

LOGAN STATE PARK

WASTEWATER IMPROVEMENTS



SPECIFICATIONS

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LOGAN STATE PARK
WASTEWATER IMPROVEMENTS PROJECT
SPECIFICATIONS
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Division 1 General Requirements



DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01010	Summary of Work
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SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Invitation to Bid contains a general description of the project work to be performed under this Contract. The Supplemental Conditions and Special Provisions and other documents contain additional information necessary to perform the work.

1.2 CONTRACT DOCUMENTS

- A. Portions of the Contract Documents are written in the imperative mode. Except where specifically intended otherwise, the subject of all imperative statements is the Contractor. For example, “Furnish...” means “Contractor shall furnish...”, “Provide” means Contractor shall provide...”. For imperatives specifically addressing the Engineer/Owner, see paragraph 1.02, General Conditions.
- B. Contract Documents are defined in Article 1, paragraph 1.01.A.12, General Conditions, as modified by Montana Public Works Standard Specifications, any supplemental conditions, and Article 9 of the Agreement Form.
- C. The Contract Documents are intended to provide the basis for proper completion of the work suitable for the intended use of the Owner. Comply with Article 3, General Conditions. Specifications and Drawings included in these contract documents establish the performance, quality requirements, location and general arrangement of materials and equipment, and establish the minimum standards for quality of workmanship and appearance. Anything not expressly set forth but which is reasonably implied or necessary for proper performance of the project shall be included.
- D. The various portions of the Contract Documents, of which these specifications are a part, are essential parts of the Agreement, and a requirement occurring in any portion or part is binding as though occurring in all. All portions are intended to be complementary and to describe and provide for a complete work as referenced in Article 3, General Conditions. Unless specifically noted otherwise, in the case of discrepancy the following hierarchy shall be observed:
 - 1. Addenda, which will govern over;
 - 2. Special Provisions, which will govern over;
 - 3. Standard Modifications, which will govern over;
 - 4. Supplementary Specifications, which will govern over;

5. Project Drawings, which will govern over;
 6. These Specifications and Standard Drawings, which will govern over;
 7. Montana Department of Transportation Standard Specifications for Road and Bridge Construction
- E. The bound copy of the Montana Public Works Standard Specifications, as distributed by the Montana Contractor's Association, Inc., will govern as the legal set of these specifications over any unbound copy, or any CD-ROM or floppy disk versions
- F. A requirement mentioned in one part/section of the Contract Documents shall be considered as having been mentioned in all parts/sections.

1.3 WORK SEQUENCE

- A. Comply with paragraph 2.07 and 6.04 of the General Conditions and Milestones specified in the Contract Documents.
- B. Submit detail schedules as specified in the Contract Documents.
- C. Field verify dimensions indicated on drawings before fabricating or ordering materials. Do not scale drawings.
- D. Notify Engineer/Owner of existing conditions differing from those indicated on the drawings. Comply with paragraph 4.03, of the General Conditions and any Supplementary Conditions. Verify the existence and location of underground utilities along the route of the proposed work. Omission of an existing or previous abandoned utility location on the Drawings is not to be considered as its nonexistence. Inclusion of existing utility locations on the Drawings is not to be considered as its definite location. Do not remove or alter existing utilities without prior written approval.

1.4 CONTRACTOR USE OF PREMISES:

- A. Comply with paragraph 6.11, General Conditions, and as specified in the Contract Documents.
- B. Do not park vehicles or equipment or store materials on private property without written permission from the property owner. Provide Engineer/Owner with copy of authorization.

1.5 OWNER-FURNISHED ITEMS

- A. Owner-furnished items are listed in the Contract Documents.

PART 2 PRODUCT — NOT USED

PART 3 EXECUTION — NOT USED

PART 4 MEASUREMENT AND PAYMENT

4.1 PAYMENT

- 4.1.1 Unless specifically noted otherwise, the work of Division 1 shall be incidental to the work, and no separate payment shall be made.

END OF SECTION 01010

SECTION 01041

PROJECT COORDINATION

PART 1: GENERAL

1.1 DESCRIPTION

- A. This section specifies the requirements for coordinating and sequencing the work under the Contract documents, and requirements regarding existing site conditions.

1.2 COORDINATION WITH PUBLIC AND PRIVATE AGENCIES

- A. Comply with Article 7, General Conditions. Permit utility companies to repair or replace their lines in the project limits.
- B. Contact the Montana one-call system for utility locations before starting work.
- C. Comply with paragraph 6.20, General Conditions.

PART 2: PRODUCT — NOT USED

PART 3: EXECUTION — NOT USED

PART 4: MEASUREMENT AND PAYMENT — NOT USED

END OF SECTION

SECTION 01050
FIELD ENGINEERING

PART 1: GENERAL

1.1 ENGINEERING SURVEYS

- A. Notify Engineer of required survey work at least 48 hours before starting work.
- B. Preserve all benchmarks, control points and stakes.
- C. Replace benchmarks, control points and stakes destroyed or disturbed by Contractor or subcontractor.
- D. Comply with paragraph 4.04, General Conditions.

1.2 STREET MONUMENTS AND PROPERTY CORNERS

- A. Mark and protect existing property pins and/or street monuments.
- B. Use a licensed land surveyor to replace all property corners or other monuments marked or shown on the plans that are destroyed by the work.

PART 2: PRODUCT — NOT USED

PART 3: EXECUTION — NOT USED

PART 4: MEASUREMENT AND PAYMENT — NOT USED

END OF SECTION

SECTION 01090

REFERENCES

PART 1: GENERAL

1.1 COORDINATION OF CONTRACT DOCUMENTS

1.2 DEFINITIONS

- A. These specifications use “Article 1 - Definitions” of the Standard General Conditions of the Construction Contract, Form No. C-700 prepared and issued by the Engineer’s Joint Contract Documents Committee (EJCDC), for the definition of terms herein. Changes to definitions are by either substitution for the article or in Supplementary Conditions.

1.3 REFERECNCES

- A. This section lists some of the construction industry organizations, professional and technical associations, societies and institutes, and government agencies issuing, promoting, or enforcing standards in the Contract Documents along with the abbreviations commonly used for those references. Also included are general requirements for using industry standards specified, and for applying quality control standards.

1.4 USE OF REFERENCE STANDARDS

- A. Work specified by reference to a published standard or specification of a government agency, technical association, trade association, professional society or institute, testing agency, or other organization must meet or exceed the minimum quality standards for the material and workmanship in the designated standard or specification.
- B. Where specified, assure products or workmanship meet the prescriptive or performance requirements in the Contract Documents when it is a more stringent standard than the referenced standard. Contract should reference only one specification to prevent argument as to which specification is most stringent.
- C. Where the specific issue date of the standard is not identified in the standard, the edition and all published amendments available on the date of the Invitation to Bid applies.

- D. If two or more standards are specified, provide the product and workmanship meeting or exceeding the requirements of the most stringent standard.
- E. If a conflict exists between standards, meet the more stringent standard.
- F. Where both a standard and a brand name are specified, assure the proprietary product names meet or exceed the specified reference standard. The listing of a trade name in a Contract Document does not warrant that the product meets the referenced standard.
- G. Copies of Standards
 - 1. Copies of applicable referenced standards are not bound in this Contract Document.
 - 2. Where the contractor needs copies of standards for work superintendence and quality control, obtain a copy or copies directly from the publication sources and maintain copies at the job site, making them available to Contractor personnel, subcontractors, Owner, and Engineer.

1.5 ABBREVIATIONS

- A. Abbreviations for Trade Organizations and Government Agencies: Following is a list of construction industry organizations and government agencies commonly referenced in the Contract Documents, with abbreviations used.

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturers' Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers' Association
AGA	American Gas Association
AGMA	American Gear Manufacturers' Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALS	American Lumber Standards
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute

ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers' Association
AWPB	American Wood Preservers' Bureau
AWPI	American Wood Preservers' Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers' Association
CBMA	Certified Ballast Manufacturers' Association
CDA	Copper Development Association
CGA	Compressed Gas Association
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers' Association of America
CRSI	Concrete Reinforcing Steel Institute
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
Fed Spec.	Federal Specifications
FS	Federal Specification
GA	Gypsum Association
HI	Hydraulic Institute
HMI	Hoist Manufacturers' Institute
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers' Association
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IES	Illuminating Engineering Society of North America
ISA	Instrument Society of America
JIC	Joint Industry Conferences of Hydraulic Manufacturers
MIA	Marble Institute of America
Mil. Sp.	Military Specification
MS	Military Specifications
MMA	Monorail Manufacturers' Association
NAAMM	National Association of Architectural Metal Manufacturers
NBHA	National Builders' Hardware Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NHLA	National Hardwood Lumber Association

NLMA	National Lumber Manufacturers' Association
NTMA	National Terrazzo and Mosaic Association
NWMA	National Woodwork Manufacturers' Association
OECI	Overhead Electrical Crane Institute
OSHA	Occupational Safety and Health Act (both Federal and State)
PEI	Porcelain Enamel Institute
PS	Product Standards Section - U.S. Department of Commerce
RLM	RLM Standards Institute, Inc.
RMA	Rubber Manufacturers' Association
SAE	Society of Automotive Engineers
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturing Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
SWI	Steel Window Institute
TEMA	Tubular Exchanger Manufacturers' Association
TCA	Tile Council of America
UBC	Uniform Building Code
UFC	Uniform Fire Code
UL	Underwriters' Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WWPA	Western Wood Products Association

PART 2: PRODUCT — NOT USED

PART 3: EXECUTION — NOT USED

PART 4: MEASUREMENT AND PAYMENT — NOT USED

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1: GENERAL

1.1 CONSTRUCTION SCHEDULES:

- A. Submit to the Engineer a progress schedule under Sections 2.05, 2.07, and 6.04 of the General Conditions.
- B. Submit to the Engineer adjusted progress schedules under Section 6.04 of the General Conditions.
- C. Submit to the Engineer, value schedules under Sections 2.05, 2.07 and 14.01 of the General Conditions.

1.2 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES:

- A. Submit shop drawings to the Engineer under Sections 2.05 and 6.17 of the General Conditions. Submit all shop drawings for the Contractor, subcontractor(s) and supplier(s)
- B. Review all shop drawings prior to submittal in accordance with Section 6.17 of the General Conditions.
- C. Submit in writing any substitutions to previously approved items for review by the Engineer.
- D. Within 15 days after Notice to Proceed, submit a complete list of products proposed for use, providing manufacturer's name, trade name, and model or catalog numbers, and manufacturer data.

Submit the number of copies needed by the Contractor, plus three copies for Engineer use.

- E. Where specified, submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices.

Where specified, submit samples of finishes including colors, textures, and patterns.

PART 2: PRODUCT — NOT USED

PART 3: EXECUTION — NOT USED

PART 4: BASIS & METHOD OF PAYMENT — NOT USED

END OF SECTION

SECTION 01400

CONTRACTOR QUALITY CONTROL AND OWNER QUALITY ASSURANCE

PART 1: GENERAL

1.1 DESCRIPTION

- A. This section describes the Contractor quality control testing requirements and Owner's quality assurance program.

1.2 References

- A. The following ASTM publication is a part of this specification.

ASTM E 329 Evaluation of Testing and Inspection Agencies as Used in
Construction

PART 2: PRODUCT — NOT USED

PART 3: EXECUTION

3.1 GENERAL

- A. Be responsible for quality control tests and inspections to control contractor production and construction processes. Include in the Contractor quality control system an internal organization, plans, and procedures to produce the specified end product. Assure the system covers all construction operations, both on-site and off-site, and is keyed to the construction sequence. Quality control testing frequency is at Contractor discretion, except where tests are specifically required in the technical specifications for individual products.
- B. Sampling and testing to assure specification conformance are performed by the Owner or the Owner's testing agency as quality assurance testing.
- C. The Owner may select a testing agency to perform quality assurance testing. (ASTM E329 is referenced as a guide to the selection of a qualified testing agency.) The Owner will pay for (or provide) the quality assurance testing. Quality assurance testing frequency is at Owner discretion for individual products.
- D. Quality assurance testing is performed following the standards in the technical specifications for individual products.

3.2 CONTRACTOR COOPERATION WITH QUALITY ASSURANCE AGENCY

- A. Assure the Owner's personnel and quality assurance agency have access to all work areas at all times work is in progress. Provide any special facilities or equipment to access work areas at Contractor expense.
- B. Notify the Engineer of the work ready for quality assurance testing. Establish and update as the construction schedule to provide the Engineer estimated sampling/testing dates and times.

PART 4: MEASUREMENT AND PAYMENT

4.1 PAYMENT FOR TESTING

- A. Pay for all quality control testing as outlined in Subsection 3.1 above. Mix designs for Portland Cement Concrete and Flowable Fill, mix designs for Asphalt Concrete, and all initial aggregate quality tests are quality control tests and are at Contractor expense. Testing costs are incidental to the work and to be included in the unit price bid for the respective item.
- B. Owner will pay all quality assurance testing costs.

4.2 RETESTING

- A. Quality assurance re-testing due to failing initial tests will be performed by the Owner or the Owner's quality assurance testing agency, and the re-test costs deducted from the contract amount for the affected bid item.

END OF SECTION

SECTION 01500

CONSTRUCTION AND TEMPORARY FACILITIES

PART 1: GENERAL

1.1 CONSTRUCTION FACILITIES

- A. Furnish temporary services and utilities, including use fees and operation costs for: potable and non-potable water; lighting and power; and, materials storage.
- B. Furnish personnel support facilities including: sanitary facilities; drinking water; first aid supplies and facilities; and, trash removal.
- C. Do not park vehicles or equipment or store materials on private property without written permission from the property owner under Section 01010.1.4.B.

1.2 SECURITY

- A. Provide fencing, barricades, warning signs, and lights to secure all work areas, equipment, and materials.

1.3 DUST CONTROL

- 1.4 Be responsible for dust control, providing all equipment and personnel for the work. Furnish Engineer name(s) and telephone number(s) of the person(s) responsible for dust control during evenings and weekends. If this person cannot be contacted, Owner may at Contractor expense, perform the work or contract the work out.

1.5 HAUL ROUTES

- A. Obtain Owner approval of haul routes.

PART 2: PRODUCTS — NOT USED

PART 3: EXECUTION — NOT USED

PART 4: MEASUREMENT AND PAYMENT

4.1 PAYMENT

- A. All items in Part 1 are incidental to the work and no separate payment is made for these items.

END OF SECTION

SECTION 01570

CONSTRUCTION TRAFFIC CONTROL

PART 1: GENERAL

1.1 DESCRIPTION

- A. This work is the furnishing of labor, materials and equipment for installing, maintaining and operating traffic control devices to insure the safety of the general public and project personnel.

1.2 REQUIREMENTS

- A. Perform work under this section meeting Manual of Uniform Traffic Control Services (MUTCD) and contract requirements.

1.3 NOTIFICATIONS

- A. Coordinate all construction activities to reduce traffic conflicts at the work site, off-site events or other construction projects.
- B. Furnish the Engineer, for Owner review, the construction traffic control plan at least one week before construction begins or before changes in segments or phases of the work on the project. The Owner will review and approve the Traffic Control Plan considering known off-site activities and may require modification to the plan or construction timing to coordinate events. Work shall not commence until said plan is approved.
- C. For project sites involving a through street, provide the Engineer with a news release. Include in the news release, as a minimum, the work activity and duration. Once approved, furnish the news release to the local media at least three days before starting work. Notify all landowners or residents adjacent to the work of the type and duration of the construction.

PART 2: PRODUCT

2.1 TRAFFIC CONTROL DEVICES

- A. Assure all signs and barricades are reflectorized. Assure all night time traffic control devices meet MUTCD lighting requirements.
- B. Use traffic control devices meeting the “Manual of Uniform Traffic Control Devices” and the “Traffic Control Devices Handbook” requirements, available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20492.
- C. Assure all traffic control devices are clean, legible, reflective for night-time use, and operable.

PART 3 EXECUTION

3.1 WORK METHODS:

- A. Place all traffic control devices as planned before permitting men or equipment on the traveled way. Install signs, cones and barricades in that order.
- B. Inspect the work area at least twice each day during construction and maintain records of traffic control devices used and their location.
- C. Assure traffic control is appropriate to the work. Assure traffic control devices are appropriate and clean before suspending work for the day.
- D. Remove traffic control devices in reverse order of installation at the end of each shift.
- E. Remove and store all unnecessary traffic control devices away from traffic's view.

3.2 NONCOMPLIANCE

- A. Remove, repair or replace any traffic control device not providing its intended function.
- B. Do not begin work until all required traffic control devices are placed.
- C. The Engineer will periodically inspect the traffic control and inform the Contractor of any deficiencies.
- D. Contractor failure to correct any deficiency in the traffic control within 4 hours of notification is cause to deduct monies from the contract payment on the next progress payment.
- E. The Engineer may direct correcting traffic control deficiencies immediately. Failure to immediately correct the deficiency is cause for the Engineer to correct the deficiency at Contractor expense.

3.3 FLAGGING

- A. Furnish competent and properly equipped flag persons as described in the booklet "Instructions for Flag persons" furnished by the Montana Department of Transportation.

PART 4: MEASUREMENT AND PAYMENT

4.1 PAYMENT

- A. Separate measurement for each traffic control device is not made unless the on-site field traffic plan requirements differ materially from the original traffic control plan in the contract. Measurement and payment for the Contractor's off-site traffic control plan and the designed on-site traffic control plan is on a lump sum basis. The lump sum payment is full reimbursement for all costs of furnishing, installing, maintaining, replacing and operating the construction traffic control systems throughout the work period. The construction traffic control system includes but is not limited to, signs, barricades, pavement markings, watering, flag persons and pilot cars.
- B. Progress payments are in proportion to total construction completed.
- C. If changes in the approved Traffic Control Plan are directed by the Engineer, additional payment or reduction in payment is made for the additional or deleted items as agreed to between the Contractor and the Engineer.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1: GENERAL

1.1 CLEANUP

- A. Before Final inspection (as outlined in Section 14.06 of the General Conditions) execute the following.
1. Where applicable, clean interior and exterior glass and surfaces exposed to view. Remove temporary labels.
 2. Where applicable, clean equipment and fixtures to a sanitary condition.
 3. Where applicable, clean debris from roof, gutters, and downspouts.
 4. Remove debris, waste, surplus materials, and rubbish from right-of-way, easements (construction or permanent) and private property.
 5. Where applicable, remove debris, dirt, and silt from storm drain basins, sanitary sewer and storm drain manholes, and water valve boxes.
 6. Rake landscaped surfaces clean of debris.
 7. Where applicable, remove temporary coverings from traffic control devices.
 8. Clean traffic control devices and signs.
 9. Where applicable, remove temporary traffic striping.
 10. Sweep dirt and debris from all paved areas affected by the work.

1.2 RECORD DOCUMENTS

- A. Submit record documents as outlined in the General Conditions. Final payment will not be processed until the documents are submitted to and approved by the Engineer.

1.3 OPERATION AND MAINTENANCE DATA

- A. Where applicable, submit two sets, before final inspection, bound in three ring binders. Prepare a table of contents for each volume with each product or system identified.
- B. Where applicable, prepare the following:

1. Directory, listing names, addresses and telephone numbers of Engineer, Contractor, Subcontractor, and Equipment Suppliers.
2. Operations and maintenance instructions, arranged by system. For each category, identify the applicable Contractor(s) or Subcontractor(s) and suppliers. Identify the following:
 1. Significant design criteria
 2. List of equipment
 3. Parts list for each component
 4. Operating instructions
 5. Maintenance instructions

1.4 WARRANTIES AND BONDS

- A. Submit, with final payment request, all warranty certificates, lien releases, and consent of security forms.

PART 2: PRODUCTS — NOT USED

PART 3: EXECUTION — NOT USED

PART 4: MEASUREMENT AND PAYMENT — NOT USED

END OF SECTION

Division 2 Site Work

MPW



Section 02100 Site Preparation

MPW



SITE PREPARATION

SECTION 02113 Adjusting Existing Manholes, Lampholes, Inlets, Water Valve Boxes, Water Services, and Fire Hydrants to Grade

SECTION 02113

ADJUSTING EXISTING MANHOLES, LAMPHOLES, INLETS, WATER VALVE BOXES, WATER SERVICES, AND FIRE HYDRANTS TO GRADE

PART 1: GENERAL

1.1 DESCRIPTION

- A. This section consists of locating and adjusting to grade existing manholes, lampholes, inlets, water valve boxes or services, and fire hydrants as shown in the contract documents, staked in the field or as required in the Special Provisions.

1.2 STANDARD DRAWINGS

- A. Standard drawings included in Appendix A of this specification book which are applicable to this section are as follows:

Standard Drawing No. 02213-1	Manhole Adjustment Detail
Standard Drawing No. 02213-2	Water Valve Adjustment Detail

PART 2: PRODUCTS

2.1 GENERAL

- A. Provide all materials including concrete, brick and mortar, complying with the specification section for the particular material involved, or if the material is not covered in these specifications, the material used for adjusting shall be equal, and comparable to that in the existing structure. If extensions for water valve boxes or services and fire hydrants are required beyond the length found to exist, provide items comparable to those in the existing structure.

PART 3: EXECUTION

3.1 GENERAL

- A. Bring to required grade all existing manholes, inlets, lampholes and water valve boxes by either lowering or raising in accordance with the details shown in the contract documents. Do not lower manholes, lampholes or inlets by removal of portions of the cones or barrel sections. Accomplish downward adjustments by replacement of existing sections with shorter sections. Assure that all structures have a minimum of one 2-inch (5cm) concrete adjusting ring and a maximum of

12 inches (30cm) of rings under the casting. Do not use brick and/or mortar for adjustment of castings.

- B. On manholes requiring steps, assure that maximum spacing between steps is 16 inches (40cm) and that 10 inches (25cm) is the maximum distance from the top of the manhole cone section to the first step.
- C. Excavate water valve boxes and services to readily determine whether height adjustment can be made without substituting a longer section. Adjust water valve boxes and services laterally so the valve stems can be operated by the extension. Adjust water services by raising or lowering the curb key stop and extension box.
- D. Adjust manholes, lampholes and water valve boxes to final grade before placing the final pavement surface. If required, make preliminary adjustment to allow placement of base courses and paving adjacent to the manhole, lamphole or water valve.
- E. Provide backfill material conforming to the requirements of Section 02235, 1 inch (25 cm) Minus Crushed Base Course, and compacted to at least 95 percent of the maximum dry density as determined by AASHTO T99 or ASTM D698.
- F. If required, make minor adjustments 5 feet (1.5 meters) to 10 feet (3.0 meters) in the horizontal location of existing fire hydrants to insure that they are the required minimum distance behind the back of curb. At the time of construction staking, any hydrants which require horizontal adjustment will be located by the Engineer and the adjusted location will be staked by the Engineer.
- G. Make any minor adjustments required as dimensioned in the contract documents to the height of existing fire hydrants to insure that they are at a reasonable height above the back of curb. At the time of construction staking, any hydrants which require vertical adjustment will be located by the Engineer and the adjusted height will be staked by the Engineer. Accomplish extension of fire hydrant height only by the use of standard extension spools provided by the hydrant manufacturer.
- H. Before final acceptance, clean all manholes, lampholes, inlets and water valve boxes/services. Assure that all water valve boxes, services and fire hydrants are operational.
- I. All requirements of this section shall apply to new, as well as to existing, manholes, lampholes, valve boxes, water services and fire hydrants.

PART 4: MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Payment indicated to include complete compensation for all labor, equipment, materials and incidentals required for the completion of the work.

4.2 ADJUSTING EXISTING MANHOLES, LAMPHOLES, INLETS, WATER VALVE BOXES AND WATER SERVICES

- A. These items are measured and paid for by the number of existing facilities adjusted, complete in place, at contract unit price bid for the item, constituting full compensation for all necessary materials, excavation, backfill, compaction, cleaning, labor, tools and incidentals.
- B. Payment will be made under:
 - 1. Existing Sewer Manholes to Adjust - Per Each
 - 2. Existing Sewer Lampholes to Adjust - Per Each
 - 3. Existing Storm Drain Inlets to Adjust - Per Each
 - 4. Existing Water Valve Boxes to Adjust - Per Each
 - 5. Existing Water Services to Adjust - Per Each

4.3 LOCATION ADJUSTMENT FOR EXISTING FIRE HYDRANTS

- A. This item is measured and paid for by the number of existing fire hydrants adjusted horizontally, complete in place, at the contract unit price bid for “Horizontal Adjustment for Existing Fire Hydrants”, constituting full compensation for all material, excavation, backfill, compaction, labor, tools and incidentals.
- B. Payment will be made under:
 - 1. Horizontal Adjustment for Existing Fire Hydrant - Per Each

4.4 VERTICAL ADJUSTMENT FOR EXISTING FIRE HYDRANTS

- A. This item shall be measured and paid for by the vertical adjustment of existing fire hydrants, complete in place, as measured in the field to the nearest one-half foot, at the contract unit price bid for “Vertical Adjustment for Existing Fire Hydrants”, materials, including any additional stem length, excavation, backfill, compaction, concrete, labor, tools and incidentals.
- B. Payment will be made under:
 - 1. Vertical Adjustment of Existing Fire Hydrant - Per Vertical Foot

END OF SECTION

Section - 02200

Earthwork

MPW



EARTHWORK

SECTION 02221 Trench Excavation and Backfill for Pipelines and Appurtenance Structures

SECTION 02221

TRENCH EXCAVATION AND BACKFILL FOR PIPELINES & APPURTENANT STRUCTURES

PART 1: GENERAL

1.1 DESCRIPTION

- A. This work is the excavation, trenching and backfilling for pipelines and appurtenances. It includes all clearing, grubbing, site preparation, removal and disposal of debris from the excavation, handling and storing materials for fill and backfill, all bracing, shoring and trench protection, construction dewatering, all backfill, subgrade preparation, final grading, site dressing and cleanup.

1.2 REFERENCES

- A. The current publications listed below form a part of this specification.

AASHTO T99	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5-lb (2.5kg) Rammer and 12-inch (305mm) Drop
ASTM D698	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5-lb (2.5kg) Rammer and 12-inch (305mm) Drop
AASHTO T191 (ASTM D1556)	Density of Soil In-Place by the Sand-Cone Method
AASHTO T310 (ASTM D6938)	In-Place density and water content of the soil and soil aggregate by Nuclear Method (Shallow Depth)
AASHTO T11 (ASTM C117)	Materials Finer Than 0.075mm (No. 200) Sieve in Mineral Aggregates by Washing
AASHTO T27 (ASTM C136)	Sieve Analysis of Fine and Coarse Aggregate
AASHTO T89	Determining the Liquid Limit of Soils
AASHTO T90	Determining the Plastic Limit and Plasticity Index of Soils
ASTM D4318	Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils

1.3 STANDARD DRAWINGS

A. Standard Drawings applicable to this section are as follows:

1. Standard Drawing No. 02221-1 - Typical Utility Trench Detail

1.4 TESTING

A. Field Density Testing

1. Meet the quality control and quality assurance testing requirements in Section 01400, Contractor Quality Control and Owner Quality Assurance.
2. In-place field density tests for quality assurance are at Owner expense meeting AASHTO T191 (ASTM D1556), Sand Cone Method; or by AASHTO T310 (ASTM D6938) Nuclear Densometer Methods. Quality assurance field density testing frequency is at the Engineer's discretion.
3. Re-testing failing areas is at the expense of the Contractor.
4. At the direction of the Engineer, provide necessary equipment and labor to excavate and replace materials for test holes up to 5 feet deep into the compacted backfill to allow testing below the surface of any layers covered without inspection and approval by the Engineer.

B. Laboratory Maximum Density and Optimum Moisture

1. Quality assurance tests will be made by the Engineer for each on-site natural soil or each source of off-site material, including borrow material, to determine the laboratory maximum density values and optimum compaction moisture content according to AASHTO T-99 or ASTM D698.

C. Material Submittals

1. Submit to the Engineer material quality test results including Type 1 Bedding gradation and plasticity index; and Type 2 Bedding gradation.
2. Submit to the Engineer samples of on-site and off-site borrow soils for laboratory moisture-density relationship testing by the Engineer.
3. If applicable, submit a blasting plan to the Engineer.

PART 2: PRODUCTS

2.1 PIPE BEDDING MATERIALS

A. TYPE 1 PIPE BEDDING

1. Type 1 Pipe Bedding includes the material placed from 4 inches (100mm) below the bottom of the pipe, around the pipe, and up to the springline of the pipe.
2. Provide Type 1 Bedding consisting of sand, sandy gravel, or gravel having a maximum 3/4 inch size (19mm) and a maximum plasticity index of 6, determined by AASHTO T89 and T90 or by ASTM D4318.
3. Where trench excavation encounters wet or unstable material, Type 1 Pipe Bedding must be free draining and non-plastic
4. Refer to Standard Drawing 02221-1 and Special Provisions for other requirements.

B. SELECT TYPE 1 BEDDING

1. Select Type 1 Bedding includes the material placed from the springline of the pipe to 6 inches (15cm) over the pipe.
2. Select Type I Bedding shall consist of soil, sand or fine gravel, free from clods, lumps of frozen material, or rock exceeding 1-1/2 inches (38mm) in its greatest dimension.
3. Excavated trench material may be screened or sorted for use as backfill subject to approval of the Engineer.
4. Where trench excavation encounters wet or unstable material, Select Type 1 Bedding must be free draining and non-plastic.

C. TYPE 2 PIPE BEDDING

1. Type 2 Pipe Bedding is used as directed by the Engineer to replace unsuitable material encountered in the trench bottom.
2. Place Type 2 Pipe Bedding from the bottom of the Type 1 Bedding material to the depth required to adequately support the pipe.
3. Type 2 Bedding shall consist of granular material meeting the following gradation.

<u>Sieve Opening</u>	<u>% Passing</u>
3 Inch	100
No. 4	0 - 25
No. 8	0 – 10

D. SEPARATION GEOTEXTILE

1. The plans may require, or the engineer may direct, the use of non-woven geo-textile fabric intended to provide materials separation. The fabric will wrap all or part of the Type 1 Pipe Bedding and Select Type 1 Pipe Bedding to prevent materials migrating into the trench bottom and trench walls as shown on the plans or as directed by the engineer. The fabric shall be AASHTO M288 Class 1, 2, or 3 as specified or determined by the Engineer and shall fully comply with MPW Section 2110.

2.2 TRENCH BACKFILL MATERIALS

A. Materials from Trench Excavation

1. Backfill material obtained from trench excavations must be free of cinders, ash, refuse, organic or frozen material, boulders, or other deleterious materials. Backfill materials and placement are further described in the Execution Section of this specification.

B. Imported Backfill Material

1. Imported backfill material is from borrow source(s) outside the project limits and is used when, in the opinion of the Engineer, an adequate volume of suitable backfill material is not available within the project limits. Imported Backfill Materials must comply with the requirements of Section 2.2.A, MATERIALS FROM TRENCH EXCAVATION.

2.3 FLOWABLE FILL

- A. If used, Flowable Fill is to meet the requirements of Section 2225, Flowable Fill.

2.4 DETECTABLE BURIED WARNING TAPE

- A. Detectable buried warning tape is to have a minimum 6 inch (15cm) width and 5 mil (0.12mm) thickness and a solid aluminum core running the full length and width of the tape enclosed in a color coded inert plastic jacket, impervious to alkalis, chemical reagents and solvents in the soil. The tape is to meet APWA/ULCC Color Code requirements and is to have a maximum 36 inch(90cm) imprint.

PART 3: EXECUTION

3.1 PROTECTION OF EXISTING PROPERTIES

A. General

1. Take precautions to protect all adjoining private and public property and facilities, including underground and overhead utilities, curbs, sidewalks, driveways, structures, and fences. Restore or replace all disturbed or damaged facilities to its original condition at Contractor's expense.
2. Contact utility owners using the Montana One Call System in accordance with Section 01041, PROJECT COORDINATION, Paragraph 1.2.B., for utility locates before starting work. Protect the utilities exposed during the work and prevent damaging underground utilities adjacent to excavations. Immediately notify the utility owner of any construction damage. Repairs of damage to marked utilities are at the expense of the Contractor.
3. Re-locate existing water mains, sanitary sewers and storm drains shown on the plans, that conflict with new pipelines or structures as indicated in the contract documents. No separate payment will be made for this work unless shown as a payment item. If the Owner authorizes the relocation of mains or sewers which are not indicated in the bid documents, and the Engineer determines the work was not included in the original contract, payment will be made under the applicable sections of the General Conditions.
4. Cut and replace existing service lines interfering with trenching operations only with the engineer's permission and at the contractor's expense. Show all repaired and/or adjusted water and sewer lines on the As-Built Plans.
5. Protect existing water and sewer mains and water and sewer services from freezing at all times during construction.

B. Privately Owned Utilities

1. If any existing private utility interferes with the work in either alignment or grade, and has to be moved, the work will be performed by the appropriate UTILITY Owner, unless otherwise specified in the contract documents. Such private utilities may include gas mains, underground electrical and telephone cables, telephone poles, light poles, etc.

2. If, however, such private utility relocation is performed by the Contractor, and the relocation is not a separate payment item, payment will be made under the Section 02221 conditions covering such changes.
 3. Such payment will be made only if the work is determined by the Engineer to be a change from the original contract work scope.
- C. Existing Structures
1. Prevent damage to existing buildings or structures in the work area. Repair all construction related damage to the satisfaction of the Owner.
- D. Existing Overhead Utilities
1. Use extreme caution to avoid conflict, contact or damage to overhead utilities during the work.
- E. Exploratory Excavation
1. The location of existing buried public utilities may need to be verified by exploratory excavation before construction.
 2. Where authorized by the Engineer, the Contractor will be reimbursed for exploratory excavation work at the unit price bid per hour for a backhoe/excavator with operator and a laborer to assist. Use a backhoe/excavator having at least 60 horsepower (45kw), as rated by the manufacturer.
 3. The unit price per hour includes the backhoe/excavator, operator and one laborer based upon the actual time, to the nearest one-half hour, that the equipment and personnel are used in actual excavating and backfilling operations including standby time between excavation and backfilling which allows the Engineer to make the necessary survey of the underground utilities.
 4. Exercise care to prevent damaging all utilities and repair any utility damage caused by exploratory excavation.
- F. Pavement Removal and Stripping
1. Where trench excavation or appurtenant structure excavation requires removing curb and gutter, concrete sidewalks, asphalt concrete pavement, or Portland cement concrete pavement, cut the concrete or pavement in a straight line parallel to the excavations edge using a spade-bitted air hammer, concrete saw or other suitable equipment to produce a straight, square and clean break. Re-cut edges broken during construction, before concrete or paving operations.

2. For trenches passing through existing pavement, cut the pavement along a neat vertical line at least 12 inches (30cm) from the trench edge. Where the neat line cut is less than 3 feet (0.9m) from the edge of the existing pavement, remove and replace the entire pavement section between trench and edge of pavement.
 3. Dispose of the asphalt concrete and/or Portland cement concrete debris off-site according to applicable state and local regulations.
- G. When excavating across existing gravel streets or other developed surfaces, remove the surfacing material full depth and stockpile for inclusion as trench backfill or legally dispose of the surfacing material.
- H. When excavating across cultivated or sodded areas, remove topsoil full depth or to a maximum 12 inch (30cm) depth, whichever is less, and stockpile for possible project use.
- I. Re-sod or reseed, as specified in the contract documents, all established lawn areas cut by trenching or damaged during the construction, in accordance with Section 2910, and/or 2920, to the satisfaction of the Engineer.

3.2 MAINTENANCE OF FLOWS

- A. Maintain the flow of sewers, drains and water courses encountered during construction. Restore culverts, ditches, fences, crosswalks and structures disturbed by construction to their original condition upon completion of the work.

3.3 TRENCH EXCAVATION

A. General

1. Meet current OSHA Safety and Health Standards for all excavation, trenching, shoring, and related work.
2. Excavate at the specified locations for pipeline installations and appurtenant structures.
3. Crossings under sidewalks or curbs may be made by tunneling, if approved by the Engineer. If a portion of a sidewalk or curb is removed, use a concrete saw to make joints, compact the backfill as specified, and replace the removed section with new concrete sidewalk or curb.
4. During excavation, stockpile backfill materials away from the trench banks to assure trench wall stability. Stockpile excavated materials on only one side of the trench without obstructing existing fire hydrants,

valves, manholes and other appurtenances. Assure surface drainage of adjoining areas is unobstructed.

5. Remove and dispose of all excess or unsuitable excavated materials.
6. Prevent surface water from flowing into excavations. Promptly remove all water accumulating in trench excavations. Do not permit water to accumulate in any open trench. Remove and re-lay all pipe out of alignment or grade caused by trench flooding.
7. Grade the trench bottoms to the specified lines and grades. Assure bedding material provides uniform bearing and support for each pipe section along its entire length. Excavate for bell and joints after the trench bedding is graded, limiting the excavation to the required length, depth and width for making the particular type of joint used. Backfill over-excavations with Type 2 Bedding Material.
8. No differentiation between common and rock trench excavation is made, except when listed as separate bid items on the bid proposal or bid form. Excavation includes removing and subsequent handling of all earth, gravel, bedrock or other material encountered regardless of the type, character, composition or condition of the material.
9. The use of trench digging machinery is permitted, except in places where its operation is likely to cause damage to existing structures or features, in which case hand methods are to be employed.

B. Trench Dimensions

1. Excavate to the trench dimensions specified below.
2. Width
 - a. Excavate to provide room to install and join the pipe as specified. The minimum trench width is 3'-6" (1.1m), for outside pipe diameters of 18 inches (0.5m) or less. The minimum trench width is 2'-0" (0.6m) plus the outside pipe diameter, for pipe sizes exceeding 18 inches (0.5m). Maximum trench width may be specified in the contract documents.
3. Depth
 - a. Excavate the trench as required for the invert grade or pipe bury as specified in the contract documents, plus 4 inches (10cm) for the Type 1 Pipe Bedding. If bedrock, boulders or large stones are encountered at the bottom of the trench, excavate at least 6 inches

(15cm) below the bottom of the pipe for backfilling with Type 1 Pipe Bedding.

C. Soft or Unsuitable Trench Subgrade

1. When soft or unstable material is encountered at the trench subgrade which will not uniformly support the pipe, excavate the material to the depth directed by the Engineer and backfill to trench subgrade elevation with Type 2 Pipe Bedding.

D. Blasting

1. Obtain Engineer approval to blast for excavation. If approved, the Engineer will establish the time limits blasting will be permitted.
2. Use utmost care to protect life and property during blasting. Use only a licensed blaster with experience in the type of blasting required for the work.
3. Safely and securely store all blasting materials meeting local laws and ordinances and clearly mark all storage places "Dangerous Explosives". Do not leave any explosives where they could endanger persons or property.
4. Blasting Rock in Trenches
 - a. When blasting rock in trenches, cover the blasting area with earth backfill or approved blasting mats. Before blasting, station workers and provide danger signals to warn people and stop vehicles.
 - b. Assume responsibility for all damage to property and injury to persons resulting from blasting or accidental explosions during the work.
 - c. Furnish the following information to the Owner and Engineer at least 48 hours before the commencement of blasting operations: Name of the contractor's powder man, powder man's experience, type of shot, type of explosives and detonator being used, proof of insurance covering liability for such operation, traffic control plans and planned procedures for protecting the public.
5. Assure blasting plan meets federal, state and local ordinances. Obtain all required permits before blasting starts.

- E. Pavement Damage Cause by Equipment
 - 1. Equip all track mounted equipment operated on pavement surfacing with pads to prevent pavement damage.
 - 2. Restore all pavement damaged by construction to its original condition.
- F. Shoring, Bracing and Sheeting
 - 1. Provide all shoring, bracing and tight sheeting required to prevent caving and protect workers, meeting current Occupational Safety and Health Act Requirements, and to protect adjacent property and structures. The cost of this work is included in the cost for trench excavation.
- G. Excavation for Appurtenances
 - 1. Make excavations for manholes, hydrants, structures and other appurtenances of the size and depth to permit compacting of backfill on all sides to the specified density. The requirements for removing water and other applicable portions of these specifications apply to excavation for appurtenances.

3.4 DEWATERING

- A. Remove all ground water encountered in trench excavations. Do not place pipe, bedding or backfill materials below the groundwater elevation established by dewatering operations. The cost of dewatering operations is considered a part of the excavation cost.

3.5 EXCAVATION STABILITY AND SAFETY

- A. The stability of construction excavations and associated worker safety, including slope geometry and shoring/bracing considerations, are the responsibility of the Contractor. Meet current OSHA regulations. This may require design of temporary slopes and/or shoring by a licensed professional engineer.

3.6 TRENCH FILLING AND BACKFILLING

- A. General
 - 1. Backfill all trenches as specified immediately after grade, alignment and pipe jointing has been inspected and approved by the Engineer. Conduct any pipe testing as specified in the respective water distribution, sewerage/drainage sections. Correct all defects discovered by tests prior to backfilling.

B. Pipe Bedding Placement

1. Type 1 Bedding.

- a. Place Type 1 Pipe Bedding material 4 inches (10cm) under the pipe, around the pipe, and up to the springline of the pipe. Place in maximum lifts of 6 inches (15cm), using hand operated or other compaction methods without damaging or disturbing the pipe. Thoroughly compact each layer. Use special care to assure compaction under the pipe haunches.
- b. Place backfill material in equal lifts on both sides of the pipe for the full trench width. Take care to prevent migration of Type 1 Bedding into surrounding soils during placement and compaction

2. Select Type 1 Bedding.

- a. Place Select Type 1 Bedding material from the springline to 6 inches (15cm) over the pipe. Where wet or unstable material exists, assure the material is free draining and non-plastic.
- b. Place in maximum lifts of 6 inches (15cm) using hand or other compaction methods without damaging or disturbing the pipe. Thoroughly compact each layer.
- c. Place backfill in equal lifts on both sides of the pipe for the full trench width. Take care to prevent migration of Select Type 1 Bedding into surrounding soils during placement and compaction.

3. Type 2 Pipe Bedding.

- a. Use Type 2 Pipe Bedding described in PRODUCTS SECTION as specified or as directed by the Engineer to replace unsuitable material encountered in the trench bottom, placing it from the bottom of the Type 1 Bedding material to the depth required to adequately support the pipe.

4. SEPARATION GEOTEXTILE

- a. Place Separation Geotextile where shown on the plans or where directed by the Engineer.

C. Trench Backfill

1. After the pipe bedding materials are placed and compacted as specified, backfill the trench. Use backfill material free of cinders, ash, refuse,

organic or frozen material, boulders, or other deleterious materials. From the top of the Select Type 1 Pipe Bedding to 6 inches (15cm) below the ground surface, or to the subgrade elevation, material containing rock up to 8 inches (20cm) in the greatest dimension may be used.

2. Trench backfill from the top of the pipe bedding to ground surface or to the street subgrade is separated into three classifications.
 - a. Type A Trench Backfill is compacted backfill typically used in streets or paved areas.
 - b. Type B Trench Backfill is typically used for unpaved alleys, cultivated areas, borrow pits, unimproved streets or other un-surfaced areas, and other areas where compaction is less critical.
 - c. Type C Trench Backfill is typically used in open and unimproved areas outside of the public right-of-way.
3. Meet the backfill and compaction requirements for all of the backfill types described in the contract documents.
4. Watering
 - a. Apply uncontaminated water, when required, at the locations and in the amounts required to compact the backfill material to the specified requirements. Maintain an adequate water supply during the work. Assure the equipment used for watering is of the capacity and design to provide uniform water application.
 - b. Apply water during the work to control dust and to maintain all embankment and base courses in a damp condition in accordance with these contract documents.
 - c. Water required for compacting trench backfill may be obtained from the municipal system if approved by the Owner, or from other sources.
5. Remove, replace, and re-compact backfill in trenches where settlement has occurred as directed by the Engineer at the contractor's expense.
6. Trench backfill types are designated as follows:
 - a. Type A Trench Backfill. Place trench backfill in maximum 8 inch compacted lifts within 3 percent of optimum moisture content, and compact to at least 95 percent of maximum dry density determined by AASHTO T99 or by ASTM D698.

- b. Type B Trench Backfill. Place backfill in maximum 8 inch (205mm) lifts, within 3 percent of optimum moisture content, and compact to at least 90 percent of maximum dry density, as determined by AASHTO T99 or by ASTM D698.
- c. Type C Trench Backfill. Place and compact Type C Trench Backfill in maximum 12 inch lifts at densities equal to or greater than the densities of adjoining undisturbed soil. Mound earth over the trench top, if so directed by the Engineer.
- d. Flowable Fill. Place flowable fill as trench backfill as shown in the contract documents or as directed by the Engineer. Flowable fill may also be used as a construction expedient, substituting for any type of trench backfill, subject to approval by the Engineer and at the expense of the Contractor.

D. Replacement of Unsuitable Backfill Material

- 1. Remove and dispose of excavated soils that are saturated, contain deleterious materials or have characteristics that, in the opinion of the Engineer, render the soils unsuitable as backfill.
- 2. Replace unsuitable soils with material obtained from trench excavations within the project limits at the expense of the Contractor. If suitable replacement material is not available within project limits, obtain material from an approved borrow source, to be paid for as Imported Backfill Material.
- 3. Place and compact all imported material according to the applicable backfill specification requirements.

E. Backfill of Appurtenances

- 1. Place and compact backfill for appurtenances to finished grade around manholes, inlets, valve boxes and other underground items without disturbing appurtenance alignments.
- 2. Meet the backfill material, placement, and compaction requirements specified for the adjoining trench.

F. Detectable Buried Warning Tape

- 1. The use of warning tape is optional and if used must not be relied on as the primary locating device. Provide warning tape as described in PRODUCTS Section 2.3. Bury tape a maximum 18 inches (45cm) below finish surface grade.

3.7 SURVEY MARKERS AND MONUMENTS

- A. Protect all survey markers and monuments. Protection includes marking with flagged high lath and supervising work near markers and monuments. Do not disturb monuments without prior approval from the Engineer.
- B. Replace all Contractor disturbed or destroyed survey markers or monuments, not approved during construction, using a licensed land surveyor. See Section 01050 for details on survey marker protection/disturbance.

3.8 CLEANUP

- A. As work progresses, remove debris and complete to finish grade each portion of the work. Once the work is complete, clear debris and finish the entire site to smooth, uniform slopes presenting a neat and workmanlike appearance. Remove and dispose of all rocks brought to the surface during excavation or backfilling.

3.9 TIME AND DISTANCE OF OPEN TRENCHES

- A. Perform the work so that trenches will remain open the minimum time required to accomplish the work.
- B. Do not begin trench excavating until appropriate compaction equipment is at the excavation site.
- C. The maximum permissible distance between backfilling/ compaction operations and the end of newly installed pipe is 200 feet (60m) in existing streets (and/or alleys) and 500 feet (150m) in all other areas.
- D. The maximum distance between the newly installed pipe and the excavator is to be 100 feet (30m) in existing streets (and/or alleys) and 200 feet (60m) in all other areas.
- E. For each work group consisting of a trench excavator, a pipe laying crew, and a backfilling/compacting crew, the maximum allowable open ditch at any time is 300 feet (90m) in existing streets (and/or alleys) and 700 feet (210m) in all other areas.
- F. The maximum distance behind the end of the new pipe is 1,500 feet (460m) for gravel surfacing replacement, base placement or pavement replacement.

PART 4: MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. The following items constitute pay items for the work covered under this section. Payment for these items is full compensation for providing all materials, tools, labor and equipment necessary to complete the item and all incidental work related thereto, whether specifically mentioned herein or not.

4.2 TRENCH EXCAVATION AND BACKFILL

- A. No separate measurement and payment is made for TRENCH EXCAVATION AND BACKFILL. Include all costs for this item in the unit price bid for pipe, complete in-place.
- B. The upper limit of the TRENCH EXCAVATION AND BACKFILL item is defined as the top of subgrade. Details of the various types of surface restoration are found in the contract documents.

4.3 TYPE 1 AND SELECT TYPE 1 PIPE BEDDING

- A. Include approved material for Type 1 and Select Type 1 Pipe Bedding in the pipe installation price. No measurement or additional payment is made for furnishing or placing Type 1 and Select Type 1 Pipe Bedding materials.

4.4 TYPE 2 PIPE BEDDING

- A. Approved material for Type 2 Pipe Bedding to replace soft or unsuitable material, is measured in cubic yards (cubic meters) of material furnished, in-place, for the depth directed. No additional payment shall be made for this item as it shall be included in the unit price for pipe installation.

4.5 IMPORTED BACKFILL MATERIAL

- A. When satisfactory backfill material is not available within the project limits, backfill material imported from borrow sources outside the limits of the project site are measured in cubic yards of material furnished, in place (compacted), for the depth directed by the Engineer.
- B. No separate measurement and payment is made for this item all costs for this item are to be included in the unit price bid for pipe, complete in-place.

4.6 EXPLORATORY EXCAVATION

- A. Measurement of this item is made for the actual time, to the nearest one-half hour, for which the equipment and personnel are used and authorized by the Engineer for actual exploratory excavation and backfilling operations, including standby time between excavation and backfilling, to allow the Engineer to survey the underground utility.
- B. Payment for this item is made within the project costs and cannot be billed as additional or separately.
- C. Surfacing repair will be paid separately, if required.
- D. Payment will be made under: Exploratory Excavation - Per Hour.

4.7 GEOTEXTILE FABRIC

- A. Measurement and payment for geotextile fabric if required based on site conditions must be approved by the engineer prior to installation.
- B. Payment for this item is full compensation for providing all materials, tools, labor and equipment necessary to complete the item and all incidental work related thereto, whether specifically mentioned herein or not.

END OF SECTION

Sections - 2700 Sewerage and Drainage

MPW



SEWERAGE AND DRAINAGE

SECTION 02730 Sanitary Sewer Collection System

SECTION 02730

SANITARY SEWER COLLECTION SYSTEMS

PART I: GENERAL

1.1 DESCRIPTION

- A. Furnish and install sewer pipe and fittings including manholes, service lines and other appurtenant structures as specified in the Contract and this section. Pipe strength classifications are shown on the plans, listed in the Contract Documents or specified herein.

1.2 CERTIFICATION BY MANUFACTURER

- A. Furnish a manufacturer's certification for all pipe and fittings, certifying that the pipe and fittings meet the contract requirements.

1.3 REFERENCES

ASTM C76	Reinforced Concrete Pipe
ASTM C361	Low Head Pressure RCP
ASTM C443	O-ring Rubber Gaskets
ASTM C478	Precast Reinforced Concrete Manhole Sections
ASTM C655	D-Load RCP
ASTM D1784	Rigid Polyvinyl Chloride Compounds
ASTM D2241	PVC Pressure Pipe
ASTM D3034	Polyvinyl Chloride Sewer Pipe and Fittings
ASTM F679	Large Diameter PVC Pipe
ASTM F714	HDPE Pipe-Dimensions
ASTM 3350	High Density Polyethylene Pipe
ASTM F949	PVC Open Profile Pipe

1.4 STANDARD DRAWINGS

- A. Standard drawings in Appendix A applicable to this section are as follows:

Standard Drawing No. 02660-2	Water and Sewer Main Separation
Standard Drawing No. 02720-3	Sanitary Sewer and Storm Drain Manhole
Standard Drawing No. 02720-4	Standard Straight Manhole
Standard Drawing No. 02720-5	48" (122 cm) Standard Manhole Showing Two Types of Cone Sections
Standard Drawing No. 02720-6	Precast Manhole Bases
Standard Drawing No. 02720-7	Typical Manhole Channel Details

Standard Drawing No. 02720-8	Standard Cast Iron Cover
Standard Drawing No. 02720-9	Standard 24" (61 cm) Cast Iron Ring Manhole Frame
Standard Drawing No. 02730-1	Nomograph for Air Testing Gravity Sewer Mains
Standard Drawing No. 02730-2	Sanitary Sewer Service Line
Standard Drawing No. 02730-3	Deep Sanitary Sewer Service Line

PART 2: PRODUCTS

2.1 GENERAL

- A. Furnish sewer pipe and fittings as specified in the Contract Documents and meeting the materials and testing requirements of this Section. Furnish wye or tee branches and service line piping of the same material and design as the sewer pipe unless specified otherwise. Pipe strength classifications are shown on the plans and/or are listed in the Contract Documents.
- B. References made to ASTM, ANSI or AASHTO designation are the latest revision at the time of call for bids.
- C. Assure all pipe is clearly marked with type, class and/or thickness as applicable. Assure lettering is legible and permanent under normal conditions of handling and storage.
- D. Furnish the joint type, class, thickness designation, castings, lining, marking, testing, etc. as specified.

2.2 PIPE MATERIALS

A. Polyvinyl Chloride (PVC) Pipe

1. General

- a. Furnish PVC pipe produced by a continuous extrusion process, employing a prime grade of un-plasticized polyvinyl chloride. Assure the grade used is highly resistant to hydrogen sulfide, sulfuric acid, gasoline, oil, detergents and other chemicals found in sewage and industrial wastes. Assure the material meets "Rigid Polyvinyl Chloride Compounds" - ASTM Designation D-1784 requirements. Assure the pipe has self-extinguishing flammability characteristics.

2. Gravity Sewer Pipe

- a. Furnish gravity sewer pipe meeting one of the following requirements:
- 1) ASTM D-3034, “Standard Specifications for Polyvinyl Chloride Sewer Pipe and Fittings”, with an SDR of 35 4"-15" (10 cm - 38 cm).
 - 2) ASTM F679, “Standard Specifications for PVC Large Diameter Plastic Gravity Sewer Pipe and Fittings” 18"-36"(46 cm - 76 cm).
 - 3) ASTM F949, “Standard Specification for PVC Corrugated (Open Profile) Sewer Pipe with a Smooth Interior and Fittings” larger than 12” (10cm).
- b. Furnish pipe having nominal 12.5 feet (3.8 meters), laying lengths, except shorter lengths may be used adjacent to manholes, lampholes or other appurtenances. Assure each pipe section is marked, as a minimum, with size, SDR, “Sewer Pipe” and Code Number.

3. Pressure Sewer Pipe

- a. Furnish pressure sewer pipe meeting ASTM D2241, “Standard Specification for Polyvinyl Chloride Plastic Pipe (SDR-PR), with an SDR of 26 and a pressure rating of 160.
- b. Use a nominal laying length of 20 feet (6.1 meters), except shorter lengths may be used adjacent to bends or other appurtenances. Assure each pipe length is marked, as a minimum, with size, SDR, pressure rating or both, ASTM designation and manufacturer’s name and code.

4. Pipe Jointing

- a. Furnish each pipe length with a bell designed to provide a watertight joint when jointing the bell and spigot with a rubber ring.
- b. Make a rubber gasket joint for PVC pipe and fittings using a rubber gasket compressed between the outer surface of the spigot

and the inner surface of the bell. Assure the joint is completely sealed by the gasket so that the assembly remains watertight under all service conditions, including expansion, contraction, settlement and pipe deformation. Follow the manufacturer's recommendations when assembling the rubber ring joint.

5. Fittings

- a. Assure wye or tee fittings for connecting service lines are of the same material, construction and joint design as the main sewer pipe.

B. Concrete Pipe

1. General

- a. Furnish concrete sewer pipe meeting ASTM Specifications C76 or C655, latest revision, except as noted herein. Assure cement used to make concrete pipe is Type II A Modified, Type V or other approved cement containing less than 5 percent Tricalcium Aluminate. The pipe strength classifications for C76 or C655 specification pipe is listed in the plans or Contract Documents.
- b. Furnish pipe meeting the referenced ASTM specifications on permissible variations in pipe dimensions. Assure the barrel thickness is uniform to providing a constant flow area without projections across joints.

2. Fittings

- a. Use wye or tee fittings for connecting service lines of the same material, construction and joint design as the main sewer pipe.

3. Jointing Material

- a. Make joints for concrete pipe using flexible, watertight, rubber-type gaskets meeting to ASTM C443, with an O-ring gasket confined in the pipe tongue groove.

4. Pipe Jointing

- a. Thoroughly clean the spigot and bell ends of the pipe before joint assembly. Follow the pipe and joint manufacturer's recommendations for pipe jointing. Check the position of the rubber gaskets and pipe assembly using a feeler gauge before

backfilling the trench. Visually inspect and gauge pipe and joints from inside the pipe where pipe size permits to assure proper gasket position and joint gap tolerances.

5. Material Testing

- a. When the pipe supplier is not an American Concrete Pipe Association Certified plant, the pipe supplier shall furnish the Engineer with certified test results from an independent testing laboratory on the following: (a) crushing strength (3-edge bearing method), (b) absorption, and (c) hydrostatic test. Furnish test results for each pipe as specified in ASTM C76 or C655, or a minimum two percent of the number of pipe supplied, whichever is greater. Cost of these tests to be borne by the pipe supplier. The engineer retains the option to witness all testing completed at the production facility.

C. High Density Polyethylene (HDPE) Pipe

1. Pipe

- a. Furnish non-profile wall HDPE pipe meeting ASTM D3350, having a cell classification of PE 34-5434C. Assure dimensions and workmanship meet ASTM F714 requirements.

2. Fittings

- a. Use wye or tee fittings for connecting service lines of the same material construction and joint design as the main sewer pipe.

3. Pipe Jointing

- a. Heat fusion weld all field joints to meet the manufacturer's recommendations.

D. Other Pipe Materials

- 1. Other pipe materials may be specified at the discretion of the Engineer and Owner.

2.3 MANHOLES

A. General

1. Construct manholes from precast concrete sections having frames, covers, and steps meeting Standard Drawings.
- B. Precast Concrete Sections
1. Furnish manholes meeting ASTM C478; “Precast Reinforced Concrete Manhole Sections”, specifically including mandatory rejection requirements.
- C. Steps
1. Furnish non-corrosive steps, 12-inches (30 cm) in width, of 1/2-inch (13 mm) steel rod encased with polypropylene. Assure steps withstand 400 pound (180 kg) vertical loads and 1,000 pound (450 kg) pull-out resistance.
- D. Frames and Covers
1. Furnish frames and covers meeting Standard Drawing Nos.02720-8 and 02720-9. Furnish 2-hole type covers unless specified otherwise.
- E. Concrete Base
1. Furnish precast concrete bases or field poured on undisturbed earth. Use concrete meeting Section 03310: STRUCTURAL CONCRETE.

PART 3: EXECUTION

3.1 PIPE AND SERVICE LINE INSTALLATION

- A. Excavation and Backfill
1. Perform pipeline excavation and backfill meeting the applicable requirements of Section 02221: TRENCH EXCAVATION AND BACKFILL FOR PIPELINES AND APPURTENANT STRUCTURES.
- B. Responsibility for Materials
1. Be responsible for all material furnished. Replace all material found defective in manufacture or damaged in handling after delivery. This includes furnishing all material and labor required for the replacement of installed material discovered defective before final acceptance of the work or during the guarantee period.

2. Be responsible for the safe storage of material intended for the work until it has been incorporated in the completed project.

C. Handling of Pipe

1. Deliver and distribute all pipe to the site. Load and unload pipe, fittings and accessories by lifting with hoists or skidding to avoid shock or damage. Do not drop any materials. Do not roll or skid pipe handled on skidways against pipe already on the ground.
2. In distributing the material at the site of the work, unload each piece opposite or near the place where it is to be laid in the trench. Keep the interior of all pipe and other accessories free from dirt and foreign matter at all times.
3. Handle pipe to prevent damaging coating or lining. If any part of the coating or lining is damaged, make all repairs in a manner satisfactory to the Engineer.

D. Laying Pipe

1. Lay and maintain all pipe to the specified lines and grades with fittings, tees and manholes at the required locations. Establish line and grade using batter boards and string line, laser equipment or other approved methods. When batter boards and string line are used, use a minimum of three batterboards at all times.
2. Install wye or tee fittings in the mainline sewer for service line connections. Furnish wye or tee fittings of the same material, design and specifications as the sewer main pipe. Joint service pipe to tee branches or main line pipe other than PVC using special joint adapters manufactured specifically for jointing the two types of pipe.
3. Use tools and equipment, satisfactory to the Engineer, for the safe and convenient prosecution of the work. Carefully lower all pipe and fittings into the trench to prevent damage to pipe materials and protective coatings and linings. Do not drop or dump any materials into the trench.
4. Take every precaution to prevent foreign material from entering the pipe while it is being installed. At times when pipe laying is not in progress, close the open ends of pipe using a plug or other means approved by the Engineer. Clean and remove all sand, gravel, concrete and cement grout that has entered the lines during construction.

E. Tolerances

1. Install the pipe within 1/2-inch (13 mm) of the specified alignment and within 1/4-inch (6 mm) of the specified grade.

3.2 MANHOLES

A. Construction

1. Construct manholes to the specified dimensions. Make invert channels smooth and semi circular in shape conforming to the inside of the adjacent sewer section. Make changes in flow direction with a smooth curve of as large a radius as the manhole size will permit. Make changes in channel grade and size gradually and evenly. The invert channels may be formed directly in the manhole base concrete or by laying half-pipe in the concrete. Make the floor of the manhole outside the channel smooth and slope toward the channel at one inch per foot (8 cm per meter).
2. Joint all connections between manhole walls and base and between wall sections adjusting rings and frame making the manhole watertight. For all horizontal joints located below the established high groundwater elevation, install a preformed rubber gasket joint. The established high groundwater level is shown on the plans or noted in the Special Provisions. For all sewer pipe to manhole joints, use gasketed, flexible, watertight connections that will accommodate differential settlement. Acceptable options for these connections to the manhole are as follows:
 - a. Adjacent Joints: Bell and spigot pipe joints with rubber sealing rings located within 12 inches (30 cm) of the manhole wall.
 - b. Compression-Type Flexible Connector: A resilient, flexible connection, cast into manhole wall, providing 10 degrees deflection.
 - c. Boot-Type Flexible Connector: A flexible, watertight connection consisting of a rubber gasket or boot, metal expansion ring and a metal take-up clamp. Assure the expansion ring holds the gasket in the manhole wall, with the take-up clamp holding the gasket to the pipe.
 - d. Options (b) and (c) are limited to precast manhole base inverts and other installations where the flexibility of the connection is not compromised.

- e. Construct manholes meeting ASTM C478, and the rejection criteria stated therein.
 - f. Keep manhole construction within one manhole distant behind sewer pipeline construction.
3. Install adjusting rings on each manhole to bring the manhole top elevation to match the existing or specified ground elevations. Use manhole rings with a 2-inch minimum (5 cm) and 12-inch (30 cm) maximum height. Furnish adjusting rings reinforced with the same percentage of steel as the riser and top.

3.3 SANITARY SEWER SERVICE LINES

- A. Construct service lines meeting Standard Drawing 02730-2. Install the service line to the property line. Plug the end of the service line with a stopper and gasket, using a gasket of the same type used for pipe jointing. Do not grout the plugs.
- B. Mark the sanitary sewer and storm drain service line ends at the property line using a steel fence post 5 feet (1.5 m) long, buried at least 2 feet (0.6 m). Place a 2" X 2" (5cm X 5 cm) wood marker extending from the pipe invert to ground line. Wire the 2" X 2" (5cm X 5 cm) marker to the steel fence post. Where applicable, mark the concrete curb to identify the service locations. Paint sanitary sewer service markers green and storm drain service markers gray.

3.4 TESTS

- A. Make all tests after backfill is completed, but before any surface restoration or street surfacing. Be responsible for finding and repairing all breaks and leaks revealed by the tests. Additionally, perform all tests in the presence of the Engineer, resident inspector, or the Owner's other designated representative.
- B. Light Test (Visual)
 - 1. After the trench has been backfilled and compacted as specified in Section 02221, perform a light test between manholes to check alignment and grade for pipe displacement. Excluding curved alignments shown on the plans, the completed pipeline is to permit a true circle of light to be visible from one manhole to the next. If alignment or grade is not that specified and displacement of pipe is found, remedy all defects.
- C. Leakage Test
 - 1. New sewer line will not be finally accepted until leakage tests are made assuring the Engineer that pipe laying and jointing are satisfactory.

D. Water Test

1. Where groundwater is at least 2 feet (0.6 m) above the sewer line, make tests by sealing off the section of lines between manholes and measuring the actual flow by collecting or pumping the discharge into barrels or other approved methods. Continue tests at a minimum of 4 hours for each section tested. Allow time to soak lines and manholes in advance of performing tests.
2. When groundwater is not 2 feet (0.6 m) above the pipe, test as follows: On flat slopes where the depth over the centerline of the pipe in the lower manhole of the section being tested will be not more than 10 feet (3 m), fill the upper manhole to 2 feet (0.6 m) over the top of the pipe or 2 feet (0.6 m) above the groundwater elevation (whichever is higher), and block the lower manhole. When the above conditions cannot be met, the Engineer may order testing the line in sections between manholes. Measure the leakage by checking the water level drop in the manhole over a 4 hour period.
3. The allowable infiltration or exfiltration, including manholes, cannot exceed 200 gallons per day per mile of sewer per inch of pipe diameter (185 liters per day per kilometer of sewer per centimeter of pipe diameter). This does not exclude obvious and concentrated leaks and physical defects, such as open joints, pinched gaskets, cracked barrels or bells, etc. Make repairs on concentrated leaks, and as required to reduce infiltration or exfiltration leakage below the specified rate.

E. Air Test (Alternative)

1. As an alternate method to water testing, the Contractor may utilize low pressure air to test the sewer mains. Use the test procedure described below: Plug both ends of the pipe under test with airtight plugs and brace to prevent slippage and blowout. Furnish one plug with an inlet tap or other provision for connecting an air hose.
2. Equip the air supply hose, connected between the air compressor and the plug, with a throttling valve, an air bleed valve and a high pressure shutoff valve for control. Equip the low pressure side of the throttling valve with a tee for a monitoring pressure gauge, protected by a gauge cock. This cock is kept closed except when the pressure loss is being timed.
3. If the pipeline is submerged under groundwater, the back pressure, caused by the water head, is measured and added to the standard test pressures to compensate for the groundwater effect on the air test.

4. Apply air slowly to the pipeline until the pressure reaches 4.0 psig(27.6 j). Throttle the air supply to maintain the internal pressure between 4.0 and 3.5 psig (27.6 -24.1 j) for at least 2 minutes. During this time check the plugs with soap solution to detect any plug leakage.
5. When the pressure reaches exactly 3.5 psig (24.1 j), disconnect the air supply, start a stop watch and record the time for the pressure to drop to 2.5 psig (17.2 j). The minimum time allowed for the pressure drop is computed on an air loss rate of 3.5 cfm (5.9m³ /min) or an air loss rate of 0.0030 cubic feet per minute (cfm) per square foot (0.055 m³ /min per square meter) of inner pipe surface area under test, whichever rate yields the least time for the pressure drop. Should the time of the pressure drop between 3.5 and 2.5 psig (24.1 - 17.2 j) be less than the allowable specified time, make the necessary leakage repairs and repeat the air test.
6. Standard Drawing 02730-1 provides a nomograph which may be used to compute testing times for air testing. The nomograph computes results based upon English (U.S. Customary) units.
7. For single pipe size test sections, the length limits for minimum test times obtained from Standard Drawing No.02730-1 entitled “Nomograph for Air Testing Gravity Sewer Mains” are contained in the following table.

**TABLE 3.1
LENGTH LIMIT FOR MINIMUM TEST TIMES**

Pipe Diameter, Inches (cm)	Test Section Length, Foot (m)	
	Minimum	Maximum
4 (10)	642(196)	1124(343)
6 (15)	429(131)	751 (229)
8 (20)	322(98)	564 (172)
10(25)	257(78)	450 (137)
12(30)	215(66)	376 (115)
15(38)	172(52)	300 (91)
18(46)	43(44)	1250 (76)
21(53)	123(37)	215 (66)
24(61)	107(33)	188 (57)

8. For test sections that are shorter than the minimum lengths, new test times must be calculated. This is done by multiplying the test time from the nomograph by the actual length of the test section (in feet) and then dividing the resultant product by the minimum test section length from the preceding table.

9. For test sections exceeding the maximum lengths, either shorten the test section to an allowable length or use the water test.

F. Number of Tests

1. Perform the number of leakage tests directed by the Engineer to assure that materials and workmanship are acceptable. Repair defective joints using only approved methods. Replace pipe having cracked or broken barrels. Do not exceed 800 feet (240 m) of sewer line per test unless otherwise approved.

G. T.V. Inspection

1. All sewer mains shall be inspected using a television camera before final acceptance. A sewer line is deficient and unacceptable if (1) the alignment is outside the specified limits, (2) water ponds in any section are equal to or greater than 2 times the grade tolerance specified herein under Section 02730.3.E.1, or (3) the pipe has visible defects such as open joints, pinched gaskets, cracked barrels or bell, or similar defects.
2. Pay all costs incurred in any television inspection performed solely for Contractor benefit.
3. Record all television inspections in a format acceptable to the Owner. Pull the camera through the sewer at 30 feet per minute (9 meters per minute maximum). If the camera is pulled by attaching to the hose of a hydraulic sewer cleaner, assure the hose is not active during the pulling process.

H. Deflection Testing

1. The Engineer may require deflection testing of all or any portion of a flexible pipe installation to assure the construction quality. Flexible pipe is pipe that will deflect at least 2 percent without any sign of structural distress.
2. Conduct deflection tests, when performed on PVC pipe, meeting ASTM D3034 and satisfy either of the following deflection limitations:

**TABLE 3.2
DEFLECTION TESTING LIMITATIONS**

Minimum Period Between Trench Backfilling & Testing	Minimum Mandrel Diameter as a Percent of Inside Pipe Diameter
7 Days	95.0
30 Days	92.5

3. Mandrels must have at least nine arms. Perform the mandrel test without mechanical pulling devices.

I. Material and Equipment for Testing

1. Furnish all labor, equipment and materials (including water) necessary for performing the sewer line tests at Contractor expense.

3.5 WATER AND SEWER MAIN SEPARATION

A. Horizontal and vertical separation between water and sewer mains is dictated by Montana Department of Environmental Quality.

PART 4: MEASUREMENT AND PAYMENT

4.1 GENERAL

A. The following items are the pay items for the work covered under this section. Payment for these items is full compensation for providing all materials, tools, labor and equipment necessary to complete the item and all incidental work related thereto, whether specifically mentioned herein or not.

4.2 SEWER MAINS

A. All sewer main and service line installation shall be included in the bid price for system improvements and is not billed on a per foot basis for the scope of this project.

4.3 MANHOLES

- A. All manhole installation shall be included in the bid price for system improvements and is not billed separately for the scope of this project.

4.4 SANITARY SEWER SERVICE LINES

- A. All sewer main and service line installation shall be included in the bid price for system improvements and is not billed on a per foot basis for the scope of this project.

4.5 GENERAL

- A. The contract bid prices are full payment for all labor, materials, tools and other incidentals as maybe required to complete the items of work in the Contract.

END OF SECTION

Sections - 2900 Landscaping

MPW



LANDSCAPING

SECTION 02910 Seeding

SECTION 02910

SEEDING

PART 1: GENERAL

1.1 DESCRIPTION

- A. This section includes ground surface preparation; furnishing and applying fertilizer; and furnishing and planting seed in areas described in the contract documents or directed by the Engineer.
- B. Hydraulic seeding is not included in this section. Hydraulic seeding is covered in Section 02920, Hydraulic Seeding.

1.2 SUBMITTALS

- A. Submit to the Engineer applicable seed mixture certifications, fertilizer descriptions and mulch certifications. Furnish duplicate signed copies of the vendors statement certifying that each seed lot has been tested by a recognized seed testing laboratory within 6 months of date of delivery. Assure the statement includes: Name and address of laboratory, date of test, lot number for each seed species and the test results including name, percentages of purity and of germination, percentage of weed content for each kind of seed furnished and, for seed mixes, the proportions of each kind of seed.

PART 2: PRODUCTS

2.1 SEED

- A. Furnish seed and seed mixture, free of all prohibited noxious weed seed or any other weed seed prohibited by state or local ordinance.
- B. Seal and label all seed containers to comply with Montana Seed Law and Regulations or meeting U.S. Department of Agriculture and Regulations under the Federal Seed Act, if shipped in interstate commerce.
- C. Do not use wet, moldy, or otherwise damaged seed in the work.
- D. Furnish seed mixture of the species described in the contract documents. Furnish seed in standard containers labeled with the seed name, lot number, net weight,

percentages of purity, germination, hard seed, and percentage of maximum weed seed content for each seed species.

2.2 TOPSOIL

- A. Use topsoil that is loose, friable, loamy soil, free of excess acid and alkali. Assure topsoil does not contain objectionable amounts of sod, hard lumps, gravel, sub-soil or other undesirable material that would form a poor seedbed. Before striping topsoil, assure it has supported the growth of healthy crops, grass or other vegetable growth.

2.3 LIME

- A. Furnish ground limestone or other material deemed suitable by the Engineer containing a minimum 85 percent of total carbonate equivalent ground so that 90 percent will pass through a No. 100 mesh sieve. Coarser material may be acceptable, if the application rates are increased to provide at least the minimum quantities and depth specified using an approved Dolomitic lime or a high magnesium lime containing at least 10 percent magnesium oxide.

2.4 FERTILIZER

- A. Furnish standard commercial fertilizers supplied separately or in mixtures containing the specified percentages of total nitrogen, available phosphoric acid, and water soluble potash. Apply fertilizer at the specified rate and depth meeting the applicable State and Federal laws. Furnish fertilizer in standard containers clearly labeled with name, weight, and guaranteed analysis of contents. No cyanamide compounds of hydrated lime are permitted in mixed fertilizers.
- B. Fertilizers may be supplied in one of the following forms:
 - 1. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;
 - 2. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or
 - 3. A granular or pellet form suitable for application by blower equipment.

2.5 SOILS FOR REPAIRS

- A. Use soil for filling and topsoiling repair areas of equal quality to the existing topsoil being repaired. Assure the soil is free of large stones, roots, stumps, or other

materials that interfere with sowing, compacting, and establishing turf. Obtain approval from the Engineer before placing topsoil.

PART 3: EXECUTION

3.1 TOPSOIL

- A. Place at least 6 inches (15 cm) of topsoil in all areas to be seeded. Import topsoil if sufficient topsoil is not available from excavated areas of the project.

3.2 ALLOWABLE SEEDING MONTHS

- A. Perform seeding when the temperature and moisture are favorable to germination and plant growth. Seed preferably before June 1st and after October 1st of each year. Seeding dates must be approved by the Engineer.

3.3 SEEDBED PREPARATION AND SOWING

- A. Clear the areas to be seeded of all debris, vegetation, and other material determined by the Engineer to be detrimental to the preparation of a seedbed. Once the area is cleared, disc, harrow, rake, or work the area by other suitable methods, into a smooth, even seedbed. Assure the prepared seedbed surface is firm enough to prevent seed loss from high winds or normal rainfall. If rolling is required, perform rolling before seeding using a suitable roller, of a weight appropriate to the soil conditions.
- B. Sow seed in the areas described in the contract documents at the specified application rates.
- C. Sow seed using a force feed drill having a grass seed attachment, except of slopes steeper than three to one or on areas too small to be seeded with a force feed drill. In these areas, seed may be sown by power sprayers, blowers or other effective methods. Use equipment in good working order.
- D. Seed a Native Grass mix as approved by the Montana FWP staff.**
- E. Do not sow seed in winds that prevent proper imbedment into the surface.

3.4 FERTILIZER

- A. Spread and work fertilizer into the soil during the final seedbed preparation. Apply fertilizer at the rate described in the contract documents.

3.5 CARE OF SEEDED AREAS

- A. Keep the seeded area moist until it has germinated and it's continued growth is assured. Prevent erosion during watering. Water is incidental to the item "Seeding".
- B. Protect all seeded areas from traffic or pedestrian use with warning barricades or other Engineer approved methods.
- C. Maintain the seeded area, performing any required watering and mowing until the seed is firmly established. Prevent weeds and other undesirable vegetation from establishing in the seeded area. Mow weeds and rake and remove the clippings from the areas.
- D. Replace any seeded areas failing to germinate which have died or been damaged by construction activities. Replace such areas to meet the contract requirements. The contract warranty period applies to this item.

PART 4: MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Seeding is a lump sum item in the bid for all disturbed areas in the project and shall be done including topsoil salvage and/or importing, topsoil placement, seedbed preparation, and seeding, complete in place and accepted by the Engineer.
- B. Payment indicated to include complete compensation for all labor, equipment, materials and incidentals required for the completion of the work.

END OF SECTION