2023

Environmental Utilities
Construction Specifications

Medicine Hat
The Gas City

REVISION INFO: 2023-03-13

City of Medicine Hat
1/1/2023

REVISIONS

DATE OF REVISION	REVISED SECTIONS
February 2020	Section 1.5.2; Section 1.6.5; Section 1.10; Section 2.1.3; Section 3.11; Section 5.5; Section 7.1.4; Section 7.3.6; Section 8.2.6; Section 9.3.4; Section 9.3.5; Section 9.3.7; Section 10.1.2; Section 10.2.2; Section 10.2.3; Section 10.2.4; Section 10.2.5; Section 10.2.6; Section 10.2.9; Section 10.2.10; Section 10.2.11; Section 10.2.12; Section 10.2.13; Section 10.3.4; Section 10.3.6; Section 10.3.7; Section 10.3.9; Section 10.3.10; Section 10.3.11; Section 10.3.13; Section 10.3.14; Section 11.2.1; Section 11.2.2; Section 11.3.3; Section 13
October 2020	Section 9.3.7.2
January 2023	Section 8.3.3.5.4; Section 9.2.2.1.2; Section 9.2.2.2.2; Section 10.2.6.1; Section 10.2.6.2; Section 10.2.6.3.1; Section 10.3.4.25; Section 11.2.1.3; Section 11.2.1.7; Section 11.2.2.4.2
March 2023	Section 10 – NSF 61 referenced for hydrants; Section 11.3.4 added; 11.3.7 added
April 2023	Section 10.2.3.8 – Smith Blair 421 added to approved couplers.

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Section 1 – General Instructions

1. Documents Required:

.1 Maintain at job site, one copy of each of the following:

.1 Contract drawings

.2 Specifications

.3 Addenda

.4 Reviewed shop drawings

.5 Change orders

.6 Other modifications to Contract

.7 Field test reports

.8 Copy of approved work schedule

.9 Manufacturer's installation and application instructions

.10 Authorizations

.11 Approvals

.12 Contractor’s safety manual

.13 Site meeting minutes

.14 Safety meeting minutes

.15 As-Built Records

.16 Permits

.17 MSDS

.18 Training certificates

2. Work Schedule:

.1 Provide within 15 days after Contract award, and in a form acceptable to Engineer, a schedule showing dates for:

.1 Submission of shop drawings, material lists and samples.

.2 Commencement and completion of work of each Section of the Contract.

.3 Final completion date within time period required by Contract documents.

.2 Interim reviews of work progress based on a work schedule will be conducted as decided by Engineer and schedule updated by Contractor in conjunction with, and to, the approval of the Engineer.

3. Measurement for Payment:

.1 Notify Engineer sufficiently in advance of operations to permit required measurements for payment. Refer to Section 4 for Measurement Rules and Section 5 Measurement Schedule.

4. Contractor's Use of Site:

.1 Do not unreasonably encumber site with materials or equipment.

.2 Move stored products or equipment which interferes with operations of Engineer or other Contractors.

.3 Obtain and pay for use of additional storage or work areas needed for operations.

.4 The following items can be located on site as noted below:

.1 Site office and Material storage

.2 Jobsite tools and Equipment

5. Codes and Standards:

.1 Meet or exceed requirements of specified standards, codes and referenced documents.

.2 Reference Standards:

.1 Within the text of these specifications, reference may be made to the following standards – reference is to latest and current standards:

.1 NSF- National Sanitation Foundation

.2 AWWA - American Water Works Association

.3 ANSI - American National Standards Institute

.4 ASTM - American Society for Testing and Materials

.5 CGSB - Canadian General Standards Board

.6 CSA - Canadian Standards Association

.7 CAN 2 - National Standard of Canada (published by CGSB)

.8 FM - Factory Mutual Engineering Corporation

.9 ULC - Underwriters Laboratories of Canada

.10 CAN 3 – National Standard of Canada (published by CSA)

.11 NASSCO-National Association of Sewer Service Companies

.12 CCGA Best Practices – Canadian Common Ground Alliance

.13 CSDA Best Practices – Concrete Sawing and Drilling Association

.2 The testing of materials may be requested by the Owner, to prove conformance with Standards, and shall be paid for by the Contractor.

.3 The referenced standard and any amendments in force on the day of receipt of tenders shall be applicable to the work during the duration of the Contract.

.4 Conform to and perform work in accordance with the Alberta Building Code, except as otherwise indicated in the Contract Documents.

.5 Conform to and perform work in accordance with Alberta OHS.

6. Project Meetings:

.1 Administrative Responsibility

.1 The Owner’s Representative will be responsible for administrative requirements for the following project meetings:

.1 Pre-Construction Meetings

.2 Construction Progress Meetings

.2 The Contractor shall be responsible for administrative requirements for the following project meetings:

.1 Workplace Orientation Meetings

.2 Safety Toolbox Meetings

.3 The Owner or Contractor may request additional meetings related to dispute resolution, environmental issues or warranty. Unless specifically agreed to otherwise, the Owner will be responsible for administrative duties related to these meetings.

.2 Administrative Requirements

.1 The administrative requirements for each of the project meetings includes:

.1 Chair meetings

.2 Record the minutes and attendance, include significant proceedings and decisions, and identify action by the parties

.3 Preconstruction Meetings

.1 Occurrence:

Within 15 days after award of Contract and prior to commencement of activities at the Site, the Owner’s Representative will request a meeting of parties in contract. Additional meetings may be required and scheduled as deemed necessary by the Owner.

.2 Purpose:

To review personnel assignments, responsibilities, schedules, submissions and administrative and procedural requirements including safety and environmental responsibilities. Issues and conflicts will be recorded using an issues resolution log.

.3 Attendees:

.1 Contractor's representatives: Contractor's senior management, Contractor's site superintendent, representatives of major subcontractors, and others as necessary

.2 Owner's representatives: as determined by Owner.

.4 Construction Progress Meetings

.1 Frequency:

During the course of Work, attend progress meetings bi-weekly or as required by the Owner to deal with problems which may arise.

.2 Purpose:

To monitor construction progress, to expedite the Work and to identify problems and action required for their solution. Problems issues and conflicts to be tracked using a issues resolution log.

.3 Attendees:

.1 Contractor's representatives: Contractor's site superintendent and when so requested by Owner, Subcontractors, suppliers and other parties involved in the Work

.2 Owner's representatives: as determined by Owner

.4 Copies of previous Construction Progress Meeting minutes to be distributed to attendees prior to meeting.

.5 Safety Toolbox Meetings

.1 Frequency:

During the course of Work, schedule safety toolbox meetings weekly for each area of Work, as Work tasks change significantly, or as otherwise required by OH&S Regulations.

.2 Purpose:

To review safety concerns and implement preventative safety measures.

.3 Attendees:

Contractor personnel for each area of work

.4 Copies of toolbox meeting minutes to be provided to Owner and Engineer no later than 2 days after the meeting, or as agreed upon at the Pre-Construction Meeting.

7. Coordination:

.1 General Coordination

.1 Coordinate all construction activities as required to ensure efficient and orderly installation of each part of the Work.

.2 Where installation of one part of the Work is dependent on installation of other components, either before or after its own

installation, schedule and coordinate construction activities in the sequence required to obtain the best results.

.3 Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

.4 Make adequate provisions to accommodate items scheduled for later installation under separate contract or by Owner's own forces.

.2 Administrative Procedures

.1 Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities shall include, but not be limited to, the following:

.1 Preparation of schedules

.2 Installation and removal of temporary facilities

.3 Delivery and processing of submittals

.4 Progress meetings

.5 Contract acceptance procedures

.3 General Installation Provisions

.1 Require the installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

.2 Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

.3 Inspect Materials immediately upon delivery and again prior to installation. Reject damaged and defective items.

.4 Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

.5 Provide uniform joint widths in exposed work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to Owner for final decision.

.6 Install each component during weather conditions and project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

.7 Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

.8 Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Owner for final decision

.9 Supervise construction activities to ensure that no part of the Work completed, or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

.4 Cutting And Remedial Work

.1 Do the cutting and remedial work required to make the several parts of the Work come together properly.

.2 Coordinate the Work to ensure that this requirement is kept to a minimum.

.3 Cutting and remedial work shall be performed by specialists familiar with Materials affected and shall be performed in a manner to neither damage nor endanger the Work.

8. Existing Services:

.1 Where work involves breaking into or connecting to existing services, or crossing existing utilities, carry out work at times directed by governing authorities, with minimum disturbance to pedestrian and vehicular traffic – refer to Section 2, Roads and Highways In Use.

.2 Before commencing work, establish location and extent of service lines in area of work and notify Engineer of findings.

.3 Submit schedule to and obtain approval from Engineer for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

.4 Where unknown services are encountered, immediately advise Engineer and confirm findings in writing.

9. Testing:

.1 Any testing carried out by the City is for the benefit of the City alone. Any dependence by the Contractor of test results taken on behalf of the City will be at the Contractor's risk and in no way will negate the Contractor's responsibility for workmanship.

.2 The Engineer will not approve the Contractor's work on the basis of test results. Rather he will inform the Contractor when tests show that the work does not meet the specifications in accordance with Clause 3.20 of the GENERAL CONDITIONS.

.3 Testing By Contractor:

.1 Contractor shall furnish to Engineer, upon request, test results from testing performed by Contractor.

.4 Testing By Owner:

.1 Owner reserves the right to employ services of independent testing agencies to establish if work complies with Contract Documents. Owner will appoint and pay for services of such testing agency.

.2 Where tests or inspections, by Owner appointed testing agency, indicate work is not in accordance with the Contract Documents, additional tests or inspections, as Owner may require verifying acceptability of corrected work, shall be paid for by Contractor.

10. Safety:

.1 All Contractors working for the City of Medicine Hat must be Low Risk status in ComplyWorks, unless the Contractor is deemed exempt.

.2 The Contractor shall have in place Safety Management Systems and policies which satisfy City of Medicine Hat policies expectations, and legislation for the jurisdiction in which work is taking place. The Safety Management System shall be in place prior to any work taking place.

.3 Work Site Safety - This Contractor Is "Prime Contractor"

.1 For the purposes of the Occupational Health and Safety Act (Alberta), and for the duration of the Work of this Contract:

.1 Be the "prime contractor" for the "work site" as described by the most up to date version of the Occupational Health and Safety Act of Alberta.

.2 Do everything that is reasonably practicable to establish and maintain a system or process that will ensure compliance with the Act and its regulations, as required ensuring the health and safety of all persons at the "work site".

.2 Direct all Subcontractors, Sub-subcontractors, Other Contractors, employers, workers and any other persons at the "work site", including City Employees, on safety related matters to the extent required to fulfill its "prime contractor" responsibilities pursuant to the Act, regardless of:

.1 Whether or not any contractual relationship exists between the Contractor and any of these entities. Whether or not such entities have been specifically identified in this Contract.

.4 Submittals

.1 Supply to the Owner's Representative 14 days prior to commencement of work:

.1 Name and contact information of Safety Representative responsible for safety supervision of Contractor's work.

.2 Names of employees qualified as first aiders and update monthly.

.3 Names of employees certified for Confined Space, Ground Disturbance Level 2, Asbestos Workers Course, Trenching and Shoring and any other safety course applicable to the scope of work.

.5 Safety Requirements

.1 All Contractors, including site superintendent, foreman and all workers must, regardless of prior experience, complete the City of Medicine Hat HSE Orientation prior to performing work for the City of Medicine Hat.

.2 Establish a joint work site health and safety committee (HSC) as per Alberta Occupational Health and Safety standards. The City of Medicine Hat reserves the right to include a representative on this committee.

.3 Conduct safety meetings and work place orientation meetings as specified in Section 1, Item 6.5.

.4 Cooperate on safety matters with the Owner, Alberta Occupational Health and Safety, and all other legislated body governing work being performed, as well as industry best practices.

.5 Provide worksite orientation for any visitor to the worksite. The prime contractor will keep a daily visitor log sheet (sign in / sign out) for the worksite.

.6 Ensure that a Safe Work Procedure (SWP) or Code of Practice (COP) is available for all work that will exist on the construction site. Each Code of Practice is expected, at minimum, to meet or exceed the City of Medicine Hat expectations. Some key examples of required, but not limited to, COP's or SWP are: Ground Disturbance; Workplace Inspections; Asbestos Workers Course as approved by Alberta OH&S; Respiratory Protection; Rigging and Hoisting; Working at Heights; Fall Safety and any COP or SWP that pertain to any work performed on the worksite, or for the City of Medicine Hat.

.7 Comply with federal, provincial, and municipal legislation, including the Workplace Hazardous Materials Information System. In the event of conflict between any of the provisions of above authorities, the most stringent provision will apply.

.8 Rectify unsafe conditions, and be responsible for all related costs and delays.

.9 Submit reports for potential hazards or near misses and all incidents within 24 hours of the near miss or incident. Notify the Owner immediately of any near miss or incident. A formalized investigation identifying the root cause of the incident or near miss must be submitted including corrective actions within 14 days of the near miss.

.10 Investigate all incidents and submit a copy of completed injury forms and incident reports to the Owner. Investigate the incident following

a formalized industry accepted process that identifies the root cause of the incident and corrective actions must be performed and submitted within 14 days of the incident. The Contractor will comply and assist with any and all request for investigation and incident documentation as requested by The City of Medicine Hat.

.11 Maintain first aid supplies and trained personnel at the work areas as required by the Occupational Health and Safety Regulations.

.12 At least one member of the crew for each work shift shall be a qualified first aider.

11. Work by Others:

.1 Because of other work within and adjacent to the limits of the Contract, the Contractor shall not have exclusive occupancy of the area within or adjacent to the limits of the Contract. Co-operate with the various companies and utilities and co-ordinate and arrange the sequence of work to expedite the completion of the entire project. Refer to Supplementary Conditions for further details.

12. Survey:

.1 Protect from damage or loss of all marks, nails and City or Provincial control monuments set by the Engineer. If loss or damage occurs, notify the Engineer and pay all expenses incurred in replacing same.

.2 Supply all stakes, lath and hubs required for layout of work.

.3 All survey to be in 3TM-111W, NAD 83 coordinates.

END OF SECTION

Section 2 – Roads and Highways in Use

1. Protection of Public Traffic:

.1 All work on City owned Right of Way shall be approved by the Municipal Works Department. All work on City owned Right of Way is to be reported to Municipal Works Department a minimum of 4 working days in advance of the expected work start date. Comply with requirements of Acts, Regulations and Bylaws in force for regulation of traffic or use of any road upon or over which it is necessary to carry out work or haul materials or equipment.

.2 When working on traveled way:

.1 Place equipment in such a position as to present a minimum of interference and hazard to traveling public.

.2 Keep equipment units as close together as working conditions will permit and preferably on same side of traveled way.

.3 Do not leave equipment on traveled way overnight.

.3 Do not close any lanes of road or highway without approval of Municipal Works Department. Provide a detailed plan of road closures or detours indicating signs required and detour routes for Municipal Works approval a minimum of five working days prior to implementing road closure or detours. Public and Emergency Services notification is required 48 hours before road closure or detours are in effect. Before re-routing traffic, erect suitable signs and devices in accordance with instructions contained in Part D of Uniform Traffic Control Devices for Canada (latest edition) and refer to City of Medicine Hat Municipal Works Temporary Traffic Control Manual (latest edition).

.4 Contractor is responsible to notify the proper authorities (Fire, police, emergency services, Municipal Works Transit, and Solid Waste etc.) of any closures a minimum of two (2) working days in advance.

.5 Keep traveled way well graded, free of potholes and of sufficient width that required number of lanes of traffic might pass.

.6 When deemed necessary by Engineer provide well-graded, paved detours or temporary roads to facilitate passage of traffic around restricted construction area. Provide and maintain signs and lights and maintain roadway.

.7 Provide and maintain reasonable road access and egress to property fronting along or in vicinity of work under contract unless other reasonable means of road access exist.

.8 Contractor is responsible to prepare, implement, modify and maintain all traffic accommodation strategies and construction zone traffic flow requirements necessary to protect pedestrian and vehicular traffic from entering construction areas and to maintain access to institutions, businesses and residences at all times.

.9 The City will not provide any traffic accommodation, detour or construction zone signage, barricades, barriers, flashers or labour to erect or install the same.

.10 Contractor is responsible to supplement, improve and/or modify traffic accommodation strategies, construction zone safety, and traffic flow requirements on an ongoing basis, to meet evolving traffic needs.

2. Informational and Warning Devices:

.1 Provide and maintain signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work which may require road user response.

.2 Supply and erect signs, delineators, miscellaneous warning devices as specified in Part D, Signs and Devices, of manual titled Uniform Traffic Control Devices for Canada distributed by Roads and Transportation Association of Canada and refer to City of Medicine Hat Municipal Works Temporary Traffic Control Manual (Latest Edition).

.3 Place signs and other devices in locations recommended in said manual.

.4 Meet with Engineer prior to commencement of work to prepare a list of signs and other devices required for project.

.5 Continually maintain traffic control devices in use by:

.1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

.2 Removing or covering signs which do not apply to conditions existing from day to day.

3. Control of Public Traffic:

.1 All work in the City owned Right of Way shall be reported to Municipal Works including sidewalk work and closure. Consult Municipal Works Department and the Temporary Traffic Control Manual (current edition) for Pedestrian Safety requirements.

.2 Provide certified, competent flagmen, properly equipped as specified in the manual of Uniform Traffic Control Devices for Canada, in the following situations:

.1 When public traffic is required to pass working vehicles or equipment which may block all or part of the traveled roadway.

.2 When it is necessary to institute a one-way traffic system through a construction area or other blockage where traffic volumes are heavy, approach speeds are high and a traffic signal system is not in use.

.3 When workers or equipment are employed on traveled way, over brow of a hill, around a sharp curve or at any other location where oncoming traffic would not otherwise have adequate warning.

.4 Where temporary protection is required while other traffic control devices are being erected or taken down.

.5 For emergency protection when other traffic control devices are not readily available.

.6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.

.7 At each end of restricted sections where pilot cars are required.

4. Operational Requirements:

.1 Ensure that traffic is minimally affected by construction.

.2 Maintain existing conditions for traffic crossing right-of-way containing work.

END OF SECTION

Section 3 – Environmental Protection

1. Contractor Responsibility:

.1 Carry out the Work and implement any necessary measures to protect the environment.

.2 Submit to the City of Medicine Hat, an ECO Plan that is in compliance with the Environmental Construction Operations Plan Framework document provided by the Government of Alberta, for the site.

2. Fires:

.1 Fires and burning of rubbish on site is not permitted.

3. Disposal of Wastes:

.1 Do not bury rubbish and waste materials on site unless approved by Engineer.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner on site or into waterways, storm or sanitary sewers.

4. Drainage:

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

.4 Control and prevent chlorinated water from entering Storm and drainage systems. Consult with Municipal Works Department for approval.

5. Site Clearing and Plant Protection:

.1 Protect trees and plants on site and adjacent properties where indicated.

.2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas indicated or designated by Engineer.

6. Work Adjacent to Waterways:

.1 Do not operate construction equipment in waterways.

.2 Do not use waterway beds for borrow material.

.3 Do not dump excavated fill, waste material or debris in waterways.

.4 Design and construct temporary crossings to minimize erosion to waterways.

.5 Do not skid logs or construction materials across waterways.

.6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

7. Pollution Control:

.1 Maintain temporary erosion and pollution control features installed under this contract.

.2 Control emissions from equipment and plant to local authority's emission requirements.

.3 Dust control requirements will be strictly enforced. Dust control measures shall be required for all earthwork operations including stockpiles and temporary roads.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

.5 In the case of a spill of raw sewage or any other hazardous substance to any roadway, storm sewer, ditch, or water course, Alberta Environmental Protection and City of Medicine Hat Environmental Utilities Department must be notified of the event. Alberta Environment will issue an incident number. A written report must be submitted to Alberta Environment and a copy of the report must be submitted to the City of Medicine Hat Environmental Utilities Department, within 5 days. Notify Environmental Utilities Department, Manager of Field Operations immediately.

.1 Alberta Environment: 1-800-222-6514

.2 Environmental Utilities: 403-529-8176

After Hours Emergency: 403-502-8042

8. Surficial Aquatic Resources:

.1 PHYSICAL

.1 Except where shown on the Contract Drawings or otherwise approved by the Engineer, the diversion, alteration or disruption of water flows in rivers, streams or other bodies of water is not permitted without prior approval of Department of Fisheries and Alberta Environment.

.2 Control surface drainage from areas of Work and include suitable sedimentation facilities. Include the design of the temporary erosion and sediment control measures in the Environmental Management Plan.

.3 Minimize the area of bare soil exposed at any one time by construction operations adjacent to rivers, streams, canals, ponds, reservoirs or other surface bodies of water.

.4 Undertake all work within the scope of this Contract in a manner which will avoid siltation of any stream, river, lake or other body of water.

.5 Provide and maintain temporary erosion and sediment control measures to prevent turbid water from entering watercourses.

.6 No bark, slash, wood chips, sawdust, organic debris, soil, gasoline, diesel fuel, oil, grease, ashes or other substances deleterious to aquatic life shall be allowed to enter any river, stream, main canal, pond, reservoir or other bodies of water.

.7 Minimize all activities within the wetted perimeter of any river, stream or other body of water.

.8 Ensure obstructions are not placed in any watercourse during excavation unless otherwise approved by the Engineer. Should any materials be inadvertently placed or dropped in a watercourse the Engineer shall be notified immediately and the material shall be removed or modified as required by the Engineer.

.9 Installation of riprap and other protective works specified shall be carried out immediately after the installation is complete if surrounding Work permits. Otherwise it shall be done at the earliest possible time to prevent erosion and siltation.

.10 Unless otherwise designated, remove temporary culverts or bridge structures upon completion of the Contract and restore and stabilize canal banks, beds and other disturbed areas.

.2 BIOLOGICAL

.1 Comply with all environmental laws so that construction work does not adversely affect the environment of fish-producing streams, rivers, lakes and other bodies of water within the scope of this Contract.

9. Terrestrial Resources:

.1 WILDLIFE

.1 No-one involved in the performance of the Work is permitted to have firearms, dogs or pets on Site.

.2 Shooting or hunting is not permitted on Site.

.3 Prevent livestock from access to the Site at all times. Maintain fences adjacent to the Site and sequence Work in such a manner that all areas of the Works are fenced prior to construction operations commencing.

.4 Wildlife harassment is not permitted. Do not use or operate construction equipment, aircraft and personal vehicles in a manner which will disturb or disrupt the normal activities of local wildlife. The Engineer will be the sole judge of activities which disturb or disrupt wildlife.

.5 The Engineer will monitor construction activities throughout the duration of Contract and will determine the presence of sensitive wildlife sites. The Contractor will immediately undertake to avoid these additional sensitive sites and will carry out any mitigating measures as directed by the Engineer.

.2 VEGETATION

.1 Protect trees, shrubs and other vegetation indicated to remain in place against unnecessary cutting, breaking and any other damage. Ensure construction operations are carried out at minimum offset distance of 10 m unless otherwise approved by the Engineer.

.2 Carry out site clearing and topsoil stripping.

.3 Control all existing and new vegetation that adversely affects construction activities, functions of constructed facilities, or adjacent landowners.

.4 Remove, disc, blade, mow or spray vegetation as necessary for control purposes.

.5 Obtain approval of the Engineer for vegetation control, including need and methods of control. Include requirements for vegetation control in the Environmental Management Plan.

.6 The Contractor shall be responsible for all damages to crops or damages resulting from pesticides or vegetation control operations.

.7 Keep records of the types and amounts of pesticides purchased, delivered, stored, mixed and actually used, and the means of disposal of all excess. Maintain records current and accurate, and make available for review by the Engineer. MSDS of all products are required onsite as well as personnel using products are certified and trained in WHMIS and handling of hazardous materials.

.3 WASTE MANAGEMENT

.1 Remove all other waste and debris from Site.

.2 Reduce the amount of waste generated during construction by reusing materials and salvaging materials for recycling where practical. Salvage and segregate clean metal, plastic, paper, cardboard, and glass; transfer them to the nearest collection facility.

.4 HAZARDOUS WASTES

.1 Ensure that the transportation of hazardous materials to and from the construction site is in compliance with all transportation of dangerous goods and hazardous wastes regulations.

.2 Ensure use of hazardous materials is in accordance with all regulations governing their use. Proper labeling, MSDS, and employee training are mandatory.

.3 Report any spills or inadvertent discharges of hazardous materials or liquid wastes to the Engineer. Spills are to be cleaned up in accordance with applicable laws.

.4 Spill Kits to be stored on site and accessible.

.5 Ensure all fuel and service vehicles carry a minimum of 10 kg of suitable sorbent material, 30 m2 of 6 mil polyethylene, a shovel and one fuel barrel (lid removed).

.6 Dispose of waste hazardous materials in accordance with Alberta Environment regulations.

.5 STORAGE, HANDLING AND TRANSFER OF FUELS

.1 Fuels and other hazardous materials shall be handled only by persons who are trained and qualified in handling these materials.

.2 Store oils, greases, gasoline, diesel or other fuels at least 100 m from any surface water.

.3 Do not store fuel, oil or other petroleum products over gravel or pervious soils.

.4 Ensure handling and fueling procedures do not contaminate ground or water.

.5 Clearly mark or barricade fuel storage areas and non-portable transfer lines. Ensure markers are visible under all weather conditions.

.6 Construct containment dykes or provide other suitable protective measures to allow cleanup of spills at fuel storage locations

.7 Store waste oils and lubricants in a tank or closed container and ship to an approved recycling facility.

.6 DISPOSAL OF UNSUITABLE EXCAVATED MATERIALS

.1 Properly dispose of unsuitable excavated materials.

.2 Grade designated disposal areas and divert surface runoff around waste sites.

10. Historical and Archaeological Resources:

.1 Take precautions to maintain all resources as they existed at the time of Contract award.

.2 Protect historical or archaeological resources which are discovered in the course of the Work.

.3 Flag an area of 15 m radius around a new find and report to Engineer as soon as possible.

.4 The Owner will pay for Work required to preserve or protect new archaeological finds in accordance with the Contract as unforeseen work.

11. Socio-Economic:

.1 AIR POLLUTION

.1 Use methods and devices to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants.

.2 Do not operate equipment and vehicles that show excessive emissions of exhaust gases or exceed regulations.

.3 Provide all labour, equipment, materials, and means required, to reduce the dust nuisance, and to prevent dust originating from the site or access roads used by the Contractor from damaging crops, cultivated fields, and dwellings, or causing a nuisance or health concern to persons and livestock. The Contractor will be held liable for any damage resulting from dust originating from his operations.

.2 NOISE

.1 Drilling, jackhammering, or other operations producing high-intensity impact noise shall be performed only during daylight unless otherwise approved by the Owner.

.3 LIGHT

.1 Direct all stationary floodlights to shine downward at an angle less than horizontal. Provide shielding for all floodlights and ensure adjacent residences are not in the direct beam of any lights.

12. Care of Water:

.1 SITE CONDITIONS

.1 Be aware that the project area is located in an area where Chinook winds, accompanied with sudden temperature changes, are prevalent.

.2 The Contractor shall protect the Work and adjacent property from damages caused by rain, snow, ice, underground water or any other source of water.

.2 EQUIPMENT AND MATERIALS

.1 Provide all pumps, hoses and related equipment and power sources required for care of water.

.2 Maintain pumps in good operating condition at all times. Have at the Site at all times, at least one standby pump for each category of pump required for care of water.

.3 Install a replacement pump or pumps of equal capacity before removing a pump or pumps for maintenance.

.3 EXECUTION

.1 Design, construct and maintain Temporary Work, construct related Permanent Work, as required for care of water, including all necessary cofferdams, channels, flumes, drains, sandpoints, wells and sumps and other temporary diversion and protective works and furnish all materials required therefore. Furnish, install, maintain and operate all necessary pumping and other equipment, for dewatering the various parts of the work and for maintaining the foundation and other parts of the work free of water, ice and snow from whatever source.

.2 Maintain all sumps, trenches and discharge lines to ensure proper containment and free flow of water to and from the pumps and other diversion and protective works at all times.

.3 Obtain and maintain permits, in addition to those obtained by the City.

.4 Ensure that care of water procedures do not interfere with the operation of the canal system.

.5 Repair damage to any part of the work caused by water or failure of protective works at no extra cost to the City.

.6 Be responsible for additional excavation and subsequent backfill made necessary by water, snow, or ice.

.7 Ensure procedures for “Care of Water” do not cause pollution in the area. Locate and control discharges of water to avoid causing damage to property, pollution of water courses, nuisance on roads, or injury to the public or wildlife.

.8 Furnish, maintain and operate all necessary pumping and vacuum trucks necessary for removing all silt in storm sewers and/or sanitary sewer downstream of the construction zone that has been deposited as a result of care of water required for construction.

.9 Remove or level all cofferdams, drainage ditches or other Temporary Work after having served its purpose so as not to interfere in any way with the operation of any canal system, drainage system or with adjacent landowners.

.10 Make provisions for handling residual water, storm runoff and snowmelt that may enter the canal or excavations.

.11 Make arrangements with the City, landowners and agencies which may be affected by disposal of water, snow and ice.

.12 Remove and dispose of all water, snow and ice from the canal work areas.

END OF SECTION

Section 4 – Measurement Rules

1. Intent:

.1 Requirements specified in this Section apply to measurement of Work for purposes of determining payment under the Contract.

.2 In case of conflict between method of measurement specified in this Section and requirements specified in Measurement Schedule, Section 5, applicable to item of Work in question, the latter shall govern.

2. Measurement System:

.1 Work shall be measured in the International System of Units (SI) in accordance with CAN/CSA-Z234 or latest revision, Canadian Metric Practice Guide.

.2 With respect to measurement for payment the following abbreviations and symbols shall have meanings indicated below:

Abbreviation/Symbol	Unit/Meaning
mm	Millimeter
m	Meter
mm2 or mm^2	Square millimeter
m2 or m^2	Square meter
ha	Hectare
m3 or m^3	Cubic meter
L	Litre
Kg	Kilogram
T	Tonne
no.	Number (quantity)
min	Minute (time)
h	Hour
d	Day
wk	Week
%	Percent
>	Greater than
≥	Greater than or equal to
<	Less than
≤	Less than or equal to
$	Canadian Dollars
°	Degree (angle)
°C	Degree Celsius

Schedule Of Prices:

.3 Schedule of Prices is divided into items for purposes of measurement and payment of Work. Each item shall be deemed to have been prepared in accordance with the methods of measurement specified in the Contract.

.4 Item names in Schedule of Prices identify the work covered by respective item, but do not define the size or nature of the unit.

.5 Item names in Schedule of Prices shall be read as part of the item scope, measurement, and payment requirements to which they apply.

.6 Each price specified in Schedule of Prices includes all costs and charges required to perform the work including overhead charges and profit, and all costs of all related work for which payment is not specified elsewhere.

.7 Subject to the provisions of the Contract, the total amount of Schedule of Prices shall cover all of Contractor's obligations under the Contract and all matters and things necessary for performance of Work in accordance with the Contract.

.8 Payment shall be made only for items specified in Schedule of Prices. Costs and charges not directly provided for in Schedule of Prices shall be deemed to be included therein.

.9 If measurement for payment requirements relating to any price in Schedule of Prices require that such price cover and be considered compensation for certain work or material essential to the item, this same work or material shall not also be measured or paid for under any other item. No item shall be paid for more than once.

.10 Omissions or errors in any item including quantities in the Schedule of Prices shall not invalidate the Contract nor release the Contractor from any of his obligations or liabilities under the Contract.

.11 If arithmetical errors are discovered in the Schedule of Prices, the unit prices shall be considered as representing the Contractor's intentions and the unit price extensions and the total amount entered in the Schedule of Prices will be corrected accordingly by Owner. Contractor shall be bound to such corrected amounts. There shall be no rectification of any errors, omissions or wrong estimates in the prices bid by the Contractor in the Schedule of Prices or in any of his calculations or computations based on the Schedule of Prices.

3. Schedule Of Prices – Divided Bid Items:

.1 Where Divided Bid items are included in the Schedule of Prices or the Measurement Schedule, such items shall be excluded from the provisions for variations specified in the General Conditions.

.2 Include in the Unit Price for the first quantity of the divided item:

.1 Costs and profit for each unit of first quantity.

.2 Contractor's fixed costs for the total quantity of the divided item specified in the Schedule of Prices plus additional quantities as specified in 4.4 Contractor's fixed costs shall include fixed costs for labour, Products, Construction Equipment, Temporary Work, Profit and overhead.

.3 Include in the Unit Price for the quantity of Work over the first quantity, hereinafter called the 'second quantity', cost and profit for each unit of Work, excluding fixed costs included in 4.2.

.4 Where the actual total quantity of the Divided Bid item is less than 120% of the estimated total quantity specified in the Schedule of Prices, the Unit Prices bid for the second quantity shall apply to all quantities in excess of the first quantity.

.5 Where the actual total quantity of the Divided Bid item is more than 120% of the estimated total quantity of the Divided Bid Item, the Contractor's fixed costs per unit of Work shall be calculated by the Owner as follows:

Fixed costs per Unit of work = ((FQUP – SQUP) x FQ)/ TQ

Where: FQUP = First Quantity Unit Price bid

SQUP = Second Quantity Unit Price bid

FQ = First Quantity in the Schedule of Prices

TQ = Total Quantity in the Schedule of Prices

Payment for the actual quantity which exceeds 120% of the total quantity in the Schedule of Prices shall be based on the Unit Price bid for the second quantity plus the fixed costs calculated by the Owner.

.6 The Unit Price for the second quantity of Work shall not exceed the Unit Price for the first quantity. Where a Unit Price for the second quantity of Work is greater in amount than the Unit Price for the first quantity, the Unit price and its extension will be corrected by the Owner to the Unit Price of the first quantity. Accordingly, the Bid will be evaluated, and the Work will be paid for at the Unit Price of the first quantity. Contractor shall be bound to such corrected amounts.

4. Quantities:

.1 Unless otherwise indicated, quantities specified in Schedule of Prices for Unit Price Work are estimated quantities and shall not be considered as actual quantities of work to be performed. Subject to Contract terms, unit prices stated in Schedule of Prices shall be applied to actual quantities of work performed as measured in accordance with Contract.

.2 When it is stated that Contractor shall be paid only for the quantity specified for an item of work, such quantity shall be considered as a fixed quantity and Contractor shall be paid for quantity specified, regardless of actual quantity performed. If a change in Work results in a change in a fixed quantity, such quantity shall be adjusted in accordance with the Contract and payment shall be made for such adjusted quantity.

5. Method Of Measurement:

.1 Unless otherwise indicated in the Contract:

.1 Earthwork materials shall be measured net in place after compaction, with no allowance for bulking, shrinkage or waste.

.2 Contours are approximate only. Actual ground elevation, locations, and coordinates shall be determined in the field during the course of the work for measuring purposes.

.3 Measurement and payment shall not be made for work carried out beyond limits indicated on Drawings or in other Contract Documents.

.2 When boundaries between different items of Unit Price Work are not shown on Drawings or otherwise indicated in Contract Documents such boundaries shall be established by the Owner.

.3 Mass:

.1 Mass shall be measured by weigh scale or by estimated or theoretical mass taken from reference documents, as specified.

.2 Items measured in tonnes shall be measured to two decimal places. Other units of mass shall be measured to the nearest whole unit except that any quantity less than one unit shall be given as one unit.

.3 Work to be measured or proportioned by weigh scale shall be scaled on accurate scales by competent and qualified personnel at locations approved by the Owner.

.4 Length:

.1 Length shall be measured by linear dimension, taken as item on centreline.

.2 Items to be measured by linear dimensions shall be measured parallel to base or foundation upon which such items are placed.

.5 Area:

.1 For rectangular, circular, and regular shaped objects, area shall be measured by square dimensions using mean length and width or radius.

.2 For irregular objects, area shall be measured by the sum of squares, triangles, and circles, etc. as selected by the Owner.

.6 Volume:

.1 Unless otherwise indicated, volume shall be measured by cubic dimensions using mean length, width and height or thickness.

.2 Excavation and fill placement volumes shall be computed using industry accepted methods. Survey cross sections will be taken as required by the Owner.

.7 Time:

.1 Construction Equipment to be paid for on a time basis shall be measured in hours of actual working time and necessary travelling time when under its own power.

.2 Hauling Equipment to be paid for in a time basis shall be measured in hours of actual working time.

.8 Number of items shall be measured on a per item basis.

.9 Lump sum items shall not be measured for payment.

6. Measurement Computation:

.1 Formulae and computer programs used for measurement computation shall be as specified in the Contract or, when not specified as selected or approved by the Owner.

7. Breakdown Of Lump Sum Items:

.1 If requested, Contractor shall submit to the Owner, within 21 days after date of Contract:

.1 A breakdown of each lump sum item included in Schedule of Prices.

.2 A breakdown of mobilization and demobilization items.

.2 Format and content of each breakdown shall be in sufficient detail to identify principal components of work and permit ready valuation of work performed.

8. Measurement of Work:

.1 Unless otherwise specified, the Owner's Representative shall measure Work for purpose of determining payment to Contractor.

.2 Owner's Representative shall, when he requires any part of Work to be measured, request the Contractor to attend with the Owner's Representative in making measurements.

.3 If nevertheless, Contractor does not attend pursuant to 9.2 hereof, measurement made or approved by Owner's Representative shall be considered to be the correct measurement for such part of Work.

.4 Owner's Representative shall prepare survey records and drawings for payment purposes as Work progresses. Owner's Representative may request the Contractor to attend, within 14 days, to examine and agree to such records and drawings. If Contractor does not attend to examine and agree to such records and drawings, they shall be considered to be correct.

.5 If, after attending pursuant to 9.2 or 9.4 hereof, Contractor disagrees with such measurements, they shall nevertheless be considered to be correct unless Contractor, within 14 days after such attendance, notifies Owner's Representative of the respects in which such measurements are claimed by him to be incorrect. On receipt of such notice, Owner's Representative shall review measurements and either confirm or vary them.

END OF SECTION

Section 5 – Measurement Schedule

1. Intent:

.1 Requirements specified in this Section apply to measurement of Work for purposes of determining payment under the Contract.

2. Extra Work Allowances:

.1 Unforeseen Work:

.1 Scope:

Includes unforeseen work for which payment is not included elsewhere; Unforeseen work shall be approved by Owner.

.2 Measurement:

Shall be made by the Owner after assessment of the nature of the unforeseen work; Method of measurement, extent of work and the limit of work shall be agreed to prior to commencing the unforeseen work.

.3 Payment:

Shall be made by an approved change order describing the unforeseen work and setting out the method of payment (i.e. lump sum, unit price and/or force account); Payment amount shall be taken from the Extra Work Allowance provided for in the Contract.

3. General Requirements:

.1 Mobilization/Demobilization & General Requirements:

.1 Scope:

Includes mobilization, demobilization and all related work. Mobilization consists of supplying, transporting to the Site, assembling, erecting, and preparing such Construction Equipment, Temporary Work, and labour necessary to start the Work. Demobilization consists of dismantling, removing, and transporting from the Site, Construction Equipment, Temporary Work, labour, products not incorporated in the Work, and debris; including cleaning of the Site; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere. General Requirements consist of all requirements outlined in Instructions to Bidders, Tender Form and General

Conditions and all related work for which payment is not included elsewhere.

.2 Measurement:

Mobilization and Demobilization and General Requirements will not be measured for payment.

.3 Payment: Lump sum payment as follows:

.1 When 5% of original contract amount is earned, 25% of lump sum bid for Mobilization and Demobilization will be paid.

.2 When 10% of original contract amount is earned, 25% of lump sum bid for Mobilization and Demobilization will be paid.

.3 When 25% of original contract amount is earned, 10% of lump sum bid for Mobilization and Demobilization will be paid.

.4 When 50% of original contract amount is earned, 10% of lump sum bid for Mobilization and Demobilization will be paid.

.5 Upon Substantial Performance the unpaid balance of the lump sum bid in the Schedule of Prices for Mobilization and Demobilization will be paid.

.2 Traffic Accommodation:

.1 Scope:

.2 Provision of all equipment, material and labour for all traffic accommodation; including construction zone and traffic flow requirements necessary to protect pedestrian and vehicular traffic from entering construction areas and to maintain traffic flow as the Work permits. Supply and install all temporary detours, temporary all-weather access to all residents, granular materials for temporary detours, temporary barricades, concrete barriers, delineators, glow posts, flashing lights, signage, flag persons, and other measures to protect the public from the work site, and maintenance of such items; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.3 Measurement:

Traffic Accommodation will not be measured for payment.

.4 Payment: Lump sum payment as follows:

.1 When the contractor commences construction within a roadway, 50% of lump sum bid for Traffic Accommodation will be paid.

.2 Upon Substantial Performance of the Contract, the unpaid balance of the lump sum bid for Traffic Accommodation will be paid.

.3 Sanitary Sewer Bypass Pumping:

.1 Scope:

Provision of all equipment, material and labour required for all sewer bypass pumping required to complete the work, including all cofferdams, channels, flumes, drains, sumps, any temporary diversions and protective works, adherence to noise bylaw, temporary connections, and clean-up. Supply and install all pumps, pump controls, pipes, hoses, connections, primary power, back up pumps, backup power, controls, main plugs/bladders; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Sanitary sewer bypass pumping will not be measured for payment.

.3 Payment: Lump sum payment as follows:

.1 When the Contractor commences sewage bypass pumping 50% of lump sum bid for Sewer Bypass Pumping will be paid.

.2 Upon Substantial Performance the unpaid balance of the lump sum bid in the Schedule of Prices for Sewer Bypass Pumping will be paid.

4. Site Work:

.1 Topsoil Stripping and Stockpiling:

.1 Scope:

Provision of all equipment, material and labour for stripping and stockpiling topsoil as directed by the Engineer; including all loading, hauling, stockpiling, windrowing; and all related work as defined within the specifications for which payment is not included elsewhere.

.2 Measurement:

Shall be on a per cubic meter basis determined by surveys of the topsoil stockpile area made prior to placement of the topsoil stockpile, and again after placement of the topsoil stockpile has been completed.

.3 Payment:

Shall be at the unit price bid in the Schedule of Prices

.2 Asphalt Removal:

.1 Scope:

Provision of all equipment, materials, and labour required for Asphalt Removal; including removal of existing asphalt by milling or other means, loading, hauling, stockpiling, disposal; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be on a per square meter basis.

.3 Payment:

Shall be at the unit price bid in the Schedule of Prices

.3 Common Excavation:

.1 Scope:

Provision of all equipment, material and labour for common excavation; including loosening, digging to the lines and grades established by the engineer, load, haul, stockpile, preparation of fill area, place, spread, and grade to the lines and grades established, shape, and compaction of material to 98% Standard Proctor Density

and +/- 2% of optimum moisture content; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be on a per cubic meter basis determined by surveys of the work area made prior to commencement of excavation and again after excavation has been completed and as derived from neat lines. Only excavation cut will be measured for payment.

.3 Payment:

Shall be at the unit price bid in the Schedule of prices;

No separate payment will be made for unnecessary excavation or excavation work performed beyond established lines or grades unless otherwise authorized by the Engineer.

No separate payment will be made for damages or for unstable soil conditions caused by surface drainage after the commencement of construction and during the maintenance period.

.4 Subgrade Preparation to 150mm Depth: (Refer to the latest revision of the City of Medicine Hat Municipal Works Standards).

.1 Scope:

Provision of all equipment, materials, and labour required to prepare the subgrade in accordance with limit lines, compacted depths, densities, moisture content and grades; including scarifying, moisture conditioning, mixing, shaping, grading, compacting, proof rolling of the subgrade material; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be on a per square meter basis determined by field measurements, to a 150 mm compacted depth of subgrade.

.3 Payment:

Shall be at the unit price bid in the Schedule of Prices.

.5 Supply and Install Granular Sub-base:

.1 Scope:

Provision of all equipment, materials, and labour required to supply and install sub-base granular material in accordance with limit lines, compacted depths, densities, moisture contents and grades specified; including all processing, loading, hauling, placing, moisture conditioning, mixing, shaping, grading, compacting and proof rolling of the sub-base granular material, and supply and installation of all granular materials as per the City of Medicine Hat Municipal Works Specifications Section 5020; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be on a per square meter basis determined by field measurements to a minimum compacted depth of 250 mm of sub-base granular material.

.3 Payment:

Shall be at the unit price bid in the Schedule of Prices.

.6 Supply and Install Granular Base:

.1 Scope:

Provision of all equipment, materials, and labour required to supply and install base granular material in accordance with limit lines, compacted depths, densities, moisture content and grades specified; including all processing, loading, hauling, placing, shaping, moisture conditioning, mixing, grading, compacting, proof rolling of the base granular material and supply and installation of all base granular materials as per the City of Medicine Hat Municipal Works Specifications Section 5020; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be on a per square meter basis determined by field measurements to a minimum compacted depth of 75 mm base granular material.

.3 Payment:

Shall be at the unit price bid in the Schedule of Prices.

.7 Supply and Install Hot Mix Asphalt c/w Prime Coat: (Refer to the latest revision of the City of Medicine Hat Municipal Works Standards).

.1 Scope:

Provision of all equipment, materials and labour required to supply and install hot mix asphaltic concrete in accordance with the mix type, limit lines, compacted depths, densities and grades specified; including all processing, loading, hauling, placing, shaping, grading, raking, ramping around appurtenances, the compaction of hot mix asphaltic concrete, and supply and installation of all asphalt, asphalt binder, aggregate, prime coat, tack coat sand; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be on a per square meter basis determined by field measurements.

.3 Payment:

Shall be at the unit price bid in the Schedule of Prices.

.8 Remove and Dispose of Concrete Monolithic Sidewalk: (Refer to the latest revision of the City of Medicine Hat Municipal Works Standards).

.1 Scope:

Provision of all equipment, materials, and labour required for removal and disposal of existing concrete monolithic sidewalk; including all saw cutting, removal, processing, loading, hauling, and offsite disposal at a suitable location; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be on a linear meter basis measure in the field.

.3 Payment:

Shall be at the unit price bid in the Schedule of Prices.

.9 Supply and Install Standard Monolithic Sidewalk: (Refer to the latest revision of the City of Medicine Hat Municipal Works Standards).

.1 Scope:

Provision of all equipment, materials and labour to supply and install standard monolithic sidewalk in accordance with the existing section, alignment and grade. The work shall include excavation, subgrade preparation, granular base, all forming, Type 50 concrete, vibrating, finishing, protection, back sloping, tie to existing monolithic sidewalk complete with 4-200 mm dowels at each tie-in embedded 100mm into existing concrete, and clean-up. Supply and install all concrete, reinforcing steel, forms, vibrators, finishing equipment; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be on a linear meter basis measured in the field;

.3 Payment:

Shall be at the unit price bid in the Schedule of Prices; where thickness, compressive strengths or air content of any of the work falls below the requirements specified, payment will be adjusted as per section 5210 of City of Medicine Hat Municipal Works Standard Specifications.

5. Water Mains:

.1 Supply and Installation HDPE Pipe and Fittings:

.1 Scope:

Includes trenching and backfilling; supply and installation of bedding and haunching material; waste excavation and hauling; utility locates and crossings (telephone, cable TV, fiber optic, power, potable water pipelines, culvert crossings, gas pipelines, oil pipelines, sanitary sewer pipes, storm sewer pipes, etc.), supply and installation of all HDPE pipe and fittings, thrust blocks, pipe anchors, flushing, pressure testing, disinfection, site restoration, and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be the length measured to the nearest meter at grade for pipe installed.

.3 Payment:

Shall be at the unit price bid therefore in the Schedule of Prices.

.2 Supply and Installation of Non- Potable or Aquifer Lines:

.1 Scope:

Includes trenching and backfilling; supply and installation of bedding and haunching material; waste excavation and hauling; utility locates and crossings (telephone, cable TV, fiber optic, power, potable water pipelines, culvert crossings, gas pipelines, oil pipelines, sanitary sewer pipes, storm sewer pipes, etc.), supply and installation of all pipe and fittings, thrust blocks, pipe anchors, flushing, pressure testing, disinfection, site restoration, and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be the length measured to the nearest meter at grade for pipe installed.

.3 Payment:

Shall be at the unit price bid therefore in the Schedule of Prices.

.3 Supply and Installation PVC Pipe and Fittings:

.1 Scope:

Includes supply, installation backfilling and compaction of all pipe and fittings, thrust blocks, pipe anchors, utility locates and crossings (telephone, cable TV, fiber optic, power, potable water pipelines, culvert crossings, gas pipelines, oil pipelines, sanitary sewer pipes, storm sewer pipes, etc.), trenching and backfilling; supply and installation of bedding and haunching material; waste excavation and hauling; flushing, pressure testing, disinfection, site restoration, and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be the length measured to the nearest meter at grade for pipe installed.

.3 Payment:

Shall be at the unit price bid therefore in the Schedule of Prices.

.4 Supply and Installation of Tracer Wire:

.1 Scope:

Includes supply and installation of 14 gauge, single conductor white copper wire and waterproof connectors taped to the top of pipe every 3 meters and at every joint connection. Provide 1 meter of slack in an expansion coil every 30 metres of installed wire. Tracer wire to terminate and start each run at fire hydrants or as identified by the Owner or indicated on the construction drawings. Terminate tracer wire using approved products. Tracer wire to be terminated on water services using approved connectors.

.2 Measurement:

Incidental with pipe installation.

.5 Supply and Install Gate Valves:

.1 Scope:

Includes trenching and backfilling, bedding and initial backfill, moisture conditioning, shoring, bracing, supply and installation of adapters, buried gate valve, valve box, operating rod and lid, necessary couplers, fittings, concrete thrust blocks, anchors, sacrificial anodes, and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Gate valves will not be measured for payment.

.3 Payment:

Unit price for each valve.

.6 Supply and Install Insert Valves

.1 Scope:

Includes all material, equipment and labour required to complete the work including trenching and backfilling, bedding and initial backfill, moisture conditioning, shoring, bracing, supply and installation of tapping sleeves, adapters, insert valve, valve box, operating rod and lid, necessary couplers, fittings, concrete thrust blocks, anchors, sacrificial anodes, tapping, pipe outside diameter investigation and confirmation, tapping sleeve, pipe inside diameter investigation and confirmation, , independent pressure testing of the installed tapping

sleeve prior to hot tap, and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall not be measured for payment.

.3 Payment:

Unit price for each valve.

.7 Supply and Install Line Stops

.1 Scope:

Includes all material, equipment and labour required to complete the work including trenching and backfilling, bedding and initial backfill, moisture conditioning, shoring, bracing, supply and installation of tapping sleeves, adapters, installing and removing the line stop, fittings, concrete thrust blocks, anchors, sacrificial anodes, pipe outside diameter investigation and confirmation, disinfection, clean tie-in procedures, tapping sleeve, pipe inside diameter investigation and confirmation, independent pressure testing of the installed tapping sleeve prior to hot tap, and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall not be measured for payment.

.3 Payment:

Unit price for each line stop.

.8 Supply and Install Fire Hydrants:

.1 Scope:

Includes trenching and backfilling, bedding and initial backfill, shoring, bracing, supply and installation of Fire Hydrant, 150mm C900 PVC hydrant lead, 150mm gate valve, valve box, operating rod and lid, complete with all necessary fittings, sacrificial anodes, thrust

blocks, all installations and adjustments and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Fire hydrants will not be measured for payment.

.3 Payment:

Unit Price for each hydrant.

.9 Supply and Install Combination Air Valve (CAV):

.1 Scope:

Includes trenching and backfilling, bedding and initial backfill, shoring, bracing, all labour and material required for supply and installation of Combination Air Valve including isolation plug valve, complete with all necessary fittings, sacrificial anodes, thrust blocks, all installations and adjustments and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Combination Air Valve will not be measured for payment.

.3 Payment: Unit Price for each Combination Air Valve.

.10 Flushing Point:

.1 Scope:

Includes trenching, excavating, backfilling, bedding and initial backfill, shoring, bracing, supply and installation of 50 mm corporation stop, 50 mm stop and drain valve complete with box and riser and sump, 50 mm flushing line, plastic valve box and locking lid, thrust blocks and tie to main and all related work for which payment is not included elsewhere.

.2 Measurement:

Flushing Point will not be measured for payment.

.3 Payment:

Unit price for each Flushing Point.

6. Sanitary Sewers:

.1 PVC Pipe and Fittings:

.1 Scope:

Provision of all equipment, material and labour required to supply and install PVC Pipe and Fittings; including trenching, backfill and compaction, waste excavation and hauling, shoring and bracing, flushing, site restoration and supply and installation of all PVC pipe and fittings, bedding and haunching, granular material, utility locates and crossings (telephone, cable TV, fiber optic, power, potable water pipelines, culvert crossings, gas pipelines, oil pipelines, sanitary sewer pipes, storm sewer pipes, etc.); and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be made on a per linear meter basis, in accordance with the pipe size, classification for pipe installed, and pipe depth as specified in the Schedule of Prices. The length shall be field measured horizontally and to the nearest tenth of a meter; from the inside face of the manhole to inside face of the manhole or to the end of pipe where no vault/manhole exists. Pipe depth shall be the difference between the existing ground and the invert of the pipe, taken at the centerline alignment for each pipe during layout of the hub line.

.3 Payment:

Shall be at the unit price bid in the Schedule of Prices.

.2 Concrete Pipe:

.1 Scope:

Provision of all equipment, material and labour required to supply and install Concrete Pipe and Fittings; including trenching, backfill and compaction, waste excavation and hauling, shoring and bracing, flushing, site restoration, and supply and installation of all Concrete Pipe and Fittings, grouting, testing of each joint if specified, bedding and haunching, granular materials, utility locates and crossings (telephone, cable TV, fiber optic, power, potable water pipelines, culvert crossings, gas pipelines, oil pipelines, sanitary sewer pipes, storm sewer pipes, etc.); and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be made on a per linear meter basis, in accordance with the pipe size and classification for pipe installed, and pipe depth as specified in the Schedule of Prices. The length shall be field measured horizontally and to the nearest tenth of a meter; from the inside face of the manhole to inside face of the manhole or to the end of pipe where no vault/manhole exists. Pipe depth shall be the difference between the existing ground and the invert of the pipe, taken at the centerline alignment for each pipe during layout of the hub line.

.3 Payment:

Shall be at the unit price bid in the Schedule of Prices.

.3 Sanitary Manholes, Complete:

.1 Scope:

Provision of all equipment, material and labour for supply and installation of complete precast concrete manholes and vaults; including excavating base preparation, backfilling and compaction, waste excavation, hauling, placing, grouting, shoring and bracing, and supply and installation of granular material; lean concrete; base; manhole barrels; ladder rungs; slab top; collars; rubber riser rings; waterproofing manholes in high groundwater areas; frame & cover; cast-in pipe stubs; precast benching, cast-in-place benching, grouting; all pipe tie-ins to manhole; all adjustments; and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Shall be on a per vertical meter unit basis as specified in the Schedule of Prices. The length shall be field measured vertically and to the nearest tenth of a meter, from the top of the floor of manhole/vault to outside rim of manhole/vault in accordance with the manhole size specified in the Schedule of Prices.

.3 Payment:

Shall be at the unit price bid in the Schedule of Prices.

.4 Supply and Install Combination Air Valve (CAV):

.1 Scope:

Includes trenching and backfilling, bedding and initial backfill, shoring, bracing, all labour and material required for supply and installation of Combination Air Valve including isolation plug valve, complete with all necessary fittings, sacrificial anodes, thrust blocks, all installations and adjustments and all related work as defined within the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Combination Air Valve will not be measured for payment.

.3 Payment: Unit Price for each Combination Air Valve.

.5 Video Inspection to City of Medicine Hat Standards:

.1 Scope:

Provision of all equipment, material and labour required for video inspection of new sewer mains to City of Medicine Hat standards. To be completed after installation of the sewer, but prior to putting the lines into service; including all flushing, camera inspection, and all related work as defined in the specifications and as shown on the drawings for which payment is not included elsewhere.

.2 Measurement:

Video Inspections shall be measured for payment on a linear meter basis or lump sum basis.

.3 Payment:

Shall be at the price bid in the Schedule of Prices.

7. Water and Sanitary Services:

.1 Water and Sewer Services:

.1 Scope:

Includes all work required to install service connections to 3 m inside property line or in the case of a gas and/or electric R.O. W., 5.0 m. Includes trenching and backfilling, bedding and initial backfill, shoring, bracing, locating other utilities; utility crossings, supply and installation of water service pipe, sanitary service pipe, storm sewer service pipe (if required), curb stop, corporation stop, plugs, saddles, tie into mainline, marker post, and all necessary fittings, thrust

blocking, flushing, hydrostatic testing and disinfecting and all other related work for which payment is not included elsewhere.

.2 Measurement:

Water and Sewer services will not be measured for payment.

.3 Payment:

Unit price for each Water and Sewer Service.

END OF SECTION

Section 6 – Roadway Excavation and Embankment

PART I - GENERAL

1.1 Definitions:

.1 Excavation classes:

.1 Topsoil Stripping:

Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding

.2 Re-spreading of Topsoil:

Material obtained from onsite stockpile suitable for top dressing landscaping and seeding

.3 Supply and Place Topsoil:

Material obtained from offsite sources to be used for top dressing, landscaping and seeding

.4 Common Excavation:

Excavation of all materials of whatever nature, which are not included under the definition of topsoil or solid rock, including dense tills, hardpan, frozen materials and partially cemented materials which can be ripped and excavated with heavy construction equipment. Only suitable material shall be used for roadway embankment construction

.5 Borrow Excavation:

Borrow excavation shall consist of the excavation of and placing of excavated material obtained from locations outside the project limits. The widening of roadway cuts and the excavation for ditches will not be considered "borrow". Only suitable material shall be used for roadway embankment construction

.6 Waste Excavation:

Excavation, hauling, disposing and leveling within the limits of the contract or at designated disposal areas of materials which are surplus or unsuitable for roadway embankment but not of materials classified as "rock excavation"

.7 Suitable Material:

Suitable material is defined as material obtained from common or borrow excavations that is free of organic, wet or frozen materials, that is suitable for compacted embankment construction

.8 Unsuitable Material:

Unsuitable material is defined as materials that are organic, wet or frozen obtained from common or borrow excavations that are not suitable for complicated embankment construction

.2 Embankment:

Material derived from suitable, approved excavation and placed above original ground or stripped surface up to subgrade elevation

.3 Pavement Structure:

Combination of layers of unbound or stabilized granular sub base, base, and asphalt or concrete surfacing

.4 Subgrade Elevation:

Elevation immediately below pavement structure

.5 Sub-grade Preparation:

Scarifying and compacting of top 300 mm of subgrade, drying or adding water, fine grading, draining water, repairing subgrade damaged by rain and any other work incidental to compliance with the requirement of this specification

1.2 Measurement for Payment

.1 Excavation:

The unit of measure of all classes of excavation will be cubic meter, and the quantity paid for will be the actual number of cubic meters of material excavated, utilized and/or disposed of, as measured in its original position. If so ordered, material suitable for special use, excavated during the progress of the work, shall be reserved and stockpiled in locations as designated by the Engineer. The material reserved will be paid for at the prices bid per cubic meter of excavation for the various classes of material excavated.

.2 Embankment:

The placing of materials in embankments will not be paid for directly, but will be considered part of the work paid for as excavation of the various classes as designated and measured as specified herein.

.3 Preparation of Existing Ground Surface:

The cost of scarifying the ground following the excavation of undesirable soil, scarifying and compacting the surface layer of old roadbeds, and scarifying smooth firm surfaces to obtain bond, shall be included in the unit price bid for excavation. The required excavation of unsuitable material encountered in old roadbeds and in the preparation of the existing ground surface will be paid for at the price bid per cubic meter for "Waste Excavation".

.4 Compaction:

Compaction will not be paid for directly, but shall be considered part of the work paid for as excavation of the various classes as designated and measured as specified herein. Moisture conditioning, including drying out of wet material or adding water to dry materials will not be paid for directly, but shall be included in the unit price bid for excavation. Where the grade line is in cut, the subgrade excavated below grade reconstructed in 0.15 m layers and compacted as directed by the Engineer will be paid for at the prices bid per cubic meter of excavation for the classes of material excavated.

.5 Subgrade preparation and compaction of top 300 mm to be measured in square meters.

.6 Excavation of sub-grade materials in cut sections to correct deficiencies discovered during proof-rolling will be measured for payment as common excavation. Backfill of sub-grade with suitable common materials will be measured for payment as common excavation and subgrade compaction. Deficiencies refer to pre-existing, unsuitable materials and do not include deficiencies discovered in trench backfill.

.7 The cost of proof-rolling shall be considered incidental to the work of this section.

.8 No measurement to be made for:

.1 Unnecessary excavation beyond lines established.

.2 Extra handling of windrowed materials blended on embankment slopes.

.3 Handling and repair of unstable soil conditions or damage caused by surface drainage after commencement of construction and during the maintenance period.

PART 2 - PRODUCTS

2.1 Materials

.1 Embankment material requires approval and must be suitable as described above.

.2 Materials used for embankment not to contain organic matter, frozen lumps, weeds, sod, roots, logs, stumps, cobbles or rock fragments greater than 75 mm, or any other objectionable matter.

PART 3 - EXECUTION

3.1 Compaction Equipment

.1 Compaction equipment must be capable of obtaining required densities in materials on project.

.2 Compaction equipment not specified herein is to be efficiency proved at no extra cost and written approval must be received from Engineer before use.

3.2 Water Distributors

.1 Apply water with equipment capable of uniform distribution.

3.3 Excavating

.1 General:

.1 Advise Engineer sufficiently in advance of excavation operations for initial cross sections to be taken.

.2 Maintain crowns and cross slopes to provide good surface drainage.

.3 Notify Engineer wherever unsuitable materials are encountered in cut sections and remove unsuitable materials to depth and extent directed.

.4 Dispose of waste material to disposal areas identified on drawings.

.5 Locate utility lines, fencing, survey reference points, instrumentation, culverts and all other existing facilities before commencement of Work; protect these items from damage.

.6 Remove and dispose of all water, snow and surface ice prior to excavation.

.7 Prevent loss of soil and sloughing of slopes if springs or seepage are encountered within the excavation.

.8 Excavate all surfaces to within +/- 20 mm of the lines, grades and elevations shown in the Contract Documents.

.2 Topsoil Stripping:

.1 Strip top soil from areas and to depths indicated or directed prior to beginning of excavation and embankment work. Avoid contamination of top soil and underlying soil.

.2 Topsoil excavated to be stockpiled in a location as directed by Engineer.

.3 Waste Excavations:

.1 Notify Engineer whenever unsuitable materials are encountered in cut or embankment sections and remove unsuitable materials to depth and extent directed.

.2 Dispose of waste excavation off-site at a suitable location.

.4 Borrow Excavation:

.1 Completely use in embankment, suitable materials removed from excavations before taking material from borrow areas.

.2 Obtain from borrow areas additional suitable embankment material.

.1 Engineer to designate location and extent of borrow areas, and allowable depth of cutting.

.2 Shape edges of borrow areas on slopes as directed by Engineer and provide drainage.

.3 Trim and leave borrow pits in a condition to permit accurate measurement of material removed.

.5 Side Ditches:

.1 Construct side ditches to depths and widths indicated on drawings, to permit ready flow of surface water.

.2 Maintain and keep ditches open and free from debris until final acceptance of work.

.6 Haul Routes:

.1 Haul routes and hauling equipment to be approved by Engineer.

.2 Keep haul routes clean and free of dust and spilled material.

.3 Provide adequate traffic control and warning signs on haul routes to ensure safety of public.

.7 Subgrade Preparation:

Where the grade line is in cut, the subgrade shall be excavated to a minimum depth of 0.30m below the grade line, or as directed by the Engineer. This subgrade shall then be reconstructed in layers, as specified, and compacted to a minimum of 100 per cent of Standard Proctor Density as specified in 3.5.3.

3.4 Embankments

.1 When directed, scarify or bench existing slopes in side hill or sloping sections to ensure a proper bond between new materials and existing surfaces. Obtain prior approval of method to be used.

.2 Do not place material which is frozen or place material on frozen surfaces.

.3 Where the embankment to be placed traverses muskeg or yielding ground where it is not possible to place the initial embankment lift required in 0.15 m compacted depths, the Contractor may, upon approval of the Engineer, construct the first embankment lift to a depth sufficient to support the construction equipment. All embankments to be constructed above this support will be constructed in 0.15 m in compacted depths as hereinbefore specified.

.4 Maintain a crowned surface during construction to ensure ready run-off of surface water.

.5 Place and compact to full width in uniform layers not exceeding 200 mm loose thickness. Engineer may authorize thicker lifts if specified compaction can be achieved.

.6 Compaction over the entire surface area of each layer shall be obtained by the use of tamping rollers, or such other equipment satisfactory to meet the density requirements specified. When compaction equipment other than the tamping roller is used, the required density shall be obtained uniformly throughout each layer. Hauling equipment will not be accepted in lieu of compaction equipment.

.7 Compact each layer to a minimum 98% of standard Proctor maximum dry density except last 300 mm up to sub-grade elevation. Compact last 300 mm to 100% of standard Proctor maximum dry density.

.8 Material is to be placed at +/- 2% of the optimum moisture content. Where moisture content tests indicate that material being used for embankment is too wet or too dry to compact under rolling, the material shall be thoroughly worked until its optimum moisture content is reached.

.9 Suspend all earthwork operations at any time when satisfactory work cannot be conducted on account of rain, floods, cold weather or other unsatisfactory conditions.

.10 Schedule fill placement operations such that the foundation areas or previously compacted earthfill does not freeze and that compacted earthfill is not placed on frozen subgrade. Remove and replace any such frozen layers of compacted earthfill at no cost to the City.

3.5 Sub-grade Preparation

.1 Remove soft or other unstable material that will not compact properly and fill resulting depressions with approved material.

.2 Shape and compact entire sub-grade to within 10 mm of design elevations but not uniformly high or low.

.3 Scarify top 300 mm and thoroughly compact roadbed, shaped to grades and cross-sections specified. Compact to 100% of standard Proctor maximum dry density at +/- 2% of optimum moisture content.

.4 Finish side slopes to a neat condition true to lines and grades specified.

.1 Remove boulders or other unsuitable material encountered in cut slopes and fill resulting cavities.

.2 Hand finish slopes that cannot be finished satisfactorily by use of machine.

.5 The Contractor shall be responsible for providing interim drainage to prevent damage to the work or the causing of unstable conditions due to high moisture content. No separate payment will be made for this work.

.6 The subgrade shall pass density and proof rolling requirements prior to the placement of granular materials.

3.6 Proof Rolling

.1 Subgrade proof rolling shall be performed on a daily basis prior to the placement of granular materials and immediately after the subgrade material has been placed, shaped and compacted as specified. The Contractor shall provide and operate a loaded vehicle with a minimum GVW

of 18,200 KG. The loaded vehicle shall be driven slowly (walking pace) in a systematic pattern so that each successive pass is next to or partially overlaps the previous pass. Where the area to be tested is large enough, successive passes shall be conducted at right angles across the previous passes. While the test is being performed, the Engineer, Municipal Works Representative, and Geotechnical Testing personnel shall observe the surface for deflections, cracking or rutting.

.2 Once the proof roll is complete and deficient areas have been sub cut and repaired, the contractor is now responsible for the condition of the road. Any further road failures in the future due to weather or any other conditions shall be the responsibility of the contractor to repair at his cost.

.3 Where an area of subgrade deflects, then rebounds more than 10 mm, the area will be deemed as failing the proof roll test. The failed areas identified by the Engineer shall be repaired to a passing condition and re-tested by proof roll method again at no cost to the City.

3.7 Maintenance

.1 Maintain finished surfaces in a condition conforming to this section.

END OF SECTION

Section 7 – Trenching, Backfilling and Compaction

PART I - GENERAL

1.1 Related Work Specified Elsewhere

.1 Manholes - Section 8

.2 Sanitary Sewers - Section 9

.3 Water mains - Section 10

.4 Service Connections - Section 11

1.2 Detailed Drawings

.1 Following detail drawings are appended hereto and form part of this Section:

- EU-109: Standard Pipe Bedding and Backfilling Details

1.3 Definitions

.1 Common Material:

Materials of whatever nature which are not included under the definition of solid rock, including dense tills, hardpan, frozen materials and partially cemented materials which can be ripped and excavated with heavy construction equipment

.2 Top Soil:

Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding

.3 Cohesionless soil for compaction purposes:

.1 Materials having less than 20% passing 75 micrometer sieve, regardless of plasticity of fines

.2 Materials containing between 20% and 50% passing 75 micrometer sieve and having a liquid limit less than 25 and plasticity index less than 6 when tested to ASTM D423 and ASTM D424

.4 Cohesive Soil:

For compaction purposes, is soil not having properties classified as cohesionless

1.4 Protection

.1 Existing Buried Utilities:

.1 Size, depth and location of existing utilities as indicated are for guidance only; completeness and accuracy are not guaranteed. Contractor to confirm pipe material and size and review the information with the Owner of the utility.

.2 Prior to commencing any excavation work review Ground Disturbance Code of Practice and notify applicable utility authorities; establish location and state of use of buried services. Clearly mark such locations to prevent disturbance during work.

.3 Maintain and protect from damage; water, sewer, gas, electric, telephone, fiber optics and other utilities encountered.

.4 Obtain direction of owner of utility and Engineer before moving or otherwise disturbing utility.

.2 Existing Surface Features:

.1 Protect existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving located within right-of-way of adjoining properties from damage while work is in progress and repair damage resulting from work.

.2 Where excavation necessitates root or branch cutting; do so only as approved by Engineer.

.3 Shoring and Bracing:

.1 Whenever shoring, sheeting, timbering and bracing of excavations is required, engage services of a Professional Engineer to design and assume responsibility for adequacy of shoring and bracing. The Professional Engineer shall be registered in Alberta.

.2 When requested, submit for review drawings and calculations signed and stamped by the Professional Engineer responsible for their preparation.

.3 Shoring and bracing shall be inspected by the Professional Engineer responsible for their preparation.

.4 Close sheeting, when required, shall be designed and constructed to prevent adjacent soil from entering excavation and to control water infiltration.

.4 Maintain unobstructed access to fire and police appurtenances, telephone, electric, water, sewer, gas and other public utilities and private properties.

.5 Protect open excavation against flooding and damage from surface water run-off.

.6 Protect the public at all times by securing access to open excavation site(s). Secure all open excavations(s) when daily construction activities cease.

1.5 Measurement for Payment

.1 Work performed under this Section will be incidental to work involved in Section 8, 9, 10, and 11.

.2 Trenching, bedding, backfilling and compaction for electrical ducts will be paid as a separate item based on meters of trench excavated.

PART 2 – PRODUCTS

2.1 Materials

.1 Common Backfill:

.1 Suitable Material shall be used as common backfill, which is defined as selected material obtained from trench, common or borrow excavations that is free of organic, wet or frozen materials, that is suitable for compacted backfill construction.

.2 Backfill to be moisture conditioned to +/- 2% of the optimum moisture content as determined by ASTM D698.

.2 Pipe Bedding Materials:

.1 Granular materials, general.

.1 Gradation shall be within specified limits when tested to ASTM C136-81 and ASTM C117-80 (AASHTO T11-78 and T2k7-78) and giving a smooth curve without sharp breaks when plotted on a semi-log grading chart

.1 Bedding Gravel: crushed gravel to following grading requirements:

ASTM Sieve	Percent Passing (%)
25 mm	100

20 mm	95-100
10 mm	60-80
5 mm	40-60
1.25 mm	20-40
0.630 mm	9-22
0.080 mm	4-10

.2 Bedding Sand: sand to following grading requirements (CSA A23.1):

ASTM Sieve	Percent Passing (%)
10 mm	100
5 mm	95-100
2.5 mm	80-100
1.25 mm	50-90
0.630 mm	25-65
0.315 mm	10-35
0.160 mm	2-10
0.080 mm	0-1

PART 3 – EXECUTION

3.1 Site Preparation

.1 Remove trees, shrubs, vegetation, fences and other obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.2 Strip top soil from within limits of excavation and stockpile as directed for re-spreading after backfilling.

3.2 Dewatering

.1 Keep excavations dry while work is in progress.

.2 Dispose of water in a manner not detrimental to public health, environment, public and private property, or any portion of work completed or under construction. Refer to Section 3 – Environmental Protection, Clause 12 – Care of Water.

3.3 Excavation

.1 Excavate to lines, grades, elevations and dimensions indicated on the Contract Documents. For pipe trenches, comply with the Pipe Trench Width Schedule.

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

.3 Notify Engineer when soil at proposed elevation of trench bottom appears unsuitable for foundation of installation.

.4 Remove unsuitable material from trench bottom to extent and depth directed by Engineer.

.5 Unless otherwise authorized by Engineer in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.6 Stockpile suitable excavated materials required for trench backfill in approved location.

.7 Dispose of surplus and unsuitable excavated material in approved location on site.

.8 Do not obstruct flow of surface drainage or natural water courses.

.9 Secure all open trenches at the end of daily operations.

.10 Limit the length of open trench to 50 meters or less and the work zone to 100 meters or less at any location.

3.4 Trench Bottom Preparation

.1 Where required due to removal of unsuitable material or unauthorized over-excavation, bring bottom of excavation to design grade with approved material.

.2 Compact trench bottom to density at least equal to density of adjacent surrounding soil.

.3 Grade and shape pipe trench to give uniform and even bearing for each length of pipe.

3.5 Pre-Installation Inspection

.1 Excavations require inspection and approval prior to commencement of installation operations.

3.6 Backfilling

.1 Do not proceed with trench backfilling operations until Engineer has inspected and approved installations.

.2 Use suitable material as indicated.

.3 Backfilling around installations:

.1 Place bedding and surround material as specified in Sections 8, 9, 10, and 11.

.2 Do not backfill around or over cast-in place concrete within 24 hours after placing.

.3 Place layers simultaneously on both sides of installed work to equalize loading.

.4 Do not place backfill in freezing weather without written permission of Engineer.

.5 Backfill trenches using fill materials as specified in Backfilling Schedule.

.6 Place fill materials in layers not exceeding loose thickness specified in Backfilling Schedule.

.7 Uniformly compact each layer of fill to minimum percentages of Standard Proctor Density specified in Backfilling Schedule.

.8 Uniform moisture content of each layer of fill to be within the Optimum Moisture Content limits specified in Backfilling Schedule.

.9 Where a trench box and/or cage is employed, the Contractor shall ensure that the pipe installation and pipe zone compaction requirements are met. Refer to Uni-Bell's, Current Edition of "Handbook of PVC Pipe - Design and Construction" for trench box/cage design and methods of installation.

.10 When there is granular material placed in the pipe zone, a compacted clay plug shall be installed at a minimum interval of 75 meters, where practical.

.11 When compacting in the pipe zone, care should be taken to avoid contact between the pipe and the compaction equipment (mechanical tampers, tamping bars, etc.).

.12 Compaction in the haunch area is to be obtained by use of mechanical tampers and tamping bars. Care should be taken to ensure that the pipe does not “float” due to the compacting methods.

.13 When compacting initial backfill, mechanical tampers are to be used adjacent to the pipe. Mechanical tampers shall not be used directly above the pipe until a minimum of 300 mm of backfill material is in place above the pipe.

.14 When compacting backfill in the intermediate zone, roller compacting equipment is not to be used until a minimum of 500 mm of backfill material has been placed above the top of pipe.

.15 The use of hydro-hammer in the pipe zone shall not be permitted.

.16 When compacting backfill in the intermediate zone, hydro-hammer is not to be used until a minimum of 1000 mm of backfill material has been placed above the top of pipe.

3.7 Pipe Trench Width

.1 Except as otherwise specified, minimum and maximum trench widths, up to a point 300 mm above top of pipe, shall be as specified in Pipe Trench Width Schedule.

.2 Maximum trench widths indicated in Pipe Trench Width Schedule exclude an allowance for shoring.

.3 Trench width at any point shall not be less than trench width at any depth below such point.

3.8 Pipe Trench Width Schedule – For Flexible Pipe

Pipe Size (Outside Diameter)	Minimum Trench Width	Maximum Trench Width
850 mm diameter or less	300 mm greater than external pipe diameter	600 mm greater than external pipe diameter or 750 mm total trench width, whichever is greater
Greater than 850 mm diameter	300 mm greater than external pipe diameter	600 mm greater than external pipe diameter

3.9 Pipe Trench Width Schedule – For Rigid Pipe

Pipe Size (Outside Diameter)	Minimum Trench Width	Maximum Trench Width
850 mm diameter or less	300 mm greater than external pipe diameter	600 mm greater than external pipe diameter or 750 mm total trench width, whichever is greater
Greater than 850 mm diameter	300 mm greater than external pipe diameter	600 mm greater than external pipe diameter

3.10 Backfilling Schedule

Location	Fill Material	Max. Lift Thickness	Minimum Compaction	Moisture Content*
Pipe Zone - pipe bedding				
Class B	Approved Granular Material Select Native Material	150 mm	95 %	±2%
Class C		150 mm	95 %	±2%

Pipe Zone – haunching				
Class B	Approved Granular Material	150 mm	95 %	±2%
	Select Native Material			
Class C		150 mm	95 %	±2%
Pipe Zone – initial backfill				
Class A & B	Approved Granular Material	150 mm	95 %	±2%
Class C	Select Native Material	150 mm	95 %	±2%
Intermediate Zone				
Class A & B	Select Native Material	300 mm	98 %	±2%
Class C	Select Native Material	300 mm	98 %	±2%
Final Zone – from 300m below subgrade				
Class A & B	Select Native Material	300 mm	100 %	±2%
Class C	Select Native Material	300 mm	100 %	±2%

*Moisture Content refers to plus or minus the optimum moisture content as determined by ASTM D698.

3.11 Restoration

.1 Replace top soil as directed by Engineer.

.2 Reinstate pavement and sidewalks to condition and elevation which existed before trenching.

.3 Clean and reinstate areas affected by work as directed.

END OF SECTION

Section 8 – Manholes

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Trenching, Backfilling & Compaction: Section 7

.2 Sanitary Sewers: Section 9

.3 General Concrete: Section 12

1.2 Measurement for Payment

.1 Manholes shall be paid within the various type classifications measured from top of cover to lowest pipe invert.

.2 Asphalt surrounding manholes in ditches considered incidental to that item and included in the unit price.

.3 Refer to Section 4 Measurement Rules and 5 Measurement Schedule for further information.

1.3 Detailed Drawings

.1 Following detail drawings are appended hereto and form part of this Section:

- EU-101: Standard Manhole Type 1220 A
- EU-102: Type I-S Manhole
- EU-103: Drop Manhole
- EU-104: Internal Drop Manhole
- EU-105: Benching Standards for Manholes
- EU-106: Manhole Invert Arrangement Intersection Less than 90 degrees
- EU-107: Benching Detail for Manhole In Cul-De-Sac
- EU-108: Standard Manhole Cover and Frame Details
- EU-113: Industrial/Commercial Site Servicing Sampling Manhole Details
- EU-114: Industrial/Commercial Offset Sampling Manhole Details

PART 2 – PRODUCTS

2.1 Materials

.1 Concrete:

.1 Cement: to CAN3-A5, Type 50.

.2 Concrete mix design to produce 25 MPa minimum compressive strength at 28 days and containing 20 mm maximum-size coarse aggregate, with water/cement ratio to CAN3-A23.1, table 7 for class A exposure and 75mm slump at time and point of deposit.

.2 Precast manhole sections:

To ASTM C478, circular or oval. Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.

.3 Reinforcing steel to CSA G30.12

.4 Welded steel fabric to CSA G30.5

.5 Wire ties to CSA G30.3

.6 Joints:

To be made watertight by using:

- Boot Connection
- Grout Connection (c/w water stop)
- Kwik-Seal (Precon)
- A-Lok (Precon)
- Link Seal
- Or equivalent as approved by Engineer

New holes to be cored into manhole barrel.

.7 Mortar:

.1 Aggregate: to CSA A82.56

.2 Cement: to CAN3-A8

.8 Ladder rungs:

To ASTM C478, 20 mm diameter aluminum step (drop step type)

.9 Adjusting rings:

To ASTM C478

.10 Concrete Brick:

To CSA A165.2

.11 Frames, covers to plan dimensions and following requirements:

.1 Metal covers to bear evenly on frames. A frame with cover to constitute one unit. Assemble and mark unit components before shipment.

.2 Gray iron castings to ASTM A48 class 20.

.3 Manhole frames and covers as per Standard Drawing EU-108 in Section 13 Standard Drawings.

PART 3 – EXECUTION

3.1 Excavation and Backfill

.1 Excavate and backfill in accordance with Section 7.

.2 Obtain approval by the Engineer before installing manholes.

3.2 Concrete Work

.1 Do concrete work in accordance with Section 12.

.2 Position metal inserts to dimensions and details indicated.

3.3 Installation

.1 Construct units to details indicated, plumb and true to alignment and grade. Excavate for installation of manholes to the required depths and lateral dimensions to allow for the safe and accurate installation of the structure. Comply with all safety requirements.

.2 Complete units as pipe laying progresses.

.3 Pump excavation free of standing water. Remove soft and foreign material before placing concrete base and replace with compacted native material or compacted granular material to bridge the unstable subgrade conditions.

.4 Cast bottom slabs directly on undisturbed ground or when permitted by Engineer, set precast concrete base on a minimum of 150 mm of well graded, approved granular material compacted to 100% Standard Proctor Density.

.5 For Precast Units:

.1 For Sanitary Manholes:

Make each successive joint watertight with approved rubber ring gaskets or an approved butyl rubber compound.

.2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses. Do not flush debris into sewer.

.3 Plug all lifting holes with non-metallic, non-shrink grout or epoxy resin cement to make a watertight seal. In areas of high ground water conditions use an approved bitumastic riser – wrap on all submerged joints or an approved equivalent.

.4 For manholes ensure the ladder rungs are aligned in a straight vertical line. The hole in the slab top shall be aligned with the ladder rungs. Top ladder rung should not exceed 600 mm below top of manhole rim. Ladder position to be aligned above largest portion of clear benching.

.5 Unused channels in manhole to be sealed off at manhole wall using grout or other permanent method approved by Engineer.

.6 For sewers:

.1 Place stub outlets and bulkheads at elevations and in positions indicated.

.2 Bench to provide a smooth U-shaped channel. Side height of channel to be 0.50 times diameter of sewer. Slope adjacent floor at 1 to 10. Curve channels smoothly. Slope invert to established sewer grade.

.3 All pipe laterals entering manhole to discharge directly into channel (not onto bench). Cut out top half of pipe where lateral extends to channel from manhole wall to end of lateral pipe.

.7 Installing units in existing systems:

.1 Where a new unit is to be installed in an existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.

.2 Make joints watertight between new unit and existing pipe.

.3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready to be put in operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.

.8 Place frame and cover on top section to elevation indicated. If adjustment required, use concrete and composite rubber ring as per Standard Manhole

Type 1220 A (EU-101). Refer to Industrial / Commercial Site Servicing Sampling Manhole Detail (EU-113) and Industrial / Commercial Offset Sampling Manhole Detail (EU-114).

.9 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

.10 After installation of the units, backfill the excavated area around the manholes with compacted backfill to the lines, grades and elevations shown in the Contract Documents. Exercise care to ensure that the backfill is brought up evenly around the manholes. Compact backfill in accordance with backfill as per Section 7 – Trenching, Backfilling and Compaction.

.11 Do not displace the alignment of unit sections during backfill operation.

.12 Clean all manholes of debris preventing any large debris from entering the new or existing system. When paving roads, avoid spraying oil on manhole covers and remove all excess asphalt from manhole covers.

.13 Where a manhole requires additional laterals, the contractor must have the added holes saw cut or cored.

.14 Environmental Utilities requires new multi-family housing (6 plex and larger), institutional, commercial, and industrial customers to install - at their expense - a monitoring/sampling manhole on the service line from the facility to the sewer main in accordance with City Sewer Bylaw 1541, Clause 509.

3.4 Tolerance

.1 Maintain constructed grade to within +/– 5mm from the lines, grades and elevations shown in the Contract Documents.

END OF SECTION

Section 9 – Sanitary Sewers

PART 1 GENERAL

1.1 Related Work

.1 Trenching, Backfilling & Compaction: Section 7

.2 Manholes: Section 8

.3 General Concrete: Section 12

1.2 Scheduling of Work

.1 Schedule work to minimize interruptions to existing services. Provide two (2) working days minimum notice when an existing line is to be interrupted.

.2 Maintain existing sewage flows during construction.

.3 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.3 Measurement of Payment

.1 Excavation backfill and compaction, including bedding, shoring, bracing, moisture conditioning and de-watering if required, will be considered incidental to work in this Section.

.2 Supply and installation of sanitary sewer including excavation, testing, backfilling and compaction will be measured horizontally from center of manhole to center of manhole in meters of each designated size and type of pipe completely installed. No depth classification will be made unless otherwise noted by the Engineer.

.3 Refer to Section Measurement Rules 4, Measurement Schedule 5.

1.4 Detailed Drawings

.1 Following detail drawings are appended hereto and form part of this Section:

- EU-111: Method for Supporting Pipes Crossing Other Utilities

PART 2 – PRODUCTS

2.1 Plastic Pipe

.1 Type PSM Poly Vinyl Chloride 200mm to 375 mm: to ASTM D3034

.1 Standard Dimensional Ratio (SDR): 35

.2 Locked-in gasket and integral bell system

.3 Nominal lengths, 4m

.4 CSA certified to CAN/CSA B182.2

.2 Type Poly Vinyl Chloride 450mm to 900 mm: to ASTM F679

.1 Standard Dimension Ratio (SDR): 35

.2 Locked-in gasket and integral bell system

.3 Nominal lengths, 4m

.4 CSA certified to CAN/CSA B182.2

2.2 Concrete Pipe

.1 Non-Reinforced Circular Concrete Pipe 200mm to 300 mm: to ASTM C14M

.1 CSA certified to CAN/CSA-A257, Series-M

.2 CSA A23.1 certified Type HS concrete

.3 Flexible rubber gasket joints to ASTM C443M

.2 Reinforced Circular Concrete Pipe 300mm to 3660 mm: to ASTM C76M

.1 CSA certified to CAN/CSA-A257, Series M

.2 CSA A23.1 certified Type HS concrete

.3 Flexible rubber gasket joints to ASTM C443M

.4 For pipe with lifting holes, provide fabricated plug to seal hole and grout in place

2.3 Combination Air Valve (CAV)

.1 Combination Air Valve (CAV). The valve to be designed to operate with liquids carrying solid particles. The CAV discharges gases during the filling, charging and operation of the system (wastewater transmission main). When the system pressure drops below atmospheric pressure, the CAV allows air back into the system.

.1 Combination Air Valves body to be stainless steel construction and approved for use for wastewater.

.2 Working pressure range required 3 – 250 psi (21 – 1,725 kPa).

.3 Must be sized for minimum and maximum flows.

.4 All inner parts must be constructed of stainless steel including O-Ring, Domed Nut, Spring, Washer, Stem, Float, Bolt & Nut.

.5 Upper body (camlock fitting) and cover to be Reinforced Nylon.

.6 Valve to be flange connected. A plug valve is required to isolate the CAV from the system.

.2 Approved Products:

.1 A.R.I. D-020

.2 Approved Equivalent

2.4 Pipe Bedding Materials

.1 Refer to Section 7 – Trenching, Backfilling and Compaction.

2.5 Backfill Materials

.1 Refer to Section 7 – Trenching, Backfilling and Compaction.

PART 3 - EXECUTION

3.1 Preparation

.1 Installation and handling of pipe shall be according to the manufacturer's recommendations and applicable ASTM or CSA Standards for the type of pipe selected or as specified herein.

.2 Clean pipes and fittings of debris and water before installation. Inspect materials for defects before installing. Remove defective materials from site.

3.2 Trenching and Backfill

.1 Do trenching and backfill work in accordance with Section 7- Trenching, Backfilling, and Compaction.

.2 Trench line and depth require approval prior to placing bedding material and pipe.

.3 Do not backfill trenches until pipe grade and alignment have been checked and accepted.

.4 Remove wet silty clay to disposal site.

3.3 Granular Bedding

.1 Place granular bedding materials in accordance with details indicated or directed.

.2 Shape bed true to grade and to provide continuous, uniform bearing surface for barrel of pipe. Do not use blocks when bedding pipe.

.3 Shape transverse depressions as required to receive bell if bell and spigot pipe is used.

.4 Compact full width of bed to at least 95% standard Proctor AASHTO T99.

.5 Fill excavation below bottom of specified bedding adjacent to manholes or structures with approved granular bedding material as directed.

3.4 Installation

.1 Lay and join pipes in accordance with manufacturer's recommendations.

.2 Handle pipe with approved equipment. Do not use chains or cables passed through pipe bore so that weight of pipe bears upon pipe ends. Do not roll pipe into the trench. If the Contractor elects to use a narrow trench, the method of lowering the pipe into the trench shall be such that no rocks or lumps of earth fall into the trench beneath the pipe. Lumps of earth and rock greater than 25 mm will not be permitted beneath the pipe and must be removed prior to pipe placement.

.3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.5 Do not exceed maximum joint deflection recommended by pipe manufacturer.

.6 Do not allow water to flow through pipe during construction, except as may be permitted by Engineer.

.7 Whenever work is suspended, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials at

construction staging limits. No extra payment will be made for capping and marking pipe ends and continuing work in subsequent stage.

.8 Position and join pipes by Pipe Manufacturer’s approved methods. Do not use excavating equipment to force pipe sections together.

.9 Install PVC pipe and fittings in accordance with CSA B181.12.

.10 Pipe Jointing:

.1 Install gaskets in accordance with manufacturer's recommendations and applicable AWWA Standards for the type of pipe selected.

.2 Support pipes with hand slings or crane as required minimizing lateral pressure on gasket and maintaining concentricity until gasket is properly positioned.

.3 Align pipes carefully before joining.

.4 Maintain pipe joints free from mud, silt, gravel and other foreign material. Clean the gasket, the bell or coupling interior, especially the groove area, and the spigot area with a rag, brush or paper towel to remove any dirt or foreign material before the assembling. Inspect the gasket; pipe spigot, bevel, gasket groove and sealing surface for damage or deformation. Lubricants shall be applied as specified by the pipe manufacturer.

.5 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned and lubricated and replaced before joining is attempted.

.6 Complete each joint before laying next length of pipe.

.7 Minimize joint deflection as per Manufacturers recommendation to avoid joint damage during installation.

.8 At rigid structures, install pipe joints not more than 1.2m from side of structure.

.9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.11 Backfill and compact trench as directed when any stoppage of work occurs to prevent the pipe shifting during down time. Install plug or cap to prevent debris or water from entering pipe.

.12 Cut pipes as required for special inserts, fittings or closure pieces in a neat manner, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave a smooth end at right angles to axis of pipe.

.13 Make watertight connections to manholes. Use non-shrink non-metallic grout when suitable gaskets are not available.

.14 Upon completion of pipe laying and after Engineer has inspected pipe joints, place specified granular material to dimensions indicated or directed.

.15 Hand place granular material in uniform layers not exceeding 300mm thick to minimum 500mm over top of pipe. Dumping of material directly on top of pipe is not permitted.

.16 Place layers uniformly and simultaneously on each side of pipe to prevent lateral displacement of pipe. Ensure the pipe is adequately secure to prevent the pipe from lifting.

.17 Compact each layer, in the pipe zone, to at least 95% of standard Proctor maximum dry density ASTM D698.

.18 For ties to existing mains requiring interruption of the sewer service, advise the Engineer three (3) working days in advance of the proposed interruption for approval. Upon approval notify the occupants, residents and businesses at least one (1) working day in advance by way of a written notice and verbal advisory. Submit a copy of the notice to the Engineer for approval prior to distribution. Minimize the period of time of the interruption and schedule the interruption for a non-peak demand time.

.19 For special fittings and tie-ins, cut the pipe to the length required as recommended by the pipe manufacturer without damaging the pipe or its coating. The end shall be cut smooth at right angles to the axis of the pipe.

.20 Prevent any large debris from entering the existing system by using a screen at the downstream tie to the existing system.

.21 In areas of high ground water conditions manufactured inline tees are required for sewer service connections. Cutting of pipe and installations of “inserta tee” or service saddles will not be permitted.

.22 Sewer mains to be installed with a minimum depth of cover of 2.6m from the finished grade to top of pipe. Insulation is required if cover is less than specified. Type of insulation and R values required to be approved by Engineer. Refer to Environmental Utilities Standard Drawing EU-221.

.23 Sanitary sewer force mains to be clearly marked or labeled and tracer wire installed along top of pipe using duct tape (Gorilla tape) or Tuck Tape to secure wire from movement during backfill procedure. Connect the tracer wire to a fink post at distances specified by Environmental Utilities.

.24 Force main appurtenances to be approved by the City of Medicine Hat Environmental Utilities Department. Where Combination Air Valves are required, install in adherence to the manufacturers specifications. Install CAV's where indicated on the drawings.

.25 The use of sewer pipe as a conduit for other buried utilities will not be permitted.

.26 Color coding of all piping in sanitary sewer lift stations and similar facilities to be approved by Environmental Utilities.

3.5 Field Testing

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 When directed by Engineer, a CCTV camera will be used to ensure that the pipe is free of obstruction. Before application for Substantial Performance all flexible pipe sanitary sewer trunk and main pipe shall be tested to ensure the pipe has not deflected in excess of 5%. The flexible pipe deflection test shall be performed by successfully pulling a mandrel, not less than 95% of the base internal diameter (as defined by the CSA or ASTM standard to which the pipe is manufactured), through the pipe. Contact the pipe manufacturer for the supply of the required mandrels.

.3 Remove foreign material from sewers and related appurtenances by flushing with power flushing equipment prior to placing the pipe into service.

.4 All concrete sanitary sewer trunk lines shall be tested by means of an air or water test according to ASTM C924M or C969M. Pipe larger than 600 mm will be accepted more conveniently by visual and individual joint testing according to ASTM C1103M.

.5 All sanitary sewer trunk and main pipe shall be inspected by means of video camera for leaks and other deficiencies as noted under 3.6 Tolerance. Refer to Section 3.7 for video camera inspections.

.6 Contractor shall inform the Engineer three (3) working days before all testing and inspections are to begin.

.7 Pressure testing of sanitary sewer force mains to be conducted based on Manufacturer's specifications and approval of Engineer.

3.6 Tolerance

.1 Maintain constructed grade to within ±5 mm from the lines, grades and elevations shown in the Contract Documents. Where departure from grade occurs, pipe shall be removed to the last joint where the pipe is within allowable tolerance and pipe shall be reinstalled to grade.

.2 Rigid Pipe:

The Contractor shall repair all deficiencies found during testing and inspections. In general deficiencies include: improper joints; any cracks wider than 0.6 mm, sheared, out of round or unduly deflected pipe; sags or rises which pond water in excess of 5% of pipe diameter; protruding service connections; and visible leaks.

Flexible Pipe:

The Contractor shall repair all deficiencies found during testing and inspections. In general deficiencies include: improper joints; any cracked, sheared, out of round or unduly deflected pipe in excess of 5% deflection for flexible pipe; sags or rises which pond water in excess of 5% of pipe diameter; protruding service connections; and visible leaks.

.3 Construct sanitary sewer as watertight as possible using rubber gaskets to the pipe manufacturer's specifications. Infiltration of groundwater into the entire system shall not exceed the allowable infiltration / exfiltration limits specified by ASTM Standards as noted under Field Testing 3.5. After the installation and backfilling of sewer pipe, services and manholes is completed, the Engineer shall have the right to require the Contractor to measure the leakage of groundwater. Should this leakage exceed the amount specified, the Contractor shall at his own expense, repair the sewer by replacing or otherwise until the leakage does not exceed the amount specified.

3.7 Sewer Inspection by CCTV (Closed Circuit Television)

.1 General

.1 All Sanitary Sewer Mains shall be inspected by CCTV after backfilling of the trench to finished grade. CCTV inspection shall be performed by the Contractor on all Sanitary Sewer Mains, unless otherwise directed by the Engineer. The Contractor shall employ a qualified CCTV Contractor acceptable to the Owner.

.2 Sewer Mains shall be flushed prior to the CCTV Inspection. The CCTV Inspection shall be performed immediately after the Sewer Mains have been flushed.

.3 All CCTV inspection shall be carried out in the presence of the Engineer, who shall be given at least two (2) working days advance notice of any testing to be carried out.

.4 Two (2) copies of the CCTV video in DVD format and report (to NASSCO Standards) shall be submitted to the Engineer. Reports to be in a format complying with PACP codes developed by NASSCO.

.5 Acceptance of the Sewer CCTV Inspection shall be based on the City of Medicine Hat Environmental Utilities Department review of all submitted material.

.2 CCTV Testing Equipment

.1 The CCTV Contractor shall provide all equipment and materials necessary to conduct the inspection as specified herein.

.2 The CCTV Operator shall be certified by NASSCO and certification shall be supplied prior to commencing the work.

.3 The CCTV equipment shall be a self-contained camera and monitoring unit connected by cable. It must be waterproof and be capable of lighting the entire pipe. Picture capabilities must be of quality to show the entire pipe periphery and display accurate colors. There must be capability of providing measurement within the line to an accuracy of 0.1% or 0.3m whichever is greater. Picture quality must be such to produce a continuous 600 line resolution picture showing the entire periphery of the pipe. The following capabilities and items must be available:

.1 A direct voice communication

.2 A solid state camera with pan and tilt capabilities mounted on a crawler

.3 Self-contained electrical power

.4 Proper safety equipment to protect employees and the general public

.5 Position camera lens centrally in the pipeline with a positioning tolerance of ±10% off the vertical centreline axis of the pipeline

.4 The camera's rate of progress shall be uniform during inspection and shall not exceed the following limits:

.1 0.10 m/s for pipe diameters less than 200 mm

.2 0.15 m/s for pipe diameters 200 mm and larger

.3 Camera to be stationary when panning and tilting defects or pipe features

.3 CCTV Report

.1 A CCTV log shall be maintained during the inspection reporting any defects based on PACP Codes developed by NASSCO or any other defect affecting the overall performance of the Sewer Main. The location of the defect shall be referenced from the manhole where the CCTV camera was inserted. A color photo of the defect shall be required as well as a pan and tilt clearly showing defect.

.2 The log shall include service connections with comments of condition. The CCTV report shall also contain a pan and tilt of each service connection.

.3 Manhole identity shall be noted clearly as indicated on the drawings.

.4 Two (2) copies of the final inspection report with corresponding video referenced to the text, along with two (2) copies of the video media (DVD or USB stick), shall be submitted within two weeks after compilation of inspection.

.5 Pipe condition comments made in the report shall be in NASSCO Industry Terminology.

.4 CCTV Cleaning

.1 The Contractor is responsible for cleaning and flushing all lines prior to CCTV inspection.

.5 CCTV Miscellaneous

.1 The Contractor shall be responsible for all works performed by the subcontractor, for traffic control and any other related work incidental to the completion of CCTV inspection.

.6 CCTV Inspection and Acceptance

.1 The location of all deficient work will be recorded and the Contractor will be required to repair, restore or otherwise make good, to the satisfaction of the Engineer, any deficient work including the repair of alignment problems, cracked or broken pipe, deformed pipe, leaks or any other faults not conforming with these specifications or the pipe manufacturers which the CCTV inspection revealed.

.2 After the deficiencies are repaired and corrected and before final acceptance, the Owner reserves the right to have the faulty areas re-inspected at the Contractor's expense.

END OF SECTION

Section 10 – Water Mains

PART 1 - GENERAL

1.1 Related Work

.1 Trenching, Backfilling and Compaction: Section 7

.2 General Concrete: Section 12

1.2 Scheduling of Work

.1 Schedule work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions for approval by Engineer. Prepare schedule to adhere to overall construction staging plans.

.3 Notify all building occupants a minimum of two (2) working days in advance of any interruption of service in writing approved by the Environmental Utilities Department. Notify any business affected by the shutdown a minimum of seven (7) business days in advance of any interruption.

.4 Do not interrupt water service for more than 8 hours and confine this period between 9:00 and 16:00 hours local time unless otherwise authorized. If the interruption is anticipated to be longer than 8 hours then the Contractor must provide temporary water service to the building occupants as directed by the Engineer. Direct hook-up from a neighboring residence is not permitted.

.5 Notify the Environmental Utilities Department of any planned or accidental interruption of water supply to hydrants.

1.3 Measurement for Payment

.1 Refer to Section 4 Measurement Rules and Section 5 Measurement Schedule.

.2 Main line fittings, including excavation, backfilling and thrust blocks, will be considered incidental to the installation of water mains and no separate payment will be issued.

.3 Tracer wire and water tight connections will be considered incidental to the installation of water mains and no separate payment will be issued.

1.4 Detailed Drawings

.1 Following detail drawings are appended hereto and form part of this Section:

- EU-201: Standard Hydrant Detail
- EU-202: Standard Gate Valve Installation Details
- EU-203: Standard Butterfly Valve Installation Details
- EU-204: Standard Main Valve Box Detail
- EU-205: Typical Thrust Block Locations for Water Mains
- EU-208: Cul-De-Sac Flushing Point
- EU-214: Temporary Water Supply from Hydrant
- EU-219: Manual Air Release

PART 2 – PRODUCTS

2.1 Pipe and Fittings

.1 Pipe:

.1 Polyvinylchloride class rated pipe 100 mm to 300 mm in diameter to AWWA. C-900, CSA certified as meeting the latest revision of CSA B137.3-M, DR 18, pressure class 150.

.2 Polyvinylchloride class rated pipe 350 mm to 900 mm in diameter to AWWA. C-905, CSA certified as meeting the latest revision of CSA B137.3-M, DR 18, pressure rating 235.

.3 All pipe products shall comply with NSF/ANSI 61“Drinking Water System Components-Health Effects”.

.2 Rubber Gasket Joint Fittings:

.1 Polyvinylchloride molded fittings to AWWA. C907, SDR 18, Class 150, ASTM cell classification 12454B, with rubber gasket joints and outside diameter conforming to cast iron fitting, bell ends, c/w 1 MPa elastomeric gasket push-on joint

.2 Ductile iron and cast iron fittings to ANSI/AWWA C110or ANSI/AWWA C152, pressure class 150 minimum. Exterior and interior fittings to be factory Fusion Bonded Epoxy Coated according to ANSI/AWWA C116and NSF/ANSI 61 “Drinking Water System

Components-Health Effects". Joints shall be to the latest revision ANSI/AWWA C111, "Tyton Joint" or approved equal.

.3 Pipe Lubricants:

.1 Only Manufacturer's recommended organic, non-toxic, water soluble gasket lubricant to be used.

.2 Pipe gasket lubricants shall comply with NSF/ANSI 61 "Drinking Water System Components-Health Effects".

2.2 Couplings and Repair Clamps

.1 Repair Clamps

.1 Designed for joining plain end pipes of equal outside diameter. To be flexible, all stainless steel construction. All welded stainless steel to be "passivated" after welding to eliminate sensitizing of the stainless steel.

.2 Shell, Sidebars, Nuts, and Bolts to be Type 304 fully passivated stainless steel. Gasket to be continuous ringed S.B.R. rubber conforming to latest revision AWWA C-111 / ANSI A21.11.

.3 Approved Products:

- Robar 1606 Style 2
- Robar 5606, 5616, 5626 and 5636
- ROMAC Industries SS1, SS2
- Smith Blair 267 and 268
- EZ-MAX plus 4000

.2 Cambridge Brass (Stainless Steel) Series 425, 435, 825 & 835 Epoxy Coated Couplings

.1 All products to be to ANSI/AWWA C116/A21.16 (American National Standard for Protective Fusion-Bonded Epoxy Coatings for the interior and exterior surfaces of ductile iron and gray-iron fittings for Water Supply Service).

.2 Epoxy Coated couplings are supplied in the three following configurations:

- Standard Couplings: designed for joining plain end pipes of equal outside diameter

- Transition Couplings: designed for connecting pipes of the same nominal size, which have great differences in outside diameter, transition to be made by "stepped-down" centre ring, c/w special end plate
- Reducing Couplings: designed for connecting pipes of different nominal sizes, reduction to be made by "stepped-down" centre ring, c/w special end plate

.3 Centre ring to be cast ductile iron to latest revision ASTM A536, factory coated with fusion bonded epoxy. Coating thickness to be 0.30 mm (12 mils) minimum, 0.50 mm (20 mils) maximum.

.4 End plates to be heat-treated cast ductile iron to latest revision ASTM A536, factory coated with fusion bonded epoxy. Coating thickness to be 0.30 mm (12 mils) minimum, 0.50 mm (20 mils) maximum. End plates shall be provided with one 6 mm (1/4") SAE J429 Grade 5, NC cadmium plated setscrew to provide electrical conductivity between the end plates and the sleeves and wrapped with petrolatum tape.

.5 Gasket to be S.B.R. rubber conforming to latest revision AWWA C-111 / ANSI A21.11.

.6 Bolts to be 15.875 mm (5/8") NC trackhead, c/w heavy-duty hex nuts. Material to be low alloy steel conforming to latest revision AWWA C-111 / ANSI A21.11. All bolts (except threaded area) to be factory coated with fusion bonded epoxy. Coating thickness to be 0.30 mm (12 mils) minimum, 0.50 mm (20 mils) maximum.

.7 Coupling components to be marked as follows:

- Centre Ring: Nominal size and manufacturers' name
- End-Plate: O.D. range and manufacturers' name
- Gaskets: O.D. range and manufacturers' name

.8 Approved Coupling Products:

- Robar 1506 or approved “Smith-Blair” or “Dresser” equivalent
- Romac 501 or approved “Smith-Blair” or “Dresser” equivalent
- Hymax coupling and flanged adapter
- Hymax Grip
- Romac Macro 2 bolt coupler

- Romac ALPHA
- Robar Vantage Coupling 1596/1598
- Robar Mega Coupling Series 3800
- Smith Blair 421

2.3 Tapping Sleeves

.1 Shall be full circle type designed to allow tightening of the sleeve bolts from the opposite side of the flange outlet. Install according to manufacturer's specifications and torque ratings. With specific approval from the Environmental Utilities Department only, a non-full circle sleeve may be used where the branch tap is a minimum of two nominal diameters smaller than the tapped main. Taps on asbestos-cement pipe always require special consideration.

.2 To be constructed of stainless steel or corrosion protected mild steel material. Corrosion protected sleeves shall be epoxy coated and lined. All welded stainless steel to be "passivated" after welding to eliminate sensitizing of the stainless steel.

.3 Sleeves to include a 19 mm (3/4") NPT test plug for pressure testing of sleeve and installed tapping valve. Test plug shall be at the 12 o'clock position after installation. Manufacturer's working pressure ratings to be approved by Engineer.

.4 Sleeves to have permanent identification marking to identify the manufacturer's name, nominal size, and O.D. range. All sleeves to be packaged and delivered as a complete unit (i.e. sleeves, gaskets, nuts, and bolts).

.5 Sleeves to have Class D flanges conforming to the latest revision of AWWA C207, 150 lb. drilling. Flanges to be fixed, not floating.

.6 Flange materials for stainless steel tapping sleeves to be stainless steel. Flange materials for fusion bonded epoxy tapping sleeves to be cast ductile iron.

.7 Gasket materials as follows:

- Flange - Virgin SBR compounded for water service use
- Ring Seal - Buna N, or virgin SBR compounded for water service use
- Liner - 3.18 mm (1/8") Neoprene, or virgin SBR compounded for water service use

.8 Bolts to be 16 mm (5/8") NC stainless steel c/w heavy hex nuts and washers, factory treated to prevent galling.

.9 Tapping sleeve to be wrapped in 6 mil polyethylene when thrust block required.

.10 Approved Products:

- Robar 6606
- Romac "SST"
- Ford FAST
- Smith Blair 662/663
- PowerSeal (Stainless Steel) Series 3480 & 3490
- JCM 440

2.4 Tracer Wire Type 14/1B MDPE Tracer

.1 Tracer wire to be 14 gauge single conductor copper wire, unstranded, color of insulation to be white or blue for water mains and green for sanitary sewer.. Wire coating must be made for direct bury.

.2 When joining tracer wire use underground waterproof splice kit.

.3 Approved Products:

- 3- M DBR or DBY splice kit or equivalent
- Copperhead Industries Snakebite Locking Connector
- Copperhead Industries MAINLINE-TO-SERVICE Connector or approved equivalent.
- Cambridge Brass No. 81 Compression Electrical Nut or approved equivalent.
- SnakePit Access Point Light Duty (blue cap for water) or approved equivalent.

2.5 Valves and Valve Boxes

.1 Resilient Wedge Gate Valves

.1 Valves sized 100 mm to 300 mm diameter shall be resilient wedge gate valves, conforming to latest revision AWWA C509 or AWWA C515, c/w fully rubber encapsulated solid wedge, non-rising stem, suitable for direct bury.

.2 Valves to open counter clockwise (turn left to open).

.3 Cast iron valve body to be constructed in accordance with ASTM A126, Class "B". All nuts, bolts, and washers shall be stainless steel.

.4 Ductile iron valve body to be constructed in accordance with ASTM A395 or ASTM 536 and shall have a minimum yield strength of 310 mPa (45,000 psi).

.5 Interior and exterior of valve to be fusion bonded epoxy coated, as per latest revision AWWA C550.

.6 Bronze valve stem to be operated by a 50 x 50 mm square operating nut. The valve stem (stuffing box) shall contain a double "O" ring seal.

.7 Valve ends to be push-on "Tyton Joint" conforming to latest revision of AWWA C111 / ANSI A21.11.

.8 Approved Products:

- Mueller A-2360 Resilient Wedge Gate Valve
- Clow F-6112 Resilient Wedge Gate Valve
- Bibby-Ste-Croix Resilient Wedge Gate Valve
- American AVK Co. Resilient Wedge Gate Valve Series 45
- East Jordan Iron Works Flowmaster Resilient Wedge Gate Valve sizes 100 mm to 300 mm diameter
- American Flow Control Series 2500 Resilient Wedge Gate Valves sizes 50mm to 300mm
- Or equivalent approved by the Environmental Utilities Department.

.2 Resilient Wedge Tapping Gate Valves

.1 Valves sized 100 mm to 300mm diameter shall be resilient wedge gate valves, conforming to latest revision AWWA C509 for Cast Iron and AWWA C515 for Ductile Iron valves, c/w fully rubber encapsulated solid wedge, non-rising stem, suitable for direct bury.

.2 Valves to open counter clockwise (turn left to open).

.3 Cast iron valve body to be constructed in accordance with ASTM A126, Class "B". All nuts, bolts, and washers shall be stainless steel.

.4 Ductile iron valve body to be constructed in accordance with ASTM A395 or ASTM 536 and shall have a minimum yield strength of 310 mPa (45,000 psi).

.5 Interior and exterior of valve to be fusion bonded epoxy coated, as per latest revision AWWA C550.

.6 Bronze valve stem to be operated by a 50 mm x 50 mm square operating nut. The valve stem (stuffing box) shall contain a double "O" ring seal.

.7 Valve ends to be push-on "Tyton Joint" by flange. Push-on joints shall conform to latest revision of AWWA C111/ ANSI A21.11. Flanged valve ends shall meet the requirements of ANSI B16.1, Class 125. Bolts, nuts, washers to be stainless steel.

.8 Approved Products:

- Clow F-6113 and F-6115 Resilient Wedge Tapping Gate Valve flange x push-on for sizes 100 to 300 mm diameter
- Mueller A-2362 Resilient Wedge Tapping Gate Valve flange x push-on for sizes 100 mm to 300 mm diameter
- Bibby-Ste-Croix Resilient Wedge Tapping Gate Valve flange x push-on for sizes 100 mm to 300 mm diameter
- Or equivalent approved by the Environmental Utilities Department.

.3 Butterfly Valves

.1 Valves sized 350 mm to 900 mm diameter shall be butterfly valves conforming to latest revision AWWA C504. They shall be short body design, Class 150B, c/w adjustable rubber seats, suitable for direct bury. All nuts, bolts, and washers shall be stainless steel.

.2 Valves to be installed in vault structures, to be approved by the City.

.3 Valves to open counter clockwise (turn left to open).

.4 Valve must be rated at 1034 kPa (150 psi) working pressure and must be able to pass a hydrostatic test at 2068 kPa (300 psi) with the valve partially open.

.5 Valve to be operated by 50 x 50 mm square operating nut connected to a totally enclosed gear actuator.

.6 Orientate valve as per manufacturer's design for flow direction. Where flow could be in either direction (looped) then place valve so that actuator is away from other utilities.

.7 Valve ends to conform to the following patterns:

- Mechanical Joint: shall meet the requirements of the latest revision AWWA C111/ ANSI A21.11, bolts to be stainless steel
- Flanged End: shall meet the requirements of ANSI B16.1
- Class 125 bolts to be stainless steel.

.8 Interior and exterior of valve to be fusion bonded epoxy coated, as per latest revision AWWA C550.

.9 Approved Products:

- Pratt
- Mueller Lineseal III 3211
- Clow
- Valmatic
- Or equivalent approved by the Environmental Utilities Department.

.4 Automatic Control Valves (Pilot Controlled PRV's, PSV's, and Check Valves)

.1 Control valves to be fusion bonded epoxy coated and lined with stainless steel seats, brass position indicator rod, copper tubing, brass fittings and pilots.

.2 PRV's and PSV's must fail in open position and Check Valves must fail in closed position.

.3 Must be designed for minimum and maximum flows. ACV's 200 mm and larger require a secondary, smaller ACV installed in parallel to handle low flows. Minimum size for secondary ACV is 100 mm (flows to be confirmed by Engineer).

.4 Each ACV to have an NRS, hand wheel operated, resiliently seated isolation valve bolted to each end. Valves to be fusion bonded epoxy coated and lined complete with stainless steel bolts.

.5 Piping to be schedule 40 with 150 # ANSI flanges and fusion bonded epoxy coated/lined. Pipe must extend through vault wall and span open excavation. Installation to include 2-1/2" pressure indictors with

½” ball valves. Low pressure side to have 0-100 psi gauge and high pressure side to have 0-200 psi gauge.

.6 Watertight, concrete vault to fit equipment complete with lifting lugs and cored or formed holes. Minimum height to be 2 m with MSU steps or ladder. If main ACV is larger than 400 mm in size, vault must have access hatch directly over ACV for removal.

.5 Cast Iron Valve Boxes

.1 To be completely fusion bonded epoxy coated sliding type, adjustable over a minimum of 450 mm. Bottom casing diameter to be compatible to size of valve. All castings shall clearly have the manufacturer's identification cast on them.

.2 Standard depth of bury to be 1.83 m (6') to 2.75 m (9'), or as required.

.3 Valve operating extension spindle to be 25 x 25 mm square. Spindle length shall be such that the operating nut will not be more than 300 mm below the cover when set on the valve operating nut.

.4 Bottom of spindle to fit 50 x 50 mm square valve operating nut and shall be riveted to spindle.

.5 Top of spindle shall have removable 50 x 50 mm square operating nut c/w stone catcher flange.

.6 Top casing to fit over 120 mm outside diameter casing. Pipe set screws shall be removed to allow top casing to slide up and down.

.7 Lid to be marked "V".

.8 Approved Products:

- Norwood "Type C"
- Trojan Industries “Type C”
- Sovereign Castings Ltd. "Type C"
- East Jordan Iron Works
- Westview “Type C”

.6 Combination Air Valve (CAV).

.1 The valve to be NSF 61 and intended for use on potable water systems. The CAV discharges gases during the filling, charging and operation of the system (wastewater transmission main). When the

system pressure drops below atmospheric pressure, the CAV allows air back into the system.

.2 Working pressure range required 3 – 250 psi (21 – 1,725 kPa).

.3 Must be sized for minimum and maximum flows.

.4 Valve to be flange connected. A plug valve is required to isolate the CAV from the system.

.5 Approved Products:

.1 A.R.I. D-060-HF

.2 Approved Equivalent

2.6 Hydrants

.1 Post type hydrants according to AWWA C502 and ULC S520 listed. Designed for a working pressure of 1724 kPa and tested at 3447 kPa. All hydrants to be NSF 61 certified or compliant.

.2 Hydrant shall include two AMA–AWO 65 mm threaded hose outlets and 100 mm N pumper port to be located 460 mm above the ground flange; 150 mm riser barrel and 25 mm bottom valve.

.3 Hydrant inlet to be 150 mm diameter push-on “Tyton Joint” c/w elastomeric gasket conforming to the latest revision of AWWA. C111/ANSI A21.11; and 150 mm connection for main.

.4 Hydrants to open counter clockwise. Threads to W.C.U.S., 6 threads per inch, 123 mm (4.84”) outside dia. and 120 mm (4.742”) pitch dia.

.5 Standard depth of bury 2.75 m for new development. Depth of water mains must be confirmed by contractor prior to ordering each hydrant for installation in existing areas. Hydrant extensions are unfavourable and will only be allowed at the discretion of the Environmental Utilities Department.

.6 Provide key operated gate valve to isolate hydrant from water main as per Standard Gate Valve Detail EU-202.

.7 Hydrant body to be red in colour with silver caps. If considered high pressure by the City of Medicine Hat, hydrant body to be yellow in colour with black caps.

.8 Operating nut to be pentagon configuration, 22 mm (7/8”) flats, 35 mm (1 3/8”) flat to point.

.9 Hydrants to be constructed with a breakaway flange complete with a safety stem (spindle). Bottom of breakaway flange set a minimum of 0.05 m (2”)

above finished grade as per Standard Hydrant Detail EU-201. Bottom of breakaway flange cannot exceed 0.20 m (8”) above finished grade.

.10 All nuts, bolts, and washers to be stainless steel.

.11 Approved Products:

- Clow Canada "Brigadier" M-67

2.7 Pipe Bedding Materials

.1 Granular material, general:

.1 Gradation to be within specified limits when tested to ASTM C136-81 (AASHTO T11-78 and T27-78) and giving a smooth curve without sharp breaks when plotted on a semi log grading chart.

Granular Bedding: Crushed gravel to following grading requirements.

ASTM Sieve Size	Percent Passing
25 mm	100
20 mm	95-100
10 mm	60-80
0.5 mm	40-60
0.630 mm	14-30
0.315 mm	9-22
0.080 mm	4-10

.2 Concrete required for cradles, encasement, supports, thrust blocks, all to Section 12 General Concrete.

2.8 Pipe Disinfection

.1 Sodium hypochlorite to AWWA B300 to disinfect water mains.

2.9 Swabbing

.1 Scouring device to be constructed of foam and have a minimum density of 2 lb/ft3. Scouring function shall be to provide light drying.

2.10 Backfill Material

.1 Refer to Section 7 – Trenching, Backfilling and Compaction, Part 2.

2.11 Corrosion Protective Tapes and Wraps

.1 Field installed corrosion protective coatings to be two part paste & tape systems.

.2 Approved Products:

- Polyken 900 system:
  - No. 930 Joint Wrap Tape
  - No. 931 Filler Tape
- Denso of Canada Ltd:
  - Denso Paste
  - Denso Tape
- Corexco Inc.:
  - Petro Primer Paste
  - Petro 40 Tape
  - Petro Overwrap Tape
- Polyguard Products Inc.:
  - Polyguard 600 Primer
  - Polyguard 600 Series Coating Tape
  - Polyguard 606 Filler System
- The Trenton Corporation:
  - Trenton Tec-Tape Primer
  - Trenton Tec-Tape Wrapper
  - Trenton Glas-Wrap
  - Trenton Fill-Putty

2.12 Cathodic Protection

.1 General

Prior to backfilling, arrange for the Engineer to witness the installation of the sacrificial anode, wires, cadwelding, etc., and the necessary continuity check. Location of Anode packs to be determined by the Engineer.

.2 Metallic Pipe and Valves

.1 Sacrificial Anodes

Sacrificial zinc anodes shall be supplied and installed by the Contractor on each buried steel pipe and adapter. Zinc anodes to be supplied and installed by the Contractor shall consist of an alloy of the following chemical composition:

- Al - 0.005% maximum
- Cd - 0.003%
- Fe - 0.0014% maximum
- Zinc - Remainder

The anode lead wires shall be 3 metres (10-feet) in length and shall consist of #13 solid copper wire with Type TW insulation. The lead wire shall be connected to the core with silver solder. The entire connection shall be insulated by filling the recess with an electrical potting compound.

The anode shall be packaged in a permeable cloth bag containing a backfill mixture of the following composition:

- Ground Hydrated Gypsum 75%
- Powdered Wyoming Bentonite 20%
- Anhydrous Sodium Sulphate 5%

Backfill shall have a grain size so that 100% is capable of passing through a 20 mesh screen and 50% will be retained by a 100 mesh screen. The mixture shall be firmly packaged around the zinc within the cloth bag by means of adequate vibration.

2.13 Thrust Blocking

.1 Concrete

.1 Concrete mix shall satisfy the requirements of Exposure Classification C-2 of Table 8, CAN/CSA A23.1, and shall be in accordance with the following minimum requirements unless shown in the drawings:

- 28 day compressive strength – 25 MPa
- Maximum nominal size of course aggregate – 25 mm

- Slump – 40 mm to 75 mm
- Maximum water cementing materials ration – 0.45
- Portland Cement – Type 50, Sulfate Resistant
- Minimum cement content – 300 kg/m3
- Fly Ash Content – 20% max.

.2 Plastic

.1 6 mil polyethylene to be placed between all fittings, valve, pipe and the concrete.

.3 Mechanical Restraint

.1 Product used and method of mechanical restraint to be approved by Engineer.

PART 3 - EXECUTION

3.1 Preparation

.1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation. Carefully inspect materials for defects. Remove defective materials from site.

3.2 Trenching and Backfill

.1 Complete trenching and backfill work to Section 7 Trenching, Backfilling and Compaction.

.2 Trench depth to provide minimum cover over pipe of 2.6 m from finished grade.

.3 Where minimum cover is less than 2.6m from finished grade, use an approved insulation method to prevent frost penetration. See Environmental Utilities Standard Drawing EU-221.

.4 Depth of cover shall not exceed 4.0m without approval of the Environmental Utilities Department.

.5 Trench alignment and depth require Engineer's approval prior to placing bedding material or pipe.

.6 Remove unsuitable materials off site.

3.3 Granular Bedding

.1 Place granular bedding materials to details indicated or directed.

.2 Shape bed true to grade to provide continuous uniform bearing surface for pipe exterior. Do not use blocks when bedding pipe.

.3 Shape transverse depressions in bedding as required to accommodate pipe bell or other non-uniform pipe components. Care must be taken so as not to create unfilled voids in the bedding that would cause pipe “bridging”.

.4 Compact full width of bed to at least 95% standard Proctor ASTM D698, Method D.

.5 Fill any excavation below level of bottom of specified bedding with crushed stone and compact.

3.4 Pipe Installation

.1 Installation and handling of pipe shall be to manufacturer's standard instructions and specifications, and applicable AWWA Specification for the type of pipe selected or as specified herein.

.2 Join pipes in accordance with manufacturer's recommendations.

.3 Handle pipe by approved methods. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends. Lift pipe by means of slings and lower into the trench by hand or mechanical equipment. **Do not roll or drop pipe into the trench**. If the Contractor elects to use a narrow trench, the method of lowering the pipe into the trench shall be such that no rocks or lumps of earth fall into the trench beneath the pipe. Lumps of earth and rock greater than 25 mm will not be permitted beneath the pipe and must be removed prior to pipe replacement.

.4 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Take up and replace defective pipe. Correct pipe which is not in true alignment or grade.

.5 Face socket ends of pipe in direction of laying. For mains on a grade of 2% or greater, face socket ends up-grade.

.6 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.

.7 Keep jointing materials and installed pipe free of dirt and water and other foreign materials. Whenever work is stopped, install a removable water tight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 Position and join pipes with approved equipment. Do not use excavating equipment to force pipe sections together.

.9 Cut pipes, as required, for special fittings or closure pieces, in a neat manner, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave a smooth end at right angles to axis of pipe.

.10 Align pipes carefully before jointing.

.11 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.12 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed or contaminated shall be removed, cleaned, lubricated and replaced before jointing is attempted again.

.13 Use only Manufacturer’s approved gasket lubricant for potable water lines.

.14 Complete each joint before laying next length of pipe.

.15 Minimize deflection after joint has been made.

.16 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.17 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Engineer. Mechanical restraints are required on all pipe joints less than 6.1 meters in length.

.18 When stoppage of work occurs, backfill and compact trench in an approved manner to prevent the pipe shifting during down time. Cap and mark at construction stage interfaces. Where existing pipe is cut in one stage but is to remain operational through the next stage, cap and seal by method approved by Engineer.

.19 Do not lay pipe on frozen bedding.

.20 Protect hydrants, valves and appurtenances from freezing.

.21 Install couplings, fittings and repair couplings to Manufacturers specifications and torque ratings.

.22 Install tracer wire along top of pipe using duct tape to secure wire from movement during backfill procedure. Secure every three (3) metres. Wire to be continuous and terminate at an approved termination access point. Start new run of tracer wire from the same termination access point. . Where hydrants are not available, tracer wire will be terminated at ground level inside an approved enclosure. When tying onto existing watermains (that have tracer wire), use an approved water proof splice kit as per Section 10

Watermains, Item 2.4; if tying to existing watermains that do not have tracer wire, terminate tracer wire on surface using approved termination points. When connecting tracer wire for services, use approved Mainline-to-Service Connector and terminate on the Curb Box or connection point using approved products as found in Section 10, Item 2.4.Continuity will be checked prior to Construction Completion and all necessary repairs will be made before signing the Construction Completion Certificate (CCC).

.23 Aquifer and non-potable waterlines to be clearly labeled to distinguish from potable waterlines.

.24 Upon completion of pipe laying and after Engineer has inspected work in place, surround and cover pipes with approved granular material placed to dimensions indicated or directed.

.25 Hand place select native granular material in uniform layers not exceeding 300 mm thick to minimum 500 mm over top of pipe. Dumping of material directly on top of pipe is not permitted.

.26 Place layers uniformly and simultaneously on each side of pipe to prevent lateral displacement of pipe.

.27 Compact each layer, in the pipe zone, to at least 95% of standard Proctor maximum dry density at ±2% of optimum moisture content as determined by ASTM D698, Method C.

.28 When hydrostatic and leakage test results are acceptable to Engineer, backfill remainder of trench to Section 7 Trenching, Backfilling and Compaction.

.29 For ties to existing water mains requiring interruption of the water service, advise the Engineer three (3) working days in advance of the proposed interruption for approval. Upon approval notify the occupants, residents and businesses at least three (3) working days in advance by way of a written notice and verbal advisory. Submit a copy of the notice to the Engineer for approval prior to distribution. Minimize the period of time of the interruption and schedule the interruption for a non-peak demand time. Notify the Environmental Utilities Department if there is water supply service interruption to any hydrants.

.30 Maintain constructed grade to within ±50 mm from the lines, grades and elevations shown in the Contract Documents. Where departures occur, return to established grade gradually over a distance of not less than 25 m.

3.5 Valve Installation

.1 Install valves to manufacturer's recommendations and applicable AWWA Specifications.

.2 Support valves 300 mm and larger by means of concrete located between valve and solid ground as per Standard valve Installation Details EU-202 and EU-203. Bedding to be the same as adjacent pipe. Minimum length of pipe on each end of valve shall be 1 m. Valves shall not be supported by the pipe.

.3 When replacing a valve on an existing watermain, ensure any portion of a valve that comes into contact with the pipe, is swabbed with 1% chlorine solution. Flush line to remove excess chlorine residual.

.4 Set the valve accurately in position and place the valve box carefully over the bonnet with the valve casing perpendicular to the axis of the pipe, and adjust the top box to the grades specified. Remove bolts from slider before backfilling.

.5 Securely set the extension rods on the valve nut. Install wooden markers as directed by the Engineer.

.6 Valves and valve boxes shall have Class B backfill as per Section 7 – Trenching, Backfilling and Compaction; sub-section 3.10 Backfilling Schedule.

.7 Main valve placement, whenever possible, should not be less than 3 metres from other fittings and a minimum of 5 metres from thrust blocks.

.8 At future stubs or dead-ends a boundary valve must be provided. For 200 millimeters diameter and smaller, a minimum of 12 metres of pipe must be installed past the boundary valve to a plug with a thrust block. For 250 millimeters and larger watermains, a minimum of 18 metres is required. At the approval of the Engineer, mechanical restraint may be considered as an alternative.

.9 When paving roads, avoid spraying oil on valve lids and remove excess asphalt on lid. Top of valve lid to be set flush or slightly below top of asphalt.

3.6 Tapping Valve Installation

.1 Install valves to manufacturer's recommendations and applicable AWWA Specifications.

.2 When connecting to an existing main that is in service an approved tapping valve and sleeve shall be used, provided the size of the existing main is at

least one size larger than the connecting main. All bolts to be torqued to manufacturer's specifications. City forces will tap sizes 100 mm to 250 mm.

.3 Ensure any portion of a tapping sleeve that comes into contact with the pipe is swabbed with 1% chlorine solution.

.4 Pressure test the tapping sleeve to 690 kPa (100 psi) for 20 minutes. Any noted pressure loss will result in a failed pressure test. The tapping sleeve will need to be adjusted, and a pressure test restarted. Pressure tests can be performed using air, or water.

.5 Set the valve accurately in position and place the valve box carefully over the bonnet with the valve casing perpendicular to the axis of the pipe, and adjust the top box to the grades specified. Remove bolts from slider before backfilling.

.6 Securely set the extension rods on the valve nut. Install wooden markers as directed by the Engineer.

.7 Provide thrust block and concrete support for valve.

.8 Fittings and pipe must be wrapped with 6 mil polyethylene to keep joints and couplings free of concrete.

.9 Valves and valve boxes shall have Class B backfill as per Section 7 – Trenching, Backfilling and Compaction; sub-section 3.10 Backfilling Schedule.

3.7 Hydrants

.1 Install hydrants at locations indicated on "Approved for Construction" plans or as directed by the Environmental Utilities Department.

.2 Where possible, all hydrants should be located on the same side of the street as the water main to avoid having the hydrant lead crossing storm and sanitary sewer mains

.3 Install hydrants in accordance with manufacturer's recommendations and AWWA Manual of Practice M-17. Also refer to Environmental Utilities Standard Detail EU-201.

.4 Install 150 mm gate valve and cast iron valve box on hydrant service leads as indicated. Valve to be positioned in asphalt roadway a minimum of 3.0m from thrust blocks where ever possible. A minimum of 1.0m may be accepted if valve is mechanically restrained to tee. Remove bolts from slider before backfilling.

.5 Set hydrants plumb with hose outlets parallel with edge of pavement or curb line, pumper connection facing roadway with underside of body flange set at elevation between 50mm and 200mm above final grade. Hydrant barrels are to be ordered to accommodate depth of bury. Hydrant extensions will not be permitted without consent from the Environmental Utilities Department..

.6 Place concrete thrust blocks as indicated and specified ensuring that drain holes are unobstructed.

.7 Install deep bury hydrants with valve and drain holes at 2.75m deep if watermain depths exceed standard cover.

.8 To provide proper draining for each hydrant, excavate a pit measuring not less than 1 x 1 x 0.5 m deep and back-fill with coarse gravel or crushed stone to a level 150 mm above drain holes. The pit to be lined with non-woven filter fabric as per Standard Detail EU-201.

.9 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.

.10 Hydrants shall have Class B backfill as per Section 7 – Trenching, Backfilling and Compaction; sub-section 3.10 Backfilling Schedule.

.11 In high water table plug drain holes from the inside as per manufacturer's recommendation.

3.8 Thrust Blocks

.1 Complete concrete work to Section 12 General Concrete.

.2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated or as directed by Engineer.

.3 Thrust-blocking material shall be purchased from a Redi-Mix concrete supplier and will not be manufactured on site.

.4 Thrust blocking shall be placed between undisturbed ground and the fitting to be anchored; the area of bearing between the pipe and the ground in

each instance shall be that shown on the Detail Drawings. The blocking shall be so placed that the pipe and fitting joints will be accessible for repair. Bearing areas shall be inspected by the Engineer prior to placing concrete.

.5 Keep joints and couplings free of concrete by wrapping with 6 mil polyethylene.

.6 Do not backfill or compact over concrete within 24 hrs after placing.

.7 Mechanical restrainment may be used as an alternative if approved by the Environmental Utilities Department. All mechanical restraints must be sealed from moisture with an approved petrolatum tape or product.

3.9 Cathodic Protection

.1 Factory Applied Fusion-Bonded Epoxy Coatings

.1 Fittings that are factory fusion-bonded epoxy coated do not require cathodic protection unless specifically requested by Environmental Utilities.

.2 Fittings that have damaged or deficient coatings may be rejected. An approved coating repair product may be allowed to cover small coating defects and/or anodes may be required at the discretion of Environmental Utilities.

.2 Installation of corrosion protective coatings:

.1 Install as per manufacturer’s recommendations.

.2 Ensure steel to be coated is clean so that coating adheres to the surface.

.3 Allow any cadwelds to cool before placing coating over cadweld.

.4 All coatings to comply with NSF/ANSI 61“Drinking Water System Components-Health Effects”

.3 Installation of Sacrificial Anodes:

.1 Remove the plastic bag from the anodes, leaving the cloth bag intact.

.2 Place the anodes a minimum distance of 915 mm (3-feet) from the main in a horizontal position at approximately the same elevation and parallel to the main.

.3 Ensure that soil is packed uniformly around the anodes to eliminate voids or air pockets adjacent to the anodes.

.4 Zinc anodes shall be cadwelded onto each length of buried steel pipe and each metal adapter.

.5 Coordinates of anodes to be recorded and marked on Record Drawings.

.4 Cadwelding:

.1 Remove a small portion of coating on the pipe or fitting if a coating exists.

.2 Thoroughly clean area to be cadwelded and file metal until a shiny, roughened surface is obtained approximately 75 mm (3-inches) square.

.3 Crimp a copper sleeve onto the bared end of the wire to be cadwelded.

.4 Use a cadweld mold M108 or equal and powder CA-15 or equal.

.5 Knock any slag off of the completed cadweld and file smooth any sharp edges.

.6 Thoroughly coat the cadweld and any area adjacent that has had the coating removed with a molded plastic patch.

3.10 Leakage and Pressure Testing

.1 General

.1 Provide labour, equipment and materials required to perform leakage tests hereinafter described. Equipment shall include a pump, pipe connections, pressure gauges with adequate pressure range, and all other necessary equipment.

.2 Notify Engineer at least three (1) working days in advance of all proposed tests. Perform tests in presence of Engineer.

.3 Where any section of system is provided with concrete thrust blocks, do not conduct tests until at least 5 days after placing concrete or 2 days if high early strength concrete is used.

.4 Before testing, bed and cover pipe in accordance with specifications to prevent movement or snaking of pipe line when pressure test is applied.

.5 Compact bedding material to specified density.

.6 Backfill, mechanically restrain, strut and brace caps, bends, tees and valves to prevent movement when pressure test is applied.

.7 In coordination with the City of Medicine Hat Environmental Utilities Department, open all valves necessary to test section of pipe.

.8 Expel air from main by slowly filling main with potable water.

.9 Thoroughly examine exposed parts and correct for leakage as necessary.

.10 Locate and repair defects if leakage is greater than amount specified. Any leaks, breaks, failures, or blockages, which are a result of faulty material and/or workmanship, are the sole responsibility of the Contractor to correct at his expense.

.11 Repeat test until leakage is within specified allowance for full length of water main.

.2 Procedure

.1 After completing the installation of the Pipeline or a section of the line including water services the lines shall be hydrostatically pressure tested. The completed line shall be tested at a pressure equal to one and one-half times the maximum operating pressure or 1,000 kPa whichever is greater, but not in excess of the Manufacturer's recommended operating pressure measured at the lowest point in the test section. Contractor shall provide additional gauges on test section at the discretion of the Engineer.

.2 When pressure testing in existing areas where against older infrastructure then testing pressures will be at the discretion of the Engineer.

.3 To compensate for initial pipe stretch and to expel all entrapped air, the pipe shall be pressurized until pressure is maintained before the test period is started.

.4 After completion of the initial expansion phase, the pressure shall be at the specified level and the test period shall commence. The test period shall be for a period of 2 hours and shall only commence prior to 2:00 p.m.

.5 During the test if the pressure drops more than 35 kPa (5 psi) then attempt to expel air and retest.

.6 After the test period, a measured amount of "make-up" water shall be added to return the pipe to the test pressure. The amount of

"make-up" water shall not exceed the allowance given in AWWA C-605.

.7 The formulas for make-up for PVC pipe per hour are as follows :

Where Qm is the quantity of make-up water per hour in litres, L is the length of the testing section in metres, D is the diameter of the pipe in mm, and P is the testing pressure in kPa.

$$Qm = \frac{L \times D \sqrt{P}}{795{,}000}$$

.8 For pressure testing HDPE pipe, the test pressure shall be 50 percent greater than the rated pressure of the pipe or specified by Engineer. The testing pressure shall be based on the lowest elevation of the test section and if there are pipes with different pressure ratings, they shall be tested separately. Dissimilar pipe materials must be pressure tested separately.

.9 The test procedure consists of an expansion and testing phase.

.10 Testing procedures and allowable losses to be determined by Engineer.

.11 When testing against a closed metal seated valve, an additional allowance of 0.0012 L/hr/mm of nominal valve size shall be allowed, per closed valve, as per AWWA Standard C605-13.

3.11 Flushing and Disinfecting

.1 Flushing and disinfecting operations shall be witnessed by Engineer. Notify Engineer at least three (3) working days in advance of proposed date when disinfecting operations will commence. Boundary valves shall be operated by Environmental Utilities personnel only.

.2 Flush water mains through available outlets with a sufficient flow in accordance with AWWA Standards to clean the pipe. If velocities cannot be achieved then an approved foam pig may be used to scour the pipe. The City of Medicine Hat does not guarantee velocities will be available when up-sizing water mains in areas with older infrastructure.

.3 Open and close valves, hydrants, and service connections using a uni-directional flushing method to ensure thorough cleaning. All boundary valves to be operated by Environmental Utilities Department and the contractor must ensure a positive flow during this procedure at all times.

.4 Ensure that all water flushed from the main is de-chlorinated and properly discharged to an approved disposal point. Testing and sampling to be witnessed by the Environmental Utilities Department.

.5 When flushing has been completed to satisfaction of Engineer, introduce a strong solution of chlorine into water main and ensure that it is distributed throughout entire system using a continuous feed method.

.6 At a minimum, disinfect water mains to the latest revision of AWWA C651 under the supervision of the Environmental Utilities Department. Additional requirements may also be required at the discretion of the Engineer depending on the circumstances.

.7 Provide connections and pumps as required by the Engineer.

.8 Install any necessary chlorination points along the pipeline route in order to properly inject the disinfectant. Connections to the main to be completed at no cost to the Environmental Utilities Department. Also the connections made shall be appropriately marked and abandoned to the satisfaction of the Environmental Utilities Department.

.9 Take water test samples at hydrants and service connections in suitable sequence to test for chlorine residual.

.10 Flush system to remove excess chlorine. Abide by all local and provincial regulations relative to the discharge of super-chlorinated water.

.11 Samples must be obtained in approved sample bottles provided by Alberta Health Services (Environmental Public Health) for analysis. Under supervision of the Environmental Utilities Department. For new installations, samples shall be collected every 370 meters of pipe, as well as one set of samples at the end of the pipe, and at least one sample from each branch greater than one pipe length (6.1 meters). Sampling to be compliant with AWWA Standard C651-14.. Samples are to be delivered to the Environmental Public Health Office for transfer to the Provincial Lab. Confirm drop-off times with local lab.

.12 Sampling to conform to most recent version of AWWA C651. Contractor to confirm testing procedure with Environmental Utilities three (3) days prior to the sampling taking place.

.13 Submit all bacterial sample results to Environmental Utilities Department for verification. Two consecutive negative results must be attained at each test location before the water main can be turned-in by Environmental Utilities and become part of the water distribution system.

.14 If test results indicate a positive result, an additional sample must be taken at that location. If that sample comes back positive for pathogens again, at the discretion of the Environmental Utilities Department, the water main will have to be re-flushed, chlorinated, and sampled again.

.15 All new valves and hydrants will be only operated by the City of Medicine Hat Environmental Utilities Department personnel once the water main is accepted and turned into the system. If any warranty work is required prior to the Final Acceptance Certificate (FAC), the Environmental Utilities Department must be notified.

3.12 Temporary Flushing and Chlorine Injection Points

.1 Contractor responsible for installation and removal of additional connections for flushing and chlorinating.

.2 Size and location of injection and flushing points to be determined by Engineer.

.3 Curb stops to be stop and drain type.

.4 Removal and abandonment of connections to be witnessed and approved by Engineer.

.5 An approved cap or saddle to be installed on closed main stop to prevent future leaks.

.6 GPS position of abandoned main stop to be provided to Engineer for Record Drawings.

.7 Flush points that are located in roadways or temporary graveled turnarounds where vehicle traffic could damage the flush point shall be protected by enclosing curb stop and pigtail in a vault or manhole.

.8 Flush points in undeveloped roadways or easements shall have marker posts to prevent damage to the curb stop.

3.13 Clean Tie-Ins and Repairs

.1 All valves and appurtenances will be operated by Environmental Utilities operators. Any hydrants that are taken out of service will be reported by Environmental Utilities to the City of Medicine Hat Fire Department. Once the water service has been restored, Environmental Utilities operators will call them in to Environmental Utilities administration staff, or if after hours, Environmental Utilities operators to call Fire Hall No. 1 (403-529-8282 or 403-502-8009), leaving a detailed voicemail if no answer, then notify Environmental Utilities admin staff the next working day.

.2 Clean ties must be completed in accordance with AWWA Standard 651-14.

.3 Contractor is responsible for arranging all locates and for site safety.

.4 All signage and road closures to be approved by Environmental Utilities and Municipal Works. A Traffic Accommodation Plan must be prepared and submitted to Municipal Works department for approval at least 1 week in advance of road closures Notification to Transit, Emergency Services, and Solid Waste pick-up will be completed by Environmental Utilities.

.5 Contractor is responsible for notifying the public and businesses affected by the shutdown at least twenty-four (24) hours in advance. Hand delivered letters are to be approved by Environmental Utilities in advance.

.6 If the repair is deemed an emergency, then the residents can be informed by going door to door as a courtesy.

.7 Pipe size, elevations and type of material to be confirmed by hydroexcavation prior to excavation, if unknown.

.8 Contractor to have all necessary, approved parts onsite to perform the task including valves, hydrants, fittings, trash pumps and hoses and/or vacuum trucks. All ditch water must have sediments removed by a suitable filtration method when pumping into storm and sanitary manholes to prevent silt deposits/sand/gravel from entering storm drainage or sanitary systems.

.9 Whenever possible, laterals should be connected by hot taps instead of cut-ins. Hot taps to be performed with the line left under pressure. In a situation where there may be some risk involved because of high pressure, high volume, pipe material or location, proximity valves will be closed by E.U. staff and the line will be fed from one direction. E.U. staff will be on standby as a precaution.

.10 All hot taps in City owned water mains must be tapped by Environmental Utilities or by an approved contractor. See Section 10, Water Mains, 3.6 Tapping Valve Installation.

.11 Prior to cut-ins and water shutdown, turbidity and chlorine residual levels will be taken as a reference to indicate the levels to be obtained after the work has been completed.

.12 Excavate below pipe to allow for a rock sump. Maintain ditch water levels below the bottom of the pipe to avoid contamination. Positive pressure must be maintained until water level is safely below the bottom of the pipe. If water, soil or other contaminants from the ditch enters the open pipe, uni-directional flush the line from all directions to flush out the line.

.13 If positive pressure is lost, the line must be isolated and bacteriological samples are to be taken to insure that coliforms and E-coli bacteria is not present. Results must be confirmed negative before line is returned into service. Refer to Section10, Water Mains, 3.11 Flushing and Disinfecting.

.14 For valve, hydrant, fitting or pipe repair, swab all parts with a minimum one (1) % hypochlorite solution. Prevent contamination by sealing parts with poly prior to assembling and use clean disposable gloves when handling and making connections.

.15 All fittings to be installed and torqued to manufacturer's specifications.

.16 Once repair has been made, backfill pipe as per Section 7, Trenching, Backfilling, and Compaction. When the pipe has sufficient backfill weight on it, the waterline can be safely loaded by Environmental Utilities uni-directionally. All air and excess chlorine residual to be expelled utilizing the closest existing hydrants or flush points. Chlorinated water must be discharged to sanitary sewer or dechlorinated before being directed to storm drainage. Contractor required to supply all fittings, hoses and manpower.

.17 A static pressure test or a visual inspection by Environmental Utilities or designated representative will be required prior to completing the backfill. Refer to Section 10 Water Mains, 3.10 Leakage and Pressure Testing.

.18 Turbidity and chlorine residual will be monitored until they return to their original readings. Once that is accomplished Environmental Utilities will return all valves to normal position.

.19 Document all fittings, pipe material and size, dimensions, elevations, date and location for the purpose of updating the GIS database. An accurate, dimensioned sketch, survey notes or GPS shots on the pipes and fittings before backfill must be provided to Environmental Utilities Engineering.

3.14 Temporary Water Services

.1 Twenty-four (24) hours' notice is required by E.U. for ordering, pre or post-inspecting hydrants, installation, removal, or relocation of blue boxes (RP backflow and meter box).

.2 All hydrants and blue boxes will be inspected prior to use and upon return to Environmental Utilities. Any damage noted at post-inspection will be repaired at the cost of the Contractor.

.3 If the water usage is not for a City of Medicine Hat project, then arrangements must be made with E.U. to rent the blue box. A deposit and consumption charges will be applied.

.4 Blue boxes will be locked and control valves inside the box are controlled by E.U. Contractor is responsible for supplying the gate valve for the hydrant and shut-off valve on the downstream side of the box. All non-plastic fittings used to connect the blue boxes must be of the No-Lead Brass type.

.5 Potable water blue boxes are available for temporary water supply to private residences and businesses as well as general water usage such as for street sweeping, earthworks projects or dust control.

.6 If the temporary service line is for domestic use, the following procedures must be adhered to.

.1 The Contractor will string out the temp water line and necessary laterals using new or clean pipe approved by the Environmental Utilities Department. Valves to be installed at each lateral and at the end of the line. Temporary water line must be designed by a qualified engineer to ensure adequate water supply provided to residents and businesses. A minimum of 150 kPa must be maintained in the system at all times.

.2 E.U. will supply water for initial leak testing and a pre-flush of the main line and laterals of the temporary water supply system.

.3 The temporary system including all laterals are then super-chlorinated as per Section Water Mains, 3.11 Flushing and Disinfecting.

.4 Water used for flushing and super-chlorination must be disposed of in the sanitary sewer system or a water truck with an approved air gap.

.5 Bacteriological testing samples will be taken at pre-determined locations. The line is to be isolated until bacteriological results come back negative. Refer to Section Water Mains, 3.11 Flushing and Disinfecting.

.6 Once bacteriological tests have passed, Contractor will have to arrange for Environmental Utilities to open the valve in the blue box to charge the temporary line.

.7 Contractor must arrange to ensure the residence’s internal meter shut-off valve is accessible and in good working condition. Outside hose bibs that are used must allow water to flow into the home. Frost-free hose bibs may have to be modified if used as a connection. Direct connection to the existing water service or other proposed

service methods may be allowed as an alternative only with specific approval from Environmental Utilities.

.8 Contractor is responsible to coordinate appointments with individual homeowners for hook-ups to the temporary water service system. The shut-off valve at meter is to be closed and confirmed to hold before temporary water is hooked up to the building. Using clean disposable gloves and a 1% hypochlorite solution, spray connections. Flush and make all the necessary connections. Homeowners or their designate to be present at all times.

.7 Curb stop pre-inspection is done by E.U. and each residence or business will be additionally isolated by E.U. to eliminate reverse flow when testing the new water main.

.8 Once the new water main has been put into service, the Contractor will again have to make arrangements with Environmental Utilities and individual homeowners to disconnect the temporary service and restore permanent water service.

.9 Temporary water must be disconnected first and meter valve opened. Environmental Utilities staff will then open up the curb stop and the Contractor will flush the house service through the outside hose bib until water flows clear and air is expelled.

.10 Once all residences have been converted over to the permanent water line, the blue box will be removed and hydrant will be put back into normal service by Environmental Utilities.

.11 The Contractor is then responsible for removing the temporary water system piping, sealing all ends to prevent possible contamination.

3.15 FLOW TESTING

.1 All fire hydrant flow testing to be performed under the supervision and approval of Environmental Utilities staff, except for testing on privately owned fire hydrants.

.2 Pressures and flow rates for the design of fire suppression and plumbing systems must be attained by the Tech Company and will not be supplied by the Environmental Utilities Department

.3 The Contractor or Tech Company is responsible for all safety and traffic control.

.4 Any hydrants or other appurtenances damaged during the testing procedure are the responsibility of the Contractor.

.5 Gate valves must be fitted on fire hydrants to control flows and dechlorination devices must be installed on the equipment used for the testing procedure.

.6 The release of water from fire hydrants onto the roadway/drainage systems that will enter the storm sewer system must be dechlorinated. As an option, the flows can be diverted into the sanitary sewer system with the approval of E.U.

.7 Fire hydrant flushing may not be allowed by the Environmental Utilities Department due to inclement weather and cold temperatures.

END OF SECTION

Section 11 – Service Connections

PART 1 – GENERAL

1.1 Related Work Specified Elsewhere:

.1 Trenching, Backfilling and Compaction: Section 7

.2 Sanitary Sewers: Section 9

.3 Water Mains: Section 10

.4 General Concrete: Section 12

1.2 Scheduling of Work:

.1 Schedule Work to minimize interruptions to existing service.

.2 Maintain existing flow during installation.

1.3 Measurement for Payment:

.1 Refer to Section 4 Measurement Rules and Section 5 Measurement Schedule.

1.4 Detailed Drawings

.1 Following detail drawings are appended hereto and form part of this Section:

- EU-107: Benching Detail for Manhole in Cul-De-Sac
- EU-112: Sewer Service Connections to Mains
- EU-206: Standard Building Service Connection Sanitary and Water
- EU-207: Standard Parks Irrigation Service Connection
- EU-208: Cul De Sac Flushing Point
- EU-216: Above Ground Sampling Station Installation Details
- EU-218: Large Diameter Irrigation Service Connection

PART 2 – PRODUCTS

2.1 Water Service

.1 General:

.1 For service connection sizes 25 mm to 50 mm diameter, pipe to be Type K Copper Tubing, or Municipex.

.2 For service connection sizes 100 mm to 300 mm diameter, pipe to be Polyvinyl Chloride (PVC) Pressure Pipe as specified in Section 10.

.3 Valves and Valve Boxes for service connection sizes 100 mm to 300 mm diameter to be as specified in Section 10.

.4 Refer to latest revision of AWWA – C-900.

.2 Copper Tubing:

.1 For services 25 mm to 50 mm diameter, copper tubing conforming to latest revision ASTM B88M, type K, annealed (as described in AWWA C-800 - Appendix - Collected Standards for Service Line Materials).

.3 Municipex Tubing:

.1 For service 25 mm to 50mm diameter, Municipex tubing (cross-linked polyethylene pipe) shall be manufactured in accordance with AWWA C904, CSA B137.5 and ASTM F876 and shall comply with NSF 14 and NSF 61. The Pipe and resin (compound) shall be manufactured in an ISO 9001 certified production facility. Municipex tubing shall have approved pressure rating of:

- 160psi @ 23°C / 73.4°F
- 100psi @ 82°C / 180°F
- 80psi @ 93°C / 200°F

.2 The outside diameter of the pipe shall be copper tube size (CTS) and shall have a standard dimension ratio (SDR) 9.

.3 The pipe shall carry the following marks every 5 feet minimum:

- Manufacturer’s name
- Nominal size
- ASTM, CSA 7 NSF designations
- SDR (standard dimension ratio)

- Pressure/temperature rating
- Potable tubing
- Manufacturing date & machine number
- Footage mark; the pipe shall have consecutive footage marks every 5 feet (minimum starting with 0 at the beginning of each coil) colour: blue.

.4 The pipe shall be shipped in protective cardboard boxes marked with the product name and size.

.5 When connecting Municipex tubing to fittings, manufacturer approved stainless steel inserts shall be used.

.4 Water Service Tubing Couplings:

.1 Compression type suitable for 1 MPa working pressure. Couplings shall be supplied without internal pipe stop.

.2 Approved Products:

- Ford "Quick Joint" couplings
- Mueller Mark II "Oriseal" couplings
- Cambridge Brass compression couplings
- Cambridge Brass Universal Coupling
- A.T. McDonald compression coupling
- All fittings to be certified NSF 61.

.5 Corporation (Main) Stops:

.1 Corporation stops to be lead free brass ball valve construction with, or without, Teflon coating. Body to be red brass to latest revision ASTM B62, compression type outlet fitting, inlet having AWWA thread conforming to latest revision AWWA C800. Valves to be full round port, reduced port not permitted. All brass fittings and valves shall be certified by a NSF or ANSI accredited test lab per ANSI/NSF Standard 61, Section 8. Proof of certification is required.

.2 Approved Products:

- Mueller B-25008 c/w "110 Compression" outlet for sizes 25, 38, and 50 mm diameter.

- Ford FB1000 – X-NL "Ballcorp" c/w "Pack Joint" outlet for sizes 25, 38, and 50 mm diameter.
- Cambridge Brass Series 301 N.L. outlet for sizes 25, 38, and 50 mm diameter.
- A.Y. McDonald Mfg. Compression outlet Series 4701 BT for sizes 25, 38, & 50 mm diameter.

.6 Curb Stops:

.1 Curb stops to be of ball valve construction. Balls to be lead free Teflon coated brass, or industrial chrome plated stainless steel c/w Teflon seats. Body to be lead free red brass to latest revision ASTM B62, without drain. Inlets and outlets to compression type fittings suitable for copper Municipex pipe and Kitec (Q-Line). Valves to be full port, reduced port not permitted. All brass fittings and valves shall be certified by an NSF or ANSI accredited test lab per ANSI/NSF Standard 61, Section 8. Proof of certification is required.

.2 Approved Products:

- Cambridge Brass Series 202 N.L. for sizes 25, 38 and 50 mm diameter.
- A.Y. McDonald Mfg. Series 6100 “Q” Compression outlet for sizes 25, 38 and 50mm diameter.
- Ford B44 Q-NL c/w “Quick Joint” outlet for sizes 25, 38 and 50mm diameter.
- Mueller B-25209 c/w “110 Compression” outlet for sizes 25, 38 and 50mm diameter.

.7 Service Saddles:

.1 Outlet to be 25 mm to 50 mm AWWA Taper thread for standard service connections. For use on chlorination points only, outlet to be 25 mm to 50 mm IP thread.

.2 Fasteners to be 15.88 mm (5/8") NC thread T304 stainless steel. Hex nuts and washers to be T304 stainless steel, lubricated to prevent galling.

.3 Approved Products:

- Robar 2616 DBL Bolt for main sizes 150mm to 300mm
- Robar 2626 DBL Bolt for main sizes 350mm to 450mm

- Canada Pipeline SC-2 for main sizes 100mm to 400mm
- Robar 2636 for main sizes 450mm to 750mm
- Canada Pipeline SC-4 for main sizes 100mm to 600mm
- Smith Blair 372 Service Saddle DBL Bolt
- Robar 2706 for main sizes 100mm to 600mm
- Cambridge Brass Series 812 for sizes 100mm to 300mm

.8 Curb Stands (Service Boxes):

.1 Standard depth of bury to be 2.75 m. Maximum depth from finish grade to curbstop valve cannot exceed 3.05m without approval.

.2 Curb stand sliders shall be 31.75 mm (1 1/4") O.D., galvanized Standard Schedule 40, wrought iron pipe. Distance from top of cap to bottom of slider to be 610 mm minimum, 1000 mm maximum. Set screw to be removed prior to backfill. A maximum of 150mm threaded riser can be used for adjustment.

.3 Casing shall be 25 mm O.D. (1"), galvanized Standard Schedule 40, iron pipe. Casing must be long enough to allow a minimum of 150mm overlap by the slider.

.4 Cap to be cast-iron, ribbed, marked "WATER" c/w 32mm pentagonal head brass plug. The exterior of the cap is to be bituminous coated.

.5 Bottom box to be 127 mm (5") I.D., cast or ductile iron. Bottom box to be factory applied fusion bonded epoxy coating.

.6 The operating rod shall be 12.70 mm (1/2") on a 25 mm service, 15.875 mm (5/8") on 38 - 50 mm service, supplied as a single unit comprised of a solid AISI Type 304 stainless steel. Rod welded to a stainless steel clevis, or approved equivalent, and fastened with a brass cotter pin.

.7 The operating rod shall be manufactured with a "W" centering bend (standard pigtail). The rod must be a minimum of 2.0m if used on a standard bury service. The top of rod should be below the top of casing.

.8 The manufacturer name shall be cast into the bottom boot to the satisfaction of the Engineer.

.9 Approved Manufacturers:

- Trojan
- Norwood Foundry or approved equal
- East Jordan Iron Works
- Westview Sales Ltd.

.9 Tracer Wire Type 14/1B MDPE Tracer

.1 Tracer wire to be 14 gauge, single conductor copper wire, unstranded, color of insulation to be white or blue for watermains and services and green for sanitary sewer. Insulation to be made for direct bury.

.2 When joining tracer wire use underground waterproof splice kit.

.3 Terminate tracer wire at curb stands for new install, and at coupling location for renewals.

.4 Approved Products:

- 3- M DBR or DBY splice kit or equivalent
- Copperhead Industries Snakebite Connector
- Cambridge Brass No. 81 Compression Electrical Nut
- Copperhead Industries Mainline-to-Service Connector

2.2 Sanitary Service

.1 Pipe – “Smooth Wall” Polyvinyl Chloride (PVC) Pipe

.1 For PVC service connections 100 mm to 150 mm in diameter, all pipe to be to latest revision ASTM D3034, CSA certified as meeting latest revision CSA B182.2, SDR 35, integral locked-in gasket bell and spigot joints.

.2 For PVC service connections 200 mm and larger, all pipe to be as per Section 9– Sanitary Sewer Pipe and Fittings; Section 2.1 “Smooth Wall” PolyVinyl Chloride (PVC) Pipe.

.2 Fittings – Polyvinyl Chloride (PVC)

.1 For PVC service connections 100 mm to 150 mm in diameter, all fittings to be to latest revision ASTM D3034-83, CSA certified as meeting latest revision CSA B182.2, SDR 35, integral locked-in gasket bell and spigot joints.

.3 Connections to Mains

.1 PVC Tee Saddle c/w rubber gasket joint:

Saddles to be manufactured with integral centering ring or teeth to align saddle opening with hole in pipe. Saddle to be fastened to main by adjustable stainless steel straps. Screw mechanism on straps to be completely stainless steel.

.2 PVC Insert type Fittings:

Insert type fittings to be PVC PSM gasket joint stubs, c/w molded rubber sleeve and adjustable stainless steel strap. Screw mechanism on straps to be completely stainless steel.

.3 Approved Products:

- IPEX Ring-Tite or equal

.4 In areas of high ground water conditions, manufactured inline tees are required for sewer service connections. Cutting of pipe and installations of “inserta tee” or service saddles will not be permitted.

.5 Inline tees to be used in situations where service lateral diameter is less than 2 nominal sizes smaller than main diameter.

.4 Flexible Rubber Couplings

.1 Flexible rubber couplings to be elastomeric PVC construction c/w stainless steel straps.

.2 Approved Products:

For pipe size up to 150 mm:

- Rollee c/w stainless steel shear ring

For pipe size greater than 150 mm:

- Fernco
- Clow, “Super-Seal”
- Mission Rubber Co. – “Flex-Seal”

- Pipeconx
- Rollee c/w stainless steel shear ring

PART 3 – EXECUTION

3.1 3.1 Preparation

.1 Carefully inspect materials for defects. Remove defective material from site.

3.2 Trenching and Backfill

.1 Complete trenching and backfill work to Section 7 Trenching, Backfilling and Compaction.

.2 Trench depth to provide minimum cover over water service pipes of 2.75 m to a maximum of 3.05m from finished grade unless otherwise indicated.

.3 In existing areas where watermains do not have sufficient minimum cover, insulation is required if cover over service is less than specified. Type of insulation and R values required to be approved by Engineer. See Environmental Utilities Standard Drawing EU-221

3.3 Water Service Installation

.1 Installation and handling of pipe and fittings shall be according to the manufacturer's recommendations and applicable AWWA Specification for the type of pipe and fitting selected or as specified herein. Refer to Standard Building Service Connection (EU-206).

.2 Service pipes to extend 3.0 m into lot from property line, unless gas and/or electric easement exists on front of property. Service shall extend 5.0 m into property, in this case. Curb stop, complete with 38 mm x 76 mm marker, painted blue to extend .6m above finished grade, will be placed on the property line.

.3 Do not backfill trenches until installed work has been inspected and accepted by the Engineer. Elevation of service pipes to be recorded for Record Drawings.

.4 Construct service connections at right angles to main, unless otherwise directed.

.5 Drill and tap water mains under pressure by means of a tapping machine. Do not direct tap PVC Series pipe. Single service connections, multiple tap service connections and cul de sac flushing points shall be tapped in the top half of the pipe at the 10:00 o'clock and 2:00 o'clock positions and at a minimum of 0.6 m on centre to other service taps or 0.6 m to nearest edge of tapping sleeve or other service tap. Manual air release points to be installed at 12 o’clock.

.6 Tap main no closer to a joint than recommended by pipe manufacturer or 1 m, whichever is greater.

.7 Service saddles are required for all services. Direct tap is not permitted. Torque bolts to Manufacturer's specifications. In high ground water conditions an approved protective tape or wrap may be required. Refer to Section 2.10 Corrosion Protective Tapes or Wraps.

.8 Leave corporation stop fully open, upon completion of installation.

.9 Locate curb stop on property line. Provide chair and blocking under curb stop to support curb stop. Rod to be fastened to curb stop with brass cotter pin. Install cotter pin bending both legs in same direction.

.10 Set service boxes plumb over the centre of the curb stop and set the top of service box to proper elevation. Remove set screw leveling bolt from top slider.

.11 In areas of clay soil, water service shall be a minimum of 2.75m below the final grade or as specified. In areas where the soil is predominantly gravel, water services may be set deeper to prevent frost penetration with approval from the Environmental Utilities Department.

.12 Tracer wire and water tight connections to be installed along top of water service pipe with duct tape, Gorilla tape, or tuck tape. Refer to Standard Details for Building Services (EU-206), Parks Irrigation Services (EU-207), Cul De Sac Flushing Points (EU-208) and Large Diameter Irrigation Service Connection (EU-218), Above- Ground Sampling Station Installation Details (EU-216), and Manual Air Release (EU-219).

.13 Abandonment of main stops to be done with an approved cap or saddle. A surveyed as-built is required and location of abandoned services must be shown on record drawings.

.14 Refer to Section 7 – Trench, Backfilling and Compaction; Section 3.10 Backfilling Schedule.

.15 Refer to Section 10 – Water Mains ; Section 3.14 for Temporary Water Services where temporary water services are required.

3.4 Water Service Abandonments

.1 All water service abandonments shall be performed by, or under the direction of City Assets Department.

.2 All work required for the excavation of the service must be performed in alignment with the CCGA Best Practices, as well as other requirements found within this document. City Asset will be given a minimum of 3 days of notice prior to the work. Mechanical means of excavation will not be permitted within 600 mm of a visible (daylighted) water pipe.

.3 Abandonment of services must be performed at the main. Excavate the main stop valve, remove the Municipex pipe from the main, and install a Cambridge Brass Series No. 90 NL Plug for CTS Compression Outlets.

.1 If the main stop valve will not accept the Series No. 90 NL Plug for CTS Compression Outlets because of damaged or flared threads, and is in good working condition, the service line can be left in the main stop. The service pipe would be cut no more than 150 mm away from the main stop. A curb stop would be installed on the service and the curb stop closed and capped using a Cambridge Brass Series No. 90 NL Plug for CTS Compression Outlets.

.2 If the main stop is leaking and will not accept a Cambridge Brass Series No. 90 NL Plug for CTS Compression Outlets, a service abandon saddle may be permitted by the City Assets Department. Install the service abandon saddle in accordance with the manufacturers instruction.

.3 In cases that the corporation main stop will not close, or cannot be abandoned using a saddle, the main stop will be removed from the main, the section of main removed and replaced.

.4 All service abandonments to be surveyed with the information provided to the City Assets – Environmental Utilities Department for record purposes.

3.5 Sanitary Sewer Service Installation

.1 Installation and handling of pipe and fittings shall be according to the manufacturer's recommendations for the type of pipe and fitting selected or as specified herein.

.2 For replacement of existing services notify the occupants, residents or business a minimum of two (2) business days in advance of any interruptions to the existing service.

.3 Lay pipe straight and true at a minimum grade of two percent (2%) for 100 mm and one percent (1%) for 150 mm diameter pipe. Maximum vertical deflection shall be 4.5 degrees. Make all service lead joints watertight. No

part of the saddle or service pipe shall protrude beyond the inside surface of the sewer main.

.4 At the discretion of Engineer, service line lateral may require CCTV inspection.

.5 Install services to centreline of individual lots, except when otherwise approved.

.6 Remove material that drops into the sewer during service tie-in. Plug or cap the open end with a watertight PVC fitting to prevent dirt intrusion. Take extra care in backfilling and tamping along the pipe and at connections. Prior to commencing backfilling of the service trench the installation shall be inspected and approved by the Engineer.

.7 Service pipes to extend 3.0 m into lot from property line, unless gas and or electric easement exists on front of property. Service shall extend 5.0 m into property, in this case. Mark location of end of service by setting a green 38 mm x 76 mm (2” x 4”) marker extending from the service invert to a height of 750 mm (30 inches) above grade.

.8 Service connections shall be tapped in the top half of the pipe at the 10:00 o'clock and 2:00 o'clock positions. Use long radius sweep bends as per Standard Building Service Connection Sanitary And Water detail EU-206. Adjacent service saddles to be spaced a minimum of 0.6m on center and 1.0m from pipe joints.

.9 Sanitary services shall have Class B backfill as per Section 7 – Trench Excavating and Backfilling; sub-section 3.10 Backfilling Schedule-Trenching, Backfilling, and Compaction.

.10 Monitoring/sampling manholes to be installed for new multi-family housing (6 plex and larger), institutional, commercial, and industrial customers if service is connected directly to main or tied in with other services. Refer to Section 8 Manholes and Standard Manhole Detail EU-101, Industrial/Commercial Site Servicing Sampling Manhole Detail EU-113 and Industrial/Commercial Offset Sampling Manhole Detail EU-114.

3.6 Sanitary, Storm and Water Service Common Trench Installation

.1 Lay water and sewer service pipe 300 mm (12 inches) apart when services are in a common trench and the water service pipe size is less than 50 mm (2 inches). Maintain a horizontal separation of 1.4 m (4.5 feet) at property line when the water service pipe size is 50 mm (2 inches) or greater. The water service shall be center in the common trench with sanitary on the left side and storm sewer on right side, when viewed from main line to the

property. Install each service as described in the previous sections for each of the respective services. Refer to Standard Building Service Connection Sanitary And Water (EU-206).

.2 Separate services to be installed at quarter points on lot frontage for duplexes. On corner lots, duplexes shall be serviced separately on front and side of lot if possible. Refer to Standard Building Service Connection EU-206.

.3 Where the sewer service (or services) are above the water service, lay the sewer services on a shelf of undisturbed ground of such width of ensure complete bedding or, lay water service at a specified depth, backfill and compact to required elevation to accommodate sewer service.

.4 Prior to commencing backfilling of the trench arrange for the Engineer to inspect the installation of the services. Locations of services to be included on submitted Record Drawings.

.5 If the bedding under a service is disturbed, replace and compact bedding as specified.

.6 Sanitary and storm service shall have Class B backfill as per Section 7 – Trench Excavating and Backfilling; sub-section 3.10 Backfilling Schedule.

.7 Water service shall have Class B backfill as per Section 7 – Trench Excavating and Backfilling; sub-section 3.10 Backfilling Schedule.

.8 Monitoring/sampling manholes to be installed for new multi-family housing (6 plex and larger), institutional, commercial, and industrial customers if service is connected directly to main or tied in with other services. Refer to Section 8 Manholes and Standard Manhole Detail EU-101, Industrial/Commercial Site Servicing Sampling Manhole Detail EU-113 and Industrial/Commercial Offset Sampling Manhole Detail EU-114.

.9 Storm services shall be properly marked and sized to avoid cross connection with the sanitary sewer service.

3.7 Sanitary Sewer Service Abandonments

.1 All sanitary sewer service abandonments shall be performed by, or under the direction of City Assets Department. All abandonments must be documented with accurate survey information, or GPS coordinates of plugs, caps and service location.

.2 All work required for the excavation of the service must be performed in alignment with the CCGA Best Practices as well as other requirements found within this document. City Asset will be given a minimum of 3 days

of notice prior to the work. Mechanical means of excavation will not be permitted within 600 mm of a visible (daylighted) utility service or main.

.3 All abandonment of services must be performed at the main. Depending on the pipe material of the main, different abandonment procedures will be followed:

.1 If there is a service saddle installed on the main, remove the service pipe from the saddle and insert a watertight SDR cap into the saddle. Cap, or concrete in the service pipe at the edge of excavation nearest to the property.

.2 If the pipe material is clay, or cement, and the service penetration is above the springline of the main, then the service pipe can be disconnected 150 mm away from the main and the service connection cemented or grouted. Plug the upstream service pipe at the edge of the excavation nearest to the property using grout or cement.

.3 If the pipe material is clay, or cement, and the service penetration is below springline of the main, remove the section of sanitary sewer main with the abandoned service. Replace the removed section with SDR 35 PVC sewer pipe of the same internal diameter of the active main. Connections to the existing main to be made using approved products, found in Section 9 of this document. The service pipe to be disconnected at the edge of the excavation nearest to the property using grout or cement.

END OF SECTION

Section 12 – General Concrete

PART 1 – GENERAL

1.1 Related Work Specified Elsewhere

.1 Manholes and Catch Basins: Section 8

.2 Sanitary Sewers: Section 9

.3 Water mains: Section 10

.4 Service Connections: Section 11

1.2 Reference Standards

.1 Do Concrete Materials and Methods of Concrete Construction and Methods of Test for Concrete to CAN3-A23, except where specified elsewhere.

.2 Refer to the latest revision of the City of Medicine Hat Municipal Works Standards.

PART 2 – PRODUCTS

2.1 Materials

.1 Cement: to CAN3-A5, (Type 50)

.2 Aggregates: to CAN3-A23

.3 Joint Filler: to ASTM D-1751 (AASHTO M213)

.4 Admixtures:

.1 Air-entraining admixture to CAN3-A266.

.2 Engineer to approve accelerating or set retarding admixtures during cold and hot weather placing.

.5 Concrete Mixes

.1 Mix design to be approved by Engineer.

.2 Compressive strength at 28d, 30 MPa minimum.

.3 Class of exposure A.

.4 Fine aggregate to CAN3-A23.

.5 Coarse aggregate to CAN3-A23. Table 3, Group 1, 28.5 nominal size.

.6 Slump at point of discharge, 65 mm + 25 mm.

.7 Where 7d strength is less than 70% of specified 28d strength, provide additional curing and make changes to mix proportions as directed by Engineer.

END OF SECTION

Section 13 – Standard Drawings

(refer to Environmental Utilities Standard Drawings Document)

Medicine Hat
The Gas City