



City of Edmonton
District Energy Sharing System

Blatchford District Energy Sharing System - Design & Construction Guideline

COE-IM-GUIDE-0008

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Facility Planning and Design – Facility Infrastructure and Delivery

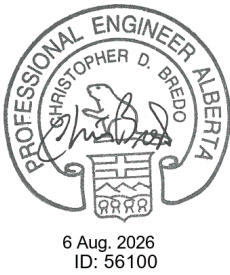
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INTENT OF USE

The City of Edmonton, authors, and members of the technical review committee, want to convey that this document does not constitute a project specific design. As such, no part of this standard alleviates the responsibility of the professionals retained to design and construct specific district energy piping systems from taking full responsibility, including legal responsibility and liability, for their designs and authenticating those designs in accordance with APEGA requirements and any other applicable standards for a specific project.

	Design and Construction Guideline Blatchford District Energy Sharing System	COE-IM-GUIDE-0008
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Professional Engineer Seal	Permit to Practice	Responsible for Sections
		Responsible for all sections not specifically referenced by the following disciplines
		Section 6.9, 6.10, 6.11 Sub-Section 6.12.5, 6.12.6, 6.12.7, 6.12.8 Section 7: 33 65 76, 33 81 29, 33 82 13.01 Section 8: Detail E01, E02, E03
	PERMIT TO PRACTICE PINCHIN LTD. RM SIGNATURE:  RM APEGA ID #: 256735 DATE: 2026-AUG-07 PERMIT NUMBER: P007802 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	Section 6.5, 6.7, 6.8 Sub-Section Section 6.2.3, 6.12.2 (Piping) Section 7: 26 03 23, 33 65 54, 33 65 55, 33 65 56 Section 8: Detail M01, M01A, M 02, M03

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Ver	Date	Revision Summary
V01	2021-Jun-30	Original Release
V02	2021-Nov-25	Add in missing Details M01, M02, and M02 Add 6.15 ETS Power Servicing Requirements
V03	2022-Dec-20	Revised DESS communication sections to include changes from COE-IM-TMO-0002 Revised DPS Piping Insulation Requirements Revised pipe marking requirements Other minor revisions
V04	2024-Feb-9	Added Detail C-16 DER/DES CURB STOP LOCATION STAMPS Added alternate pipe marking option Other minor revisions



Ver	Date	Revision Summary
V05	2025-Feb-7	Added DPS pull box (vault) detail. Updated drainage specification in Section 33 81 29 for pull box drainage requirements. Update Telethermics Flushing, Testing, and Cleaning of Pipe Section 33 65 15 – Pressure Testing Requirements Other minor revisions
V06		• Section 3 - Bylaw 18100 updated to 20865 per latest applicable bylaws • Section 5 - Design flow rates and thermal capacity requirements added • Section 5 - "If required" added for URW & Crossing Permits • Section 6 - Updated 6.1.3.1 Valve Location and Spacing • Section 6 - Updated 6.1.9.5 Communications Pedestals • Section 6 - Added 6.1.9.6 Communications Conduit Labeling • Section 6 - Updated 6.1.12.1 Buried DPS piping materials • Specification 26 03 23 Conduit Labeling Standard added • Specification 33 65 14 Telethermics Distribution Piping HDPE updated • Specification 33 65 15 Telethermics Flushing Testing Cleaning of Pipe updated • Specification 33 65 76 Direct Buried Underground Cable Ducts updated • Specification 33 82 13.01 Copper Communications Distribution Cabling updated • Details C-01,04,05,06,08,09,12 updated • Detail M-01 Mechanical Sensor bypass Manhole updated • Detail M-01A Mechanical Inline Sensor Bypass Manhole added • Detail E-03 Metal Tag Detail added

1 SCOPE OF STANDARD

1.1.1 Preface

This standard outlines the design and construction requirements for the Distribution Piping System (DPS) component of a District Energy Sharing System (DESS) project within the City of Edmonton (COE). This standard encompasses eight sections:

1. Scope of the Standard
2. References and Definitions
3. Acts, Bylaws, and Standards
4. Notice
5. Submission and Approval of Engineering Drawings and Documents
6. System Requirements and Design Standards
7. Construction Standard Specifications
8. Standard Drawing Details

The standard is supplemented by the COE Design and Construction Standards Volume 1: General, Volume 2: Complete Streets Design and Construction, Volume 3: Drainage, Volume 4: Water, and Volume 7: Power.

1.1.2 Intent of the Design and Construction Standard

This standard sets out the minimum requirements to be satisfied in the design and construction of the DPS component and DESS Communications component of a DESS project within the City of Edmonton. This standard is to be utilized as a reference document for designers and engineers engaged in the work in the City, or preparation of engineered drawings and associated reports that will be subject to the acceptance or approval, as applicable, to the City.

The performance standards and the detailed requirements defined in this standard shall apply to the preparation of engineering drawings and the execution of projects by Developers under the terms of the Servicing Agreements with the City.

1.1.3 Responsibilities of the Developer and Consultant

When using this standard, the Developer and Consultant remain fully responsible for the design and construction of municipal improvements according to good engineering standards that address the specific needs and site conditions of their project. Without limiting that broad and general obligation, this standard shall be the minimum requirement and further design and construction requirements may apply to specific projects depending on the circumstances. The Consultant must be satisfied of the applicability of the design criteria in these standards to the project at hand and apply more stringent criteria where appropriate.

Notwithstanding the use of the terms Contractor or Developer, any obligations found within this standard are ultimately the responsibility of the party or parties that has entered in the Servicing Agreement or Contract with the City.

The Engineer's acceptance covers only compliance with these standards and is not a warranty of the design work. Further, the City expressly disclaims any responsibility for the suitability of the drawings or the designs to a particular site but requires the Consultant to assume full responsibility in this regard.

2 REFERENCES AND DEFINITIONS

2.1.1 References

- COE Design and Construction Standards Volume 1: General
- COE Design and Construction Standards Volume 1: Table of Minimum Offsets
- COE Design and Construction Standards Volume 2: Complete Streets Design and Construction
- COE Design and Construction Standards Volume 3: Drainage
- COE Design and Construction Standards Volume 4: Water
- COE Design and Construction Standards Volume 7: Power

For technical references, refer to the applicable construction standard specification.

2.1.2 Definitions

In addition to the contract definitions provided by the City of Edmonton under '*Volume 1: General*':

- **District Energy Sharing System (DESS):** An all-encompassing, ambient temperature district energy system (i.e. Energy Centre, District Energy Piping System, and Energy Transfer Station). The DESS differs from a traditional system in that it consists of one supply/return network at an ambient temperature which can either be upgraded for heating or downgraded for cooling via a heat pump at each end user. A traditional district energy system usually consists of one high temperature "hot" water network and a second low temperature "chilled" water network to supply heating and cooling. No heat upgrade/downgrade is required at the end user for a traditional system.
- **District Energy Supply (DES):** The supply pipe for a closed loop warm and/or cool distribution network.
- **District Energy Return (DER):** The return pipe for a closed loop warm and/or cool distribution network.
- **Distribution Piping System (DPS):** A closed loop pipe distribution network, typically buried, carrying warm and/or cool fluid for the purpose of providing heating and/or cooling energy from an Energy Centre to multiple end users.
- **Energy Centre (EC):** Central heating and/or cooling plant.
- **Energy Transfer Station (ETS):** A system consisting of equipment and instrumentation for the purpose of transferring and/or upgrading, monitoring, and controlling the transfer of thermal energy between the DPS and the end user. Typical ETS process equipment will include: Heat exchanger, heat pump, flow control valve, energy meter, temperature transducer, and pressure transducer.
- **Service Connection:** A pair of service pipes—one supply and one return—connecting a customer property to the DPS.
- **The Utility:** The owner or agent responsible for the operation of the DESS.



3 ACTS, BYLAWS, AND STANDARDS

Where acts, bylaws, and standards are referred to, they shall be current, amended, and updated issues of such.

The Consultant will notify Alberta Environment and Parks of the proposed construction as required by the Alberta Environmental Protection and Enhancement Act.

It shall be a responsibility of the Consultant undertaking a development project to be aware of the statutory requirements governing such works and for compliance with those requirements. The listing provided below is for guidance. Other statutory instruments, not included here, may be applicable. All work performed on the DPS shall meet the minimum requirements as set out in:

- The Province of Alberta, Environmental Protection and Enhancement Act
- The City of Edmonton, Drainage Bylaw 18093
- EPCOR Drainage Services Bylaw 20865
- City of Edmonton Utility Bylaw 17943
- National Plumbing Code of Canada
- National Electrical Code of Canada

Some aspects of DESS design and construction require compliance with the requirements of volumes and sections of the COE Design and Construction Standards. The listing provided below is for guidance. Other requirements, not included here, may be applicable. All work performed on the DPS shall meet the minimum requirements as set out in:

- Volume 1: General
- Volume 2: Roadways
 - Sections: 02317 - Fillcrete
02318 - Trench and Backfill
02965 - Utility Cut Restoration
03210 - Reinforcing Steel
 - Drawings: 1020 to 1025 - Transverse Cut Restoration
2100 to 2710 - Utilities Location Plans
7980 to 7981 - Backfill Details with Valve Raised to Grade
- Volume 3: Drainage
 - Sections: 02445 - Bored Undercrossings
02446 - Horizontal Directional Drilling
02631 - Manholes and Catch Basins
 - Drawings: 7013, 7014, 7034, 7043 - Standard 1200 Manhole
7063 - Standard Riser Connections
- Volume 4: Water
 - Sections: Section 3: Water Valves
Section 7: Cathodic Protection
- Volume 7: Power



4 NOTICE

48 hours written notice shall be given to the Engineer or Inspector before commencement of work, or changes in work schedules or working, to facilitate coordination with Utility inspection staff.

All existing valves must be operated by or under the supervision of Utility Operations Staff or designate. The Utility must be contacted a minimum of 48 hours (2 working days) in advance to make arrangement for the operation of any existing valve. Additional notice may be required on a case-by-case basis as per the discretion of the Utility.

5 SUBMISSION AND APPROVAL OF ENGINEERING DRAWINGS AND DOCUMENTS

All drawings submitted for approval must be signed and sealed by a registered professional engineer indicating their proposals for:

1. Sizes and routes of DESS distribution and transmission mains, communications conduits, and service connections.
2. Locations of valves, air vents, bypasses, blow-offs, junction boxes, pull boxes, and manholes.
3. Details of manholes and other appurtenances.
4. Design flow rates and thermal capacity for each parcel connection.

5.1.1 Submission Requirements

The drawings shall conform to the requirements of 'Volume 1 – General' of the COE Standards and shall be subject to the approval of the Engineer. In addition to the requirements in 'Volume 1 – General', all engineering drawing submissions must include the following:

- An overall drawing schematic showing the proposed DPS in relation to the existing system. The overall drawing schematic should include sizes and arrangement for all proposed mains, branches, valves, reducers, blow-offs, bypasses, and service connections. The schematic should show locations of instrumentation manholes and all sensors. The schematic should indicate street names, and location or direction of energy centres.
- The schematic should show for each proposed block: the block identification number, zoning or building type, design DES peak heating load, design DES peak cooling load, and design DES flow rates for the peak heating and peak cooling loads.
- An overall plan drawing (to scale) showing the proposed DPS in relation to the Stage development. The DPS should include proposed and existing mains and branches, service connections, manholes, and valves. The stage development plan should show proposed and existing: streets, street names, blocks, block IDs, and staging boundaries.
- A list of DPS quantities for the stage being submitted in accordance with the submitted drawings. Quantities should include the length of DPS mains by size, lengths of DPS branches by size, number of service connections by size, and numbers of blow-offs, bypasses, drains, and manholes.
- A copy of the geotechnical report with any recommendations for deviation from minimum soil bearing capacities and any water table readings that result in the natural water table being above the elevation of the DESS infrastructure for any areas within the stage being submitted clearly identified within the report.



- Plan and profile depicting DPS piping to include pipe grades.
- Differentiate DES and DER line types on plan drawings.

Where the design include crossings (e.g. railways, high-pressure pipelines. etc.) the individual(s) responsible for the design shall also be fully responsible for:

1. The preparation and submission of drawings to the owners and proper authorities.
2. Obtaining the necessary permission or permits to enter upon, cross over, or construct under any crossing.
3. Any work, extra costs, damage claims, or insurance costs related to any of the crossings.
4. The submission of documentary evidence that such permits have been obtained prior to the approval of the drawings.

Should the Utility not approve any part of the drawings or design, they will be returned for revision to the satisfaction of the Utility and the period from return to re-submission of such drawings or proposals shall be deemed to be additional to that specified for first submission.

5.1.2 Drawing Package Submission

A **drawing package** containing one (1) full-sized PDF print of the approved detailed engineering drawing set must be submitted and received by the Utility or City a **minimum of three business days** prior to holding the pre-construction meeting.

5.1.3 Responsibilities and Requirements After Approval

The submissions described in the remainder of this section take place after the completion and approval of the design. The Consultant responsible for the project must ensure that these submissions are completed. These requirements are listed here because the Consultant who prepared the design will normally provide these services.

1. Submit Approved Drawings to the Utility For Review:
 - Within six months after the CCC inspection, revised drawings containing any changes made to the approved design shall be submitted to the Utility for review.
 - The as-built data that differs from the design shall be clearly identified on an electronic copy of the original design.
2. Submittal of Final As-built Drawings:
 - Shall be submitted in PDF format and AutoCAD format within 30 days of receipt of the Utility's response to the revision drawings submission.
 - Design data shall be erased on the original and replaced with as-built data.
 - All quantities, lengths and pipe/conduit sizes, appurtenances, and fittings shall be tabulated on and provided with the as-built drawings.
 - All service details must be updated with as-built coordinates and alignments prior to CCC and presented in a lot servicing report for each of the lots serviced.
 - The details must be submitted to the Utility in Microstation .dgn format with the service information provided in the NAD83 3TM coordinate system.
 - The file must include all property lines for reference.
 - Include a sensor manhole control wiring as-built drawing(s).
3. Submittal of all Service Information:

- Must be collected and submitted directly to the Utility within 3 months of the issuance of CCC in a Comma Separated Value (.csv) file.
 - Include survey data for curb stop and end of pipe, in addition to any pipe deviations, in addition to the service information required above.
 - The data file is to clearly indicate the Lot and Block number, the point description, service size, service line material, and coordinates in NAD 83 3TM coordinates.
4. Submission Deadlines:
- The following documentation shall be submitted by the deadlines as shown in Table 1 below.

Table 1: Submissions Required After DPS Construction

Item	Deadline
Pressure and Leakage Test Results	Prior to CCC inspection
Turbidity Testing Reports	Prior to CCC inspection
URW Documentation & Crossing Permits (if required)	Prior to CCC signing by Engineer
As-Built Quantities and Costs Report	Prior to CCC signing by Engineer
DPS Facility Reports (Valves, bypasses, blow-offs, etc.)	Within 3 months after CCC inspection
DPS Service Reports	Within 3 months after CCC inspection
As-Built Drawings (for review by the Utility)	Within 6 months after CCC inspection
Final As-Built Drawings	30 days after receipt of the Utility's response on as-built drawings

5. Construction Completion Certificate (CCC) and Final Acceptance Certificate (FAC):
- Procedures: CCC and FAC applications are required to be submitted digitally. Post-inspection approvals/rejections by the City will be administered digitally as well. The full list of guidelines and procedures can be found within the City of Edmonton eServices User Manual.
- Requirements: This list is not exhaustive, and additional items may be required on a case-by-case basis at the sole discretion of the Utility.
- a) The following items are required in conjunction with the request for inspection:
- All Departments:
- A readable plan (11X17) highlighting the improvement, plan must be approved drawing, approved redline, or as-built depending on inspection.
 - Pre-inspection report prepared and signed by the Consultant.
 - Completion of work.
- The Utility:
- Paving complete for CCC inspection of DPS. Alternative surfaces may be accepted at the sole discretion of the Utility.
 - Passed Water Pressure Test report .
 - Turbidity Testing Results.

- Water Treatment Results.
- b) The following items are required in conjunction with the application for Construction Completion Certificate:

The Utility:

 - Site Inspection.
 - Pressure Tests.
 - Geotechnical Compliance Letter confirming compliance with the technical specifications for bedding and backfill.
 - Turbidity Test Results.
 - Copies of registered easement and restrictive covenant documents.
 - As-built drawings submitted.
 - Other design considerations.
 - As-Built Quantities and Costs Report.
 - Utility Right-of-Way (URW) Documents and Crossing Permits (if required).
 - As-built record drawing (pdf).
 - Individual lot servicing reports with as-built service data.
- c) The following items are required in conjunction with the application for Final Acceptance Certificate:

The Utility:

 - Final As-built Drawings.
 - Land Titles registered URW document.
 - Land Titles registered URW plan.
 - System Requirements and Design Standards.

6 SYSTEM REQUIREMENTS AND DESIGN STANDARDS

6.1 Scope

Boundary parameters for tie-in delineation to be provided by the Utility.

6.2 DPS Mains and Branches

1. Definition:
 - DPS Mains: those sections of the DPS that carry flow across a development stage.
 - DPS Branches: those sections of the DPS that provide flow to blocks within a development stage or blocks immediately adjacent to and serviced from a development stage.
2. Location:
 - DPS mains and branches shall be installed in a street, avenue, or laneway.
 - DPS mains and branches may be located in a park, plaza, or Utility easement if approved in advance by the Utility.
3. Sizing:

- DPS mains sizing for each stage to be provided by the Utility.
- DPS Branch sizing to be provided by the Consultant. Sizing to be based on the design DES heating and design DES cooling load of each block.
- Required DPS flow rates for sizing in Blatchford to be calculated from the design DES heating and DES cooling loads and the following DES operating temperatures at the respective design conditions:
 - Winter (heating) design: 10 °C DE supply, 5 °C DE return
 - Summer (cooling) design: 30 °C DE supply, 35 °C DE return
- The DPS must be sized to meet the larger of the seasonal design flow rates.
- The minimum size of DPS branches is 150 mm.
- The maximum head loss of any Branch from the Main to the furthest service connection is not to exceed 35 kPa (one-way) at design flow.
- Maximum head loss in any DPS branch is not to exceed 2 m/100 m at design flow.
- The maximum velocity in any DPS is not to exceed:
 - For Mains: 4.0 m/s
 - For Branches: 3.4 m/s
- Minimum velocity in any DPS branch at design condition: 0.6 m/s.

Separation from Utilities – DPS Mains and Branches:

- Refer to Volume 1: Table of Minimum Offsets.

4. Bury Depth:

- Pipe grades shall be shown on the engineering drawings.
- Minimum DPS main or branch invert below the curb top or finished grade: 3.0 m.
- DPS mains and branches must be designed so that the depth of the valve operating nut is between 1.8 m and 2.5 m from finished grade.

5. Slope:

- DPS mains should be sloped a minimum of 0.4% to facilitate draining and air release.
- Slope mains up towards air vents or blow-off manholes, and down towards energy centres or drains.

6. Dead Ends:

- Mains are not to be looped (aka “ring circuit”) except as directed and/or approved by the Utility.
- Temporary dead ends for connection to future development stages shall be terminated with an isolation valve, flange connection, and blind flange. Refer to Detail C-09.
 - If the dead-ended branch or main includes customer service connections, a Blow-off and Bypass Valve Manhole is required before the blind flange at the dead-end. Refer to Detail C-12.
- Slope mains upwards at dead ends to allow removal of air.
- Permanent dead ends shall be terminated with:
 - A Sensor and Bypass Manhole (Detail C-01 and M-01) for branches servicing predominantly Fee Simple Townhouse lots or other parcels which are not anticipated to include Utility-owned Energy Transfer Stations, or

- o A blind flange with a Blow-off and Bypass Valve Manhole (Detail C-12) for other streets.

7. Casings:

- DPS casings are required at the following locations:
 - o Railway Crossings.
 - o Pipeline Crossings.
 - o Light Rail Transit Crossings.
 - o Creek Crossings.
 - o When the DPS is crossing under a large diameter storm main.
 - o At all other locations as designated by the Engineer.
- Casings to be installed in accordance with Volume 4, Drawing 2511-07, modified for HDPE pipe. DPS casing material to be PVC, concrete, or steel complete with anodes unless otherwise specified on the engineering drawings.

6.3 Valves

1. Location and Spacing:

- The location and spacing of valves in the DPS should be such that when in operation:
 - o No more than four valves are required to achieve a shutdown for a section of the DPS.
 - o No more than 52 single-family lots are taken out of service by shutdown of a DPS main 300 mm and under.
 - o No more than six (6) multifamily, mixed-use, commercial, or other lots are taken out of service by shutdown of a DPS main 350 mm and under in the ultimate design.
- Valves must be located a minimum 30 m away from arterial and collector road intersections, unless approved by the Engineer.
- Valves will be located at both ends of a DPS main passing through a Utility lot, walkway, or easement and will be placed a minimum of 0.5 m from the property line or its projection.
- Mainline valves at intersections of DPS mains and mid-block mainline valves shall be located on projections of the property lines, where possible, or dimensioned to a property line.
- Avoid locating valve boxes in parking spaces.
- Pressure testing lengths and segments shall be considered when selecting valve locations.

2. Valve Identification:

- The valve of each main is to be assigned a unique identification tag on the drawings. The identification tag must start with the designation "DE" followed by the development stage number, a two digit valve identification number, and the letter S for supply or R for return.
 - o Example: The DER and DES main valves #01 located in Development Stage 2 would have the corresponding identification tags of DE-201R and DE-201S, respectively.
- Valves to be numbered sequentially.
- Service connection valves and blow-offs, bypass valves, and manhole valves do not require identification tags on the drawings.

6.4 Cathodic Protection

- All buried steel and non-steel metallic pipe, valves, and fittings require cathodic protection. Refer to Detail C-13.
- All exterior bolts on valves and couplings shall be Stainless Steel type 304 or an approved equivalent.

6.5 Air Vents

- An automatic air vent is required at permanent dead ends of DPS mains or branches on streets where a Utility-owned Energy Transfer Station cannot be provided as the final service connection. An air vent is to be included in the Sensor and Bypass Manhole. Refer to Details C-01 and M-01.
- A manual blow-off for venting air is required at all other permanent dead ends and intermediate high points of DPS mains. Place manholes for manual blow-offs within the boulevard. Refer to Detail C-12.

6.6 Drain Valves

- The need for drain valves should be avoided. Slope DPS mains to allow draining at energy centres. Avoid creation of intermediate global low points in the DPS. Localized low points at under crossings are permitted.
- Where a global low point is created and approved by the Engineer, a drain valve is required.
- Drain valves must be located in proximity to a catch basin or storm sewer manhole to allow for future flushing and draining operations.

6.7 Service Connections

1. General:
 - The scope of work described in this section pertains only to that portion from the connection at the distribution main/branch to the curb stop valves. Service connection extensions on the private side of the property line will be provided by the property developer in accordance with the District Energy Design Guidelines provided by the Utility.
 - Some properties may be provided with more than one service connection to allow for possible subdivision.
 - DPS services 50mm and smaller are not permitted to be connected to DPS Main lines.
2. Sizing:
 - DPS Service Connection sizing to be provided by the Consultant. Sizing to be based on the flow required to meet the design DES heating and design DES cooling load of each block. Refer to DPS Mains and Branches section for DES design parameters.
 - The service connection must be sized to meet the full DES heating and DES cooling loads of the block.
 - Head loss in any DPS Service Connection is not to exceed 2 m/100 m at design flow.
 - For DPS service connections, valves shall be of the same size as the DPS service connection.
 - Blatchford Renewable Energy Standard service connection size for a typical fee simple townhouse (BRH zoned lot) with an expected dwelling of up to 250 m² of conditioned floor area is 40 mm (1-1/2"). Larger lots or different zonings may require differently sized services.
3. Services:
 - Refer to Volume 1: Table of Minimum Offsets.
 - The invert of the DPS service shall be a minimum of 2.60 m below finished grade at property line.

- The DPS service shall be aligned to service each lot in coordination and in conjunction with the water and drainage servicing.
- Services shall have the supply service on the right when facing the connected property.
- Loop every DES and DER service pair with a temporary U-bend. U-bend to be sized as:
 - o For services 150 mm and under: Line size
 - o For services 200 mm – 300 mm: 200 mm
 - o For services 350 and above: 300 mm
- Services installation shall be in accordance with Details C-03 to C-06.
- Once accepted by the City, service connection valves shall only be opened or closed by the Utility or under the supervision of the Utility.

6.8 Manholes

- A Sensor and Bypass manhole is required at dead ends for branches servicing predominantly Fee Simple Townhouse lots or other parcels which are not anticipated to include Utility-Owned ETSs. Refer to Details C-01 and M-01.
- Bypass auto flow valves are to be sized to turnover the branch volume 1x per hour. Specify auto flow valve flow rates on the drawings for each manhole.
- Installation of manhole sensors and termination and integration into the Energy Centre controls is to be completed by a Utility-approved vendor retained by the DPS prime contractor. Sensor wiring and commissioning scope is to be indicated on the DESS Communications Wiring Diagram.
- In some cases a sensor and bypass manhole may be required inline to a branch main rather than at a dead end. Refer to detail M-01A.
- A blow-off and bypass valve is required at dead ends for all other streets. Refer to Detail C-12.
- Preference is to locate manholes outside roadway travel lanes but still within the overall road right-of-way.

6.9 Communication Conduit System

1. Conduit Quantity and Routing:
 - Communication conduits are to be provided to connect all sensor manholes and each Multifamily, Mixed-Use, Commercial, and Institutional Lots, intended for an ETS, to the communication network and Energy Centre(s).
 - Conduit runs shall be continued from previous adjacent Stages, and Stages shall leave capped conduit for continuation into future Stages.
 - The existing system schematic design of conduit routing and quantity of ducts to be provided by the Utility.
2. Conduit Location and Clearances:
 - Conduits to be located within multiparty shared trench as telecommunications conduit. Refer to 'Volume 7: Power'.
 - Bend radii shall be minimum 10 times the internal diameter of the conduits.
3. Service Connections for Communication Conduit:
 - General Routing:

- o Four (4) 53 mm (2") ducts.
 - o Between all pull boxes and pedestals.
 - Multifamily, Mixed-Use, Commercial, and Institutional Lots with ETS:
 - o Two (2) 53 mm (2") ducts.
 - o From pull box to property line and capped with pull string and tracer wire.
 - Energy Centres:
 - o Six (6) 53 mm (2") ducts.
 - o Connection details at Energy Centre property to be provided by the Utility. With pull string and tracer wire.
 - Sensor and Bypass Manholes:
 - o One (1) 53 mm (2") duct.
 - o From pull box to manhole. With pull string and tracer wire.
4. Pull Boxes:
- To be located in roadway boulevards.
 - Must be located at both sides of a road crossing.
 - Must be located to ensure maximum of two (2) 90 degree of conduit bends between pull boxes. If this cannot be achieved, cable pull tension calculations to be completed for all conduit paths between boxes in the Stage to ensure suitability of network for installation of fibre optic cables and instrumentation cables.
 - o Fibre cable installation pull tension to be calculated for all conduit runs exceeding the bend limitation. Assumptions to be used for fibre cable:
 - *Maximum tensile strength of 1300 N.*
 - *Crush resistance of 1000 N/10 cm.*
 - *Polyethene cable jacket.*
 - *8 mm outer diameter.*
 - *58 kg/km weight.*
 - *2 fibre cables present in one conduit.*
 - *Assume lubrication will be utilized. Polywater J or equivalent.*
 - o Instrumentation cable installation pull tension to be calculated for all conduit runs exceeding the bend limitation and having instrumentation trunk cable installed.
 - The section length of conduits shall not exceed 200 m between pulling points.
 - Each pull box to be assigned a unique tag on the drawings. Starting with the designation "PB", the development Stage, a unique abbreviation relating to the road name, and a sequential number for each box or pedestal on that road from North to South or East to West. e.g., the Stage 4 East second from the North pull box on Alpha Blvd would be tagged "PB-4E-AB-2".
5. Pedestals
- To be located as a pull box and used in place of pull box for wire pulling.
 - Location shall facilitate the installation of future fibre optic network wiring to all multifamily lots and copper communication network wiring to all sensor manholes.
 - Typical Pedestal locations:
 - o The boundaries of a development Stage or as requested by the Utility.

- o At the service connection to an Energy Centre property, at the first location the conduit network diverges into two or more routes.
 - o If another design consideration prevents the installation of a Pedestal at the most adjacent location to a Stage boundary, submit proposed alternative to Utility for approval.
 - Each Pedestal to be assigned a unique tag on the drawings. Starting with the designation “JB”, the development Stage, a unique abbreviation relating to the road name, and a sequential number for each box or Pedestal on that road from North to South or East to West. E.g. the Stage 4 East second from the North Pedestal on Alpha Blvd would be tagged “JB-4E-AB-2”.
6. Conduit Labeling
- Conduits to be tagged at both ends with indelible permanent tags. Use laser engraved or etched stainless steel tags with stainless steel bands. Handwritten labels are not acceptable. Labels shall be waterproof.
 - Conduits to be tagged with destinations of a conduit run, including the name of pull box, pedestal, customer building or manhole.
 - If multiple parallel conduits are run between the same locations, conduits to be numbered sequentially after the destination name (ie. JB-4E-AB-2-1, JB-4E-AB-2-2, etc.).
 - Where conduits are stubbed for future stages, label with abbreviated street name and FUTURE. (ie. AB-FUTURE-1)
 - Where a conduit is later abandoned, label with the abbreviated street name and ABANDON (ie. AB-ABANDON-1)
 - Where conduit is stubbed for lot services, label with the legal land description (ie. LOT1-BLOCK3-1)
 - Where conduit is stubbed for a sensor manhole, use the manhole ID# (ie. MH6B-1)

6.10 Sensor/Instrumentation Network Wiring

1. Sensor/Instrumentation Hardware and Connection:
 - See Section 33 65 55.
 - See Section 33 65 76.
 - See Section 33 82 13.01.
 - See Section 33 85 05.
2. Instrumentation Cabling:
 - Purpose is to provide twisted pair connections between manholes instruments in the field and control system 4-20 mA analog inputs in an Energy Centre.
 - Cables to be run from manholes with instrumentation to nearest Energy Centre via Instrumentation Pedestal.
 - Trunk cables to be run between Instrumentation Pedestals and between an Instrumentation Pedestal and an Energy Centre, providing a direct or indirect path between each Pedestal back to an Energy Centre. Each new Pedestal must be connected by a cable back to a previous Stage Pedestal with capacity or homerun to an Energy Centre.

- If connecting to a previous Stage Pedestal, Utility to provide schedule indicating utilized and spare pairs. Designer to indicate pairs to be utilized for Sensor Manholes in the new Stage and return to Utility.
 - All underground junction boxes below grade including those in manholes are to be done with submersible NEMA Type 6 or IP68 rating.
3. Instrumentation Cables Tagging:
- Cables to have indelible permanent tags attached. Handwritten labels are not acceptable. Labels shall be waterproof.
 - Cables to be tagged upon entry into a box, pedestal, manhole, and/or building/room. Cables to be tagged when passing between conduits within pull boxes, even if not terminated. Pairs to be tagged at terminal blocks, splices, and termination points.
 - Cables to be tagged with destinations of both ends of a cable run, including the name of manholes, pedestals, and/or buildings. If multiple parallel cables are run between the same locations, cables to be numbered with C#. E.g. The second cable between Manhole 4A and Pedestal JB5A may be tagged "MH 4A to JB-6W-BPL-1 - C2".
 - Wires in use for an instrument to be tagged with instrument tag.
4. Instrumentation Pedestal Terminations:
- Terminal blocks in pedestals to provide connection between the pairs of different instrumentation cables.
 - Pedestal to contain terminal blocks as required for the trunk cable towards the Energy Centre connection, plus 20% spare. Each pair of the trunk cables requires two terminal blocks.
 - Consultant to clearly identify locations of Instrumentation Pedestals on drawings and indicate what future Stage they are to serve and how many remaining unused pairs are available for use with connection back to an Energy Centre.
 - Utility will provide information on available unused pairs from previous Stage if information is not available on record drawings.
5. Record Drawings
- Provide record drawings, at minimum, for the following:
 - Control sensor wiring
 - Multipair cable wiring
 - Updated pedestal wiring schedules

6.11 Fibre Network

- Where applicable and requested by the Utility, the Consultant shall complete the fibre network design for any particular DESS stage and will be fully responsible for all of the components associated to the fibre network design and for ensuring compliance with all Utility requirements. The Utility will review and provide recommendations on the Consultant's submission. The Utility will identify the Energy Centre location intended for fibre to be connected.

6.12 Materials

1. Buried DPS:

- Buried DPS pipe, fittings, and flanges shall be HDPE with a minimum cell classification of PE445474C or higher for PE 4710 materials in accordance with ASTM D3350 or CSA B137.1.
- Pipe Dimension ratio (DR) to be selected by the Engineer. DR must meet the following:
 - DR17 or thicker pipe shall be used for pipe 75mm diameter and larger.
 - DR11 or thicker pipe shall be used for pipe under 75mm diameter.
 - Pipe pressure class (PC) and pressure rating (PR) shall be 125 psig (water at 23 °C or 73 °F). Maximum operating pressure shall be 100 psig.
 - DR of pipe shall be necessitated by structural evaluation of burial, installation, and minimum H-20 live loading
- Pipe and fittings 100 mm diameter and larger to be butt fused.
- Pipe and fittings 75 mm diameter and smaller to be butt fused and/or socket fused.
- Electrofusion acceptable where indicated on drawings or upon Engineer approval.
- 90 degree bends shall be long-radius 5-segment.
- 45 degree bends shall be long-radius 3-segment.
- DPS mainline, branch piping, and services to be manufactured with coloured stripes co-extruded in the pipe outside surface. Alternatively, the pipe may be marked with coloured tape. Refer to Section 33 65 14 Item 2.9 for Pipe Markings.
- Refer to Section 33 65 14 for further detail.

2. Sensor and Bypass Manholes:

- Fittings, flanges, and appurtenances to be used for manhole bypass to be stainless steel.
- Bypass piping in manhole to be 316 stainless steel conforming to ASTM A312.
 - Refer to Section 33 65 54 for further detail.
- Manhole material to be closed profile wall HDPE meeting the requirements of ASTM F894. Refer to Section 33 85 05 and Detail C-01.
- Bypass manholes are required to be watertight and sealed to prevent water from entering the manholes from the surface or subsurface.

3. Insulation:

- Sensor and bypass manholes and internal piping to be insulated. Refer to Section 33 65 23, 33 85 05, and Detail C-01 for further detail.
- Buried DPS pipe to be protected with HI-40 Styrofoam board or approved equal in the event that minimum cover cannot be achieved. Refer to Section 33 65 14 and Detail C-14.
- Board insulation is required where minimum clearances to Storm or Sanitary can not be maintained.

4. Bedding and Backfill:

- Refer to 'Volume 2: Roadways Design and Construction', Section 02318 – Trench and Backfill and 'Volume 4: Water', Section 6: Pipe Bedding.
- For Utility crossings or areas where compaction cannot be achieved, use Fillcrete (non-shrink geo grout), piping to be wrapped in poly.

5. Conduit:
 - Direct buried conduit material may be Schedule 40 PVC or HDPE.
 - Approved installation requirements of the conduit system are listed in Section 33 65 76.
6. Pull Boxes:
 - Underground open bottom precast pull box with lid.
 - Minimum dimensions 900 mm high, 1000 mm long, 1000 mm wide.
 - To be rated to ANSI/SCTE-77 Specifications for Underground Enclosure Integrity Tier 15 "Driveway, parking lot, and off-roadway applications subject to occasional non-deliberate heavy vehicular traffic."
 - Lid to be marked "DPS".
 - If required to satisfy conduit cable pull calculations, deeper boxes with side entry for conduit may be used.
7. Telecommunication Pedestals:
 - Above ground telephone pedestal:
 - Minimum dimensions 900 mm high, 350 mm wide, 275 mm deep.
 - NEMA Type 3R or IP equivalent minimum environmental rating.
 - Pad lockable.
 - ANSI 61 grey.
 - To be marked "DPS".
 - Complete with back panel with DIN rails for mounting of terminal blocks for connection of instrumentation cable pairs.
 - Terminal blocks.
 - Terminals to be CSA approved for 300 V, 10A, accepting #14 AWG - #26 AWG wire, and coloured beige or grey.
 - Spring or cage clamp terminals to be used.
 - AC-Dandy 6A-DPP-1 or equivalent.
 - Refer to Details E-01 and E-02.
 - Precast concrete base sized to pedestal with allowance for belowground conduit entry. Knelsen #4-0046 size for pedestal. Refer to Detail E-01.
8. Instrumentation Cables:
 - Instrumentation wiring to be twisted pair #24 AWG, shielded, wet location rated, FT4 instrumentation cable.
 - Sensor cable(s) to Manholes to contain minimum 5 pairs.
 - Trunk cable(s) between Instrumentation Pedestals and Energy Centres to contain minimum 60 pairs.
 - Pair requirements may be achieved with single cables or with multiples cables pulled through the same conduit route at the same time.
9. Deviation from the approved materials shall only be permitted on a case-by-case basis with the written approval of the Engineer.

6.13 Execution

1. Manufacturer's Recommendation:
 - The manufacturer's recommended installation procedure is to be obtained and followed for all materials and equipment installed. In the case of discrepancy between the manufacturer's requirements and these specifications, advise the Engineer, and request instruction before proceeding.
2. Quality Control:
 - The Engineer of Record shall be the primary authority responsible for monitoring the works for compliance with quality control standards.
 - The Engineer of Record shall conduct inspections at his/her discretion and report any noted deficiencies and/or quality workmanship concerns and issues to the Contractor.
 - All noted deficiencies, quality control concerns and workmanship issues must be addressed and resolved to the satisfaction of the Engineer of Record prior to the issuance of the Construction Completion Certificate (CCC).
3. Flushing, Testing, Cleaning and Charging:
 - All works associated with flushing, testing, and cleaning of DPS to be performed by the Contractor.
 - Pressure testing must be completed and passed prior to commencement of the roadway surface structure and/or walkway or pathway infrastructure. After completion of flushing, testing, and cleaning, the Contractor will charge the system with water. Inhibitor to be injected in accordance with 6.13.6.
 - Refer to Section 33 65 15 for further details.
4. Tie-in to Existing:
 - Existing boundary valves to the existing DPS will be opened by the Utility after the contractor has demonstrated the system is clean and ready for energization and once approved by the Engineer and the Utility.
 - Contractor to coordinate with Utility for tie-in to existing DPS.
 - Existing DPS valves are to be opened only by Utility personnel.
5. Commissioning and Testing:
 - Commissioning and testing to be performed by the Contractor in coordination with the Utility.
 - During commissioning, and when directed by the Utility, the contractor will be required to take the following steps with oversight by the Engineer and Utility:
 - Open and close each service connection or branch 75 mm or over to demonstrate flow capacity.
 - Open and close select service connections under 75 mm as directed by the Utility.
 - Demonstrate functionality of all sensor manholes, bypass manholes, blow-offs, drains, and mainline valves.
6. Corrosion Inhibitor:
 - Corrosion inhibitor is to be injected by the contractor via the existing Energy Centre once the DPS has been energized. Contractor to coordinate with the Utility to understand which Energy Centre to use to inject the corrosion inhibitor along with coordination for access requirements.



- Circulate inhibitor through the DPS for 72 hours and top up as required to maintain required levels.

7 CONSTRUCTION STANDARD SPECIFICATIONS

Refer to the following specifications:

- 26 03 23 – Conduit Labeling Standard
- 33 65 14 - Telethermics Distribution Piping HDPE
- 33 65 15 - Telethermics Flushing, Testing, and Cleaning of Pipe
- 33 65 23 - Telethermics Thermal Insulation
- 33 65 54 - Telethermics Stainless Steel Piping
- 33 65 55 - Telethermics Piping Specialities
- 33 65 56 - Telethermics Bypass Valves
- 33 65 76 - Direct Buried Underground Cable Ducts
- 33 81 29 - Communication Vaults, Pedestals, and Enclosures
- 33 82 13.01 - Copper Communications Distribution Cabling MBUS
- 33 85 05 - HDPE Manhole

Part 1 General

1.1 SUMMARY

- .1 This standard defines the minimum requirements for labeling of communications conduits and fibre optic cables associated with the District Energy Utility. The intent is to ensure that all communications infrastructure is clearly identifiable, logically organized, and traceable for construction, operations, maintenance, and future expansion.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 GENERAL REQUIREMENTS

- .1 Permanence and Durability
 - .1 All labels shall be permanent, legible, and suitable for underground, vault, manhole, and building service conditions.
 - .2 Labels shall be corrosion resistant and securely attached to the conduit or cable.
- .2 Consistency with Records
 - .1 Label identifiers shall match terminology and identifiers shown on:
 - .1 Construction drawings
 - .2 As built drawings
 - .3 Fibre schedules
 - .4 Asset management records
 - .2 Any changes to labeling in the field shall be reflected in record documentation.
- .3 Location of Labels
 - .1 Conduit labels shall be installed at accessible locations within structures, vaults, pedestals, pull boxes, and manholes.
 - .2 Fibre optic cables shall be labeled at both ends of each cable run.

3.2 CONDUIT LABELING PHILOSOPHY

- .1 End Point Based Identification
 - .1 Communications conduits shall be labeled based on the remote termination or intended destination of the conduit, not the point of origin.
- .2 Multiple Conduits
 - .1 Where multiple conduits terminate at the same destination, conduits shall be sequentially numbered using a numeric suffix (e.g., -1, -2, -3).

3.3 CONDUIT LABELING CONVENTIONS

- .1 Conduits Terminating at Pull Boxes or Pedestals
 - .1 Where conduits terminate at a known pull box or pedestal, each conduit shall be labeled as follows:

- .2 Format: [Structure ID]-[Conduit Number]
- .3 Examples:
 - .1 PB-6W-BPL-2-1
 - .2 PB-6W-BPL-2-2
 - .3 PB-6W-BPL-2-3
 - .4 PB-6W-BPL-2-4
- .2 Abandoned or Not Used Conduits
 - .1 Where conduits are not used in the current stage of construction and are not connected to an active structure, they shall be labeled to clearly indicate non use.
 - .2 Format: [Road or Location ID]-ABANDON-[Conduit Number]
 - .3 Examples:
 - .1 LAR-ABANDON-1
 - .2 LAR-ABANDON-2
 - .3 Note: “ABANDON” indicates the conduit is not active for the current stage. Future reuse, if any, shall require re labeling.
- .3 Stubbed Conduits for Unknown Future Use
 - .1 Where conduits are stubbed for future use and the downstream connection is unknown at the time of construction, conduits shall be labeled accordingly.
 - .2 Format: [Road or Location ID]-FUTURE-[Conduit Number]
 - .3 Examples:
 - .1 FCR-FUTURE-1
 - .2 FCR-FUTURE-2
 - .4 Upon connection to a defined asset, these conduits shall be re labeled to reflect the final destination.
- .4 Stubbed Conduits for Future Lot Service
 - .1 Where conduits are stubbed specifically for future service to a defined lot, conduits shall be labeled using the legal land description.
 - .2 Format: LOT[Lot Number]-BLOCK[Block Number]-[Conduit Number]
 - .3 Examples:
 - .1 LOT1-BLOCK3-1
 - .2 LOT1-BLOCK3-2
- .5 Conduits Terminating at Manholes
 - .1 Where conduits terminate at a manhole, conduits shall be labeled using the manhole identifier.
 - .2 Format: [Manhole ID]-[Conduit Number]
 - .3 Example:
 - .1 MH6B-1

3.4 FIBRE OPTIC CABLE LABELING PHILOSOPHY

- .1 End to End Identification

- .1 All fibre optic cables shall be labeled based on the two structures at which the cable terminates.
- .2 Labeling at Both Ends
 - .1 Each fibre optic cable shall be labeled at both terminations using identical text.
- .3 Multiple Fibre Cables Between Structures
 - .1 Where more than one fibre cable exists between the same two structures, cables shall be sequentially numbered. Where fibre counts differ, the cable with the larger fibre count shall receive the lower number.

3.5 FIBRE OPTIC CABLE LABELING CONVENTIONS

- .1 Pedestal to Pedestal Fibre
 - .1 Format: [Structure A] TO [Structure B] ([Cable Number])
 - .2 Examples:
 - .1 JB-6W-SL-1 TO JB-6W-BPL-1 (1)
 - .2 JB-6W-SL-1 TO JB-6W-BPL-1 (2)
 - .3 The order of structures shall be consistent within a project. Where possible, a standardized ordering convention shall be applied.
- .2 Pedestal to Manhole Fibre
 - .1 Where fibre runs between a pedestal and a manhole, the pedestal shall be listed first.
 - .2 Format: [Pedestal ID] TO [Manhole ID]
 - .3 Example:
 - .1 JB-6W-SL-1 TO MH6B

3.6 AS-BUILT AND CLOSE-OUT DOCUMENTATION

- .1 All conduit and fibre labeling shall be verified prior to project closeout.
- .2 As built drawings and fibre schedules shall reflect:
 - .1 Final conduit destinations
 - .2 Final fibre routing
 - .3 All label identifiers exactly as installed in the field
- .3 Any temporary or placeholder labels (e.g., “FUTURE”) shall be clearly identified in as built documentation.

3.7 AUTHORITY

- .1 This labeling standard applies to all District Energy communications infrastructure unless otherwise directed by the District Energy Utility.

Part 1 General

1.1 SUMMARY

.1 Section Includes:

- .1 Distribution Piping System (DPS) piping, fittings, and valves. The DPS connects the Energy Centre (EC) into each Energy Transfer Station (ETS).

1.2 REFERENCES – LATEST EDITION

.1 American Society for Testing and Materials International (ASTM)

- .1 ASTM D638, Standard Test Method for Tensile Properties of Plastics.
- .2 ASTM D790, Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- .3 ASTM D792, Standard Test Methods for Density and Specific Gravity of Plastics by Displacement.
- .4 ASTM D1238, Flow Rate of Thermoplastics by Extrusion Plastomer.
- .5 ASTM D1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique.
- .6 ASTM D1598, Standard Test Method for Time-to-Failure of Plastic Pipe under Constant Internal Pressure.
- .7 ASTM D1599, Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing and Fittings.
- .8 ASTM D1603, Standard Test Method for Carbon Black Content of Olefin Plastics.
- .9 ASTM D1621, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- .10 ASTM D1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics.
- .11 ASTM D1693, Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.
- .12 ASTM D2290, Standard Test Method for Apparent Hoop Tensile Strength of Plastic or reinforced Plastic Pipe by Split Disk Method.
- .13 ASTM D2683, Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
- .14 ASTM D2774, Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
- .15 ASTM D2837, Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
- .16 ASTM D2842, Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- .17 ASTM D2856, Standard Test Method for Open Cell Content of Rigid Cellular Plastics by the Air Pycnometer.
- .18 ASTM D3261, Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for PE Plastic Pipe and Tubing.

- .19 ASTM D3350, Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
- .20 ASTM D3574, Standard Method of Testing Flexible Cellular Materials - Slab, Bonded and Molded Urethane Foams.
- .21 ASTM E96/E96M, Standard Test Methods for Water Vapour Transmission of Materials.
- .22 ASTM F714, Standard Specification for Polyethylene Plastic Pipe (SDR-PR) Based on Outside Diameter.
- .23 ASTM F1473, Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins.
- .24 ASTM F1055, Standard Specification for Electrofusion Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.
- .25 ASTM F2164, Standard Practice for Field Leak Testing of Polyethylene Pressure Piping Systems Using Hydrostatic Pressure.
- .26 ASTM F2206, Standard Specifications for Fabricated Fittings of Butt-Fused Polyethylene Plastic Pipe, Fittings, Sheet Stock, Plate Stock or Block Stock.
- .27 ASTM F2620, Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.
- .28 ASTM F3190, Standard Practice for Heat Fusion Equipment (HFE) Operator Qualification on Polyethylene (PE) and Polyamide (PA) Pipe and Fittings.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-B137.1, Polyethylene pipe, tubing, and fittings for cold-water pressure services.
- .3 American Water Works Association (AWWA)
 - .1 AWWA Manual M55.
 - .2 AWWA C906, Standard for Polyethylene Pressure Pipe and Fittings, 100 mm (4 in.) through 1,600 mm (63 in.), for Water Distribution.
- .4 Plastic Pipe Institute (PPI)
 - .1 PPI Handbook of Polyethylene Pipe – 2nd Edition
 - .2 PPI TN-38, Bolt Torque for Polyethylene Flanged Joints.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 Manufacturer written product and installation documentation

1.3 SUBMITTALS

- .1 Submit shop drawings prior to ordering materials.
- .2 Indicate dimensions, RSI-values, corrosion protection (as required) construction details and materials for the following:
 - .1 All piping and fittings.
- .3 Submission of fusion procedures including fuser qualifications are to be submitted 2 weeks prior to start of anticipated pipe fusion activities. Submittal to include:

- .1 Description of all heat fusion equipment and product support equipment to facilitate joining.
- .2 Heat fusion equipment operator qualifications to ASTM F3190.
- .3 Product pipe data including manufacturer's instructions, printed product literature, and data sheets.
- .4 Contractor shall submit an electrofusion plan outlining the pipe preparation and fusion method for the Engineer's review.. The plan shall include proposed tools and materials and outline the proposed methods to square any cut ends, re-round the pipe, scrape and clean the surface of the pipe, clamp the fitting into place. The plan shall outline the power source, fusion machine, and cooling duration.

1.4 RECORD DRAWINGS

- .1 Provide data necessary to produce record drawings on project completion in accordance with the following requirements:
 - .1 Give details of pipe material, location of fittings, maintenance and operating instructions and recommended spare parts list.

1.5 MANUFACTURER'S INSTRUCTIONS

- .1 To be obtained from manufacturer(s) as required.

1.6 SCHEDULING

- .1 Schedule work to be coordinated and in conjunction with installation of drainage and water utilities.

Part 2 Products

2.1 HDPE PIPE

- .1 Pipe shall be made from a high density polyethylene resin compound with a minimum cell classification of PE445474C or higher for PE 4710 materials in accordance with ASTM D3350.
- .2 Pipe and fittings shall meet the requirements of AWWA C906. All fittings must be fully pressure rated fittings.
- .3 Pipe design shall conform to ASTM F714.
- .4 Hydrostatic Design Stress (HDS) shall be 1,000 psi (water at 23 °C or 73 °F) as listed in PPI TR-4 for PE 4710 materials.
- .5 Pipe Dimension ratio (DR) to be selected by the Engineer. DR must meet the following:
 - .1 DR17 or thicker pipe shall be used for pipe 75mm diameter and larger.
 - .2 DR11 or thicker pipe shall be used for pipe under 75mm diameter.
 - .3 Pipe pressure class (PC) and pressure rating (PR) shall be 125 psig (water at 23 °C or 73 °F). Maximum operating pressure shall be 100 psig.
 - .4 DR of pipe shall be necessitated by structural evaluation of burial, installation, and minimum H-20 live loading, or as specified on the drawings.

- .6 Polyethylene to polyethylene joints: to be thermal butt fusion joined, to ASTM F2620
- .7 Conform to manufacturer's recommended minimum bending radius and PPI Handbook of Polyethylene Pipe

2.2 HDPE FITTINGS

- .1 Fittings, flanges, and mechanical joint adapters shall be made from a polyethylene resin compound with a minimum cell classification of PE445474C or higher for PE 4710 materials in accordance with ASTM D3350.
- .2 Fittings, flanges, and mechanical joint adapters shall have a pressure rating equal or greater to the pipe unless otherwise specified on the drawings.
- .3 45 and 90 degree bends to be minimum 3-segment mitered bends.
- .4 Electrofusion Fittings
 - .1 Manufacturing standard to conform to ASTM F1055.
 - .2 Fittings shall be marked in accordance with ASTM F1055.
 - .3 All electrofusion fittings shall have a nominal burst value of four (4) times the working pressure rating of the fitting.
- .5 Butt Fusion Fittings
 - .1 Manufacturing standard to conform to ASTM D3261, ASTM D2683 and AWWA C906.
 - .2 Molded fittings shall be marked in accordance with ASTM D3261. Fabricated fittings shall be marked in accordance with ASTM F2206. Socket fittings shall be marked in accordance with ASTM D2683.
- .6 Flanges and Mechanical Joint Adapters
 - .1 Manufacturing standard to conform to ASTM D3261 and ASTM F2206.
 - .2 Molded flanges and mechanical joint adapters shall be marked in accordance with ASTM D3261. Fabricated flanges and mechanical joint adapters shall be marked in accordance with ASTM F2206.
 - .3 Van-Stone style, metallic (including stainless steel), convoluted or flat-plate, back-up rings and bolt materials shall follow the guidelines of PPI TN38 and shall have the bolt-holes and bolt-circles conforming to one of ASME B-16.5 Class 150 or ASME B-16.1 Class 125.
 - .1 The back-up ring shall provide a long-term pressure rating equal to or greater than the pipe. The pressure rating shall be marked on the back-up ring.
 - .2 The back-up ring, bolts and nuts shall be protected from corrosion by a suitable system approved by the Engineer.

2.3 DISTRICT ENERGY SHARING SYSTEM (DESS) VALVES

- .1 Direct-Bury Gate Valves:
 - .1 For pipes 75 mm to 300 mm in diameter: use a valve size equal to the pipe size, or as directed on the drawings.

- .2 Cast iron body, flanged ends for connecting to HDPE, rating 860 kPa 125 psig steam.
- .3 Conform to AWWA C509 or C515; resilient seated, cast/ductile iron body, bronze mounted wedge valves with non-rising stainless-steel stems, suitable for 1.2 MPa with mechanical, flanged. Epoxy coating 10-14 mil inside and to AWWA C550, stainless steel bolts ANSI 304.
- .4 All external nuts and bolts to be Type 304 stainless steel or better.
- .2 Direct Bury Butterfly Valves:
 - .1 Butterfly Valves 350 mm & larger: Ductile iron lug body, EPDM seat liner, 304 SS, 316 SS, bronze, or ductile iron chrome plated disc, 403 SS, 416 SS, or 410 SS stem; curb stop nut gear operator; compatible with ANSI B16.1 Class 125 and ANSI B16.5 Class 150 flanges; 1034 kPa (150 lb) rating.
 - .2 Conform to AWWA C504.
- .3 Valve Boxes:
 - .1 Provide a 50 mm square operating nut; that turns clockwise to close.
 - .2 Provide "O" Ring seals for the valve stem.
 - .3 Valve stem is to be Type 304 stainless steel or grade B, C, D, or E bronze as per AWWA C509.
 - .4 Provide Type B (Screw Type) valve casing set with plug in accordance drawings and City of Edmonton Design and Construction Standards Volume 4: Water.
 - .5 Provide Type B (Screw Type) middle extension for valves with depths in excess of 3.0 meters from top of operating nut to surface grade of valve box.
 - .6 Castings are to have no cracks, gas holes or flaws. Surfaces shall be reasonably smooth with no burnt-on sand. Casting runners, risers and fins shall be removed.
 - .7 Castings shall be true to pattern, and within industry standard dimensional tolerances with no excessive shrinkage or deformity. Gray iron castings shall conform to ASTM A48, Class 30B.
 - .8 Ductile iron castings (plugs and bonnets) shall conform to ASTM A536, grade 60-40-18.
- .4 Corporation (main) Stops and Curb Stops (up to 50 mm):
 - .1 Brass corporation (main) stops: to AWWA C800, threaded type. Mueller, Cambridge Brass or approved equal.
 - .2 Brass inverted key-type curb stops: to AWWA C800, threaded type. Mueller, Cambridge Brass or approved equal.
 - .3 Curb stops to have adjustable epoxy coated cast iron service box supported on treated wooden block with stainless steel stem to suit depth of bury. Norwood Foundry NESB-1 or NESB-2, Westview Sales Edm. Service box or approved equal. 1.25" diameter CC caps shall be used.
 - .4 DPS service connections to properties shall be of the non-bleeder (not self-draining) type unless specifically approved
- .5 Valve Markings:
 - .1 All valve covers (plug) shall be either stamped with DES (supply) or DER (return).

2.4 INSULATION

- .1 DPS Insulation:
 - .1 Insulation is required to protect mains, branches, and services from freezing in the event that minimum cover as specified cannot be achieved. Designer shall specifically address this item and advise the utility in contemplating their design for inclusion of insulation as an alternate to achieving minimum depth of cover.
 - .2 Insulation shall be DOW HI-40 Styrofoam Board or approved equal.
 - .3 Insulation thickness shall be determined by the designer on the basis of depth of cover and risk of freezing.
 - .4 Insulation width as shown on DPS Details.

2.5 VALVE OPERATORS

- .1 Provide valve operating nuts (50 mm square for gate valves, standard curb stop for curb and corp stops).

2.6 WARNING TAPE

- .1 Polyethylene tape: located as shown on drawings.

2.7 BEDDING AND MATERIALS

- .1 Pipe bedding and materials shall be in accordance with current edition of the City of Edmonton Design and Construction Standards – Volume 4: Water or as specified on the drawings.

2.8 BACKFILL MATERIALS

- .1 Trenching and backfill materials shall be in accordance with current edition of the City of Edmonton Design and Construction Standards – Volume 2: Roadways or as specified on the drawings.

2.9 PIPE MARKINGS

- .1 The DPS piping larger than 100 mm shall be marked in accordance with the standards to which it is manufactured.
- .2 The DPS piping larger than 100 mm shall be manufactured with coloured stripes co-extruded in the pipe outside surface. Subject to review by the utility, alternative pipe marking using colored tape spiral wound around the pipe may be accepted. Acceptable Product: Polyflex® 136, or approved equal.
- .3 DPS piping smaller than 100 mm shall be marked with colored tape spiral wound around the pipe and extended to the termination point for the piping. Acceptable Product: Polyflex® 136, or approved equal.
- .4 Marking color for DPS piping:

Contents	Pipe Marking Colour
DPS supply	Red
DPS return	Blue

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for distribution piping installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Engineer.
 - .2 Inform Engineer of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Engineer.

3.3 PREPARATION

- .1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
 - .1 Inspect materials for defects to approval of Engineer.
 - .2 Remove defective materials from site.

3.4 DELIVERY, STORAGE AND HANDLING OF PIPE

- .1 Handle the pipe in accordance with the PPI Handbook of Polyethylene Pipe (2nd Edition), using approved strapping and equipment rated for the loads encountered. Do not use chains, wire rope, forklifts or other methods or equipment that may gouge or damage the pipe or endanger persons or property.
- .2 Field storage is to be in compliance with AWWA Manual M55.
- .3 Lift, do not drag, pipes from storage area to job site.

3.5 DAMAGED PIPE

- .1 If any gouges, scrapes, or other damage to the pipe results in loss of 10% of the pipe wall thickness, cut out that section or do not use

3.6 GRANULAR BEDDING AND SURROUND

- .1 Pipe bedding and materials installation shall be in accordance with current edition of the City of Edmonton Design and Construction Standards – Volume 4: Water or as specified on the drawings.

3.7 PIPE INSTALLATION

- .1 Installation of HDPE pipe shall be in accordance with ASTM D2774 for pressure piping, ASTM F2620, AWWA Manual M55 and PPI Handbook of Polyethylene Pipe.

- .2 Install pipe as per manufacturer's instructions and as per orientation in drawings, noting the following. (In the case of discrepancies between the manufacturer's installation guideline and this specification the more stringent recommendation shall be applied.)
 - .1 On dry ground, assemble shipping lengths of pipe into suitable installation lengths.
- .3 Polyethylene Pipe shall be jointed by the thermal butt-fusion method in accordance with ASTM F2620. and in accordance with the pipe manufacturer's recommended procedure for jointing the pipe. Pipe or fittings jointed by any form of fusion method can only be performed by technicians certified by the pipe manufacturer within the last two years.
- .4 The Contractor shall complete quality control testing on the fused joints to ASTM F3183; samples shall be prepared from the first joint fused each day fusion occurs, per fusion machine, per heat fusion equipment operator. All test results shall be provided to the Engineer for review within 24 hours and prior to pipe installation.
- .5 Remove all cuttings from the interior of the pipe before fusing.
- .6 All joint fusions shall be recorded on an electronic data logger and the fusion logs shall be provided to the Engineer for review prior to installation.
 - .1 The log on each joint shall include the name of the certified operator, time, date, diameter, wall thickness, heating plate, temperature, fusing time, and cool down time. The operator shall immediately report to the Engineer any joint that fails.
 - .2 Whenever practicable the jointing shall be carried out at ground elevation and the jointed pipe subsequently lowered into the trench.
 - .3 Field inspect fusion joints and visually examine melt bead to ensure quality heat fusion joints.
- .7 Perform pressure testing as per Section 336515 – Telethermics - Flushing, Testing and Cleaning of Piping.
- .8 Do not lay pipe on frozen bedding.
- .9 Do not let rocks or other foreign material, which might damage the pipe, fall on pipe.
- .10 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
- .11 Install removable watertight bulkhead at open end of pipe to prevent entry of foreign materials.

3.8 ELECTROFUSION FITTINGS

- .1 Notify the City and the Engineer 72 hrs in advance of electrofusion fittings installations to allow for inspection during installation.
- .2 Install electrofusion fittings according to the manufacturer's recommendations.
- .3 Pipe preparation and fitting installation procedures shall follow the HDPE Municipal Advisory Board (MAB) guides for electrofusion (MAB-1, 2025 or MAB-2, 2023) and the PPI Handbook of Polyethylene Pipe.
- .4 Electrofusion service saddles shall be pressure tested to confirm a complete fusion joint and prior to tapping into the main. See Section 33 65 15.

- .5 The contractor shall complete the Electrofusion Service Saddle Installation Inspection Checklist, included in Appendix E of MAB 01 or 02 for each service saddle installed. Inspection checklists shall be provided to the Engineer following installation of service saddles.

3.9 VALVE INSTALLATION

- .1 Install valves to manufacturer's recommendations at locations as indicated.
- .2 Support valves by means of either concrete or wood blocks, located between valve and solid ground. Bedding same as adjacent pipe. Valves not to be supported by pipe. Thrust blocks to follow City of Edmonton Design and Construction Standards, Volume 4, or as designed by the Engineer of Record.

3.10 DPS INSULATION

- .1 Per manufacturer's recommended installation instructions where required.
- .2 Installation of insulation shall be continuous with no gaps or holes between boards or sections.
- .3 Insulation shall be installed tight up to the walls of DESS manholes.
- .4 Insulation shall be installed tightly around all vertical penetrations such as valve risers.

3.11 TRENCHING AND PIPE BACKFILLING

- .1 Trenching and backfilling shall be in accordance with current edition of the City of Edmonton Design and Construction Standards – Volume 2: Complete Streets Design and Construction Standards or as specified on the drawings.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Distribution Piping System (DPS) flushing, testing, and cleaning procedures.

1.2 REFERENCES – LATEST EDITION

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM F2164, Standard Practice for Field Leak Testing of Polyethylene Pressure Piping Systems Using Hydrostatic Pressure.
- .2 American Water Works Association (AWWA)
 - .1 AWWA Manual M55.
- .3 Plastic Pipe Institute (PPI)
 - .1 PPI Handbook of Polyethylene Pipe – 2nd Edition
 - .2 PPI TN-22, PPI Guidelines for Qualification Testing of Mechanical Couplings for PE Pipes in Pressurized Water or Sewer Service.

1.3 PREREQUISITE REQUIREMENTS

- .1 No flushing or testing of the piping shall commence until all the mains and services have been completely installed, including all piping appurtenances, both temporary and permanent. No installations of any sort shall be allowed after the mains have been flushed and/or tested.
 - .1 If installation of DPS pipe is proposed to be done in sections, submit installation plan a minimum of two (2) weeks prior to commencing with any pipe installation to Engineer for review and comment.
- .2 A minimum of two (2) weeks prior to commencing with any flushing and testing of the piping, the Contractor shall submit a Flushing and Testing Plan (FTP) for the Engineer's review and comment as per *1.4 Submittals*.
- .3 The Flushing and Testing Plan shall provide a detailed, step-by-step outline of the methodology(s) that the Contractor proposes to use when conducting the flushing and testing of the piping.
 - .1 Flushing method shall be selected based on the pipe diameter, valve type, and piping configuration. Flushing method shall be reviewed and approved by the Engineer.
- .4 The Contractor shall provide the Engineer with seventy-two (72) hours' notice of intent to proceed with the flushing and testing of the completed piping.
- .5 The Contractor shall review the flushing and testing procedures with the Engineer so that the Engineer can check compliance with the minimum requirements of these specifications and the Contractor's FTP.
- .6 The Contractor shall allow the Engineer unrestricted access during the entire flushing and testing operation(s) to monitor the Contractor's compliance with the requirements of the

Flushing and Testing Plan, and to document the results of the flushing and testing process.

- .7 Flushing and testing is to be conducted by competent and experienced personnel using equipment appropriate for the piping being flushed and tested.
- .8 All flushing shall be in compliance with municipal by-laws for billing of water consumption.

1.4 SUBMITTALS

- .1 Submit a Flushing and Testing Plan for the Engineer's review and comment, a minimum of two (2) weeks prior to construction. As a minimum, flushing and testing plan shall include:
 - .1 Proposed source of flush water and test results of flush water that were taken at most two weeks prior to the FTP submitted.
 - .2 Method of pumping water into the piping.
 - .3 Method of disposal of flush water.
 - .4 Product name of any de-chlorination mechanisms or products to be used prior to flush water disposal.
 - .5 Pressure testing equipment to be used and location.
 - .6 Location, size, and product names of any temporary installation required for flushing, and procedures for their installation and removal.
 - .7 Step by step procedure of the flushing and testing process, including direction of flushing. If swabbing or power flushing is proposed, the Contractor shall include a Swabbing or Flushing section in the Flushing and Testing Plan. Details shall include, but not be limited to:
 - .1 A descriptive outline of the swabbing or power flushing methodology;
 - .2 Type and size of swabs, as well as swab material;
 - .3 Swab launch/retrieval locations;
 - .4 Main sections to be swabbed or power flushed;
 - .5 Flushing velocities and durations;
 - .6 Monitoring and documentation procedures;
 - .7 Swab pumping pressures;
 - .8 Method for collection and disposing of swab or power flushing debris and flush water;
 - .9 Alternate method for swab retrieval should the swab become irretrievable from the launch/retrieval location in the manner the Contractor intended;
 - .10 Schedule for flushing/swabbing; and
 - .11 Source of water for flushing.
- .2 Submit the Testing Logs with the relevant information in accordance with Section 3.2 Hydrostatic and Pressure Testing.
- .3 Submit corrosion inhibitor product data and volumetric calculations required to achieve required concentration in the mains.

Part 2 Products

2.1 CLEANING

- .1 Engineer to approve all proposed cleaning agents as part of the Flushing and Testing Plan submittal.

2.2 CORROSION INHIBITOR

- .1 Engineer to approve proposed corrosion inhibitor as part of the Flushing and Testing Plan submittal.
- .2 Acceptable product: AQUAGUARD 810.

Part 3 Execution

3.1 SWABBING & FLUSHING

- .1 Upon completion of all piping installations and the prerequisite requirements, all mains and services shall be thoroughly flushed with potable water, power flushed, and/or swabbed to remove entrapped air and foreign matter.
- .2 Power flushing may be completed prior to or after laying piping in trenches, however CCTV and turbidity samples verifying the turbidity requirements have been met are required after installation and prior to commissioning. Additional flushing will be required if debris is present in the CCTV or if turbidity samples fail.
- .3 Notify the Engineer of the source of the potable water. If the potable water is to be withdrawn from the municipal water distribution system, notify the municipal authorities at least forty-eight (48) hours in advance of withdrawing water from the municipal water system and obtain permits as required.
- .4 Test the flush water using an approved turbidimeter in the presence of the Engineer.
- .5 Flushing:
 - .1 Flush mains and branches at a minimum velocity of 0.9 m/s to achieve scouring. If velocities can not be achieved, alternate cleaning methods shall be used.
 - .2 Water must be exchanged a minimum of five times to achieve a completed flush.
 - .3 Provide temporary fill and blow-down points as needed to achieve specified water velocity.
 - .4 Flush DPS services from supply to return through their service u-bends.
- .6 The swabbing and/or power flushing procedure for all mainlines shall be as follows:
 - .1 Swabs shall be urethane type and shall have a diameter of at least 50 mm larger than the largest pipe internal diameter.
 - .2 Each pipe section shall be swabbed by passing a minimum of three (3) swabs through the main section being swabbed.
 - .3 Swabbing or power flushing of the piping shall continue until there is no further evidence of foreign materials in the pipes.
 - .4 All pipes are to be swabbed or power flushed.

- .5 The Contractor shall supply and install temporary launch/retriever ports to facilitate swabbing. Contractor to remove these items following the completion of the swabbing.
- .6 Flush and test each section of main until the turbidity is 1.0 NTU or less in three (3) consecutive tests taken five (5) minutes apart, or such duration that the Engineer deems to provide an accurate representation of the length of pipe being flushed.
- .7 Turbidity testing to be completed ahead of the swab. i.e. in advance of the swab retrieval/exit from the pipe.
- .8 The flush water shall not be discharged to the sanitary or storm sewer systems unless otherwise approved by the local authority(s) having jurisdiction. Flush water (and debris) shall be discharged to a suitable disposal area as reviewed and approved by the local authority(s) having jurisdiction.
- .9 When extending an existing DPS stub, power flush existing stubs back to the nearest isolation valve prior to connection.
- .7 If the Contractor fails to achieve the specified swabbing and flushing requirements and results, Contractor may need to engage the services of a professional firm specializing in utility systems servicing and maintenance, at the Contractor's expense, to swab and flush the piping.
- .8 Where, due to pipe size, it is impractical to clean and flush the mains using the methodologies outlined above, the Flushing and Testing Plan shall specifically address and detail the methodology proposed for cleaning and flushing the piping.

3.2 HYDROSTATIC AND PRESSURE TESTING

- .1 Hydrostatic and pressure testing of piping.
 - .1 Complete testing in accordance with ASTM F2164 and this specification. Refer to AWWA Manual M55 and PPI Handbook of Polyethylene Pipe.
 - .2 Pressure test each section of DPS separately. Test in the smallest segments possible based on available mainline isolation valves.
 - .3 Supply main to be pressure tested independently of return. Mainline valves and supply CC valves to be closed during testing. Return CC valves to be open where services are looped.
 - .4 Provide temporary gauge locations for monitoring pressure of each test segment.
 - .5 Submit to the Engineer a pressure testing plan showing each testing segment boundary, test gauge locations, and points for system filling and air bleeding.
 - .6 Install temporary blind flanges, struts, and bracing, as required, to guard against pipe movement when test pressures are applied.
 - .7 The water injection rate (fill rate) shall be controlled and monitored by means of a throttling valve installed on the discharge line(s) on a temporary basis.
 - .8 Install ball valves where no air release valves are installed to allow for the expulsion of air. Cap and record the location of the ball valves after satisfactory completion of the testing.
 - .9 Main lines and branch lines shall be tested independently whenever possible.
 - .10 Open all valves within the test section. Open all vents within the vent-valve-vent assemblies.

- .11 Expel air from pipe by slowly filling main with potable water at a filling velocity of <0.5 m/s.
 - .12 Test pressures shall not exceed the pipe manufacturer's recommended maximum test pressure.
 - .13 Do not conduct tests when ambient air temperatures drop below -5°C during the test period. If the temperature(s) drop below -5°C at any time during the test, the test shall be considered invalid and a re-test will be required.
 - .14 Pressure testing must be completed and passed prior to commencement of the roadway surface structure and/or walkway or pathway infrastructure.
 - .15 Test pressures to 125psi based on the elevation of the lowest point of the main being tested and corrected to the elevation of the test gauge.
 - .16 Initial Expansion: The test pressure shall be maintained continuously for four (4) hours and water added as needed. Do not measure this volume. Hydrostatic pressure expands HDPE pipe.
 - .17 Maintain the specified test pressure by injecting additional water if test pressure deviates from the specified pressure by 13.8 kPa (2.0 psi) or more.
 - .18 Pressure Test: Reduce pressure to 10 psi (70 kPa) below test pressure. Monitor pressure for four (4) hours.
 - .19 If there is no visible leakage, and the test pressure during the test phase remains constant, within 5 percent of the test pressure, a passing test is indicated. There is no allowable makeup water for this test. Thoroughly examine exposed joints and correct for leakage as necessary.
 - .20 Remove pipes, joints, fittings, and appurtenances found defective and replace with new sound material and make watertight. Identify Engineer of all failures.
 - .21 Repeat hydrostatic test until all defects have been corrected. Allow pipe to relax for at least 8 hours before repeating the test.
- .2 Electrofusion Saddles.
- .1 Pressure test electrofusion saddles after fusion installation and prior to tapping the mains.
 - .2 Allow saddles to completely cool prior to testing.
 - .3 Hydrostatically test saddle at 115 PSI for 20 min. Visually inspect saddles for leaks.
 - .4 No visible leakage, and test pressure holding within 5% of the test pressure, indicates a passing test.
 - .5 Schedule the work to allow Engineer and/or City to witness all saddle testing. Notify the City and the Engineer 72hrs in advance of testing to witness.
 - .6 Replace any saddles that fail testing.

- .3 Air pressure testing of piping:
 - .1 The use of compressed air for pressure testing piping shall not be allowed under any circumstances.

3.3 ENERGIZATION AND COMMISSIONING

- .1 Contractor to complete commissioning and energization of the new sections of DPS as directed by the City.
- .2 Existing boundary valves to the existing DPS will be opened by the Utility after the contractor has demonstrated the system is clean and ready for energization and once approved by the Engineer and the Utility.
- .3 Existing DPS valves are to be opened only by Utility personnel.
- .4 During commissioning:
 - .1 Open and close each service connection or branch 75 mm or over to demonstrate flow capacity.
 - .2 Open and close select service connections under 75 mm as directed by the Utility.
 - .3 Demonstrate functionality of all sensor manholes, bypass manholes, blow-offs, drains, and mainline valves.

3.4 WATER TREATMENT

- .1 Prior to energization, supply and install corrosion inhibitor via an injection point at the energy centre or other approved location.
- .2 Submit calculation of new DPS pipe volume being added and required volume of inhibitor to be added to the system.
- .3 After energization, allow circulation of water through the new DPS sections from the energy centre to mix and thoroughly distribute inhibitor.
- .4 Circulate inhibitor through the new DPS for 72 hours. Re-check final system inhibitor levels at the energy centre and top-up as necessary to maintain 1ppm concentration of filming amine.
- .5 Submit final water treatment report from the water treatment supplier.

3.5 MONITORING, DOCUMENTATION AND REPORTING

- .1 Monitoring of the work
 - .1 The Engineer shall be the primary authority responsible for monitoring the works for compliance with these and other applicable requirements and quality control standards.
 - .2 The Engineer shall conduct inspections at his discretion and report any noted deficiencies and/or quality and workmanship concerns and issues to the Contractor.
 - .3 All noted deficiencies, quality control concerns and workmanship issues must be addressed and resolved to the satisfaction of the Engineer prior to the issuance of the Construction Completion Certificate (CCC).
- .2 Documentation

- .1 The Contractor shall document the detailed methodologies and results of all aspects of the flushing, testing, and corrosion inhibitor addition procedures. Final concentration values of corrosion inhibitor shall be tested and documented.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This section specifies the thermal insulation for piping inside the bypass and sensor manholes installed as part of the District Energy Sharing System (DESS).

1.2 RELATED REQUIREMENTS

- .1 33 65 54 – Telethermics – Stainless Steel Piping
- .2 33 65 55 – Telethermics – Piping Specialties
- .3 33 65 56 – Telethermics – Bypass Valves

1.3 REFERENCES – LATEST EDITION

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C1710, Installation Guide for Flexible Closed Cell Foams
 - .2 ASTM C1729, Standard Specification for Aluminum Jacketing for Insulation

1.4 SUBMITTALS

- .1 Submit shop drawings. Submittal to include:
 - .1 Manufacturer technical data sheets including dimensions, physical properties, and installation procedures.
 - .2 Installer qualifications.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: specialist in performing insulation work of this Section, and have at least three [3] years of successful experience with this size and type of project. Contractor to submit qualifications.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling, and unloading:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.
 - .3 Store at temperatures and conditions as required by manufacturer.
 - .4 Replace damaged material at no additional cost to Owner.

2 Products

2.1 INSULATION

- .1 Manhole Pipe and Valve Insulation
 - .1 Closed-cell, cellular insulation, non-absorptive and non-combustible.
 - .2 Insulation shall be K-Flex Insul-Tube, AP ArmaFlex Tube, or approved equal.
 - .3 Thickness shall be 40 mm (1-1/2”).

2.2 INSULATION SECUREMENT

- .1 Manhole Pipe and Valve Insulation
 - .1 Tape: self-adhesive, 10 mil polyethylene film, 50 mm wide.
 - .2 Contact adhesive: quick setting, waterproof, approved by the insulation manufacturer.

2.3 JACKETS

- .1 Manhole Pipe Insulation
 - .1 Aluminum:
 - .1 Aluminum jacketing shall comply with the requirements of ASTM C1729 Standard Specification for Aluminum Jacketing for Insulation
 - .2 Standard Roll or Sheet Aluminum Jacketing:
 - .1 Bare surface, 3105/3003 alloy, H14 temper, 3 mil moisture barrier.
 - .2 Classification: Type I, Grade 1, Class A, 0.016” thick
 - .3 Fastenings:
 - .1 Flashing sealants shall be used to seal around protrusions, insulation terminations, and jacketing slip joints.
 - .2 Banding shall be stainless steel, 19 mm wide, 0.5 mm thick

3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed, and certified.
- .2 Surfaces clean, dry, free from rust, scale, grease, dirt, moisture, and foreign material.

3.3 INSTALLATION

- .1 Apply materials in accordance with manufacturers' instructions and this specification.

.2 Manhole Pipe Insulation

- .1 Install in accordance with ASTM C1710 standard.
- .2 Use two layers with staggered joints when required to achieve specified thickness.
- .3 Install insulation so longitudinal joint seams are placed on bottom of pipe.
- .4 Provide pre-formed tube insulation over all piping up to manhole sensors.
- .5 Jackets:
 - .1 Metal jacketing overlaps at joints shall be positioned in an orientation to best avoid water infiltration. Whenever possible, openings at joints shall point downward to naturally shed water.
 - .2 All fasteners and bands shall be neatly aligned and overall work must be of high quality appearance and workmanship.
 - .3 Where elbows meet vertical straight pipe, the butt joints shall be installed such that the opening points downward in order to shed water.

3.4 REMOVABLE INSULATION COVERS

- .1 Application: at sensor unions, auto flow valves, air vents, strainers, and sensors.
- .2 Design: to permit access for periodic removal, cleaning, and replacement without damage to adjacent insulation.
- .3 Insulation:
 - .1 Insulation type: same as system.
 - .2 Jacket type: polyethylene pipe wrap.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This section specifies the stainless steel hydronic piping and fittings within the bypass and sensor manholes installed as part of the District Energy Sharing System (DESS).

1.2 RELATED REQUIREMENTS

- .1 33 65 23 – Telethermics – Thermal Insulation
- .2 33 65 55 – Telethermics – Piping Specialties
- .3 33 65 56 – Telethermics – Bypass Valves

1.3 REFERENCES – LATEST EDITION

- .1 The publications listed below form part of this specification to the extent referenced. The publications are referenced in the text by basic designations only.
- .2 American Society of Mechanical Engineers (ASME):
 - .1 ANSI/ASME B1.20.1, Pipe Threads, General Purpose.
 - .2 ASME/ANSI B16.5, Pipe Flanges and Flanged Fittings.
 - .3 ASME/ANSI B16.9, Stainless Steel Butt-welding Fittings.
 - .4 ASME/ANSI B16.11, Forged Steel Fittings, Socket Welding and Threaded.
 - .5 ASME/ANSI B16.25, Buttwelding Ends.
 - .6 ASME/ANSI B31.9, Building Services Piping.
 - .7 ASME/ANSI B36.19, Stainless Steel Pipe
- .3 American Society for Testing and Materials (ASTM):
 - .1 ASTM A182, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves
 - .2 ASTM A312, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - .3 ASTM A403, Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
 - .4 ASTM A473, Standard Specification for Stainless Steel Forgings
 - .5 ASTM F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

1.4 SUBMITTALS

- .1 Submit shop drawings. Submittal to include:
 - .1 Product Data: Model number, options, dimensions, material, and capacities for each type of product indicated.
 - .2 Shop Drawings: Shop drawings shall clearly indicate dimensions and materials to show compliance with specified values.
 - .3 A current and formal welder certificate.

1.5 RECORD DRAWINGS

- .1 Provide data necessary to produce record drawings on project completion in accordance with the following requirements:
 - .1 Give details of piping sizes, fittings, and location.

1.6 SCHEDULING

- .1 Schedule work to be coordinated and in conjunction with installation of DESS bypass manholes, DESS DPS, and other relevant site services.

1.7 QUALITY ASSURANCE

- .1 All hydronic piping shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.
- .2 All materials to be new and free from defects.
- .3 Where any standard referenced has been superseded prior to bidding, the Contractor shall comply with the latest edition of the standard.
- .4 Where the pipe size is not specified nor shown, the size shall be determined by the Engineer.
- .5 All welders to be certified under the Alberta Boilers Safety Act and Regulations. As a minimum, welders will hold a Level B Journeyman Welders Certificate.
- .6 All castings used for coupling housings, fittings, valve bodies etc., shall be date stamped for quality assurance and traceability.
- .7 Gaskets and elastomeric material shall be verified as suitable for the intended service.

2 Products

2.1 COMPONENTS

- .1 General – Piping Joints:
 - .1 For stainless steel piping 2.5-inch (65 mm) and greater in diameter, use buttwelds or flanges;
 - .2 For stainless steel piping 2-inch (50 mm) and under in diameter, butt-weld or use threaded couplings and fittings. Use unions where disassembly is required.
 - .3 Flanges shall conform to ANSI B16.5, Class 150 unless otherwise indicated.
 - .4 Welding to conform to ANSI/ASME B31.9.
- .2 Piping – Stainless Steel:
 - .1 To NPS 10 (250 mm), Schedule 40S, 316 stainless steel.
 - .2 Conform to ASTM A312.
 - .3 For all District Energy Sharing System bypass manhole internal piping.
- .3 Threaded Couplings and Fittings – Stainless Steel:
 - .1 Make screwed joints using American Standard threads to ANSI B1.20.1.
 - .2 Use Teflon tape as thread lubricant for threaded joints.
 - .3 Class 150 conforming to ASTM A403.

- .4 Dimensions conforming to ASME/ANSI B16.11
 - .4 Flanges – Stainless Steel Pipe:
 - .1 Class 150 conforming to ASME/ANSI B16.5.
 - .2 Provide compatible flanges for mating to equipment or valves.
 - .5 Butt Welded Fittings – Stainless Steel
 - .1 Schedule 40S, 316 stainless steel.
 - .2 Conform to ASTM A403.
- 3 Execution**
- 3.1 INSTALLATION**
- .1 Piping:
 - .1 All manhole bypass pipe and fittings to be 316 stainless steel.
 - .2 Use only standard or long radius elbows.
 - .3 Install piping and components as indicated on the drawings.
 - .4 Support piping within manholes.
 - .5 Provide clearance for proper access to air vents, strainer baskets, sensors, auto flow control valves, shutoff valves, blowoff valves, and other components.

END OF SECTION

General

1.1 SUMMARY

- .1 This section specifies the piping specialties and controls sensors to be installed inside the bypass and sensor manholes installed as part of the District Energy Sharing System (DESS).
- .2 Section Includes:
 - .1 Automatic Air Vents
 - .2 Strainers
 - .3 Auto Flow Balance Valves
 - .4 Thermowells
 - .5 Unions
 - .6 Manhole Pressure Transducers
 - .7 Manhole Temperature Sensors
 - .8 Manhole Float Switch
 - .9 Conduits and Junction Boxes

1.2 RELATED REQUIREMENTS

- .1 33 65 23 – Telethermics – Thermal Insulation
- .2 33 65 54 – Telethermics – Stainless Steel Piping
- .3 33 65 56 – Telethermics – Bypass Valves

1.3 REFERENCES – LATEST EDITION

- .1 The publications listed below form part of this specification to the extent referenced. The publications are referenced in the text by basic designations only.
- .2 American Society of Mechanical Engineers (ASME):
 - .1 ASME B16.11, Forged Steel Fittings, Socket Welding and Threaded.
 - .2 ASTM A473, Standard Specification for Stainless Steel Forgings.

1.4 SUBMITTALS

- .1 Submit shop drawings. Submittal to include:
 - .1 Product Data: Model number, options, sizes, materials, and capacities for each type of product indicated.
 - .2 Clearly indicated dimensions and capacities of equipment as well as selected options to show compliance with specified values.
 - .3 Operation and Maintenance Data: Upon request, submit manufacturer's product installation and maintenance instructions.

1.5 RECORD DRAWINGS

- .1 Provide data necessary to produce record drawings on project completion in accordance with the following requirements:
 - .1 Give details of piping specialties used, locations, orientations, and sizes.

- .2 Give details of operation and maintenance instructions and recommended spare parts list.

1.6 SCHEDULING

- .1 Schedule work to be coordinated and in conjunction with installation of DESS bypass manholes, DESS DPS, and other relevant site services.

1.7 QUALITY ASSURANCE

- .1 All materials to be new and free from defects.
- .2 All piping specialties shall be installed as per good engineering practice, manufacturer's recommendations, and conform to the engineering drawings and specifications.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling, and unloading:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.
 - .3 Store at temperatures and conditions as required by manufacturer.
 - .4 Replace damaged material at no additional cost to Owner.

1.9 WARRANTY

- .1 Standard Warranty: Include manufacturer's Standard Form in which manufacturer agrees to repair or replace piping specialties that fail in materials or workmanship within specified warranty period.

2 Products

2.1 AUTOMATIC AIR VENTS

- .1 Vertically mounted:
 - .1 Float-type air eliminator mounted at high point in the piping system mains where air may trap and where indicated on the drawings and detail sheets.
 - .2 Cast iron body with threaded connections. Outlet threaded to accept vent tubing connection. Valve head shall be EPDM material to provide positive shut-off. All other internals to be stainless steel.
 - .3 Casing and internal parts suitable for system operating pressure and temperature.
 - .4 Air vent shall have a minimum venting capacity of 2.3 L/s (4.8 SCFM) at 689 kPa (100 psig).
 - .5 Air vents of systems operating at 1,034 kPa (150 psig) and less shall be Sarco 13WS or equivalent.

2.2 STRAINERS

- .1 Y-type:
 - .1 Furnish and install strainers where indicated on the drawings.
 - .2 All strainers shall be provided with a blow-off ball valve, full size of blow-off tapping, with a short nipple on discharge side.
 - .3 Standard of Acceptance:
 - .1 NPS 2-inch (50 mm) and Under:
 - .1 Cast 316 stainless steel body, threaded end, Y-pattern, 304 SS screen.
 - .2 5,000 kPa (720 psi) WOG rating – Watts 87SI or equivalent.

2.3 AUTO FLOW BALANCE VALVES

- .1 Y-type, brass body. Comes with two pressure/temperature test ports.
- .2 Removable stainless steel cartridge and spring, can be removed without the use of special tools, cartridge to be permanently marked with the flow rate (L/s or GPM) and spring range.
- .3 Flow rate as indicated on drawings.
- .4 Control Range: 34-414 kPa (5-60 PSID)
- .5 Two pressure test ports on inlet and outlet.
- .6 Minimum pressure rating of 2,758 kPa (400 psi).
- .7 Standard of acceptance: Flow Design Inc Series YR, or approved equal.

2.4 THERMOWELLS

- .1 Thermowell to be 316 stainless steel with 13 mm (½”) NPT external thread size and 100 mm (4 inch) stem length or to provide minimum insertion between ½ to 2/3 of the pipe diameter.
- .2 Standard of acceptance: Greystone T2 series.

2.5 UNIONS

- .1 Unions to be forged, 316 stainless steel to ASME/ANSI B16.11.
- .2 2,068 kPa (300 PSI) WOG rating.
- .3 NPT threaded or socket weld ends.

2.6 MANHOLE PRESSURE TRANSDUCERS

- .1 0-689 kPa (0-100 PSIG) range with accuracy of +/- 0.2% of full scale.
- .2 2-wire 4-20mA output.
- .3 Stainless steel body capable to operate while submersed.
- .4 Pressure port: 8 mm (¼ inch) NPT.
- .5 3 meter (10 ft) Polyurethane cable (depth rated).
- .6 -40 to +80 °C temperature compensated range.

- .7 Zero/span data calibration.
- .8 Accessories:
 - .1 Druck STE sensor termination enclosure.
- .9 Make and model:
 - .1 Druck model UNIK 5000, or approved alternate.
 - .2 Configuration code: PTX-5-0-3-2-TC-A1-CA-H0-PF, 0-100 PSI gauge, 3m cable.

2.7 MANHOLE TEMPERATURE SENSORS

- .1 RTD 1000 ohm sensor, accuracy +/- 0.3 °C.
- .2 0 to 50 °C scaled range.
- .3 4-20 mA output.
- .4 304/316 Stainless steel fully-potted probe, length suited for installation in thermowells.
- .5 Minimum 3 m (10 ft) waterproof sensor lead wires.
- .6 ABS IP65 (NEMA4X) enclosure.
- .7 Threaded cable gland at enclosure.
- .8 Make and model: Greystone TXRP

2.8 FLOAT SWITCHES

- .1 Polypropylene or ABS housing with flexible, fully sealed 18 gauge 2 conductor cable.
- .2 Normally open with narrow angle operating range.
- .3 Make and mode: Gems Series M, SJE MilliAmpMaster™ or equivalent

2.9 CONDUITS AND JUNCTION BOXES

- .1 Conduits for sensor wiring in manhole to be liquid tight, flexible, PVC coated.
- .2 Junction box in manhole for sensors to be IP68.

3 Execution

3.1 INSTALLATION

- .1 Automatic Air Vents:
 - .1 Install automatic air vents at the high point in bypass manhole piping system where air may trap and/or where indicated on drawings.
 - .2 Install on tees and not on horizontal pipe runs or elbows.
 - .3 Pipe the vent discharge to the exterior of the manhole using schedule 80 CPVC pipe or schedule 40 stainless steel pipe.
- .2 Strainers:
 - .1 Install line strainers where indicated on drawings.
 - .2 DESS Strainers shall be equipped with fine mesh screens (40-mesh or finer).

- .3 Perform final cleaning of strainers immediately prior to handover to the owner, when directed by the engineer.
 - .4 Install strainers with a blow off ball valve and nipple.
- .3 Auto Flow Balance Valve:
 - .1 Install auto flow valve in direction of flow, with P/T ports facing up and as per manufacturer instructions.
 - .2 Perform final cleaning of auto flow valve by removal, cleaning, and replacement of the flow control cartridge immediately prior to handover to the owner, when directed by the engineer.
- .4 Thermowells:
 - .1 Install thermowell in stainless steel tee to accommodate thermowell length.
 - .2 Ensure thermowell does not contact side of pipe.
 - .3 Provide temporary plastic cap to prevent debris from entering thermowell.
- .5 Unions
 - .1 Install where shown on the drawings or necessary for assembly.
- .6 Manhole pressure sensors:
 - .1 Install pressure transducers with isolation ball valve and union to allow removal for cleaning.
 - .2 Install sensors vertically and in an accessible position for servicing and protected from damage.
 - .3 Install with sensor termination enclosure (STE). STE to be installed within the IP68 junction box at high level in the manhole.
 - .4 Install wiring in a tidy fashion and protect from damage. Install away from the access ladder and manhole opening.
- .7 Temperature sensors:
 - .1 Install sensors in an accessible location for servicing and protected from damage.
 - .2 Install with thermally conductive paste in thermowells.
 - .3 Install sensor in thermowell and secure in place with threaded gland to prevent accidental dislodgement.
 - .4 Install sensor transmitter remotely in a watertight IP68 / NEMA Type 6P enclosure at the top of the manhole.
- .8 Float Switches
 - .1 Suspend float switch in manhole sump to detect presence of water. Anchor cable at floor or side of manhole.
 - .2 Float switch to alarm if water reaches 150 mm (6") depth above the manhole floor.
 - .3 Connect float switch to street wiring at a watertight junction box at high level in manhole. Use watertight glands where cable enters the junction box.
- .9 Conduits and Junction Boxes:

- .1 Install with watertight threaded connections to sensor wire conduits. Flexible conduit runs between the sensors and a single water proof IP68 junction box at the top of the manhole near main conduit entry into manhole.
- .2 Install sensor flexible conduits with a low point as a drip leg.
- .3 Multipair cable to manhole to enter junction box with watertight grommet maintaining the integrity of the junction box's rating.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This section specifies the valves to be installed inside the bypass and sensor manholes installed as part of the District Energy Sharing System (DESS).
- .2 Section Includes
 - .1 Shut-off Valves – Ball
 - .2 Shut-off Valves – Butterfly

1.2 RELATED REQUIREMENTS

- .1 33 65 23 – Telethermics – Thermal Insulation
- .2 33 65 54 – Telethermics – Stainless Steel Piping
- .3 33 65 55 – Telethermics – Piping Specialties

1.3 REFERENCES – LATEST EDITION

- .1 The publications listed below form part of this specification to the extent referenced. The publications are referenced in the text by basic designations only.
- .2 American Society of Mechanical Engineers (ASME):
 - .1 ASME/ANSI B16.34, Valves - Flanged, Threaded, and Welding End.
 - .2 ASME/ANSI B16.1, Gray Iron Pipe Flanges And Flanged Fittings
 - .3 ASME/ANSI B16.5, Pipe Flanges and Flanged Fittings.
 - .4 ASME/ANSI B1.20.1, Pipe Threads, General Purpose.

1.4 SUBMITTALS

- .1 Submit shop drawings. Submittal to include:
 - .1 Shop drawings shall clearly indicate make, model, type, materials, size and pressure rating.

1.5 RECORD DRAWINGS

- .1 Provide data necessary to produce record drawings on project completion in accordance with the following requirements:
 - .1 Give details of valves used, locations, orientations and sizes.
 - .2 Give details of operation and maintenance instructions and recommended spare parts list.

1.6 SCHEDULING

- .1 Schedule work to be coordinated and in conjunction with installation of DESS bypass manholes, DESS Distribution Piping System, and other relevant site services.

1.7 QUALITY ASSURANCE

- .1 All valves shall be installed as per good construction practice and conform to the engineering drawings and specifications.

1.8 WARRANTY

- .1 Standard Warranty: Include manufacturer's Standard Form in which manufacturer agrees to repair or replace valves that fail in materials or workmanship within specified warranty period.

2 Products

2.1 DISTRICT ENERGY SHARING SYSTEM (DESS)

- .1 Manhole Bypass Valves
 - .1 Ball Valves 13 mm (1/2 in.) up to 50 mm (2 in.):
 - .1 Approved valve shall have two-piece stainless steel body, full-port type, blowout proof stem, PTFE seats/seal, 316 stainless steel ball, nut and lever handle. Valve shall be pressure rated to 5000 kPa (720 PSI) WOG min. Threaded ends to ANSI B1.20.1.
 - .2 Make and model: MAS G2E, Kitz No. 53F, Red-White Fig 4880, or approved equal.
 - .2 Butterfly Valves 65 mm (2½ in.) & larger:
 - .1 Ductile iron lug body, EPDM seat liner, 304 SS, 316 SS, bronze, or ductile iron chrome plated disc, 403 SS, 416 SS, or 410 SS stem; handwheel worm gear operator; compatible with ANSI B16.1 Class 125 and ANSI B16.5 Class 150 flanges; 1034 kPa (150 lb) rating.
 - .2 Make and model: Toyo 918 series or approved equal.
- .2 Manhole Valve Identification:
 - .1 Stainless steel tags and chains with 12 mm characters stamped "DES" for supply, "DER" for return, or "BYPASS".

2.2 VALVE OPERATORS

- .1 Manhole Bypass Valves
 - .1 Provide suitable hand wheels or lever operators for valves.

3 Execution

1.1 INSTALLATION AND APPLICATION

- .1 Install valves with stem upright or horizontal, not inverted.
- .2 Install valves as per manufacturer's recommendations.
- .3 Install valve tags on manhole valves.
 - .1 Tag bypass isolation ball valves indicating DE Supply and DE Return.
 - .2 Tag bypass butterfly valve indicating "BYPASS".

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Control system conduits for housing control cabling along the length of the Distribution Piping System (DPS) piping. Conduits run from the Energy Centre (EC) into select Energy Transfer Stations (ETS) and bypass (instrumentation) manholes.

1.2 RELATED REQUIREMENTS

- .1 Section 33 82 13.01 – Copper Communications Distribution Cabling
- .2 Section 33 81 29 – Communications Vaults, Pedestals, And Enclosures

1.3 REFERENCES – LATEST EDITION

- .1 Conduit / Raceway System - ASTM F-2160, ASTM D-3350, ASTM D-2239, ASTM D-3485, NEMA TC-7, UL 651, UL 1990,
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
 - .2 CAN/CSA C22.2 No. 227.3, Flexible Nonmetallic Tubing.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data / Shop Drawings:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.
- .2 Provide shop drawings for:
 - .1 Conduit and inner channels.
 - .2 Above and below ground enclosures.
 - .3 Terminal blocks.
 - .4 Glands and couplings.
 - .5 Pull string/trace wire.
 - .6 Cable pull lubricant.
 - .7 Water stop/removable foam sealant.

1.5 QUALITY ASSURANCE

- .1 Quality assurance submittals: submit following in accordance with Quality Control:
 - .1 Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

- .2 Manufacturer's Instructions: for installation and special handling criteria, installation sequence, and cleaning procedures.

Part 2 Products

2.1 CONDUITS

- .1 HDPE or PVC conduit:
 - .1 Use Sch 40 HDPE or PVC ducts suitable for direct burial with minimum wall thickness at any point of 3.0mm.
 - .2 Multicell inner channels required where indicated.
 - .3 Size, number of ducts and configuration as indicated on the drawings.

2.2 CONDUIT FITTINGS

- .1 If required for rigid conduit installations.
- .2 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .3 Long-radius conduit elbows where 90° bends are required. Minimum bend radii to be 10 times the inner diameter of the conduit.

2.3 CONDUIT SEALANT

- .1 Duct sealant shall be Polywater FST Foam Sealant
- .2 Duct sealant shall be a 2-part, 98% closed-cell urethane foam that reacts to set in 5- 10 minutes at 21°C. It shall be reusable and capable of sealing up to 103-mm conduits with multiple cable configurations. Duct sealant shall be re-enterable.
- .3 It shall be capable of withstanding temperatures from 30°C to 95°C; and be chemically resistant to gasoline, oils, dilute acids, and bases.
- .4 Duct sealant shall not affect the physical or electrical properties of wire and cable. Duct sealant shall have good adhesion to duct and cable jacket surfaces with good structural strength. It shall have 145-lb compressive strength (ASTM D1621).
- .5 Duct sealant shall be capable of holding 6 m water head pressure continuous or 27 m water head pressure short-term.
- .6 Sealant shall meet UL 94 fire rating HBF to be UL recognized.
- .7 Provide vendor supplied 75 mm plug / damming strips FST-DAM
- .8 Work to be completed between 4-35 °C

2.4 LOCATABLE TAPE

- .1 Duraline bull-line tape or equivalent.
- .2 450 kg tensile strength, 22 AWG

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install conduit in accordance with manufacturer's instructions and at elevations as indicated by drawings and specifications for shared multiparty trench.
- .2 Clean inside of conduit before laying.
- .3 Slope ducts with 1 to 400 minimum slope, or as indicated on drawings.
- .4 Install waterstop paste within conduit entrances to buildings. Install plugs and cap (fusion welded) both ends of ducts to prevent entrance of foreign materials during and after construction.
- .5 Pull through each duct steel mandrel with length as recommend by the duct supplier and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.
 - .1 Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .6 Install a pull rope (mule tape) and solid #10 AWG white tracer wire, continuous throughout each duct run with 3 m spare rope at each end.
- .7 Cap ends of all unused conduits.
- .8 Place continuous strip of warning tape 300 mm above duct before backfilling trenches.
- .9 Provide Stainless Steel conduit tags at each end of conduits; minimum size of 50mm x 100mm with 40mm high text. Press conduit designation into label and affix to conduit with beaded metal chain on inside of cabinets/pullboxes where conduit terminates.
- .10 Conduit and manhole installations shall have annotated (e.g. location) digital photos taken during installation, prior to back-fill, for "as-installed" record keeping.
- .11 Notify the Engineer for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Underground pull boxes for Distribution Piping System (DPS) piping communication conduit system.
 - .2 Telecommunications pedestals for Distribution Piping System (DPS) piping instrumentation cable connections.

1.2 RELATED REQUIREMENTS

- .1 Section 33 65 76 – Direct Buried Underground Cable Ducts
- .2 Section 33 82 13.01 – Copper Communications Distribution Cabling

1.3 REFERENCES – LATEST EDITION

- .1 Specification for Underground Enclosure Integrity - ANSI/ SCTE 77 - - Tier 22 / CSA 22.2 No. 344.
- .2 Enclosures / Pedestals - CSA C22.2 NO. 94.2

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Provide shop drawings for pull boxes and pedestals.
 - .2 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.

1.5 QUALITY ASSURANCE

- .1 Quality assurance submittals: submit following in accordance with Quality Control:
 - .1 Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
 - .2 Manufacturer's Instructions: for installation and special handling criteria, installation sequence, and cleaning procedures.

Part 2 Products

2.1 OUTDOOR PULL BOXES

- .1 Construction: Non-metallic.
- .2 Covers: Suitable for Vehicle Traffic. Rated to ANSI/SCTE-77 Specifications for Underground Enclosure Integrity Tier 15 or 22 “Driveway, parking lot, and off-roadway applications subject to occasional non-deliberate heavy vehicular traffic.”

- .3 Lid to be marked "DPS".
- .4 Bottom: Open or closed with drain.

2.2 TELECOMMUNICATIONS PEDESTALS

- .1 Above ground telephone pedestal:
 - .1 Construction: Metallic.
 - .2 Dimensions 900 mm high, 350 mm wide, 275 mm deep.
 - .3 NEMA Type 3R or IP equivalent minimum environmental rating.
 - .4 Pad lockable.
 - .5 ANSI 61 grey.
 - .6 To be marked "DPS"
 - .7 Complete with back panel with dinrails for mounting of terminal blocks for connection of Fee-Simple Town-House meters to M-BUS network.
 - .8 Terminal blocks
 - .1 Terminals to be CSA approved for 300 V, 10A, accepting #14 AWG - #26 AWG wire, and colored beige or grey.
 - .2 Spring clamp terminals to be used.
 - .9 AC-Dandy 6A-DPP or equivalent.
- .2 Foundation:
 - .1 Precast concrete base sized to pedestal with allowance for belowground conduit entry. Knelsen #4-0046 size for pedestal.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Open Bottom Pull Boxes and Closed Bottom Pull Boxes (Vaults):
 - .1 Shall be Placed on 200 mm crushed washed rock. Washed rock at the base of the pull box shall extend a minimum of 2000mm in all directions around the pullbox.
 - .2 Closed Bottom Vaults shall have a minimum 50mm drainage hole in bottom of the vault to allow water to drain freely.
 - .3 Conduits in the pull boxes should be sealed in accordance with specification 33 65 76 Direct Buried Underground Cabling Ducts.
 - .4 Lid at finished grade.
- .2 Pedestals:
 - .1 As per Detail E-01 – Typical Junction Pedestal Elevation Detail.

- .3 Painted or power-coated surfaces on material supplied or installed under this Contract, which are damaged in any way, i.e., by welding, scraping, cutting, etc., to be thoroughly cleaned, primed with a rust inhibiting primer, and repainted to the original colour.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Manhole sensor system wiring for along the length of the Distribution Piping System (DPS) piping. Wiring run from sensor manholes to BMS I/O in an Energy Centre (EC), via connections at communication pedestal terminals.

1.2 RELATED REQUIREMENTS

- .1 Section 33 65 76 – Direct Buried Underground Cable Ducts
- .2 Section 33 81 29 – Communications Vaults, Pedestals, And Enclosures

1.3 REFERENCES – LATEST EDITION

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Provide shop drawings for cables.
 - .2 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.

1.5 CLOSE OUT DOCUMENTS

- .1 Provide red line drawings including the tagging of each cable and confirmation of the location of the cables.
- .2 Provide testing reports for each length of cable organized by tags.

Part 2 Products

2.1 SENSOR CABLES

- .1 Type: Analog instrument cable
 - .1 Twisted pair #24 AWG stranded copper
 - .2 Foil shield
 - .3 Wet location rated
 - .4 300V minimum
 - .5 FT4

- .2 Sensor cable(s) to Manholes to contain minimum 5 pairs.
- .3 Trunk cable(s) between Instrumentation Pedestals and Energy Centres to contain minimum 60 pairs.
- .4 Pair requirements may be achieved with single cables or with multiples cables pulled through the same conduit route at the same time.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Wiring shall be free from abrasion and tool marks and shall have a minimum bending radius of 1¼".
- .2 Where spare conductors are pulled into an instrument or junction box, tie back spare conductors.
- .3 Ground shields on one end.
- .4 Where not connected to a terminal, the shield wire on the cable shall be trimmed and covered with heat shrink tubing.
- .5 Cable terminations to be stripped with approved stripping tool.
- .6 Use Polywater J or other lubrication for cable pulls. Ensure cable maximum tension is not exceeded on pulls.
- .7 Splices shall be avoided. If required, such as with modifications to existing conduit runs with existing cables, direct buried waterproof splices are to be utilized within the pull boxes. Coordinate with Blatchford Renewable Energy Utility for testing of spliced runs from end to end.
- .8 All underground junction boxes are to be submersible NEMA Type 6 or IP68 rated, including those located in the manholes. All cable entries into boxes must maintain integrity of box's rating. Connections to sensors in manholes must be done in accordance with manufacturer instrumentations to maintain the rating, see Section 36 65 55.

3.3 LABELING

- .1 Instrumentation Cables Tagging
 - .1 Cables to have Stainless Steel tags with pressed lettering attached. Tags to be 50mmx100mm with 30mm tall lettering attached to cable with beaded chain or tie wrapped. Handwritten labels are not acceptable.
 - .2 Cables to be tagged upon entry into a box, pedestal, manhole, and/or building/room. Cables to be tagged when passing between conduits within pull

- boxes, even if not terminated. Pairs to be tagged at terminal blocks, splices, and termination points.
- .3 Cables to be tagged with destinations of both ends of a cable run, including the name of manholes, pedestals, and/or buildings. If multiple parallel cables are run between the same locations, cables to be numbered with C#. E.g. The second cable between Manhole 4A and Pedestal JB5A may be tagged "MH 4A to JB5A, C2".
- .4 Wires in use for an instrument to be tagged with instrument tag.
- .2 All cables:
 - .1 Cables to have Stainless Steel tags with pressed lettering attached. Tags to be 50mmx100mm with 30mm tall lettering attached to cable with beaded chain or tie wrapped.
 - .2 Tag where a conduit or cable enters a box.
 - .3 Write-on labels are not acceptable.
 - .4 Cable tags to be attached with two black UV resistant tie-wraps or beaded chain.
- .3 All wires:
 - .1 Shall be provided with indelible permanent wire tags at each end of the wire.
 - .2 Shall use polyester or polyolefin heat-shrinkable sleeves.
 - .3 Marking shall be abrasion, ozone, ultraviolet, and solvent resistant.
 - .4 Numbering shall match on both ends of conductors and be machine printed.
 - .5 Maintain colour or marking coding throughout.

3.4 TESTING

- .1 General
 - .1 All testing to be witnessed by the Engineer.
 - .2 Provide a copy of all test reports.
- .2 All cable connections must pass visual inspection for workmanship and conformance with standard practice.
- .3 All wire and cable shall be tested for continuity. Continuous runs consisting of multiple segments shall be tested individually and combined from controller locations to field device or pedestal.

END OF SECTION

Part 1 General

1.1 SCOPE

- .1 This section covers supply and installation the HDPE Manhole.
- .2 Tasks covered under this section include:
 - .1 Procurement of HDPE manhole including internal pipe, fittings, and valves; delivery of all equipment to site;
 - .2 Installation of HDPE Manhole and all associated items for a complete and functioning system; and
 - .3 Hydrostatic pressure test of HDPE Manhole.

1.2 SPECIFIC ITEMS TO BE FURNISHED BY THE CONTRACTOR

- .1 Scope of work includes provision of all materials, equipment, and labour for completing the tasks identified herein in accordance with the agreed upon construction schedule.

1.3 QUALIFICATIONS

- .1 Demonstrate direct experience of installing similar equipment or shall make arrangements to obtain experienced assistance.

1.4 ADHERENCE TO GUIDELINES, CODES, REGULATIONS

- .1 The work described herein shall be conducted in such a manner so as to comply with all applicable bylaws, ordinances, codes, and regulations, including all those pertaining to environmental and safety matters.

1.5 SUBMITTALS AND QUALITY ASSURANCE

- .1 Manufacturers certificate verifying materials of construction and factory manhole pressure test results.
- .2 HDPE material specifications.
- .3 Shop drawings showing position of the inlets, outlets, and overall dimensions along with any other special features such as manways, ladders etc.
- .4 The HDPE Manhole supplier will submit calculations to the project engineer indicating:
 - .1 That the manholes meet the requirements of ASTM F1759 “Design of HDPE Manholes for Subsurface Applications”.
 - .2 The details for concrete anchoring of the HDPE Manhole given the soil and groundwater conditions specific to the site. Manhole base shall be assessed for suitability for groundwater conditions in accordance with ASTM F1759.
 - .3 Detail of concrete slab above the HDPE manhole for H-20 highway loading conditions.
- .5 The HDPE Manhole and internal piping systems shall both be tested with water and air upon completion of the fabrication process. The supplier will send certification that the Manhole is leak free. An identification plate indication the job number, testing data and when built and by whom, shall be attached to the Manhole.
- .6 Where buoyancy may be a factor, anti-buoyancy calculations are to be provided as a part of the submittal package.

- .7 Spray foam insulation product details shall be provided.

Part 2 Products

2.1 HDPE MANHOLE

- .1 The Manhole body shall be made from a closed profile wall HDPE pipe meeting requirements of ASTM F894 with a nominal internal diameter of at least 1800 mm. and ring stiffness class necessitated by structural evaluation of burial, installation, and minimum H-20 live loading.
- .2 The Manhole ends shall also be made from HDPE material having the same or higher resin designation as the manhole body.
- .3 Prior to installation, spray the manhole exterior with a minimum 100 mm coating of polyurethane foam insulation with a minimum R value of 3.9 per 25 mm. Extend insulation coverage to the first 1 m of the header and main lines or to the main trench excavation level whichever is greater. Insulation to be suitable for direct buried applications. Repair any damage to insulation prior to backfill.
- .4 Construction of the HDPE manhole manway shall be made from the same material as the manhole as described above in 2.1.1 HDPE Manhole. Attach by means of extrusion welding to the outside wall of the structure. The minimum ID of the access is 600mm. Lid to have H-20 load bearing capacity.
- .5 Provide insulated frost barrier for manhole access to be installed immediately beneath the access lid but in such a fashion that opening and closing the lid does not damage the frost barrier.
- .6 The entry ladder shall be made of Fibre Reinforced Polymer and shall conform to current OSHA guidelines.
- .7 All main and header connections to the manhole to have a minimum 300 mm stub length to facilitate fusing and allow for cutting and re-fusing if necessary. Inlets and outlets will be extrusion welded.
- .8 Factory test structures with a 1 psi air test for no less than 30 minutes with no leaks. Hydrostatically test the internal piping system to 100 psi with water for no less than 30 minutes with no leaks.

2.2 MANHOLE MECHANICAL PIPING AND VALVES

- .1 Manhole internals, fittings, mechanical piping, and valves shall be as specified in Section 23 05 53 – Mechanical Identification.

Part 3 Execution

3.1 CONFINED SPACE

- .1 The Manhole constitutes a confined space. The Contractor is responsible for ensuring all the required Health and Safety regulations are met while working in the manhole. Reference is to be made to Part 5 of the Alberta Occupational Health and Safety Code.

3.2 HANDLING AND STORAGE

- .1 The HDPE manhole is to be stored on clean level and dry ground to prevent undue scratching or gouging. Handling to be done in such a manner that there is no damage. Nylon slings are preferred.

3.3 INSTALLATION

- .1 Install the HDPE manhole at the location shown on the contract drawings. After installation the manhole lid is to be enclosed with the F-41 frame and cover, grade rings to be used for level with the finished surface grade.
- .2 A pit will be excavated to accommodate the width and length of the manhole with an allowance of 1000 mm on all sides to facilitate installation. Excavate the pit to the depth of the manhole plus 300 mm below finished grade. See contract drawings for details.
- .3 Lay a 300 mm bed of Class I materials in the bottom of the installation pit and compact to 95% proctor density per ASTM F 1759.
- .4 The manhole will be lowered in place. Concrete hold down blocks will be cast and poured in accordance with the vendor supplied calculations specific to the site.
- .5 Backfilling shall be done with Class I or Class II materials as defined by ASTM D 2321
 - .1 Class IA – Open graded clean manufactured aggregates.
 - .2 Class IB – Dense graded clean manufacture, processed aggregates.
 - .3 Class II – Clean coarse-grained soils.
- .6 Backfilling shall be done to conform to the ASTM F 1750 Design Assumptions. Backfill shall extend to at least 1.0m beyond the edge of the structure for the full height of the structure and extend laterally to undisturbed soils. Compaction shall be to 95% proctor density.

3.4 JOINTS

- .1 Make all exterior flanged connections to the main supply and return and the distribution piping system supply and returns prior to backfilling.

3.5 PRESSURE TESTING

- .1 After completion of all joints, the entire system shall be hydrostatically pressure tested in accordance with the procedure described in Section 33 65 15 –Telethermics Flushing Testing and Cleaning of Pipe.
- .2 Notify the Engineer in advance of pressure testing and coordinate the testing to accommodate inspections by the engineer. Complete a pressure test log for submission.

3.6 INSULATION

- .1 Apply spray foam insulation according to manufacturer's instructions to all surfaces of the Manhole and the header and mains lines to an extent of a 1m radius from the manhole body or the trench base excavation level whichever is greater.
- .2 Install manhole insulated lid/frost barrier.

3.7 BACKFILL, AND COMPACTION

- .1 Backfill and compaction shall be as specified in Volume 2: Roadways, Section 02318 – Trench and Backfill or as specified on drawings. INSPECTIONS

-
- .2 Comply with all applicable requirements of Section 02517 Acceptance Testing
 - .3 Final installation to be reviewed by Engineer. To be co-ordinated with inspection of completed header systems.
 - .4 The Contractor is responsible for keeping the engineer up to date with the construction schedule and ensuring the field review requirements are met.

END OF SECTION

8 STANDARD DRAWING DETAILS

Several drawing details applicable to this standard can be found in 'Volume 4: Water'. These details are listed in the subsequent section. All other drawing details are provided herein.

0. Referenced Drawing Details: See 'Volume 4: Water':
 - 2512-01: Valve Casing
 - 2512-02: Valve Casing Top Section and Plug
 - 2512-03: Valve Casing Middle Extensions
 - 2512-04: Valve Casing Bottom Section
 - 2512-05: Valve Bonnet
 - 2512-06: Valve Box Material Detail
 - 2512-07: Valve Box Construction Detail
 - 2512-08: Valve Casing Detail for Fillcrete Backfill
1. Drawing Details:
 - C-01: HDPE Sensor and Bypass Manhole Section Plan and Sections
 - C-02: F-41 Manhole Frame and Cover
 - C-03: DPS Goose Neck (Up to 75 mm Service)
 - C-04: DPS Service (Up to 75 mm)
 - C-05: DPS Service (Larger than 75 mm)
 - C-06: DPS Tee Connection Plan and Section
 - C-07: DPS Mainline Connection to Existing Dead-End
 - C-08: DPS Isolation Valve Plan and Section
 - C-09: DPS Mainline Termination Valve
 - C-10: Typical Stainless Steel to HDPE Connection
 - C-11: F-90 Type Manhole Frame and Cover
 - C-12: Blow-off and Bypass Valve Manhole
 - C-13: Typical Anode Installation, For All Buried Valves, Metal Fittings, and Couplings
 - C-14: Insulation Dimensions
 - C-15: Typical DPS Trench
 - C-16: DER/DES Curb Stop Location Stamps Plan
 - M-01: Mechanical Sensor and Bypass Manhole
 - M-01A: Mechanical Inline Sensor and Bypass Manhole
 - M-02: Mechanical Temperature Sensor
 - M-03: Mechanical Pressure Sensor
 - E-01: Electrical Typical Junction Pedestal Elevation Detail
 - E-02 Electrical Pull Box with Drain
 - E-03: Electrical Stainless Steel Tag

SEPARATION BETWEEN DPS PIPES AS REQUIRED BY MANHOLE EQUIPMENT. SEPARATION OF BURIED PIPE OUTSIDE MANHOLE TO ADJUST TO MATCH SEPARATION OF PIPE INSIDE MANHOLE

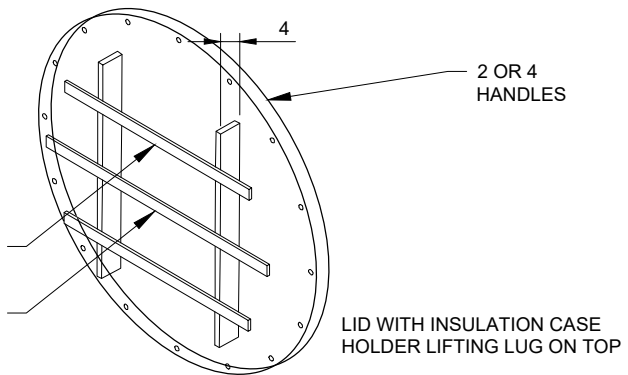
INFRA PIPE 84 RSC250 X 10 FT BYPASS MANHOLE OR AN APPROVED ALTERNATE

REFER TO DRAWING M-01 FOR MANHOLE MECHANICAL DETAILS

DPS PIPE MAY NOT BE EXACTLY AS SHOWN. PIPE SIZE TO MATCH MAINLINE DPS

REINFORCED P96W BASE

PLAN



DETAIL
WEHOLITE MANWAY LID

F-41 FRAME AND COVER WITH VENT HOLES. FOR COVER REFER TO DETAIL C-02

WEHOLITE MANWAY LID TO BE BOLTED TO MANHOLE

OD OF MANWAY AND ACCESS LID TO BE LESS THAN ID OF F-41 FRAME AND COVER

END OF SWEEP TO BE MIN. 2.0 m AWAY FROM MANHOLE, FOLLOW MANUFACTURER GUIDELINES FOR CONNECTION DETAILS

FRP LADDER SECURED ON TO THE HDPE MANHOLE

REFER TO DRAWING M-01 FOR MANHOLE MECHANICAL DETAILS

INFRA PIPE 84 RSC250 X 10 FT BYPASS MANHOLE OR AN APPROVED ALTERNATE

MIN.
500 mm

350 mm DIAMETER by 100 mm SUMP

HDPE PIPE SUPPORTS

CONCRETE GRADE RING

ELECTRICAL CONDUIT FOR DPS COMMUNICATION TO BE FUSED INTO HDPE MANHOLE AT 1.20 m FROM FINISHED GRADE AND GROUT SEALED AFTER WIRES ARE INSTALLED

DPS PIPE MAY NOT BE EXACTLY AS SHOWN PIPE SIZE TO MATCH MAINLINE DPS

FLANGED SPOOL FUSED INTO HDPE MANHOLE

DPS PIPE MAY NOT BE EXACTLY AS SHOWN. PIPE SIZE TO MATCH MAINLINE DPS.

CONCRETE PIPE SUPPORT. PIPE AND FITTINGS WRAPPED IN POLY

SECTION

ELECTRICAL CONDUIT FOR DPS COMMUNICATION TO BE FUSED INTO HDPE MANHOLE AT 1.20 m FROM FINISHED GRADE AND GROUT SEALED AFTER WIRES ARE INSTALLED

DPS PIPE

F-41 FRAME AND COVER WITH VENT HOLES, FOR COVER SEE DETAIL C-02

MIN 150

20 mm FUSED HDPE AIR VENT DISCHARGE OUTSIDE MANHOLE, REFER TO MECHANICAL DETAILS FOR INTERNALS

PROVIDE 100 mm THICKNESS OF POLYURETHANE FOAM INSULATION AROUND EXTERIOR OF MANHOLE WALLS, ROOF, AND RISERS FROM BASE OF MANHOLE TO 500 mm BELOW FINAL GRADE

BEDDING AND BACKFILL AROUND MANHOLE AS PER CITY OF EDMONTON DESIGN AND CONSTRUCTION STANDARDS VOLUME 2

REINFORCED P96W BASE FUSED ONTO THE MANHOLE PIPE

300 mm OF 20 mm WASHED ROCK

NON-WOVEN FILTER CLOTH

SECTION

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2026AUG05
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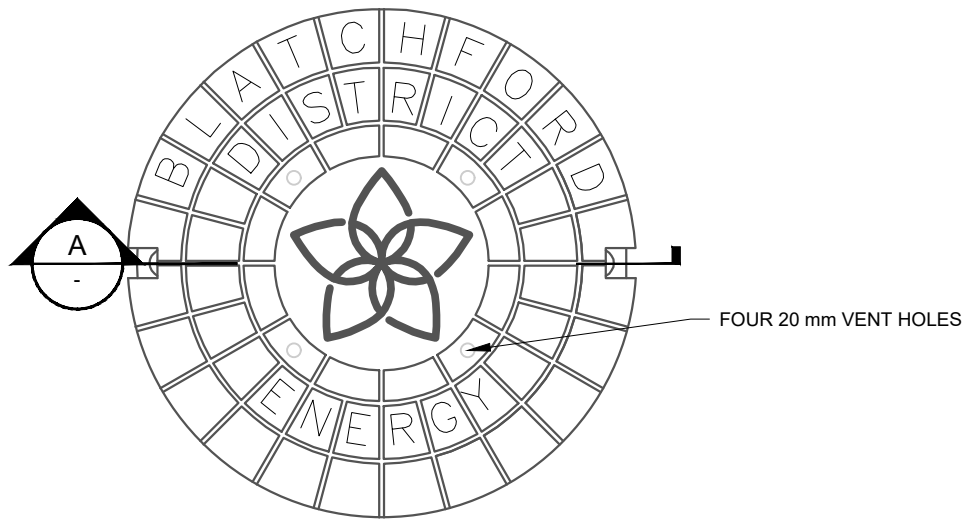
DETAIL C-01

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

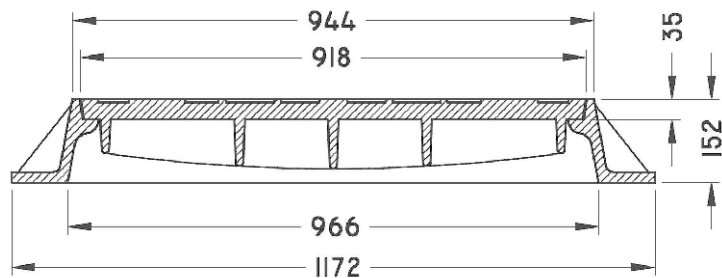
CIVIL
HDPE SENSOR AND BYPASS MANHOLE
PLAN AND SECTIONS

DWG No.

C-01



PLAN



SECTION

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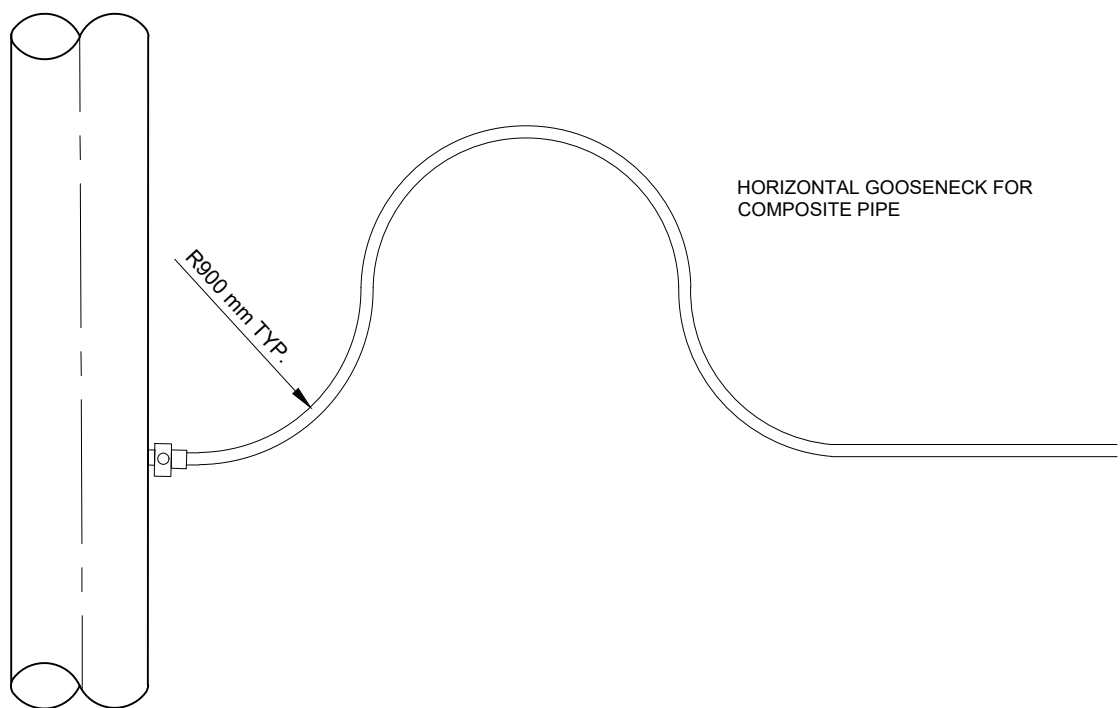
DETAIL C-02

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

CIVIL
F-41 MANHOLE FRAME AND COVER

DWG No.

C-02



PLAN

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DETAIL C-03

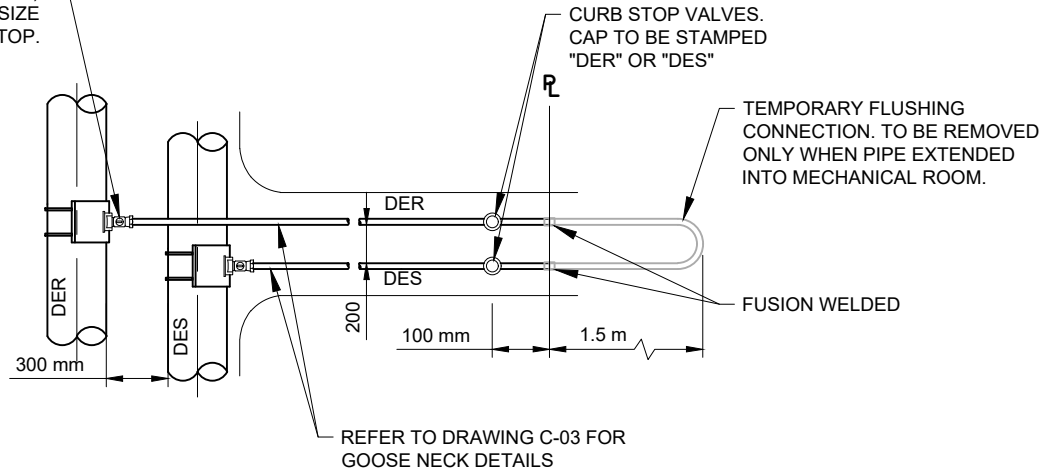
CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

CIVIL
DPS GOOSE NECK
(UP TO 75 MM SERVICE)

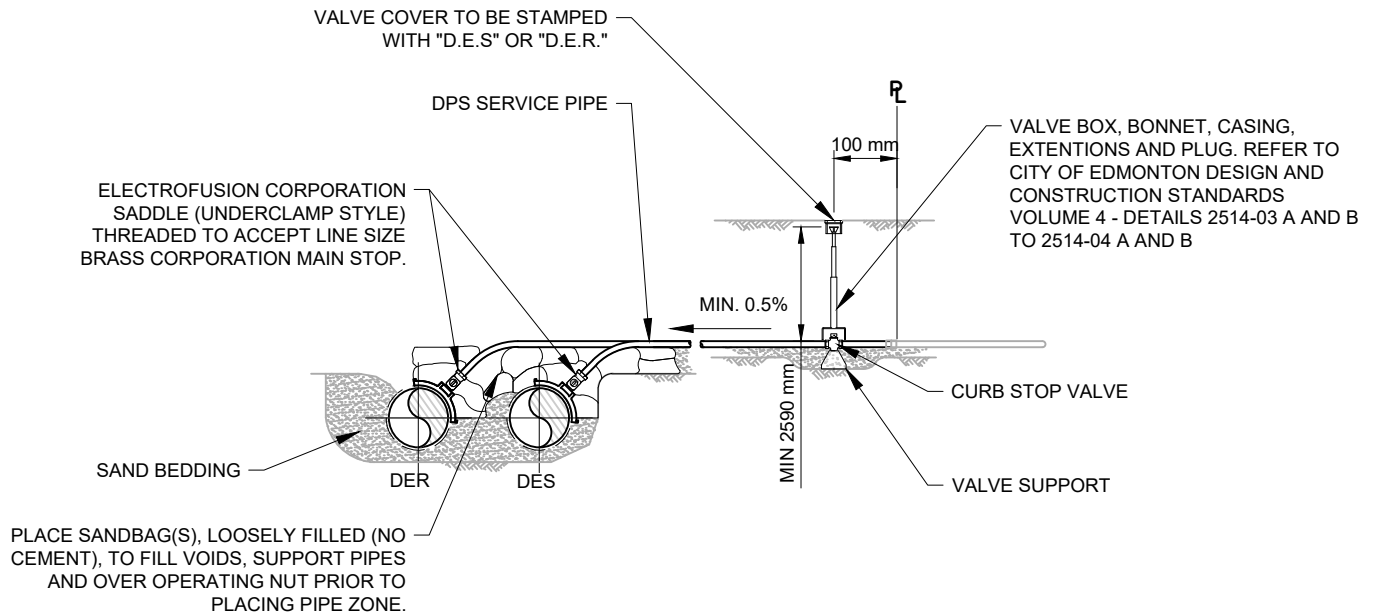
DWG No.

C-03

ELECTROFUSION CORPORATION
SADDLE (UNDERCLAMP STYLE)
THREADED TO ACCEPT LINE SIZE
BRASS CORPORATION MAIN STOP.



PLAN



SECTION

NOTES:

- DES (SUPPLY) MUST BE ON RIGHT WHEN FACING THE PROPERTY FROM THE STREET.

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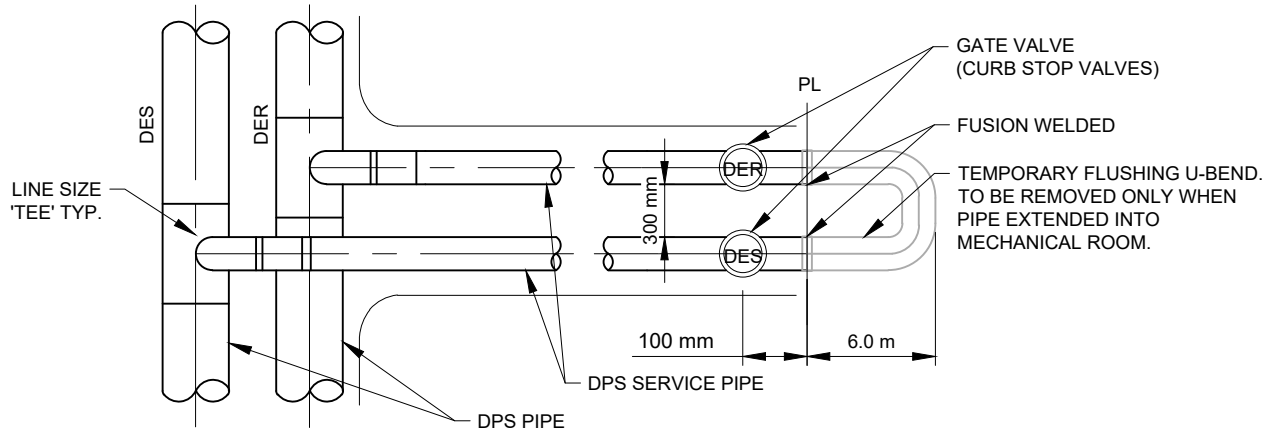
DETAIL C-04

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

CIVIL
DPS SERVICE (UPTO 75 MM)
PLAN AND SECTION

DWG No.

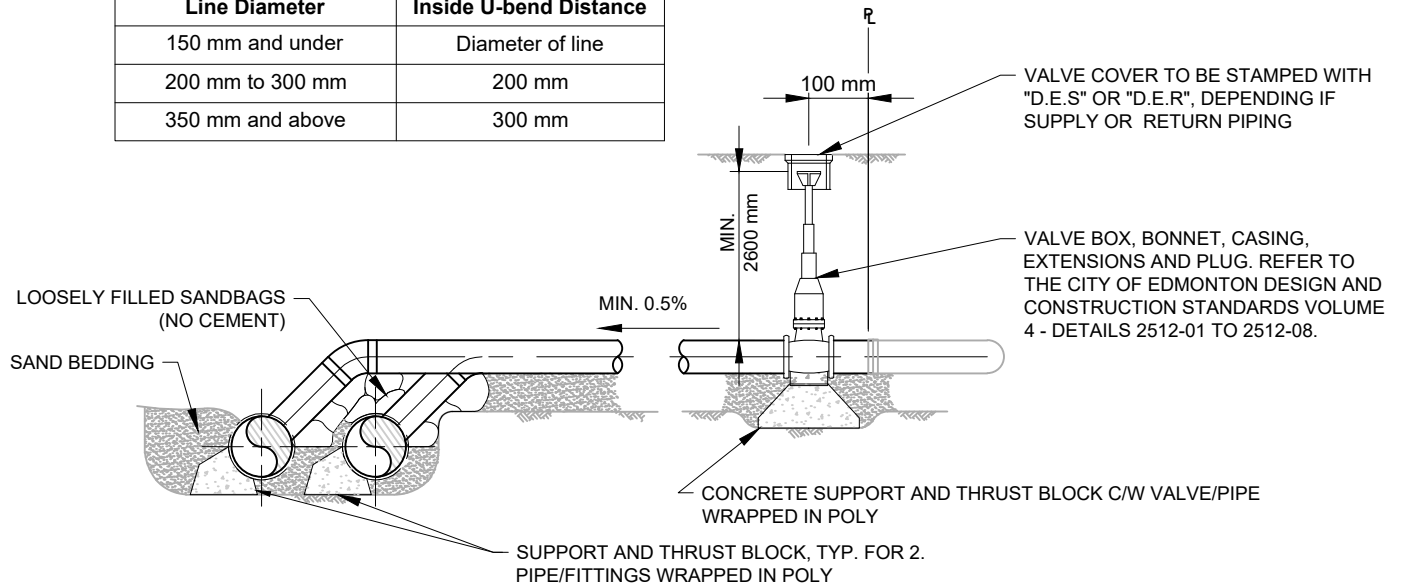
C-04



PLAN

Minimum U-bend Sizes

Line Diameter	Inside U-bend Distance
150 mm and under	Diameter of line
200 mm to 300 mm	200 mm
350 mm and above	300 mm



SECTION

NOTES:

- SERVICES MAY CROSS OVER OR UNDER ADJACENT MAINS.
- DES/DER MAIN ORIENTATION MAY VARY.
- DES (SUPPLY) MUST BE ON RIGHT WHEN FACING THE PROPERTY FROM THE STREET.

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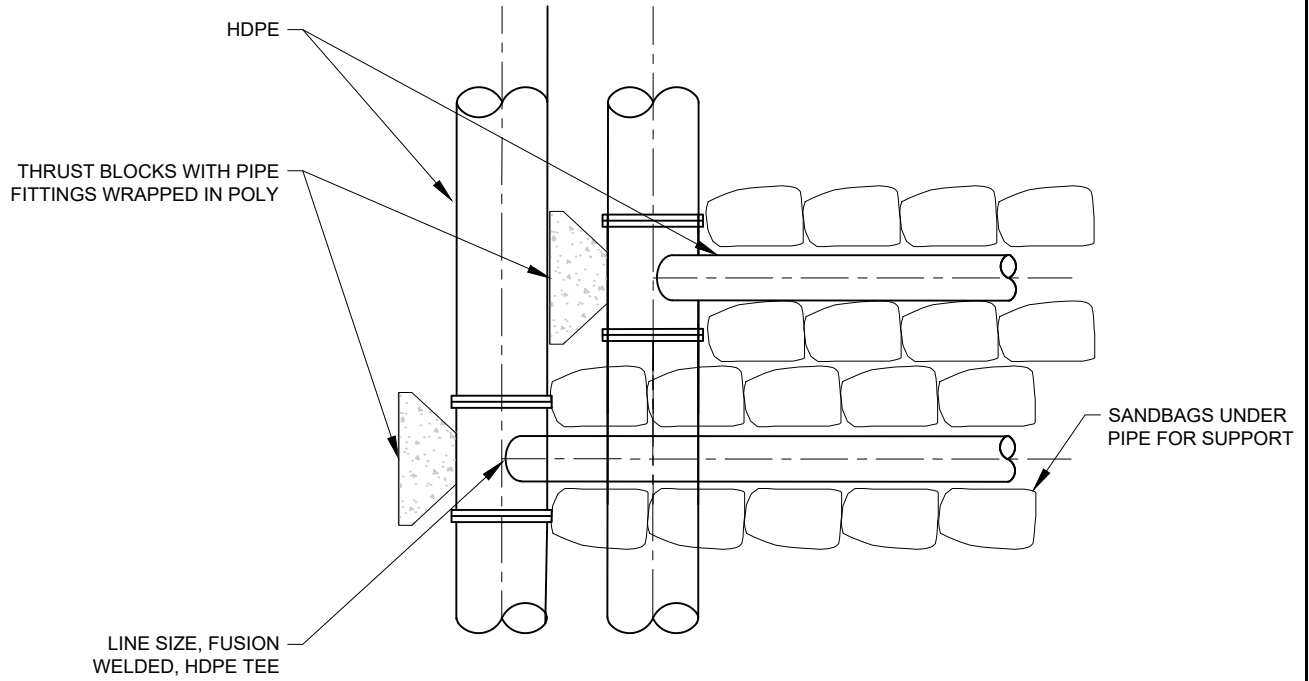
DETAIL C-05

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

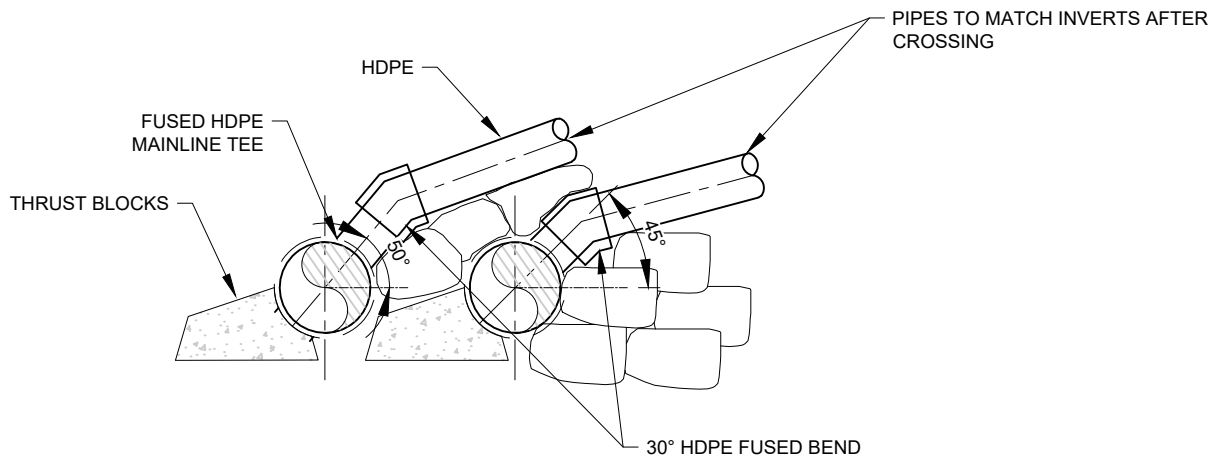
CIVIL
DPS SERVICE (LARGER THAN 75 MM)
PLAN AND SECTION

DWG No.

C-05



PLAN



SECTION

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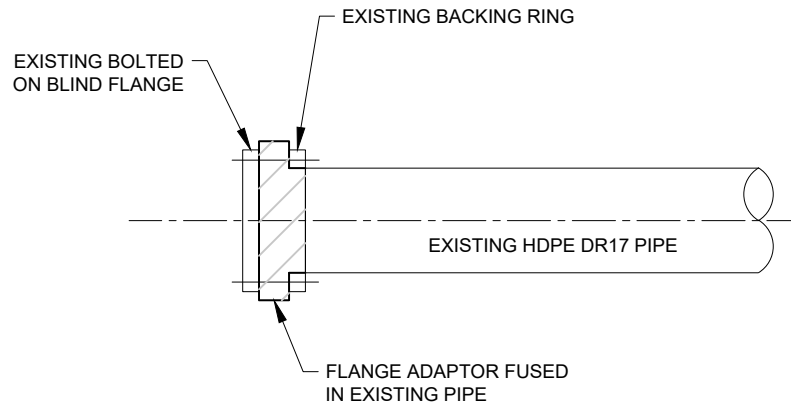
DETAIL C-06

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

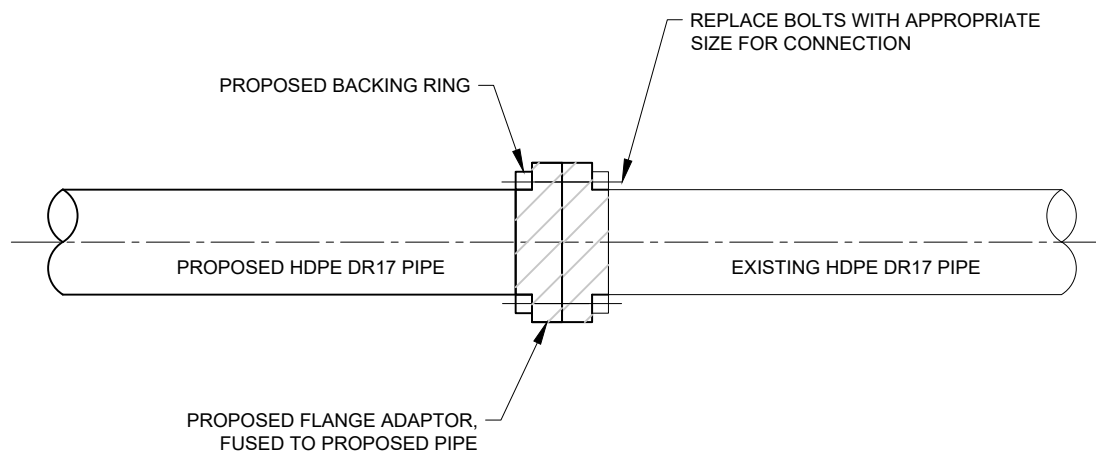
CIVIL
DPS "TEE" CONNECTION
PLAN AND SECTION

DWG No.

C-06



PLAN



PLAN

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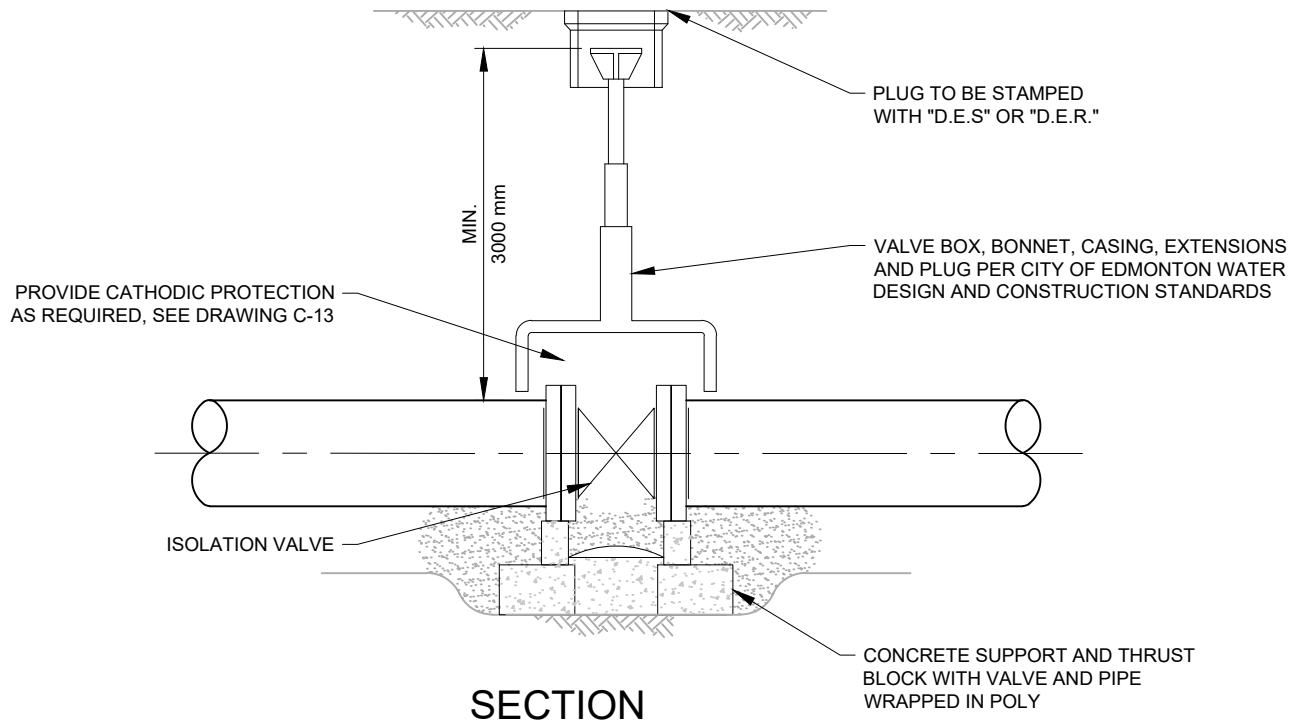
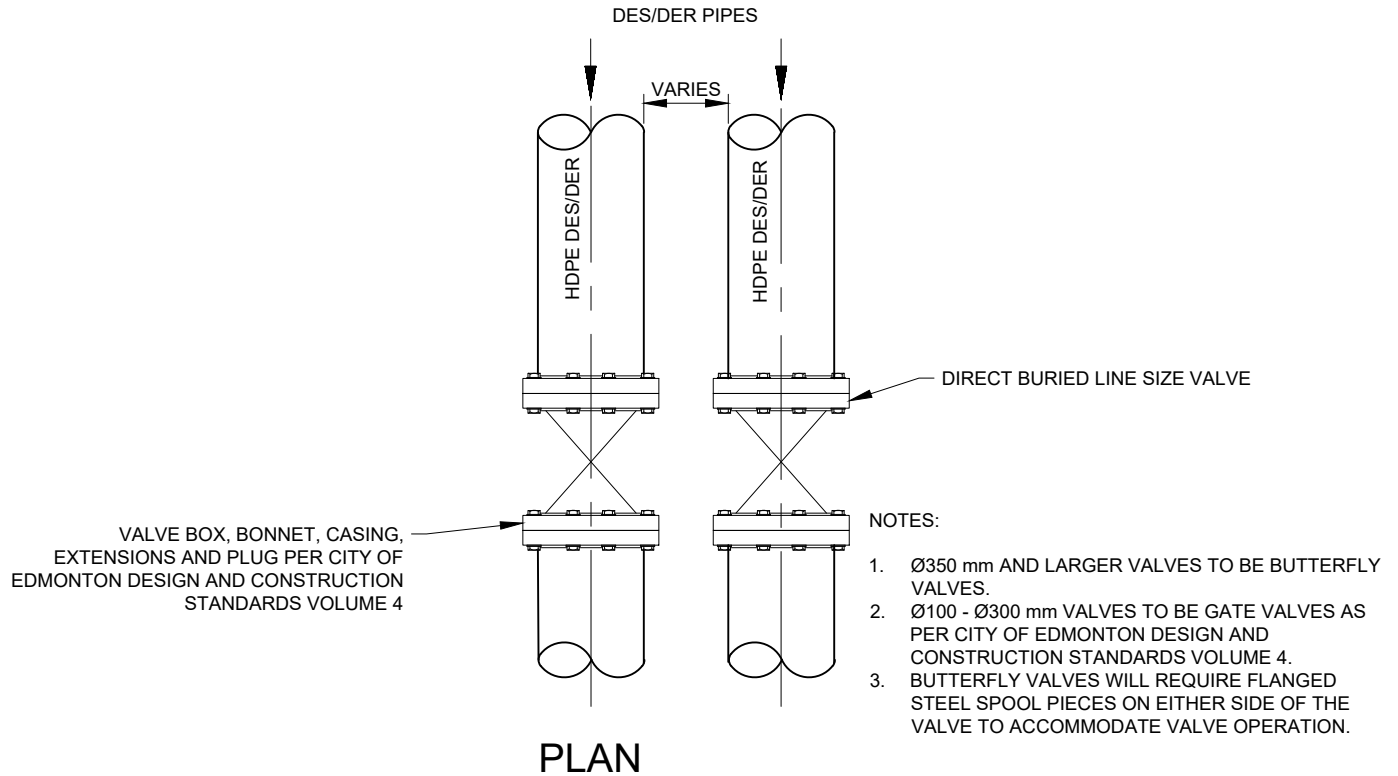
DETAIL C-07

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

CIVIL
DPS MAINLINE CONNECTION TO
EXISTING DEADEND

DWG No.

C-07



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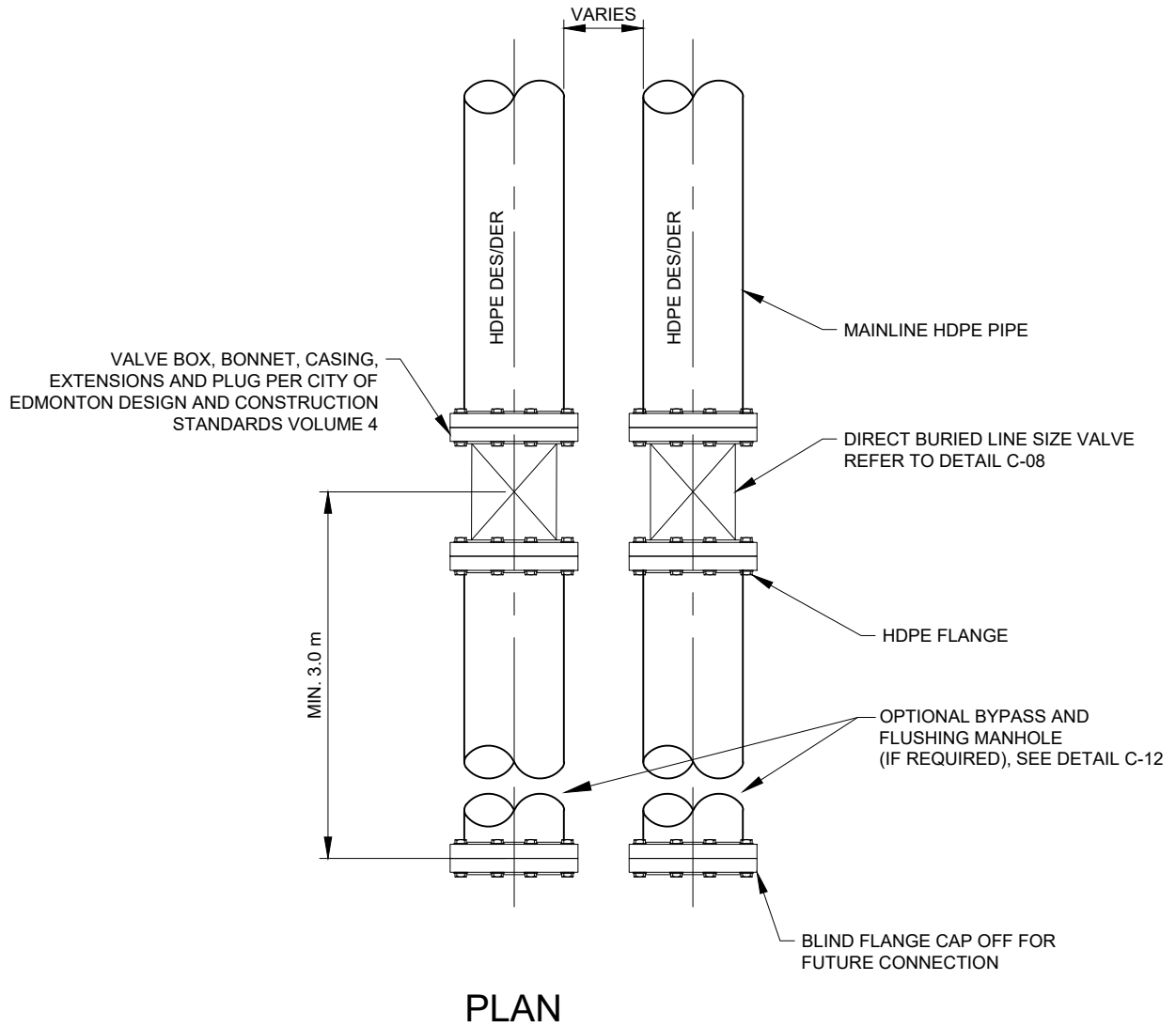
DETAIL C-08

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

CIVIL
DPS ISOLATION VALVE
PLAN AND SECTION

DWG No.

C-08



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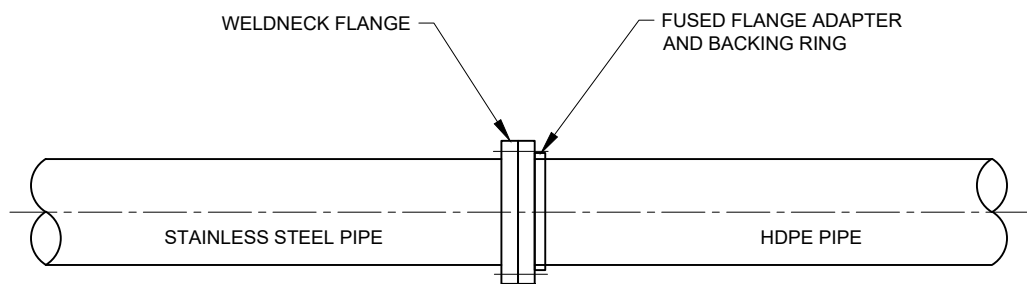
DETAIL C-09

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

CIVIL
DPS MAINLINE TERMINATION VALVE
PLAN

DWG No.

C-09



NOTES:

1. WRAP FLANGED CONNECTION WITH DENSO MASTIC AND TAPE.
2. PROVIDE CATHODIC PROTECTION ON COMPLETED ASSEMBLY.

PLAN

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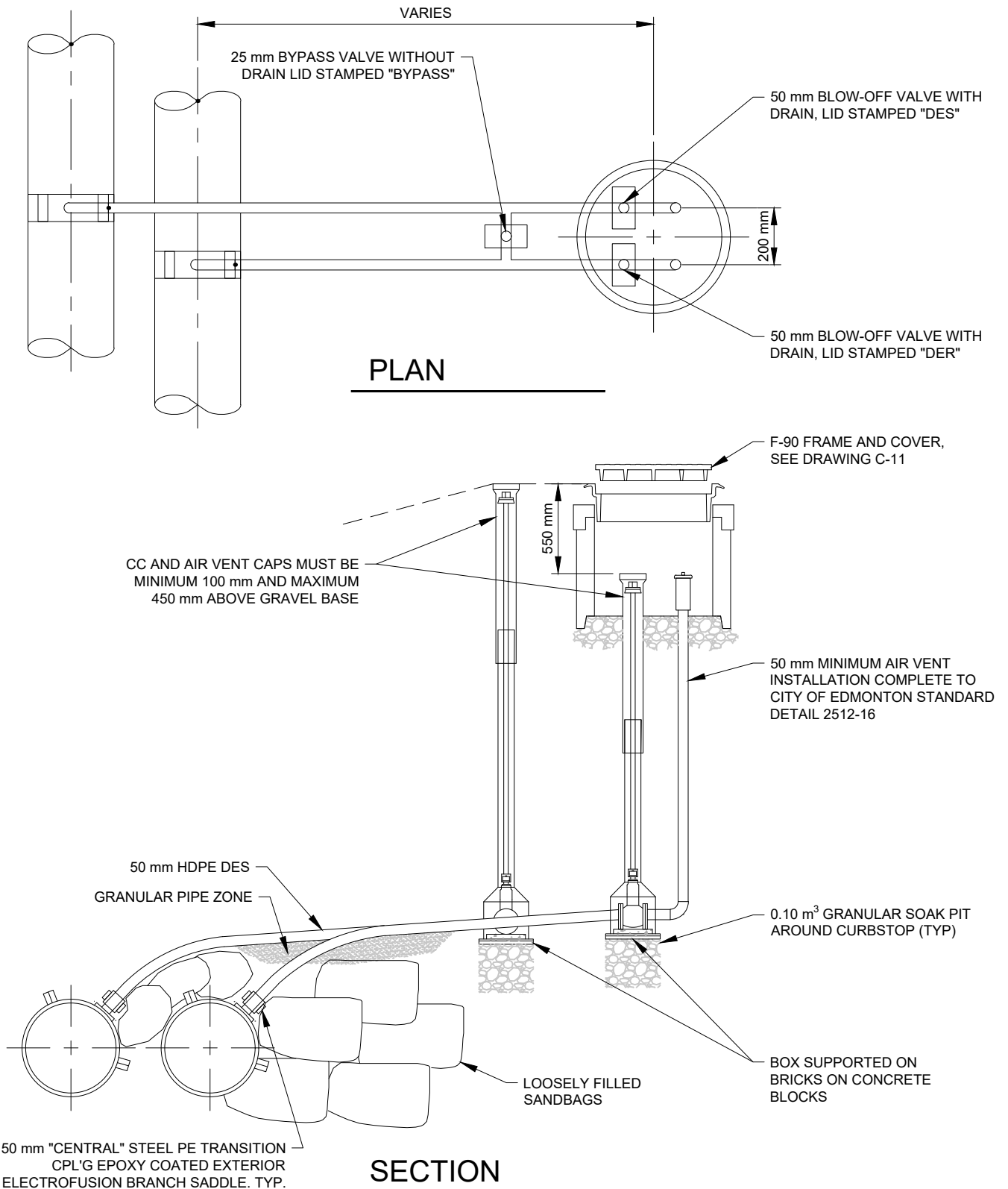
DETAIL C-10

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

CIVIL
TYPICAL STAINLESS STEEL TO HDPE CONNECTION

DWG No.

C-10



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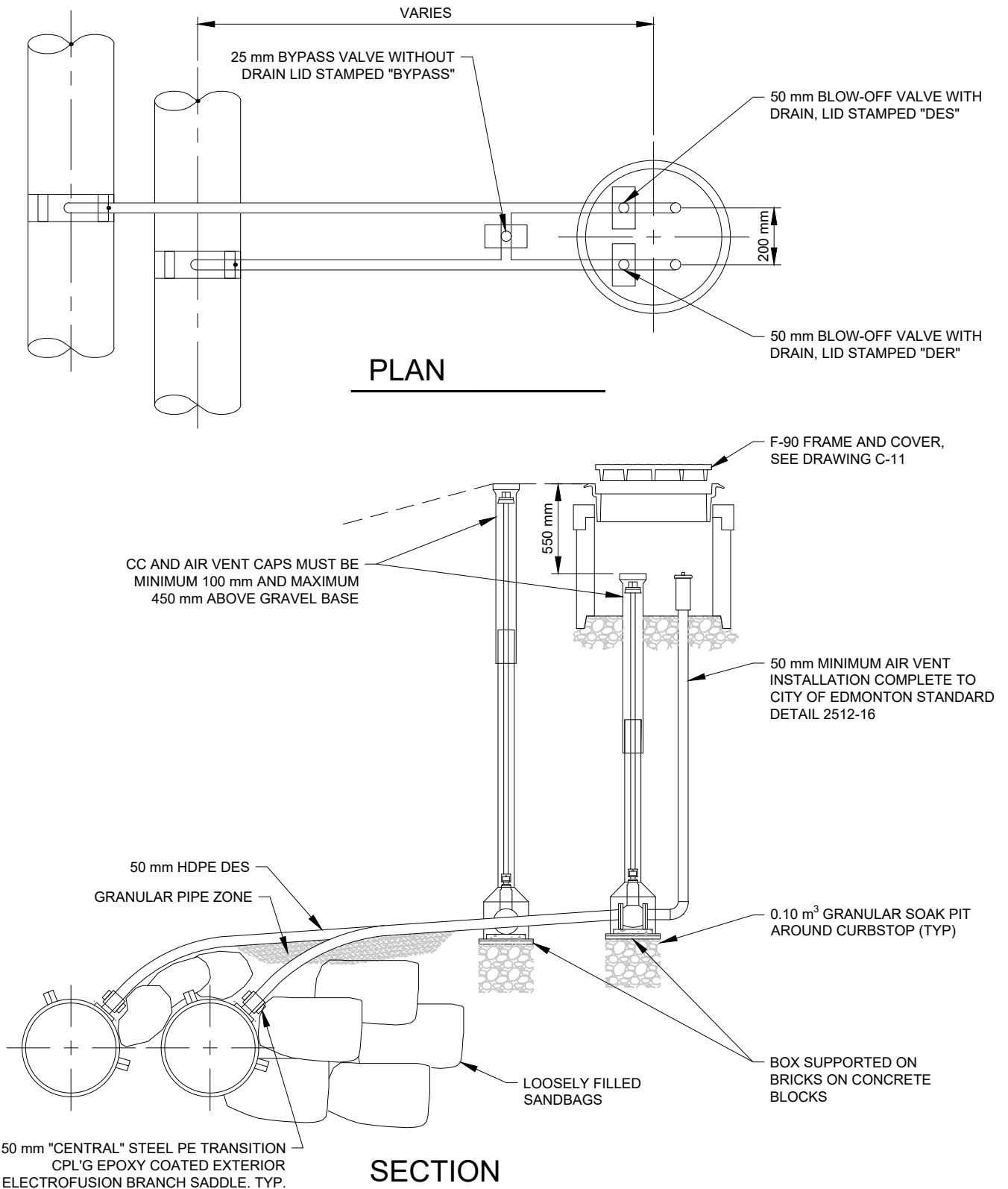
DETAIL C-12

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

CIVIL
BLOW-OFF AND BYPASS VALVE MANHOLE
PLAN AND SECTION

DWG No.

C-12



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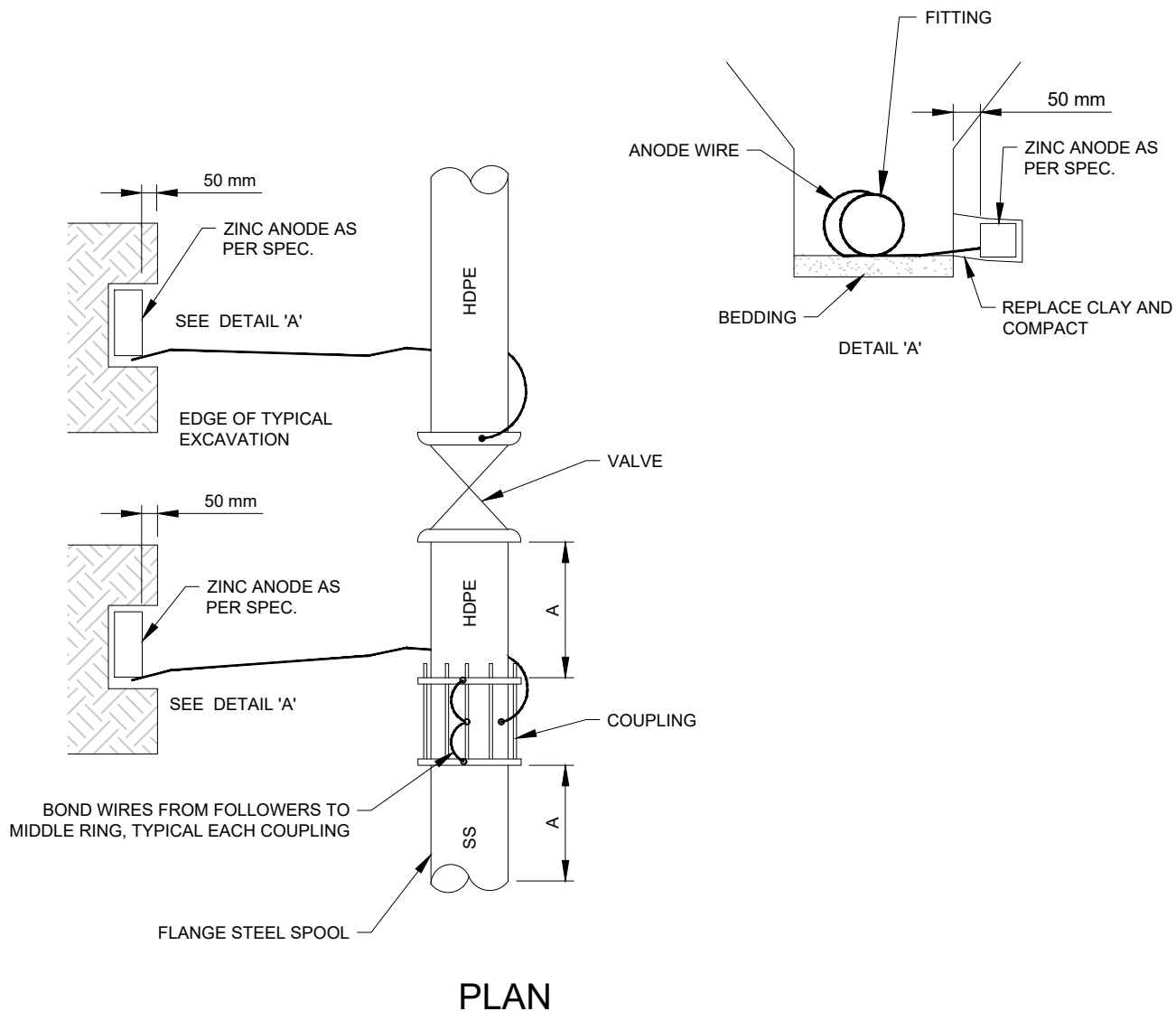
DETAIL C-12

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

CIVIL
BLOW-OFF AND BYPASS VALVE MANHOLE
PLAN AND SECTION

DWG No.

C-12



NOTES:

1. MINIMUM DISTANCE FROM ANODE TO PIPE, FITTING OR VALVE IS 150 mm.
2. INSTALL ANODE AT APPROX. PIPE DEPTH IN NATIVE SOIL.
3. BOND WIRES MAY BE USED TO PROTECT UP TO TWO FITTINGS WITH ONE ANODE WHEN DIMENSION 'A' DOES NOT EXCEED ONE (1) METER.
4. ALL ZINC ANODES ON FITTINGS AND VALVES ARE AS PER SPEC.
5. ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50 mm OF NATIVE CLAY COMPLETELY SURROUNDING THE ANODE.
6. ANODES TO BE AT LEAST 300 mm CLEAR OF THRUST BLOCK.

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DATE
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DETAIL C-13

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

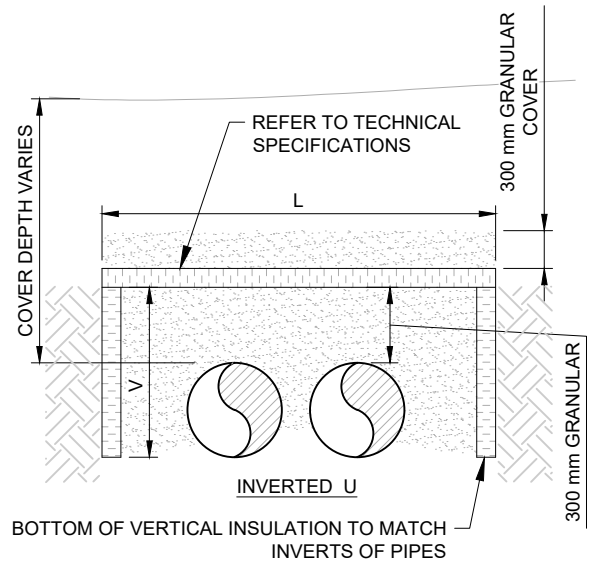
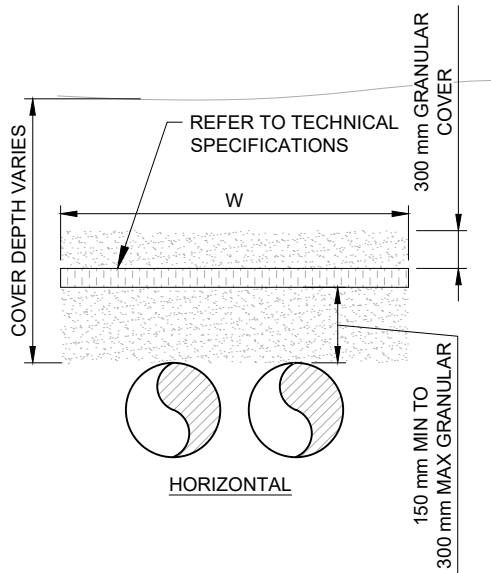
CIVIL
TYPICAL ANODE INSTALLATION, FOR ALL BURIED
VALVES, METAL FITTINGS AND COUPLINGS

DWG No.

C-13

TYPICAL INSULATION DIMENSIONS

'L' - TRENCH WIDTH	'W' - MIN. INSULATION DIMENSION	'V' - MIN. INSULATION DIMENSION
(mm)	(mm)	(mm)
850	1650	400
950	1850	450
1100	2100	500
1200	2300	550
1300	2500	600
1500	2900	700
2050	3850	900



SECTION

NOTES:

1. REFER TO TABLE FOR DIMENSIONS. V TO BE LESS THAN OR EQUAL TO L.
2. INSULATION SHALL BE DOW HI-40 STYROFOAM BOARD, OR APPROVED EQUAL.
3. SEE DRAWING C-15 FOR TRENCH DETAIL.
4. TOP OF INSULATION MUST REST ON VERTICAL SECTIONS OF INSULATION.
5. PIPE ZONE MATERIAL AND COMPACTION TO MEET CoE STANDARD SPECIFICATIONS.
6. ADDITIONAL LAYER OF INSULATION REQUIRED WHEN INSULATION JOINTS ARE ADJACENT TO PIPES.

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DETAIL C-14

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

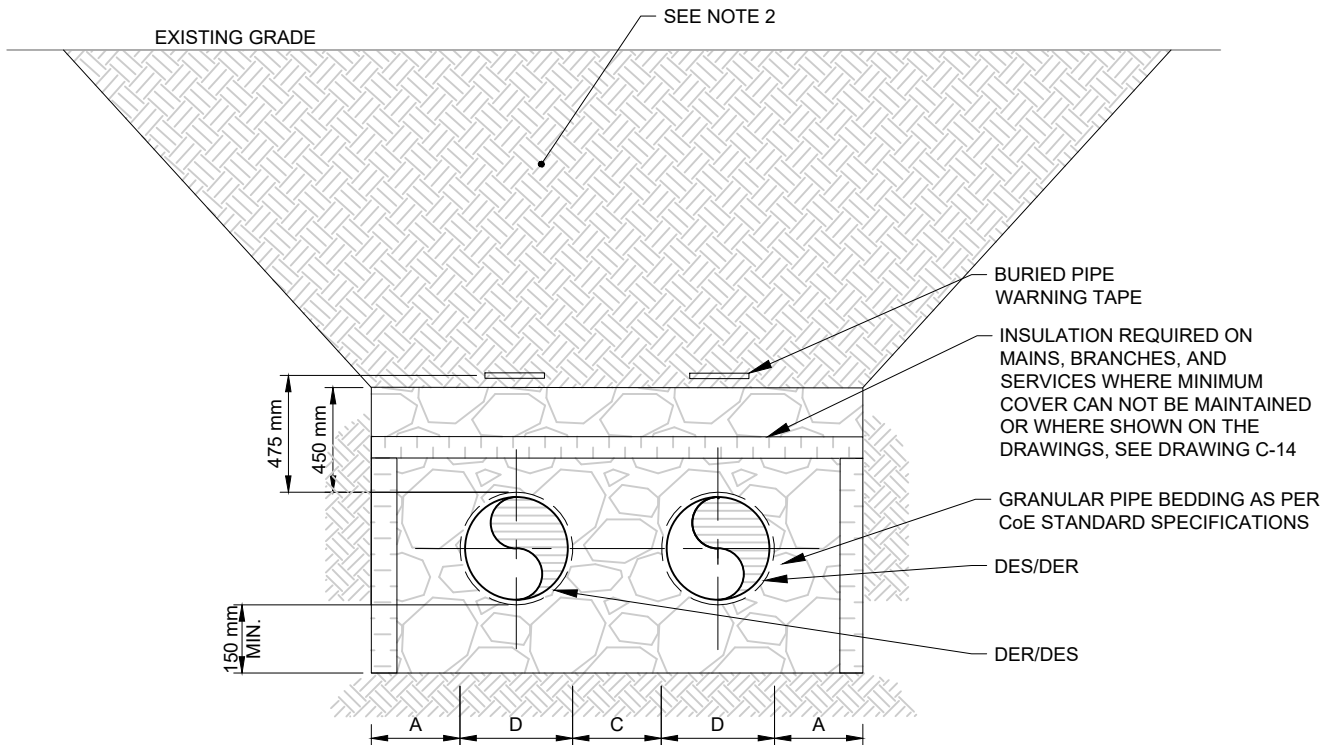
CIVIL
INSULATION DIMENSIONS
DETAIL

DWG No.

C-14

TYPICAL TRENCH DIMENSIONS

'D' - DPS PIPE OD, HDPE DR17	'A' - MAX. SEPARATION BETWEEN OUTER CASING OF PIPE AND TRENCH WALL	'C' - MINIMUM SEPARATION BETWEEN OUTER CASING OF PIPES
(mm)	(mm)	(mm)
100	225	200
150	225	200
200	225	250
250	225	250
300	225	250
400	225	250
600	225	400



SECTION

NOTES:

1. DEPTH OF PIPES VARY.
2. TRENCH AND BACKFILL SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE CIVIL DRAWINGS AND VOLUME 2: ROADWAYS, SECTION 02318 - TRENCH AND BACKFILL. UTILITY CUT RESTORATION SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE CIVIL DRAWINGS AND VOLUME 2: ROADWAYS, SECTION 02965 - UTILITY CUT RESTORATION. FILLCRETE BACKFILL SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE CIVIL DRAWINGS AND VOLUME 2: ROADWAYS, SECTION 02317 - FILLCRETE. PIPE BEDDING SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE CIVIL DRAWINGS AND VOLUME 4: WATER, SECTION 02515 - PIPE BEDDING.

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DATE
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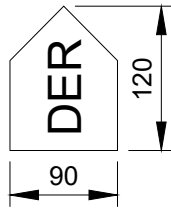
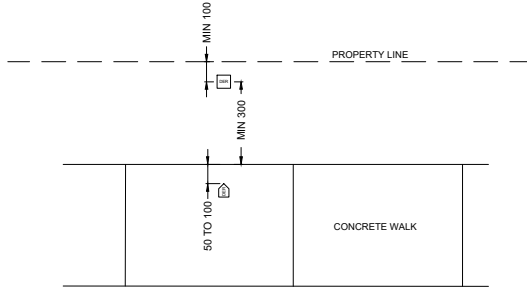
DETAIL C-15

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

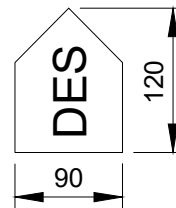
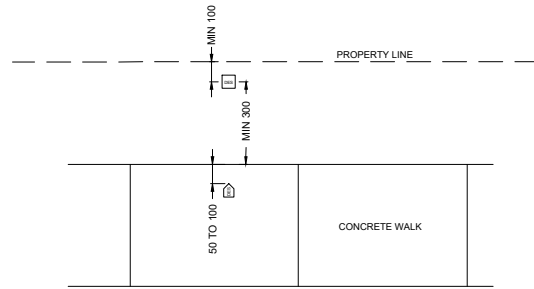
CIVIL
TYPICAL DPS TRENCH
SECTION

DWG No.

C-15



PLAN



PLAN

NOTES:

1. DER/DES SYMBOL TO BE PLACED 50mm to 100mm FROM EDGE OF WALK
2. TIP OF DER/DES SYMBOL MUST POINT IN THE DIRECTION OF THE CURB STOP LOCATION

SCALE
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DATE
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V04

DETAIL C-16

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

CIVIL
DER/DES CURB STOP LOCATION STAMPS
PLAN

DWG No.

C-16

HDPE MANHOLE. SEE
DRAWING DETAIL
C-01

THERMOWELL AND TEMP SENSOR,
SEE DRAWING DETAIL M-02
50Ø (2") STAINLESS STEEL
BY-PASS PIPE C/W INSULATION.

100Ø (4") STAINLESS STEEL
BLIND FLANGE W/ 50MM (2") NPT
TAPPING ON CENTRE.

100Ø (4") SCH 40 STAINLESS
STEEL TEE C/W INSULATION.

HDPE FLANGE

HDPE SPOOL FUSED INTO
MANHOLE, SEE DRAWING
DETAIL C-01

HDPE FLANGE, TYP.

GATE VALVE. SEE DRAWING
DETAIL C-08

HDPE DE RETURN PIPE

PRESSURE SENSOR, TYP OF 2.
SEE DRAWING DETAIL M-03

50MMØ (2") AUTO FLOW
CONTROL VALVE.

100Ø (4") LUG
STYLE BUTTERFLY
VALVE. OPEN FOR
FLUSHING

NOTE: ALL MANHOLE PIPING AND
VALVE BODIES TO BE INSULATED.

NOTE: ALL BOLT SETS, FITTINGS,
AND OTHER MATERIALS TO BE
MADE FROM STAINLESS STEEL.

1
—
DETAIL — PLAN VIEW

25MM (1") AIR VENT DISCHARGE
OUTSIDE HDPE MANHOLE.

FUSED HDPE VENT PENETRATION

20MM (3/4") AIR VENT
DISCHARGE PIPE, SCH80 CPVC
OR STAINLESS STEEL.

AUTOMATIC AIR VENT.

AUTO FLOW CONTROL VALVE.

50MM WYE STRAINER C/W
BLOW-OFF

50MMØ (2") STAINLESS STEEL
BY-PASS PIPE, INSULATED.

50MM SS BALL VALVE

100MMØ STAINLESS STEEL
DES/DER PIPING

HDPE MANHOLE. SEE
DRAWING DETAIL C-01

IP68 JUNCTION BOX FOR
SENSOR WIRING TO CONNECT
TO STREET WIRING. LOCATE
AT TOP OF MANHOLE IN DRY
LOCATION. SECURE WITH SS
BOLTS TO MANHOLE WALL.

OPTIONAL CLASS 150 SS
UNION (FOR ASSEMBLY).

S.S. THERMOWELL IN TEE
WITH TEMP SENSOR.
SEE DETAIL M-02

PRESSURE SENSOR, SEE
DETAIL M-03. MIN 1.2M
ABOVE FLOOR.

100MMØ (4") BUTTERFLY
VALVE. NORMALLY CLOSED,
OPEN FOR FLUSHING.
C/W HANDWHEEL OPERATOR.

100Ø (4") STAINLESS
STEEL BLIND FLANGE
W/ 50MM (2") NPT
TAPPING ON CENTRE.

MECHANICAL FLOAT SWITCH.
SUSPENDED IN SUMP AND
ANCHORED AT FLOOR.
SET TO ALARM IF WATER
REACHES 150MM DEEP.

2
—
SECTION A-A

SCALE
APPROVED
DATE
REV

N.T.S.
A.BYRNES
2026JUL13
V04

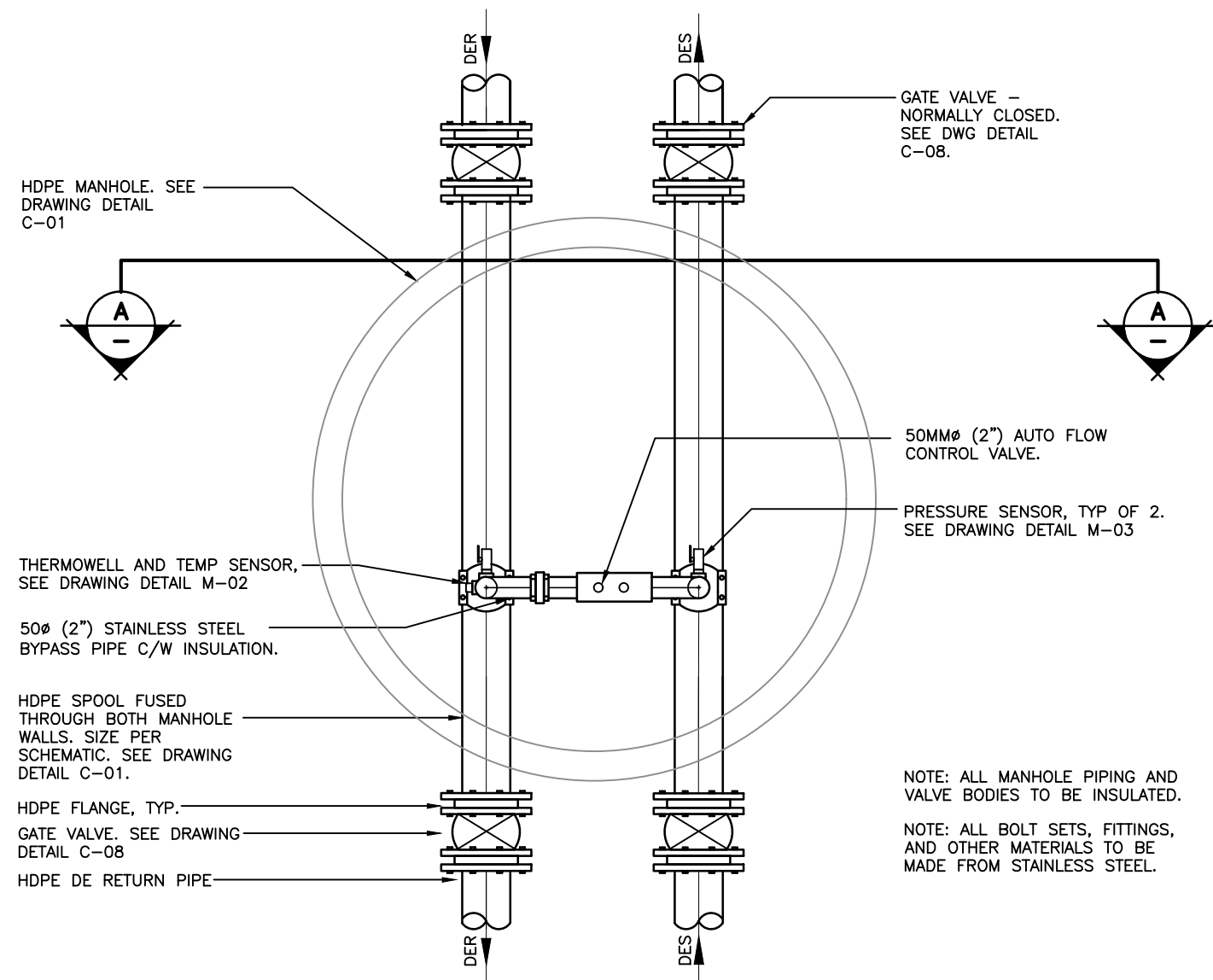
DETAIL M-01

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEM

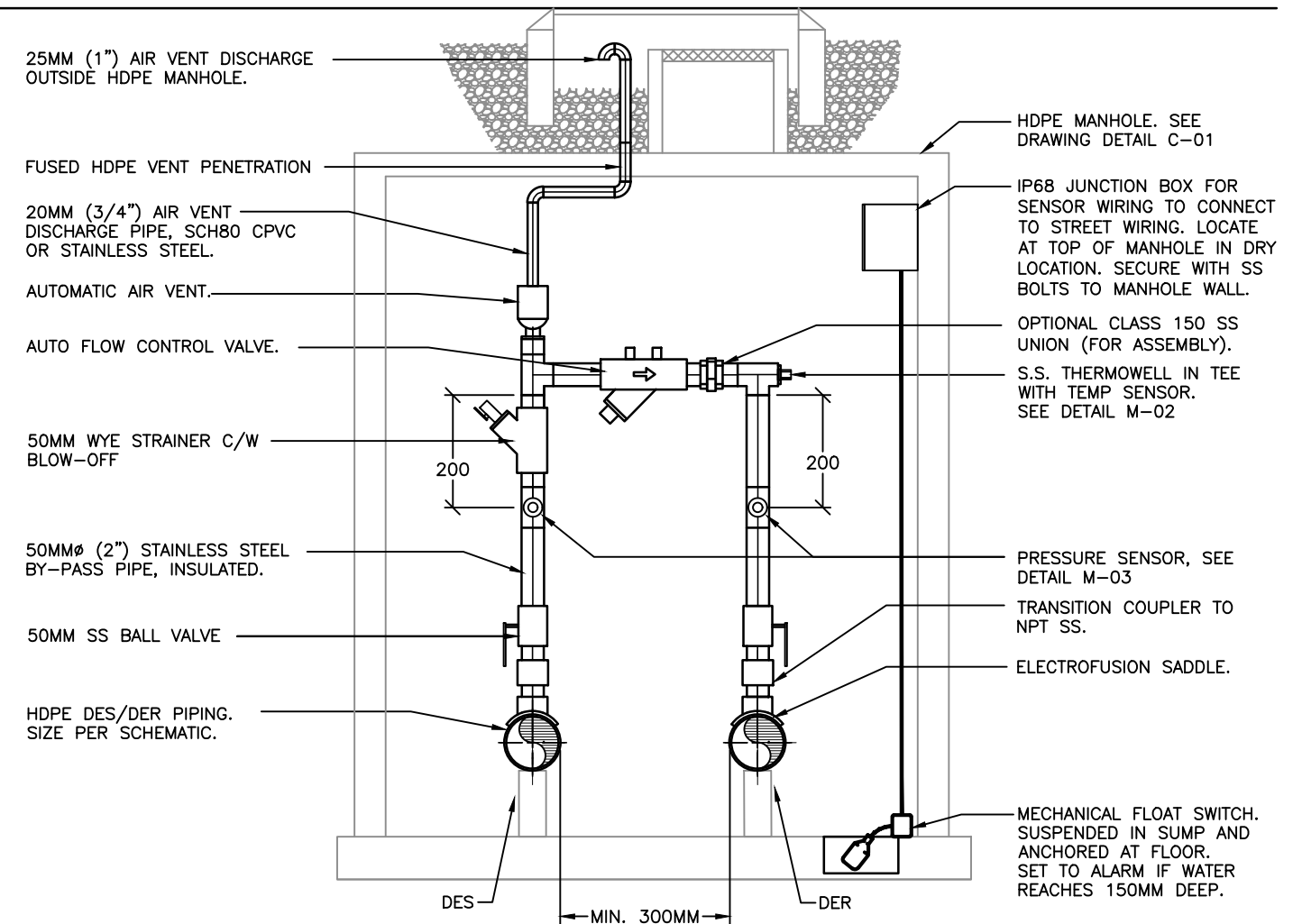
MECHANICAL
SENSOR AND BYPASS MANHOLE

DWG No.

M-01



1 — DETAIL — PLAN VIEW



2 — SECTION A-A

SCALE
APPROVED
DATE
REV

N.T.S.
A.BYRNES
2026JUL13
V02

DETAIL M-01A

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEM

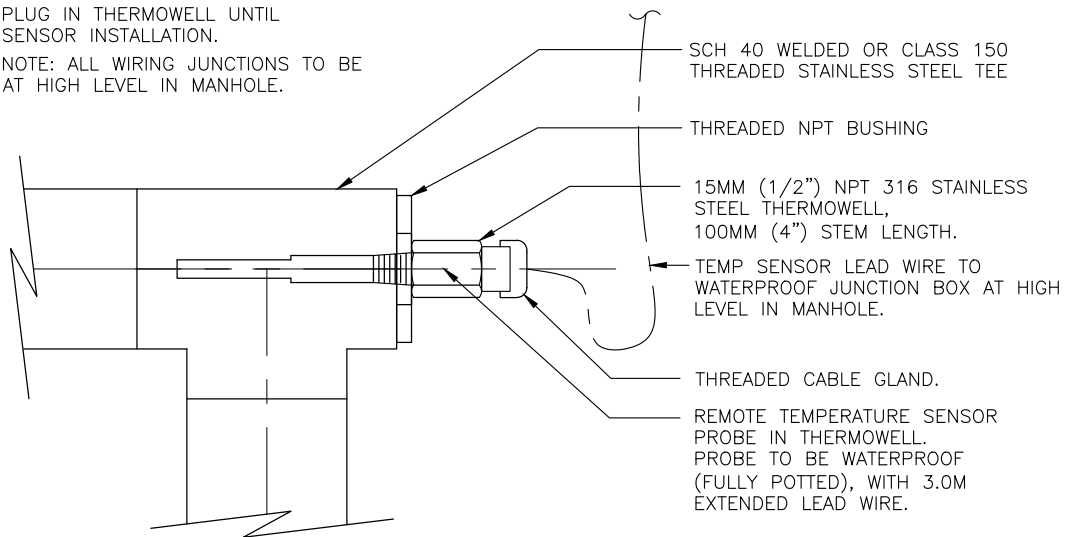
MECHANICAL
INLINE SENSOR AND BYPASS MANHOLE

DWG No.

M-01A

NOTE: PROVIDE TEMPORARY PLASTIC
PLUG IN THERMOWELL UNTIL
SENSOR INSTALLATION.

NOTE: ALL WIRING JUNCTIONS TO BE
AT HIGH LEVEL IN MANHOLE.



SCALE
APPROVED
DATE
REV

N.T.S.
A.BYRNES
2022DEC20
V03

DETAIL M-02

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEM

MECHANICAL
TEMPERATURE SENSOR

PROVIDE INSULATION AND 10MIL
POLY PIPE WRAP COVERING
OVER ALL 1/2" SENSOR PIPING
AND VALVE UP TO SENSOR
CONNECTION. MAINTAIN ACCESS
FOR VALVE HANDLE.

POLYURETHANE COATED SENSOR
CABLE, 3.0M (10FT) LENGTH.
MAKE CONNECTION TO STREET
WIRING AT WATERPROOF JUNCTION
BOX AT HIGH LEVEL IN MANHOLE.

PRESSURE SENSOR (0-100 PSI)
DRUCK MODEL UNIK 5000 WITH
WATERPROOF ENCLOSURE.
CONFIGURATION
PTX-5-0-3-2-TC-A1-CA-H0-PF.

15 MM (1/2") UNION W/ 8 MM
(1/4") BUSHING FOR SENSOR.

15 MM (1/2") SS BALL VALVE.

15MM (1/2") SS PIPE NIPPLE.

15MM (1/2") WELDOLET, THREADED.

50MM SS BYPASS PIPE

SCALE
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DATE
REV

N.T.S.
A.BYRNES
2022DEC20
V03

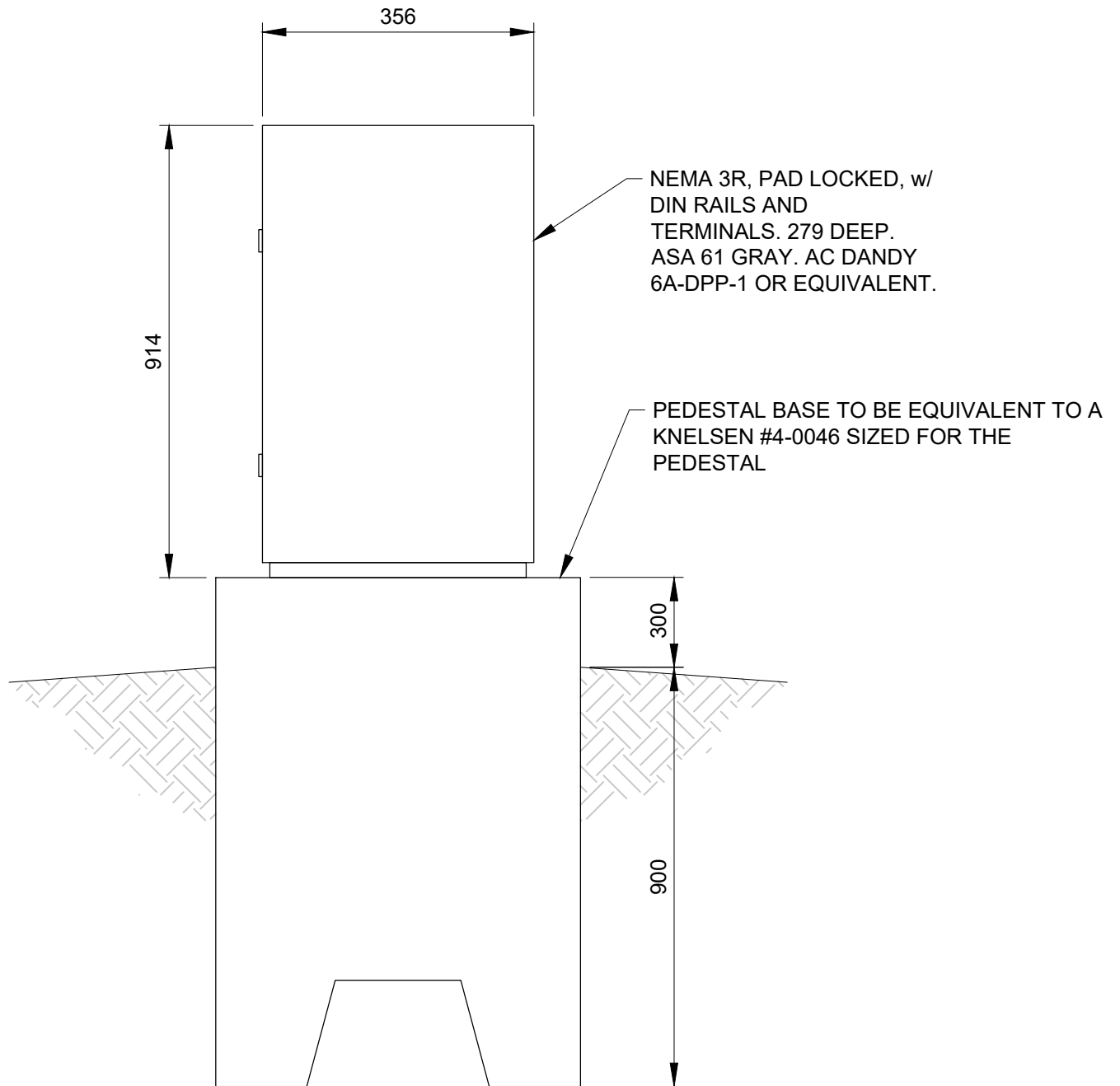
DETAIL M-03

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEM

MECHANICAL
PRESSURE SENSOR

DWG No.

M-03



DETAIL

1:10

JUNCTION PEDESTAL

**SCALE
APPROVED
DATE
REV**

AS SHOWN
K. DARRACH
2022DEC20
V03

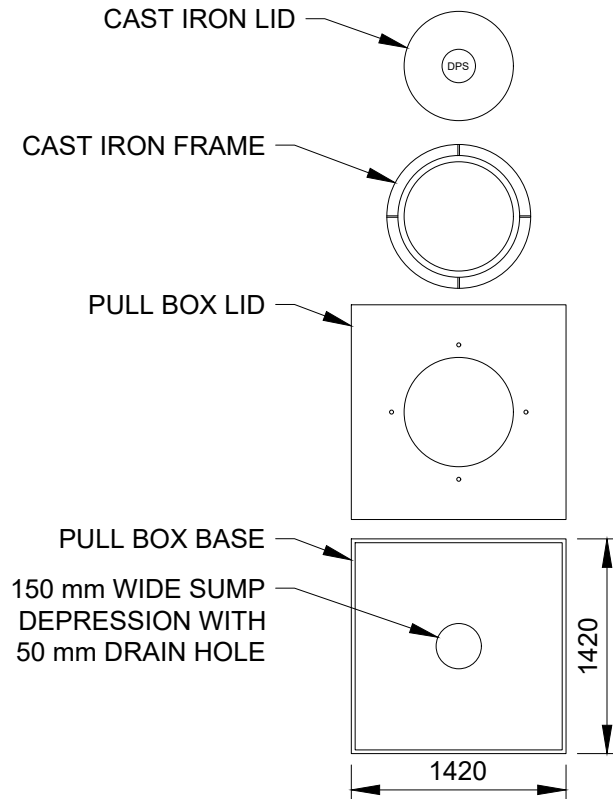
DETAIL E-01

CITY OF EDMONTON
RENEWABLE ENERGY SYSTEMS

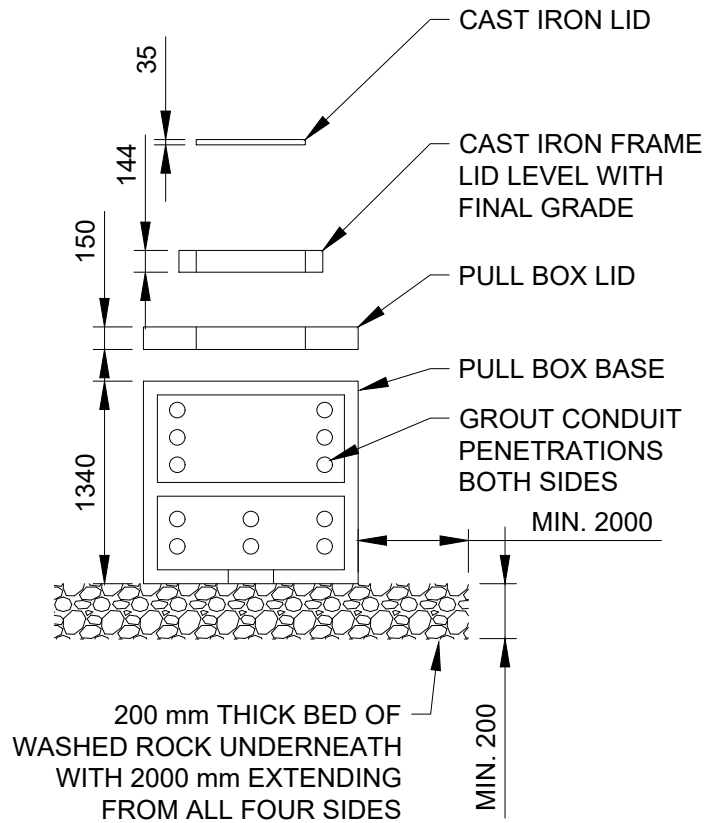
ELECTRICAL
TYPICAL JUNCTION PEDESTAL
ELEVATION DETAIL

DWG No.

E-01



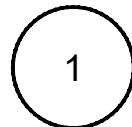
TOP VIEW



FRONT VIEW

NOTE:

VAULT DIMENSIONS ARE APPROXIMATE.



TYPICAL DETAIL

PULL BOX WITH DRAIN

NTS

PLOT DATE: 9/3/2024 3:30:19 PM
 SAVE DATE: 9/3/2024 3:30:16 PM
 DWG PATH: I:\ae\cdm\working\2019-3623-00\elec\model\pull box with drain.dwg



**Associated
Engineering**



Platinum member

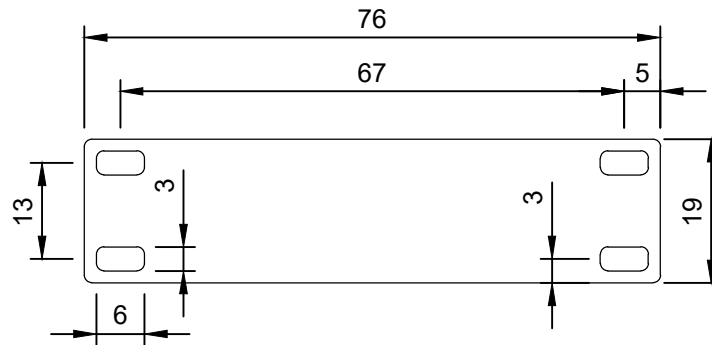
AE PROJECT No.
SCALE
APPROVED
DATE
REV
DESCRIPTION

2019-3623-00
 AS SHOWN
 C. BREDO
 2024SEP03
 0
 ISSUED FOR MEMO

DETAIL E-02

CITY OF EDMONTON
 BLATCHFORD RENEWABLE ENERGY

ELECTRICAL
 PULL BOX WITH DRAIN



NOTES:

1. DIMENSIONS ARE IN MILLIMETRES.
2. TEXT IS ENGRAVED OR EMBOSSED; SIZE TO FILL TAG SPACE AS NEEDED.

PLOT DATE: 2026-07-08 11:32:41 AM
SAVE DATE: 2026-07-08 11:32:06 AM SAVED BY: LINDSAYS
DWG PATH: \\ae.ca\data\working\edmonton\2019-3623-00\electrical\stainless steel tag detail.dwg



AE PROJECT No.
SCALE
APPROVED
DATE
REV
DESCRIPTION

2019-3623-00
1:1
C. BREDO
2026JUL08
0

ISSUED FOR MEMO

DETAIL E-03

CITY OF EDMONTON
BLATCHFORD RENEWABLE ENERGY

ELECTRICAL
STAINLESS STEEL TAG