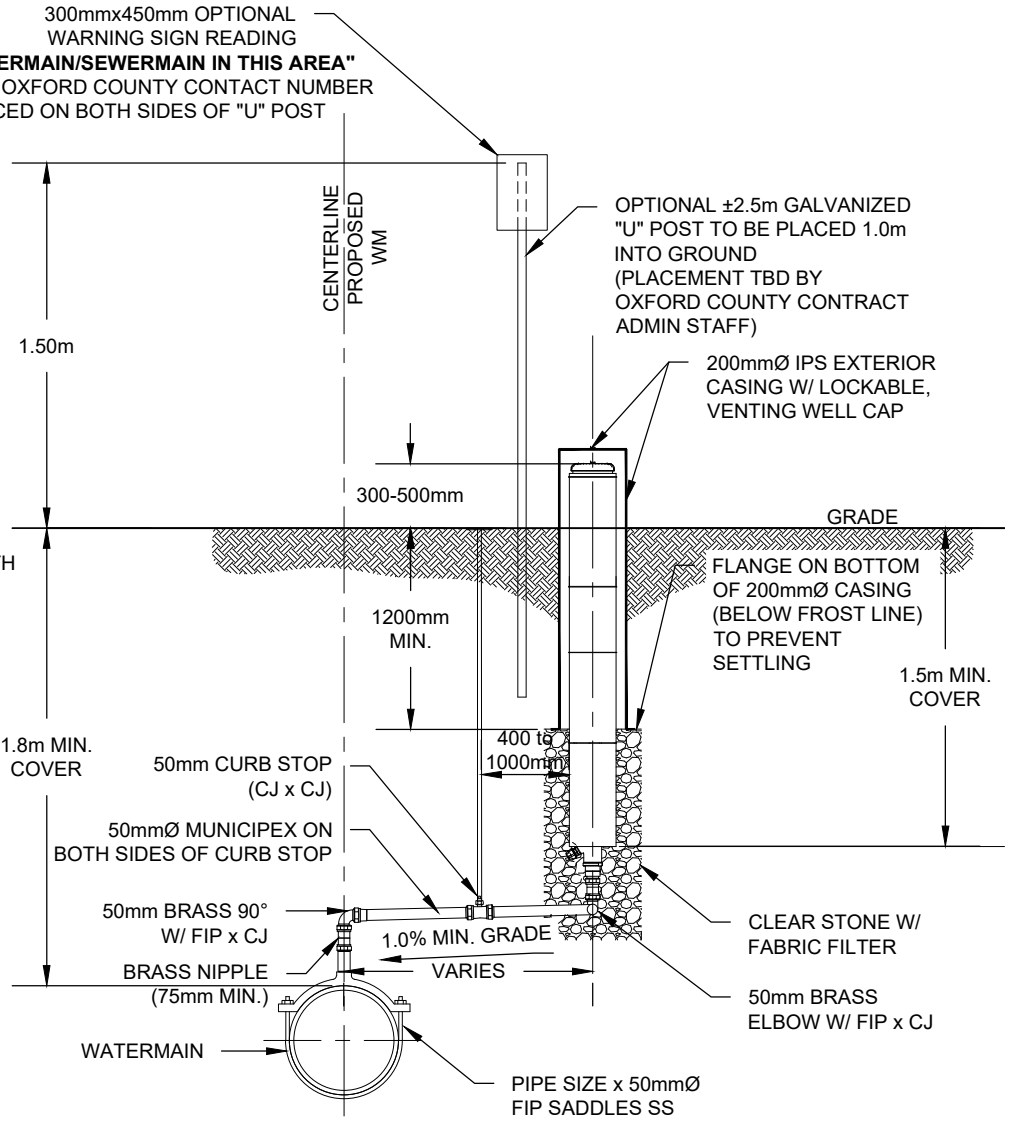
08/2025

FIG. 6.18

PREVIOUSLY: D1852-1-2011



1 TOP VIEW
Scale: N.T.S.



2 A-A SECTION
Scale: N.T.S.

OXFORD COUNTY STANDARD DRAWING

AIR RELEASE w/ CASING

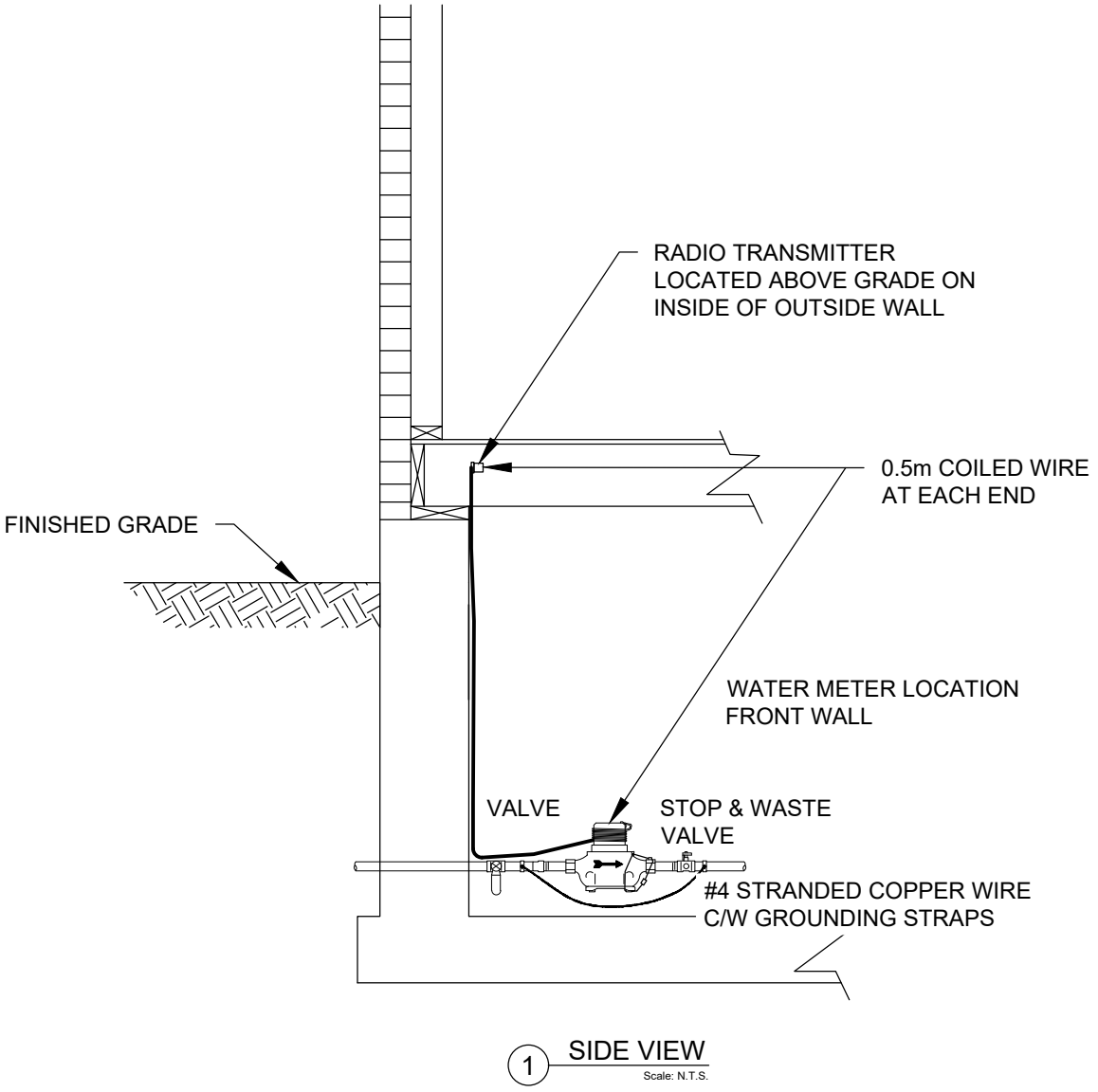
REV#: 2

08/2025

Oxford County
Growing stronger together

FIG. 6.19

PREVIOUSLY: D1852-2-2011



1 SIDE VIEW
Scale: N.T.S.

NOTES:

1. ONE SERVICE PER RESIDENTIAL UNIT (1.8m MINIMUM COVER FROM FINISHED GRADE).
2. WATER METERS MUST BE INSTALLED IN **HORIZONTAL POSITION**. CONTRACTOR/OWNER MUST ENSURE METER IS ACCESSIBLE FOR FUTURE MAINTENANCE.
3. RADIO TRANSMITTER MUST BE LOCATED ABOVE GRADE AND SECURELY FASTENED INSIDE ON AN OUTSIDE WALL. 22 GAUGE - 3 COND. SOLID COPPER WIRE MUST BE USED TO CONNECT THE WATER METER TO THE RADIO TRANSMITTER.
4. RADIO TRANSMITTER MUST BE INSTALLED AS PER MANUFACTURER SPECIFICATIONS.
5. COMMERCIAL/INDUSTRIAL SERVICES WILL BE ASSESSED ON AN INDIVIDUAL BASIS.

OXFORD COUNTY STANDARD DRAWING

WATER METER AND REMOTE RADIO TRANSMITTER

REV#: 1

08/2025

OxfordCounty
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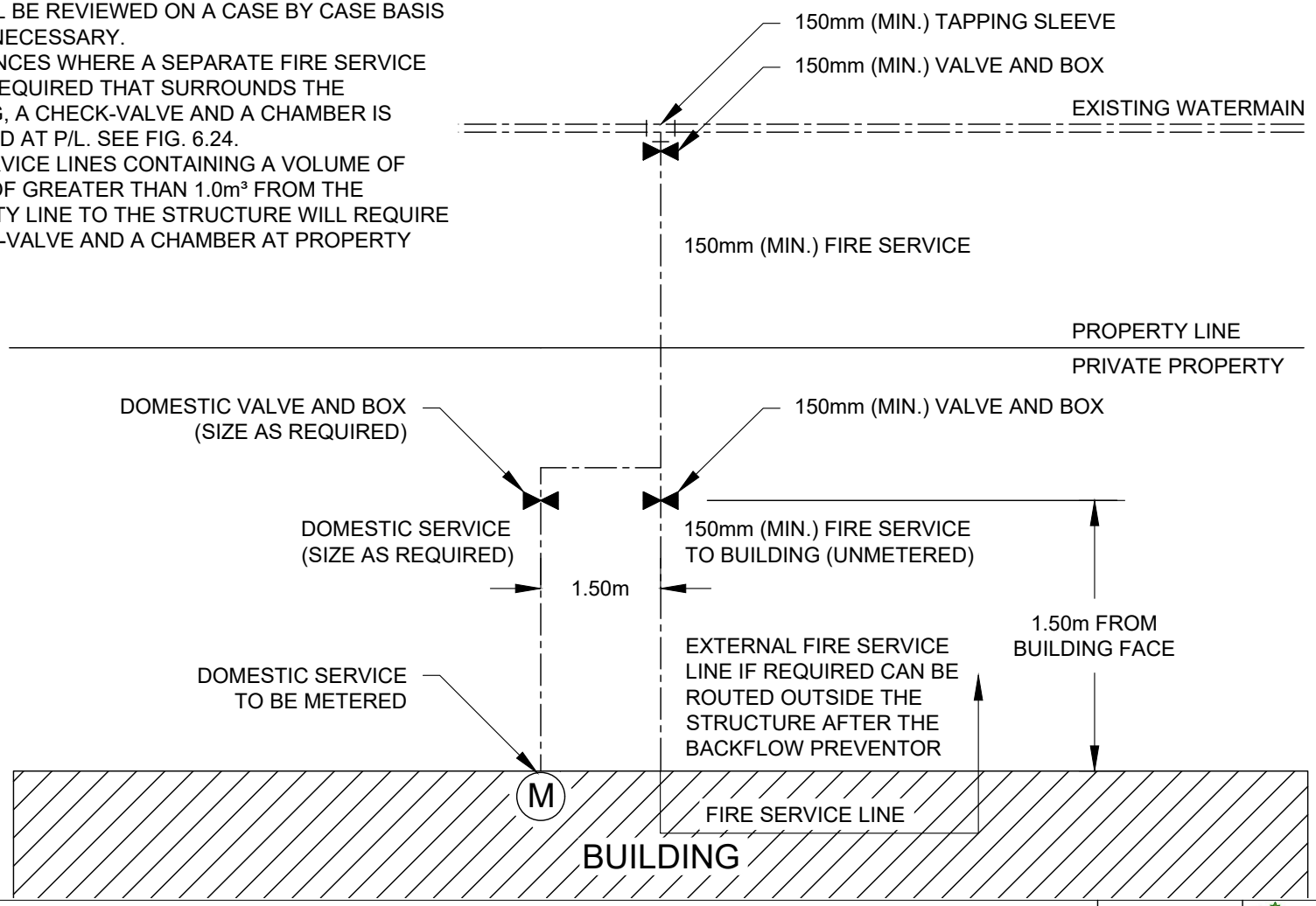
FIG. 6.20

PREVIOUSLY: D1856-1-2016

NOTES:

1. TRACER WIRE TO BE INSTALLED AS PER OXFORD COUNTY DESIGN GUIDELINES AND SUPPLEMENT SPECIFICATIONS.
2. WHERE WATERMAINS CAN BE SHUT DOWN AND A TEE INSTALLED DOMESTIC AND FIRE SERVICE VALVES TO BE PLACED ON PROPERTY LINE.
3. VALVE LOCATION AT WATERMAIN OR PROPERTY LINE WILL BE REVIEWED ON A CASE BY CASE BASIS WHERE NECESSARY.
4. IN INSTANCES WHERE A SEPARATE FIRE SERVICE LINE IS REQUIRED THAT SURROUNDS THE BUILDING, A CHECK-VALVE AND A CHAMBER IS REQUIRED AT P/L. SEE FIG. 6.24.
5. FIRE SERVICE LINES CONTAINING A VOLUME OF WATER OF GREATER THAN 1.0m³ FROM THE PROPERTY LINE TO THE STRUCTURE WILL REQUIRE A CHECK-VALVE AND A CHAMBER AT PROPERTY LINE.



OXFORD COUNTY STANDARD DRAWING

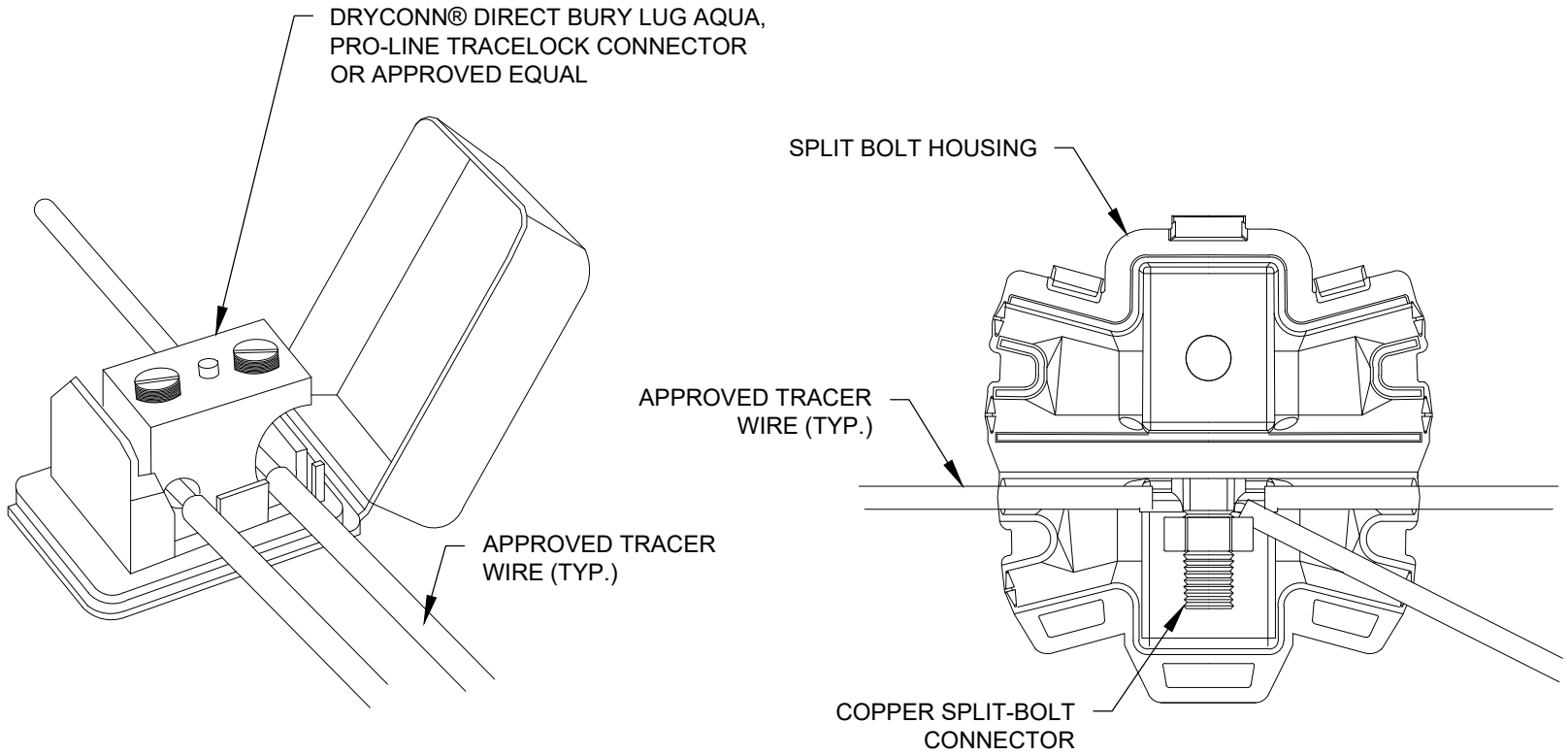
DOMESTIC AND FIRE SERVICE DETAIL

REV#: 1

08/2025

FIG. 6.21

PREVIOUSLY: D1857-1-2016



NOTES:

1. ALL CONNECTORS TO BE WRAPPED WITH DENSO TAPE OR APPROVED EQUAL AND COMPRESSED TIGHTLY BY HAND AROUND CONNECTOR.

OXFORD COUNTY STANDARD DRAWING

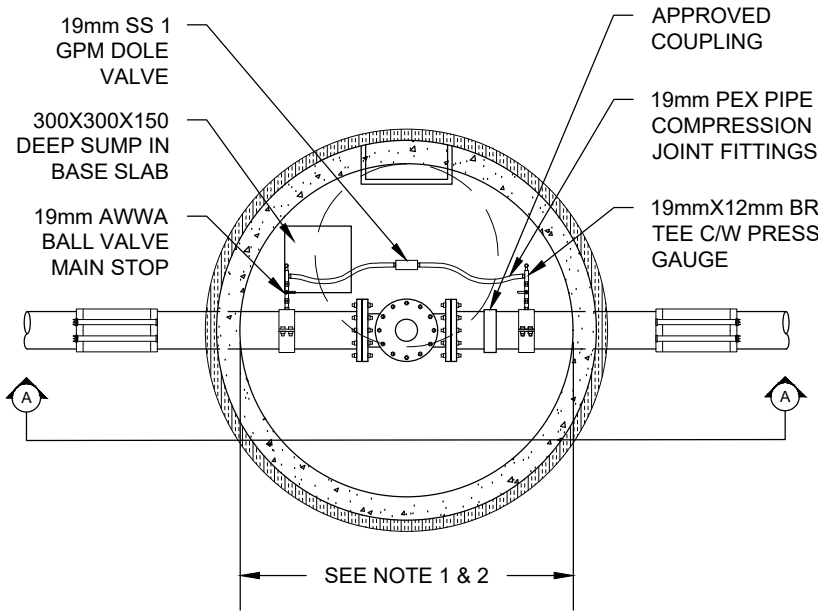
TRACER WIRE CONNECTION DETAILS

REV#: 1

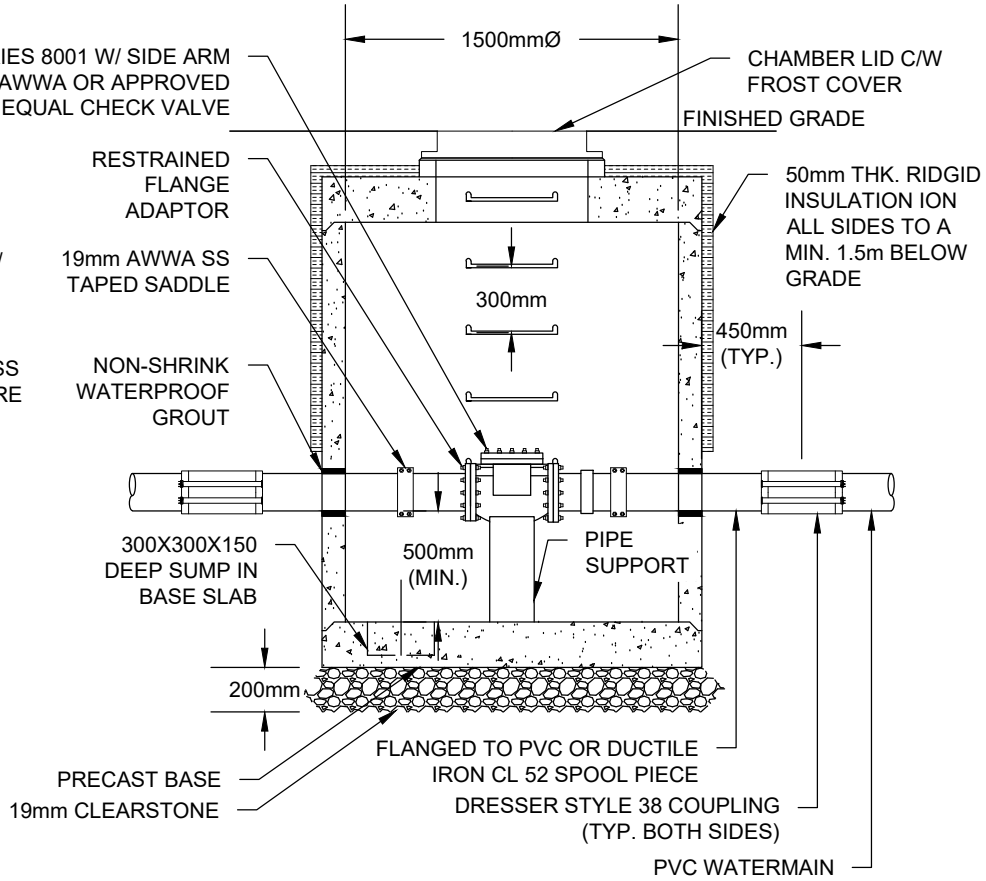
08/2025

FIG. 6.22

PREVIOUSLY: D1858-1-2016



1 TOP VIEW
Scale: N.T.S.



2 A-A SECTION
Scale: N.T.S.

NOTES:

1. FOR 150mmØ WATERMAIN, CHAMBER SHALL BE MIN. 1500mmØ MANUFACTURED AS PER OPSD 1101.010 & 401.010 "CLOSED COVER".
2. FOR 200mmØ AND LARGER WATERMAIN, CHAMBER SHALL BE MIN. 1800mmx2400mm MANUFACTURED AS PER OPSD 1101.012 & 402.030. THREE PIECE VALVE CHAMBER COVER C/W FROST COVER.
3. CHAMBER, PIPING, AND FITTINGS TO BE INSTALLED AS PER OXFORD COUNTY DESIGN GUIDELINES.
4. CHAMBER SHALL REQUIRE FROST STRAPS AS PER OXFORD COUNTY DESIGN GUIDELINES.
5. WATER PROOFING OF CHAMBERS SHALL BE COMPLETED USING WATER PROOFING MEMBRANE-SEAL TIGHT MEL-ROL SYSTEM OR APPROVED EQUAL.

OXFORD COUNTY STANDARD DRAWING

WATERMAIN CHECK VALVE & CHAMBER c/w 19mm BY-PASS (PRESSURE ZONE)

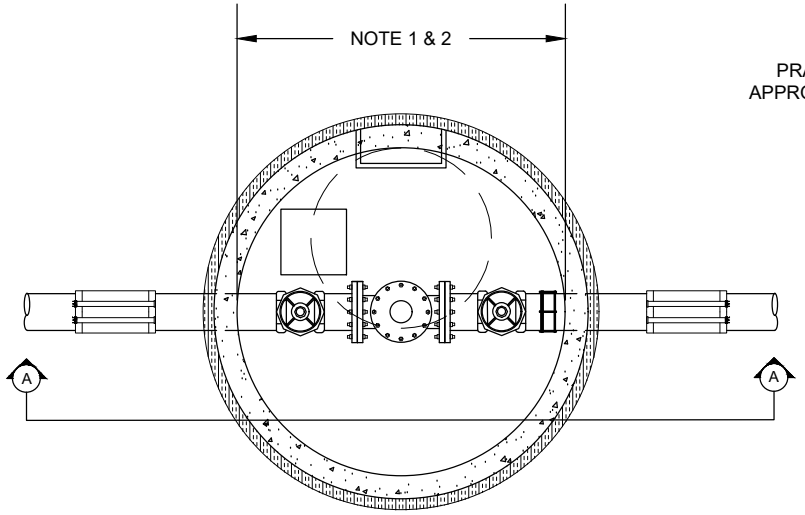
REV#: 3

08/2025

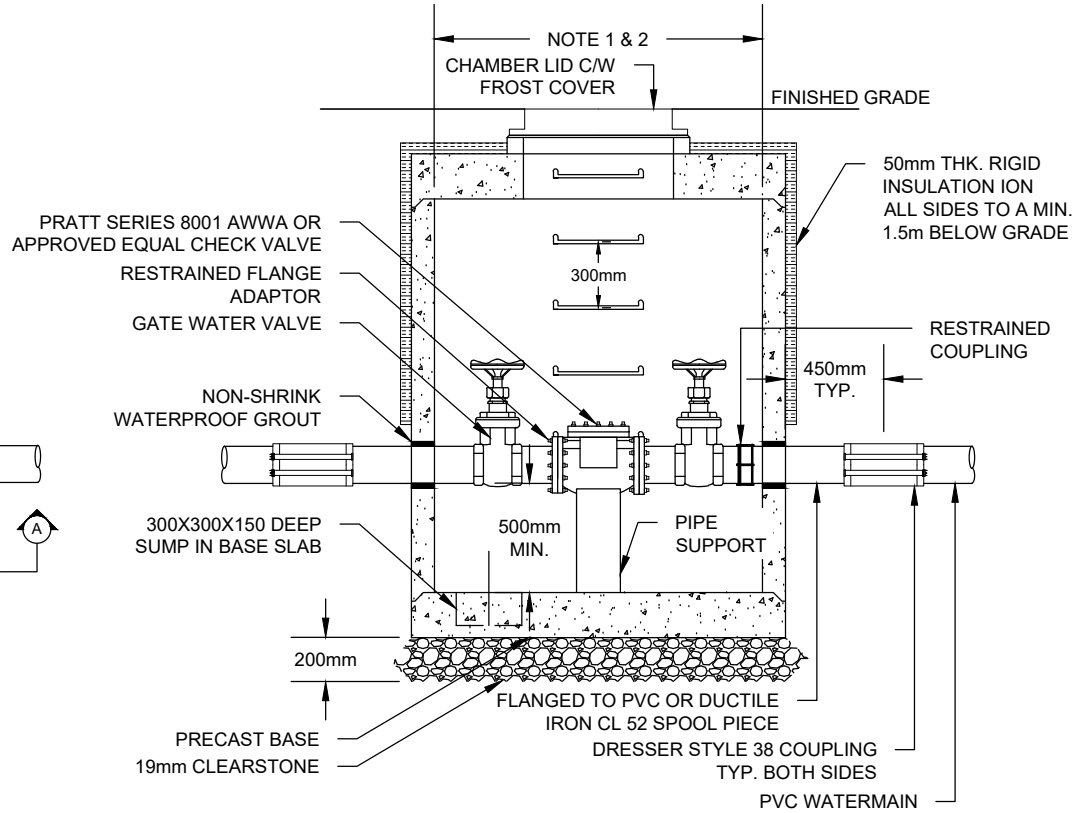
Oxford County
Growing stronger together

FIG. 6.23

PREVIOUSLY: D1860-1-2018



1 TOP VIEW
Scale: N.T.S.



2 A-A SECTION
Scale: N.T.S.

NOTES:

1. FOR 150mmØ WATERMAIN CHAMBER SHALL BE MIN. 1500mmØ MANUFACTURED AS PER OPSD 1101.010 & 401.010 "CLOSED COVER".
2. FOR 200mmØ AND LARGER WATERMAIN CHAMBER SHALL BE MIN. 1800mm x 2400mm MANUFACTURED AS PER OPSD 1101.012 & 402.030.
3. CHAMBER, PIPING, AND FITTINGS TO BE INSTALLED AS PER OXFORD COUNTY DESIGN GUIDELINES.
4. CHAMBERS SHALL REQUIRE FROST STRAPS AS PER OXFORD COUNTY DESIGN GUIDELINES.
5. WATER PROOFING OF CHAMBERS SHALL BE COMPLETED USING WATER PROOFING MEMBRANE-SEAL TIGHT MEL-ROL SYSTEM OR APPROVED EQUAL.

OXFORD COUNTY STANDARD DRAWING

WATERMAIN CHECK VALVE AND CHAMBER (FIRE ALARM)

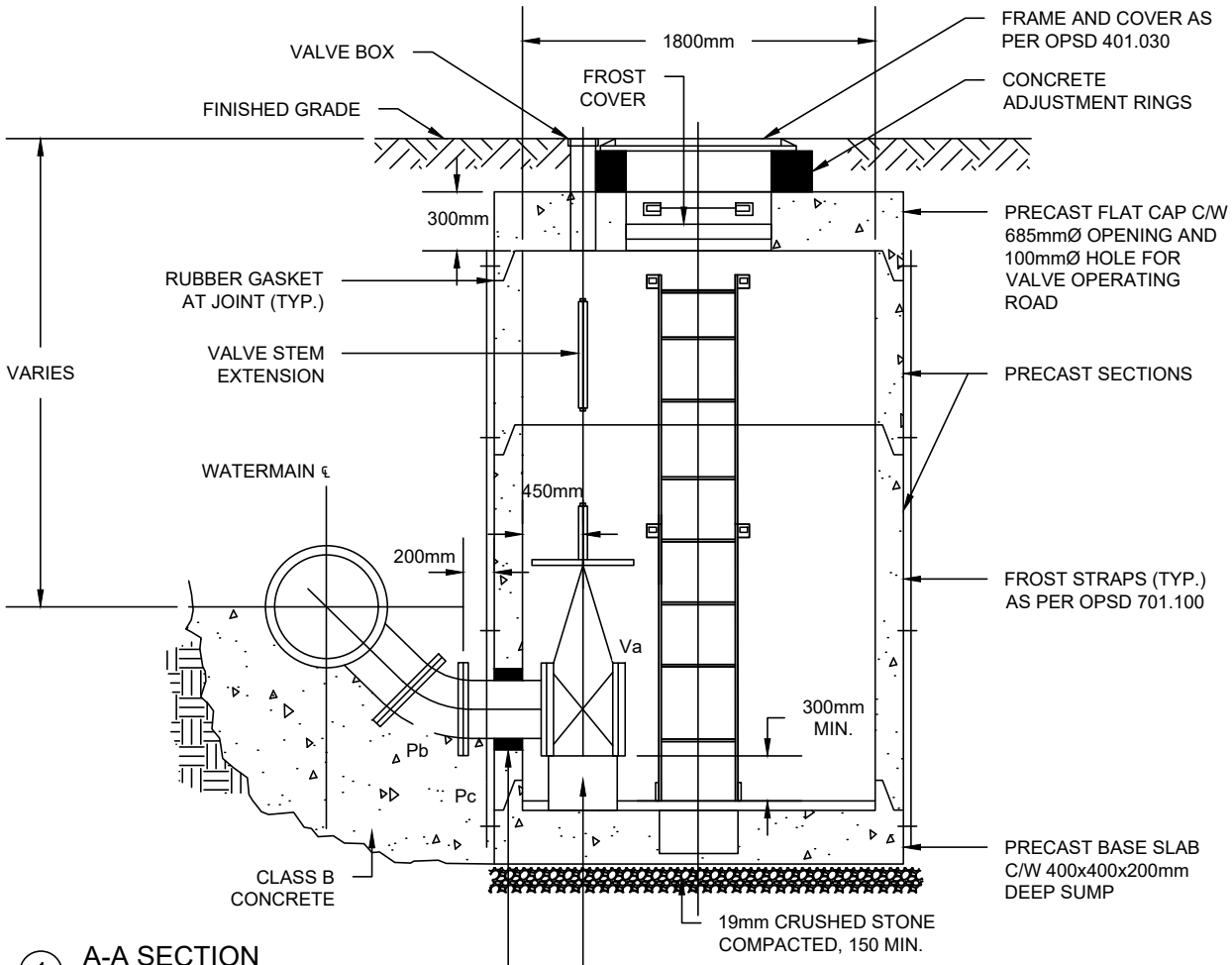
REV#: 1

08/2025

Oxford County
Growing stronger together

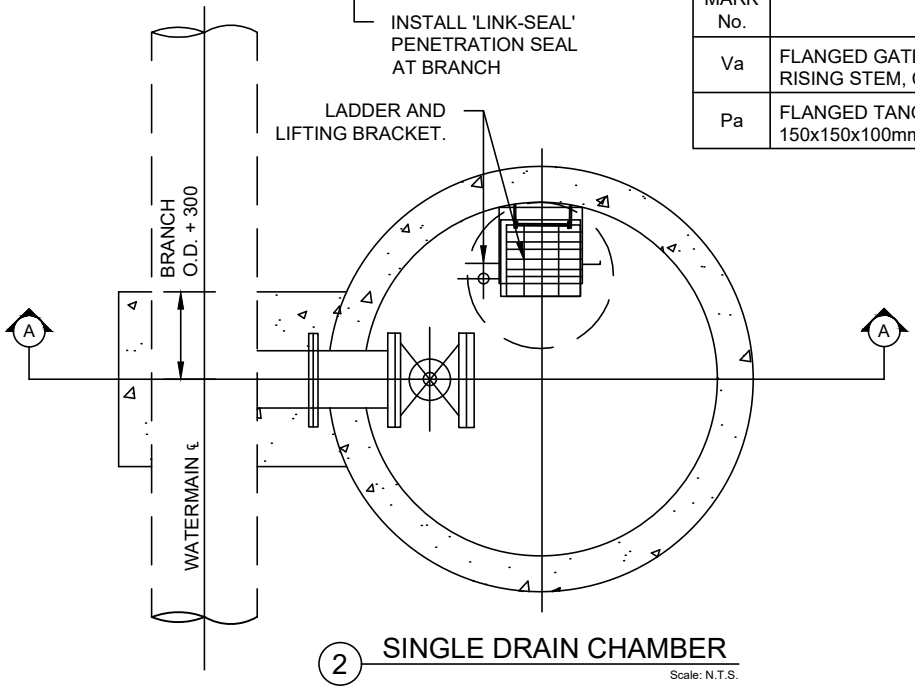
FIG. 6.24

PREVIOUSLY: D1861-1-2019



1 A-A SECTION
Scale: N.T.S.

MARK No.	MATERIAL
Va	FLANGED GATE VALVE, NON RISING STEM, C/W BLIND FLANGE
Pa	FLANGED TANGENTIAL DRAIN, 150x150x100mm MECHANICAL JOINT TEE



2 SINGLE DRAIN CHAMBER
Scale: N.T.S.

OXFORD COUNTY STANDARD DRAWING

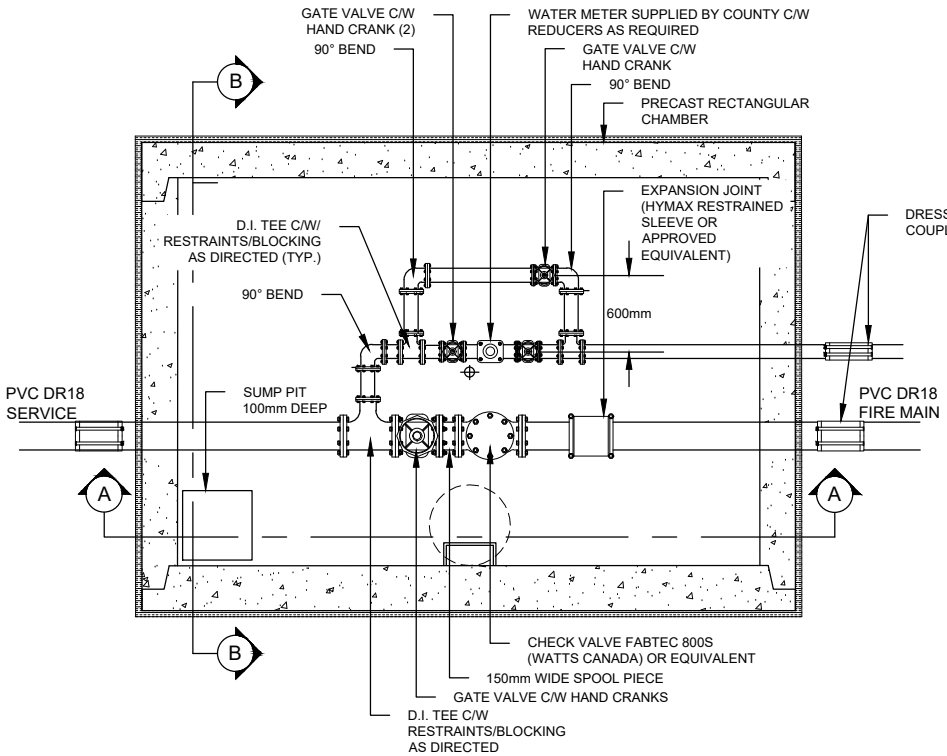
SINGLE DRAIN CHAMBER

REV#: 0

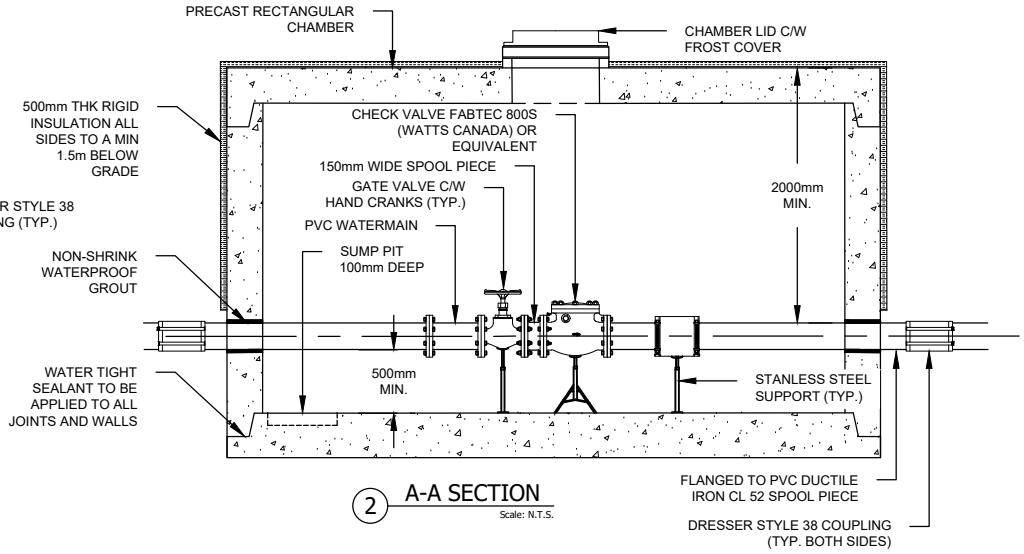
08/2025

FIG. 6.25

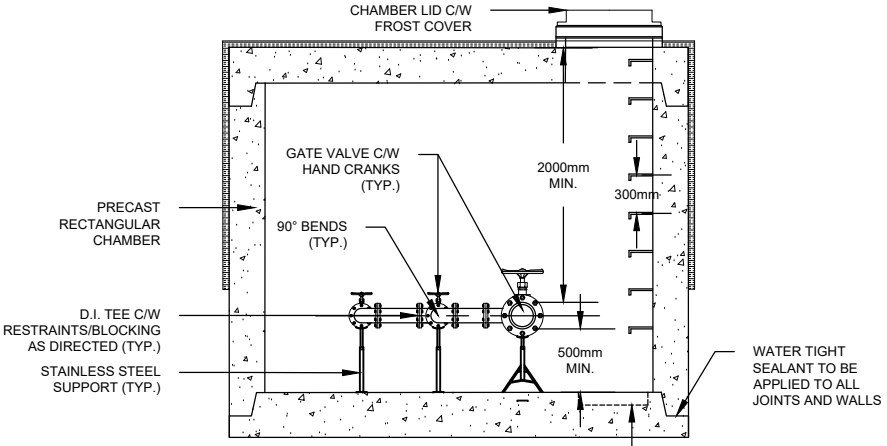
PREVIOUSLY: N/A



1 WATERMAIN CHAMBER
Scale: N.T.S.



2 A-A SECTION
Scale: N.T.S.



3 B-B SECTION
Scale: N.T.S.

NOTES:

1. WATERMAIN AND FITTINGS SHALL BE INSTALLED A MINIMUM OF 500mm FROM THE CHAMBER FLOOR.
2. ALL FITTINGS SHALL BE SUPPORTED BY STAINLESS STEEL RISERS.
3. WATER METER TO BE SUPPLIED BY COUNTY OF OXFORD.
4. STEPS TO BE INSTALLED AS PER OPSD STANDARDS.
5. WATERMAIN SHALL BE A MINIMUM OF 2.0m OF COVER AT THE CHAMBER.
6. CHAMBER SHALL HAVE A MAXIMUM OF 300mm OF ADJUSTMENT FOR THE FRAME AND GRATE.
7. FRAME AND GRATE SHALL BE PER OPSD 401.010.
8. FROST STRAPS REQUIRED ON CHAMBER.
9. CONCRETE CHAMBER AS PER OPSD 1108.010 OR PRECAST EQUIVALENT.
   - 9.1. ADJUSTMENT UNITS FOR FRAME INSTALLATION WILL NOT BE PERMITTED, ONE PIECE CONSTRUCTION ONLY (MAX. HEIGHT 1.0m)
   - 9.2. ONE PIECE ADJUSTMENT UNIT MUST EXTEND MINIMUM 100mm TO MAXIMUM 300mm ABOVE FINISHED GRADE.
   - 9.3. FRAME TO BE POURED INTO CONCRETE RISER.
10. CONCRETE CHAMBER TO BE APPROPRIATE SIZED AND INSTALLED IN A LANDSCAPED AREA.
11. BY-PASS LINE SIZE TO BE SAME SIZE AS THE METER LINE, BE IN CLOSED POSITION, AND SEALED BY THE COUNTY OR SERVICE PROVIDER.
12. METER CHAMBER MUST BE WATERPROOF AND PROVIDED WITH A 300mmX300mmX250mm (DEEP) SUMP.
13. NO CONNECTION FOR AN IRRIGATION SYSTEM OR OTHER TYPES OF EQUIPMENT ARE PERMITTED WITHIN CHAMBER.
14. IF A BACKFLOW DEVICE IS REQUIRED, A SEPARATE CHAMBER IS REQUIRED.
15. A FLASH MOUNT ACCESS HATCH IS AN ACCEPTABLE INSTALLATION WITHIN A WALKWAY, PROVIDING A BILCO LU-2 GALVANIZED LADDERUP SAFETY POST IS INSTALLED AT THE ENTRANCE.
16. VEHICLES MAY NOT PARK WITHIN 2.0m OF THE CHAMBER.
17. ALL NEW PIPE FITTINGS SHOULD BE RATED TO 200 PSI.
18. FLANGE MATERIAL: AWWA C207 CLASS D RINGS.
19. EXTERNAL POST MOUNTED REMOTE READER IS PREFERRED. IF THE REMOTE READER IS MOUNTED INSIDE THE CHAMBER, IT MUST BE JUST BELOW THE LID. REMOTE READER AND WIRING WILL BE INSTALLED BY COUNTY OR SERVICE PROVIDER.
20. IF THE ACCESS IS INSTALLED WITHIN A DRIVEWAY OR PARKING LOT, THE REMOTE READER IS TO BE MOUNTED ON A PERMANENT STRUCTURE WITHIN 5.0m OF THE CHAMBER. REMOTE READER AND WIRING WILL BE INSTALLED BY COUNTY OR SERVICE PROVIDER. THE CONTRACTOR IS TO INSTALL A 19mm DIA. PVC CONDUIT WITH PULL STRING FROM THE CHAMBER TO THE STRUCTURE. THE CONDUIT IS TO BE TURNED UP THE SIDE OF THE STRUCTURE AND TEMPORARILY CAPPED A MIN. OF 300mm ABOVE GRADE. CONDUIT & CONNECTIONS ARE TO BE IP68 RATED AND ALL BENDS ARE TO BE SWEEPING BENDS.

PIPE SIZE	MINIMUM INTERIOR DIMENSIONS	
	A (m)	B (m)
75mm AND 100mm	4.3	2.5
150mm	6.0	3.0
GREATER THAN 150mm	DESIGNED TO SUIT	

OXFORD COUNTY STANDARD DRAWING

WATERMETER CHAMBER w/ DOMESTIC AND FIRE SERVICE

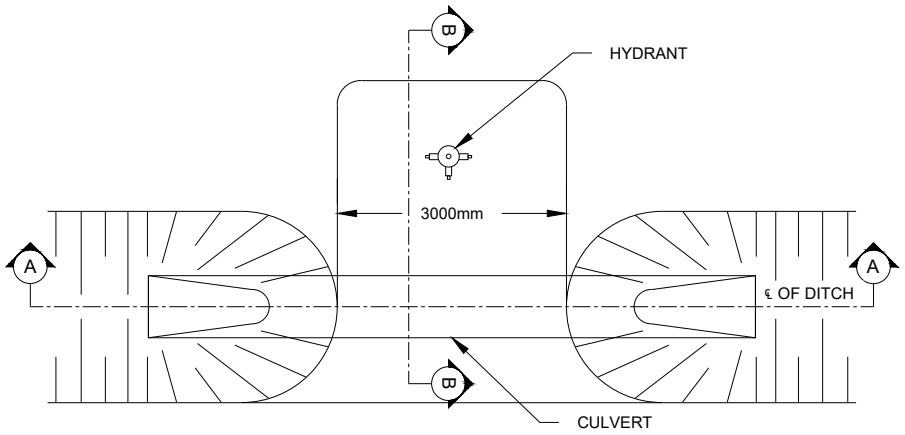
REV#: 1

08/2025

Oxford County
Growing stronger together

FIG. 6.26

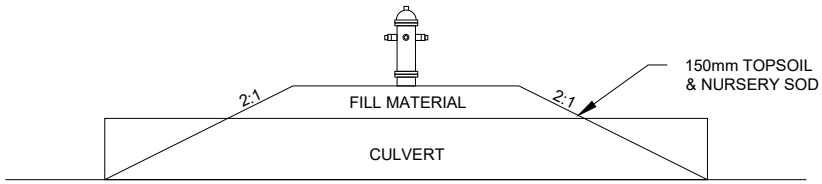
PREVIOUSLY: D1813-1-2019



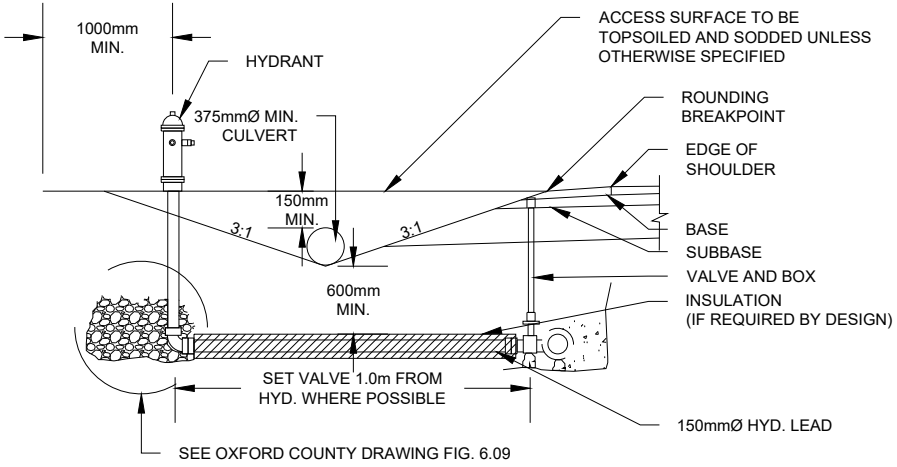
1 PLAN VIEW
Scale: N.T.S.

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.



2 A-A SECTION
Scale: N.T.S.



3 B-B SECTION
Scale: N.T.S.

OXFORD COUNTY STANDARD DRAWING

HYDRANT PLATFORM DETAIL

REV#: 1

08/2025

FIG. 6.27

PREVIOUSLY: TSD-1331