SECTION 00900

GENERAL CIVIL – SPECIAL PROVISIONS

ARTICLE 1 WORK DESCRIPTION

Work performed under the plan sheets and specifications consists of ALL materials, equipment, tools, labor, construction, coordination, administration, building permits, local septic permits, material lead times, and work appurtenant thereto, to complete the project as detailed on the drawings and as specified. Work includes, but it not limited to site excavation, grading, material and demo export, trench and general excavation, relocation of owner-provided electrical meter base, security lighting, water lines with connections and backflow prevention, dump station w/ water tower, precast building and door stoop, stone/gravel building foundation, two (2) 5,000-gallon holding tanks, wastewater piping, bollards, stormwater retention ponds, gravel surfacing, signage, fencing & gates, site reclamation & seeding, and building plumbing, electrical, and mechanical work. Requests for clarification of plans and specifications are to be made PRIOR to submitting a bid.

ARTICLE 2 SPECIFICATIONS

Specification order of precedence is as follows: 1. Written answers to questions/clarifications; 2. Special Provisions; 3. Engineer comments/notes on contractor submittals; 4. Project Specifications; 5. Plan sheets; 6. Montana Public Works Standard Specifications – 7th Edition, 2021. Under no circumstances can the Bidder, Prime Contractor, Subcontractor, or Supplier assume that a Work Item does not have required specifications. Seek clarification when in doubt.

ARTICLE 3 WORK HOURS

Hours of work may be from 7AM to 7PM, MST and up to seven (7) days/week. Overtime and non-traditional working hours should be expected to meet the project completion date. Tight coordination with Owner and pre-approval from Owner PRIOR to shutting down any site utilities is required.

ARTICLE 4 TESTING & INSPECTION

The Contractor is responsible for ALL Quality Control testing and inspections required by each specification section. The Contractor is also responsible for coordinating all inspections with the Engineer. The Contractor is responsible for pressure tests, leakage tests, video inspection (if visual inspections raise quality concern), soil tests, proctors, concrete mix designs, concrete production testing, nuclear density testing, and other related tests/inspections. Laboratory testing must be performed by an accredited and independent laboratory. The Contractor will coordinate with the Engineer for Engineer inspection and equipment startup. Accommodations will be made for Engineer and his/her agent(s) to inspect work as it progresses. Testing and QC costs are to be absorbed in their respective bid items.

ARTICLE 5 ADJACENT IMPROVEMENTS

Maintain and protect existing improvements/structures onsite and on adjacent properties. Do not disturb anything beyond the project limits. Do not disrupt current facility operations and traffic flow. Provide a plan to the Owner for Approval prior to making major traffic change/flow operations. All

damaged onsite items must be restored to preexisting condition. Contractor-caused damage will be immediately repaired or replaced at the Contractor's expense.

ARTICLE 6 SUBSURFACE CONDITIONS

Seasonal high groundwater should be expected at depths exceeding 5' below natural ground surface. Subsurface soils generally consist of clay/loam topsoil to approximately 30" BGS and cobbly sand/gravel from 30" to 96" BGS. A Geotechnical Report is not part of the Contract Documents.

ARTICLE 7 UNDERGROUND INSTALLATIONS

Underground installations including water lines, sewer lines, natural gas lines, telephone lines, fiber-optic lines, power lines, culverts, and subsurface structures in the vicinity of the work are indicated on the plans only to the extent that such information was made available for preparation of the plans. There is no guarantee, expressed or implied, as to the accuracy or completeness of such information provided by others, and all responsibility for accuracy and completeness is expressly disclaimed. Exploratory Excavation is required to confirm the horizontal and vertical location of existing subsurface utilities. Multiple Exploratory Excavations of the same utility may be necessary to correctly identify the location of a subsurface utility.

ARTICLE 8 COORDINATION WITH OTHER WORK AND SITE USES

Contractor is responsible to coordinate with and allow access to other Contractors, Subcontractors, Owner, Utility companies, Engineer/Architect and other parties that may use the property or adjacent property. This will include but is not necessarily limited to material distributors, Owner's reps., utility companies, local government jurisdiction, sign contractors, electrical contractors, phone service, and cable tv and hi-speed internet services for the building.

ARTICLE 9 WARRANTY PERIOD

Contractor will warranty ALL site/civil improvements for a period of one-year from the date of Substantial Completion. Ensure that quality concrete finishing measures are employed and enforced, and that excess finish water/moisture is NOT introduced to the concrete. The General Contractor's site Superintendent MUST be onsite for ALL subcontractor concrete placements to ensure quality concrete practices are consistently used.

ARTICLE 10 CRUSHED BASE COURSE (CBC)

Minimum subgrade compaction is 95% of theoretical maximum density. Density testing required.

Minimum subbase & CBC top surfacing compaction is 95% of theoretical maximum density. Density testing required.

ARTICLE 11 OWNER-SUPPLIED MATERIALS

Owner will supply the SCAT Machine & Poop Tube Washing Machines and deliver to site. Contractor shall provide the plumbing rough-in per the plans and specifications and coordinate with the SCAT Machine equipment manufacturer when he delivers and installs the machines.

Owner will supply a new electrical power supply (by NWE) & a temporary meter base that the Contractor can use for construction power needs. The meter base shall be relocated to the pre-cast utility building by Contractor's electrician.

ARTICLE 12 GENERAL NOTES

Contractor may use existing sanitary facilities and may camp at the site. If Contractor uses the site facilities, the Contractor is responsible for cleaning and leaving the facilities in good condition. Coordinate camping with site host always. No smoking outside a vehicle will be permitted. Contractor responsible for site security and temporary fencing of the worksite to keep the public safe. Contractor to pay particular attention to safety around open excavations as the general public can be using the Eden Bridge Boat Launch and parking area at any time during construction. Contractor shall practice good jobsite housekeeping. All waste and trash shall be picked up immediately and property stored each day. If odors arise, trash shall be removed from site immediately.

- **END OF SECTION -**

TECHNICAL SPECIFICATIONS

HUMAN WASTE DISPOSAL IMPROVEMENTS
EDEN BRIDGE FISHING ACCESS SITE, MONTANA
AUGUST 2022

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Section 02111 Clearing, Rehabilitation, & Seeding

1. General

The project site, along with all associated earthwork, shall be cleared and stripped of surface vegetation to a width necessary for excavation equipment to complete the job. The term vegetation includes such material as brush, trees, grass and weeds, and all other objectionable matter as determined by the Owner or Engineer's Representative. The stripped material, tree roots, and grass root mass shall not be incorporated within the embankment/backfill. Upon completion of the work, all work areas shall be cleaned up, re-graded, and seeded.

2. Materials

All seed and plant materials shall be in accordance with AIA specifications for Number One Grade. Prior to installation of plant materials, areas that have been compacted shall be thoroughly loosened. Soil shall be amended with organic compost at a rate of 3 CY/1000 SF and tilled to a depth of at least 8 inches.

All seeding shall be accomplished using the following Native Seed Mix:
Name: Low Grow Mix
Manufacturer: Arkansas Valley Seed Solutions

Ephram Crested Wheat Grass:	30%
Perennial Rye Grass:	15%
Blue Fescue:	20%
Canada Blue Grass:	20%
Chewing's Fescue	15%

Seed shall be drilled at a rate of 40 lbs/acre to depth of ½ - ¾" depth.

3. Execution

3.1 Protection of Existing Properties

Take precautions to protect all adjoining private and public property and facilities, including underground and overhead utilities, curbs, sidewalks, driveways, structures, and fences. Contact Montana One Call System for utility locates before starting work (1-800-424-5555 minimum of two days prior to excavation). Restore and replace all disturbed or damaged facilities to its original condition at Contractor's expense.

3.2 General

Prior to installation of plant materials, areas that have been compacted shall be thoroughly loosened. Soil shall be amended with organic compost at a rate of 3 CY/1000 SF and tilled to a depth of at least 8 inches.

The topsoil shall be stripped to a minimum depth of 4-inches. To the maximum extent feasible, topsoil that is removed during construction shall be stockpiled on the job site and replaced when the trench excavation and backfill procedures are completed.

Unsatisfactory backfill & waste materials from clearing operations shall be disposed of off-site at the expense of the Contractor. The work of clearing shall be kept well in advance of the pipe laying operations.

Section 02221
Trench Excavation and Backfill for Pipelines and Appurtenant Structures

1. General

This work is the excavation, trenching and backfilling for pipeline 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, pavement patching and cleanup.

1.2 References and Standard Drawings

The current publications listed in the Montana Public Works Standard Specifications (MPWSS), Seventh Edition, April 2021. Standard drawings within the aforementioned documents shall also apply to this project.

1.3 Testing

Compaction & in-place density testing is required. The Contractor shall be responsible for ensuring a qualified individual completes compaction testing. In addition, any costs associated with testing shall be the sole responsibility of the Contractor.

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 spring line of the pipe. Provide Type 1 Bedding consisting of sand, sandy gravel, or fine 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. Where trench excavation encounters wet or unstable material, Type 1 Pipe Bedding must be free draining and non-plastic. Refer to MPWSS Standard Drawing 02221-1 and Special Provisions for other requirements. Type 1 Bedding shall be replaced with on-site materials only if specifically stated on the Project Drawings.

B. Select Type 1 Bedding

1. Select Type 1 Bedding includes the material placed from the spring line of the pipe to 6 inches (15cm) over the pipe. Select Type I Bedding shall consist of soil, sand or fine gravel, free from clods, lumps of frozen material, or rock exceeding 1-½ inches (38mm) in its greatest dimension. Excavated trench material may be screened or sorted for use as backfill subject to approval of the Engineer. Where trench excavation encounters wet or unstable material, Select Type 1 Bedding must be free draining and non-plastic. Select Type 1 Bedding shall be replaced with on-site materials only if specifically stated on the Project Drawings.

C. Pipe Bedding Alternate

1. Pipe Bedding Alternate material is described on Standard Drawing 02220-2, and is applicable only if specified in the contract documents.

D. Type 2 Pipe Bedding

Type 2 Pipe Bedding issued as directed by the Engineer replace unsuitable material encountered in the trench bottom. Place Type 2 Pipe Bedding from the bottom of the Type 1 Bedding material to the depth required to adequately support the pipe. The Type 2 Bedding consists of granular material meeting the following gradation. Type 2 Bedding shall be replaced with on-site materials only if specifically stated on the Project Drawings.

Sieve Opening	% Passing
3 Inch	100
No. 4	0 - 25
No. 8	0 - 10

2.2 Trench Backfill Materials

A. Materials from Trench Excavations

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 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 insert 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 inches (90cm) imprint.

3. Execution

A. Protection of Existing Properties

A. General

A 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.

B Contact utility owners using the Montana One Call System for utility locate before starting work (1-800-551-8344 or 1-800-424-5555). 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.

C Re-locate existing water mains, sanitary sewers and storm drains shown on the plans, which conflict with new pipelines or structures as indicated in the contract documents.

D Notify the Engineer of existing service lines interfering with trenching operations. Show all repaired and/or adjusted water and sewer lines on the As-Built Plans.

E Protect existing water and sewer mains and water and sewer services from freezing at all times during construction.

B. Existing Overhead Utilities

A Use extreme caution to avoid conflict, contact or damage to overhead utilities during the work.

3.2Pavement Removal and Stripping

A.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. For trenches passing through existing pavement, cut the pavement along a neat vertical line at least 112 inches (300cm) 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. Dispose of the asphalt concrete and/or Portland cement concrete debris off-site according to applicable state and local regulations.

2. Before cutting of any existing pavement or curb, the Contractor shall obtain any necessary permits.

3. 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.

4. 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.

5. Re-sod or reseed, as specified in the contract documents, all established lawn acres cut by trenching or damaged during the construction, in accordance with the contract documents, to the satisfaction of the Architect.

3.3 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.

3.4 TRENCH EXCAVATION

A. General

A. Meet current OSHA Safety and Health Standards for all excavation, trenching, shoring and related work.

B. Excavate at the specified locations for pipeline installations and appurtenant structures.

C. 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.

D. 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.

E. Remove and dispose of all excess or unsuitable excavated materials.

F. 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.

G. 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.

H. **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.

I. 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

3.1Width

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.

3.2Depth

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 Unstable 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. Pavement Damage Caused by Equipment

1. Equip all track mounted equipment operated on pavement surfacing with pads to prevent pavement damage. Restore all pavement damaged by construction to its original condition.

E. 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.

F. Excavations 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 requirement for removing water and other applicable portions of these specifications apply to excavation for appurtenances.

E. DEWATERING

Groundwater is anticipated at this project site. Any groundwater encountered in trench excavations must be removed. The cost of dewatering operations is considered a part of the excavation cost.

F. EXCAVATION STABILITY AND SAFETY

1. 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.

G. TRENCH FILLING AND BACKFILLING

1. General

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.

A.Pipe Bedding Placement

3.1Type 1 Bedding.

Place Type 1 Pipe Bedding material 4 inches (10cm) under the pipe, around the pipe and up to the spring line of the pipe. Place in maximum lifts of 6 inches (15cm), using hand or other compaction methods without damaging or disturbing the pipe. Thoroughly compact each layer. Use special care to assure compaction under the pipe haunches. 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. Type 1 Bedding shall be replaced with on-site materials only if specifically stated on the Project Drawings.

B. Select Type 1 Bedding

Place Select Type 1 Bedding material from the spring line to 6 inches (15cm) over the pipe. Where wet or unstable material exists, assure the material is free draining and non-plastic. Place in maximum lifts of 6 inches (15cm) using hand or other compaction methods without damaging or disturbing the pipe. Thoroughly compact each layer. 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. Select Type 1 Bedding shall be replaced with on-site materials only if specifically stated on the Project Drawings.

C. Type 2 Pipe Bedding

Use Type 2 Pipe Bedding described in PRODUCTS SECTION 2.1.D as specified or as directed by the Architect to replace unsuitable material encountered in the trench bottom, placing it from the bottom of the Type 2 Bedding material to the depth required to adequately support the pipe. Type 1 Bedding shall be replaced with on-site materials only if specifically stated on the Project Drawings.

D. Pipe Bedding Alternate

Place and compact the pipe bedding alternate material on Standard Drawing 02221-1, where specified in the contract documents and/or where directed by the Architect.

3. 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 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 the street subgrade is separated into three classifications. Type A Trench Backfill is compacted backfill typically used in streets or paved areas. Type B Trench Backfill is typically used for alleys, cultivated areas; borrow pits, unimproved streets or other un-surfaced areas, and other

areas where compaction is less critical. Type C Trench Backfill is typically used in open and unimproved areas outside of the public right-of-way. Meet the backfill and compaction requirements for all of the backfill types described in contract documents.

3. Remove, replace, and re-compact backfill in trenches where settlement has occurred as directed by the Architect at the Contractor's expense.

D 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.

E 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 (ASTM D698). Cultivated areas are to be backfilled with Type B Trench Backfill. In cultivated areas, place stripped topsoil uniformly over the backfill trench to the original depth. Do not compact the topsoil, but grade to provide a smooth surface conforming to the adjoining ground surfaces. Remediate any settlement of the trench surface below final surface grade throughout the contract warranty period.

F 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.

4. Replacement of Unsuitable Backfill Materials

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. 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. Place and compact all imported material according to the applicable specification.

A Backfill for Appurtenances

1. Place and compact backfill for appurtenances to finished grade around manholes, inlets, valve boxes and other underground items without

disturbing appurtenance alignments. Meet the backfill material, placement, and compaction requirements specified for the adjoining trench.

B Detectable Buried Warning Tape

1. **The use of warning tape is mandatory on all water & sewer lines**. Provide warning tape as described in PRODUCTS Section 2.3. Bury tape a maximum 18 inches (45cm) below finish surface grade.

C Tracer Wire

1. **The use of tracer wire is mandatory on all water lines.**

5. Pavement Patching

Any asphalt pavement removed for trench excavation shall be replaced with compacted hot-mix asphalt pavement to a depth equal to or greater than original.

H SURVEY MARKERS AND MONUMENTS

1. 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 Architect. Replace all Contractor disturbed or destroyed survey markers or monuments, not approved during construction, using a licensed land surveyor.

I CLEANUP

1. As work progresses, remove debris and complete to finish grade each portion of the work. Once the works 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. Remove any deleterious material, including any concrete or asphalt spoils, from the site upon completion.

SECTION 02230
STREET EXCAVATION, BACKFILL, AND COMPACTION

1. General

1.1 Description

This work is the topsoil stripping, clearing, grubbing, excavation, filling or backfilling, and subgrade preparation to the lines, grades and cross sections as preparation for overlying base course material, and crushed surfacing. Also included are the removal and disposal of debris and excess soil, the furnishing and placing of fill materials, and compaction.

Construction Execution, Materials, and Testing shall be performed in accordance with the Montana Public Works Standard Specifications, Seventh Edition, 2021.

A. Protection: Protect utilities, and other facilities in areas of work. Barricade open excavations. Comply with regulations and requirements of regulatory authorities having jurisdiction.

B. Temporary excavations deeper than four feet should be no steeper than 1-1/2H:1V or shall be shored. Excavations greater than 4'-0" in depth, which workers will enter, shall be governed by OSHA Guidelines in Part 1926.6842 Appendix B to subpart P (Type C subsoils).

1.2 References

The current publications listed in Section 02230 of the MPWSS, seventh edition.

1.3 Density Control Testing

A. Field Density Testing

Contractor shall employ and pay for a qualified independent geotechnical testing laboratory to perform compaction tests on sub-base, base course gravel and crushed surfacing gravel surface. Compaction testing shall include the required proctor testing of on-site and off-site materials.

NOTE: In-Place Field Density Testing shall be performed in accordance with Section 02235 Montana Public Works Standard Specifications (MPWSS), Seventh Edition. Testing shall be conducted every 300' measured down the centerline of the each road corridor and at each lift of subgrade, select base and top surfacing. Tests shall be staggered randomly from centerline. Tests which fail the required compaction shall be recompacted and retested at no additional cost to the Owner.

B. Laboratory Maximum Density and Optimum Moisture

Laboratory Maximum Density and Optimum Moisture determinations will be made by the Engineer for each on-site natural soil in accordance with Section 02230 of the Montana Public Works Standard Specifications (MPWSS), Seventh Edition.

It will be the responsibility of the Contractor to supply testing for all off-site (imported) materials to be used within this section of the work.

C. Material Submittals

Material submittals for all off-site materials included in this section shall be in accordance with MPWSS.

2. Products

2.1 On-Site Embankment

On-site embankment from excavation and shaping of the roadway shall be used for sub base material over which the base course material will be placed, or the material shall be wasted on-site. Fill and backfill materials are to consist of natural soils free from organic matter, frozen material, refuse, construction debris, or other man-made items. Obtain approval of the Engineer for all fill before placing and use only the fill from the roadway excavations unless otherwise instructed by the Engineer.

2.2 Imported Borrow Materials (For Embankments In-Place)

The use of imported borrow materials is not likely part of this project. However, if required imported borrow materials shall conform to MPWSS.

2.3 Sub excavation/Replacement Below Subgrade

Sub excavation and Replacement below subgrade shall be in accordance with MPWSS. Replacement material for sub excavations shall consist of imported select fill (pit run), and must be approved by the Engineer prior to placement.

3. Execution

Execution of all work related to this section shall be performed in accordance with MPWSS.

A. Preparation:

Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Erosion and Sediment Control:

Provide erosion and sedimentation control measures per Montana Department of Environmental Quality Stormwater Pollution Prevention Plan & Local Standards.

C. Surface Water and Ground Water Ponding:

Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area.

D. Subgrade Protection:

Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

E. Excavate to Subgrade:

Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

F: Cold Weather Site Work:

If cold weather conditions (below freezing temperatures) inhibit proper excavation, watering, and compaction operations, contractor shall notify Engineer.

G. Subgrade Damage:

Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities.

H. Stockpiles:

Stockpile borrow materials and satisfactory soil materials, without intermixing, in shaped, graded, drained, and covered stockpiles. Stockpile soil materials away from edge of excavations and outside drip line of remaining trees.

I. Site Grading:

The contractor shall strip topsoil and grade the site to the contours and limits shown on the project drawings. All excavation and grading shall be the responsibility of the Contractor.

1. Stockpiling of soils is permitted within the project site within the limits of construction.
2. Provide dust control methods during grading operations to minimize air-borne dust and dirt. Engineer to have final approval of methods and procedures.

J. Project Cleanup:

Remove excess trash, debris, and waste material from site and dispose of in an approved landfill.

K. Repair and Reestablishment:

Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction. Where settling occurs before Project correcting period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing, at no additional cost to the Owner.

Section 02235
Select Base Course

1. General

1.1 Description

This work is the placing of one (1) 6" (compacted thickness) layer of select base course material. The select base course material shall be composed of crushed or non-crushed hard, durable stone, gravel or other similar materials mixed or blended with sand, stone dust, or other binding or filler materials produced from sources that provide a uniform mixture. The material shall meet the gradation and other quality criteria specified within the MPWSS, Seventh Edition.

Placing shall be performed to the grades & horizontal limits shown and described on the Plan Sheets.

Construction Execution, Materials, and Testing shall be performed in accordance with the MPWSS, Seventh Edition.

1.2 References

The current publications listed MPWSS, Seventh Edition.

1.3 Density Control Testing

A. Field Density Testing

Field Density Testing shall be performed in accordance with MPWSS, Seventh Edition. Testing shall be conducted every 300' measured down the centerline of the road corridor and at each lift of subgrade, select base and top surfacing. Tests shall be staggered randomly from centerline. Density testing shall be at the sole expense of the Contractor.

B. Laboratory Maximum Density and Optimum Moisture

Laboratory Maximum Density and Optimum Moisture determinations will be made by an independent laboratory for each on-site natural soil in accordance with MPWSS, Seventh Edition. It will be the responsibility of the Contractor to supply testing for all on-site and off-site (imported) materials to be used within this section of the work.

1.4 Material Submittals

A. Submit to the Engineer gradations, moisture density curves (proctor curve) and other test results for sources to be used for base materials prior to delivery to the site for approval by the Engineer.

   Material submittals for this section shall be in accordance with the MPWSS, Seventh Edition.

2. Products

2.1 General

Furnish aggregate base meeting the applicable aggregate quality and gradation requirements within the MPWSS, Seventh Edition.

2.2 Select Base Material

One layer of 6" compacted thickness select base course gravel shall be applied over an acceptable sub-base to all roads within the limits of this project. The gradation for the select base course gravel shall be per MPWSS, Seventh Edition.

Qualities of Select Base Material used within this project shall conform to the MPWSS, Seventh Edition.

2.3 Gradation

Gradation of the Select Base Material used within this project shall be in accordance with MPWSS, Seventh Edition.

2.4 Watering

Use only uncontaminated water from a source approved by the Engineer before placement or application.

3. Execution

Execution of all work related to this section shall be performed in accordance with MPWSS, Seventh Edition.

Section 02236
Crushed Aggregate Surfacing

1. General

1.1 Description

This work is the placing of one (1) 3" (compacted thickness) layer of crushed aggregate surfacing material. The crushed aggregate surfacing material shall be composed of crushed gravel, stone, or similar material consisting of hard, durable particles or fragments of stone; free of excess flat, elongated, soft or disintegrated pieces, dirt or other deleterious matter.

The material shall meet the gradation and other quality criteria specified within MPWSS, Seventh Edition and all Addenda thereto.

Placement shall be performed to the grades & horizontal limits shown and described on the latest, Engineer-stamped, Plan Sheets.

Construction Execution, Materials, and Testing shall be performed in accordance with the MPWSS, Seventh Edition.

1.2 References

The current publications listed in MPWSS, Seventh Edition.

1.3 Density Control Testing

A. Field Density Testing

Field Density Testing shall be performed in accordance with MPWSS, Seventh Edition. Testing shall be conducted every 300' measured down the centerline of each road corridor and at each lift of subgrade, select base, and aggregate surfacing. Tests shall be staggered randomly from centerline. Density testing shall be at the sole expense of the Contractor.

B. Laboratory Maximum Density and Optimum Moisture

Laboratory Maximum Density and Optimum Moisture determinations will be made by an independent laboratory for each imported material in accordance with the MPWSS, Seventh Edition. It will be the responsibility of the Contractor to supply testing for all off-site (imported) materials to be used within this section of the work.

1.4 Material Submittals

A. Submit to the Engineer gradations, moisture density curves (proctor curve) and other test results for sources to be used for crushed aggregate surfacing materials prior to delivery to the site for approval by the Engineer.

Material submittals for this section shall be in accordance with the MPWSS, Seventh Edition.

2. Products

2.1 General

Furnish crushed aggregate surfacing meeting the applicable aggregate quality and gradation requirements within MPWSS, Seventh Edition.

2.2 Crushed Aggregate Surfacing Material

One layer of 3" compacted thickness crushed aggregate surfacing shall be applied over an acceptable base to all roads within the limits of this project.

Qualities of Crushed Aggregate Surfacing Material used within this project shall conform to MPWSS, Seventh Edition.

2.3 Gradation

Gradation of the crushed aggregate surfacing material used within this project shall be in accordance with MPWSS, Seventh Edition.

2.4 Watering

Use only uncontaminated water from a source approved by the Engineer before placement or application.

3. Execution

Execution of all work related to this section shall be performed in accordance with Section 4 of the Lewis and Clark County Public Works Manual, adopted November 25, 2014.

SECTION 02760 PRE-CAST UTILITY BUILDING

1.0 SCOPE

This specification covers the construction/procurement and placing of a precast multi-purpose building.

2.0 STANDARD SPECIFICATIONS

ASTM C33	Concrete Aggregates
ASTM C39	Method of Test for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C143	Method of Test for Slump of Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM A185	Standard Specification for Steel Welded Wire Reinforcement, Plain, or Concrete
ASTM C192	Method of Making and Curing Test Specimens in the Laboratory
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C309	Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel bars for Concrete Reinforcement
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C979	Standard Specification for Pigments for Integrally Colored Concrete
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 306	Cold Weather Concreting
ACI 318	Building Code Requirements Structural Concrete and Commentary (includes Errata)
PCI MNL 116	Quality Control for Plants and Production of Precast Prestressed Concrete Products

3.0 MANUFACTURER CRITERIA

BRAND NAME DISCLAIMER
The use of a brand name item is to set a standard of quality and is not intended to restrict the Contractor from offering an item from other source(s) of supply as approved by the Engineer.

The manufacturer supplying the requested precast concrete vault facility must meet the following:
A. Manufacturing plant must be PCI certified at the time of bid.
B. Manufacturer must not have defaulted on any contract within the last five (5) years.
C. Manufacturer must provide stamped, engineered drawings prior to acceptance.
D. Manufacturer must be pre-approved prior to bidding.
E Manufacturer must show five (5) examples of past buildings produced.
F. Manufacture shall provide a one (1) year warranty.
G. UL 752 Bullet Resistance on 4" thick concrete samples.

Manufacturers meeting these criteria are:
Missoula Concrete Construction
PO Box 16086
Missoula, MT 59808
Phone 406-549-9682

BUILDING MANUFACTURER Incorporated
6701 E. Flamingo Avenue, Building 300
Nampa, ID 83687
Phone 800-696-5766

4.0 DESIGN CRITERIA

The buildings have been designed to individually meet the following criteria. Calculations and engineer's stamped drawings are available, for standard buildings, upon request by the Contractor and are for their sole and specific use only. The design criteria are to ensure that they not only will withstand the forces of nature listed below but will provide protection from vandalism and other unforeseen hazards. Building will be manufactured using precast concrete including the roof. Building's structural and foundation design will be relevant to the region and properties associated with its final placement. Design will also meet all applicable accessibility and building code requirements. Vault buildings will also meet various structural loads such as below, but not limited to/or restricted by them.

A. Roof Snow Load 1. The buildings are designed to withstand a 350 pounds per square foot snow load.

B. Floor Load 1. The buildings are designed to withstand 400 pounds per square foot floor load.

C. Wind Load 1. The buildings will withstand the effects of 150 miles per hour (3-second gust) wind exposure.

D. Earthquake 1. The buildings will withstand the effects of a seismic design category E earthquake.

E. Additional Design Standards

1. The buildings are an all concrete design with a minimum 3/12 roof pitch.
2. The buildings shall have a minimum 4" wall, 4½" roof, and 5" floor thickness.
3. All wall to floor interior surface seams shall have a minimum 1" radius coving made of high strength grout.

5.0 MATERIALS

A. Concrete – General 1. The concrete mix design is designed to ACI 211.1 to produce concrete of good workability.

2. Concrete will contain a minimum of 675 pounds of cementitious material per yard. Cement is a low alkali type I/II or III conforming to ASTM C-150.

3. Coarse aggregates used in the concrete mix design will conform to ASTM C33 with the designated size of coarse aggregate #67.

4. Maximum water/cement ratio will not exceed .45.

5. Air-entraining admixtures will conform to ASTM C260. Water reducing admixtures will conform to ASTM C494, Type A.

6. If Self Compacting Concrete (SCC) is used, it must conform to ASTM C1611.

B. Concrete – Cold Weather 1. Cold weather concrete placement is in accordance with ACI 306.

2. Concrete will not be placed if ambient temperature is expected to be below 35ºF during the curing period unless heat is readily available to maintain the temperature of the concrete at least 50ºF.

3. Materials containing frost or lumps of frozen materials will not be used.

C. Concrete – Hot Weather 1. The temperature of the concrete will not exceed 90ºF at the time of placement. When the ambient reaches 90ºF the concrete is protected with moist covering.

D. Concrete Reinforcement 1. All reinforcing steel will conform to ASTM A615. All welded wire fabric will conform to ASTM A185.

2. All reinforcement is new, free of dirt, oil, paint, grease, loose mill scale and loose or thick rust when placed.

3. Details not shown on drawings or specified are to ACI318.

4. Steel reinforcement is centered in the cross-sectional area of the walls and will have at least 1¼" of cover on the under surface of the floor.

5. The maximum allowable variation for center-center spacing of reinforcing steel is ½".

6. Full lengths of reinforcing steel are used when possible. When splices are necessary on long runs, splices are alternated from opposite sides of the components for adjacent steel bars.

a. Lap bars under #4 a minimum of 12" bar diameters.

b. Lap bars larger than #4 a minimum of 24" bar diameters.

7. Reinforcing bars are bent cold. No bars partially embedded in concrete are field bent unless approved by the Contractor.

E. Caulking, Grout, Adhesive and Sealer

1. Caulking service temperatures from -40ºF to +194ºF.

2. Interior and exterior joints are caulked with a paintable polyurethane sealant.

3. Grout is a non-shrink type and are painted to match the color of surrounding concrete as nearly as possible.

4. Cement base coating is formulated with a very fine aggregate system and is a built-in bonding agent.

F. Dead Bolt

1. Certified ANSI/BHMA A156.5-2001 Grade 1

2. Heavy duty tamper resistant.

3. 2¾" backset.

4. U.S. 26D finish.

G. Doors – Steel

1. Doors are flush panel type 1¾" thick, minimum 16-gauge galvanized steel, top painted with DTM ALKYD.

2. Door frames are knockdown or welded type, single rabbet, minimum 16-gauge prime coated steel top

painted with DTM ALKYD, width to suit wall thickness.
3. Three (3) rubber door silencers are provided on latch side of frame.

H. Door Hinges
1. Three (3) per door with dull chrome plating 4½" x 4½", adjustable tension, and automatic closing for each door.

I. Doorstop
1. Dome style stop meeting ANSI 156.16.

J. Door Sweep
1. Provided at the bottom of door with an adjustable brush.

K. Lockset
1. Meets ANSI A156.2 Series 4000, Grade 1 cylindrical lockset for exterior door.
2. Lever handle both inside and out.
3. Either handle operates latch unless outside handle is locked by inside push-button.
4. Push-button will automatically release when inside lever handle is turned or door is closed.
5. Emergency slot on exterior so door can be unlocked from the outside with a coin, screwdriver, etc.
6. Inside lever always active.
7. U.S. 26D finish.

L. Paint
1. All paints and materials will conform to all federal specifications or be similar "top-of-the-line-components."
2. Paints will not contain more than .06% by weight of lead.
3. Type of paints for toilets.
a. Inside concrete surfaces.
i. Interior floors – chemical resistant urethane. The color is gray.
ii. Interior walls and ceilings – modified acrylic, water repellent penetrating stain. The color is white followed by a clear acrylic anti-graffiti sealer.

b. Exterior concrete surfaces.
i. Exterior slab – clear sealer.
ii. Exterior walls and roof – water repellent penetrating stain in the same color as the walls or roof followed by a clear acrylic anti-graffiti sealer.
b. Metal surfaces (both inside and out).
1. DTM ALKYD.

M. Sealers and Curing Compounds
1. Curing compounds, if used, are colorless, complying with ASTM C309, type I or 1-D.
2. Weatherproofing sealer for exterior of building are a clear water repellent penetrating sealer.

N. Wall Vent
1. Vent cover is 14-gauge, type 304 stainless steel painted with DTM and anchored into the concrete wall with high strength anti-rust tap con fasteners.
2. Vent louver frame and louvers are non-vision, .1" extruded, aluminum jet coat finish.
3. Vent comes with insect screen.
4. Cover to be recessed a minimum ¾" on exterior walls with a 45-degree bevel. Interior to be flush mounted. Wall vent will not protrude from the wall.

O. Electrical

1. See electrical plans & specifications

6.0 MANUFACTURE

A. Mixing and Delivery of Concrete

1. Mixing and delivery of concrete are in accordance with ASTM C94, Section 12.6 through 12.9.

B. Placing and Consolidating Concrete

1. Except for SCC, concrete is consolidated by the use of mechanical vibrators. Vibration are sufficient to accomplish compaction but not to the point that segregation occurs.

C. Finishing Concrete

1. Interior floor and exterior slabs are floated and troweled.
2. All exterior building walls and exterior screen walls are any one of the available textures.
3. All exterior surfaces of the roof panels are cast to simulate any one of the available textures. The underside of the overhang will have a smooth finish.

D. Cracks and Patching

1. Cracks in concrete components which are judged to affect the structural integrity of the building are rejected.
2. Small holes, depressions, and air voids are patched with a suitable material. The patch will match the finish and texture of the surrounding surface.
3. Patching will not be allowed on defective areas if the structural integrity of the building is affected.

E. Curing and Hardening Concrete

1. Concrete surfaces will not be allowed to dry out from exposure to hot, dry weather during initial curing period.

7.0 FINISHING AND FABRICATION

A. Structural Joints

1. Wall components are joined together with two (2) welded plate pairs at each joint.
2. Each weld plate is 6” long and located one (1) pair in the top quarter and one (1) pair in the bottom quarter of the seam.
3. Weld plates are anchored into the concrete panel and welded together with a continuous weld.
4. Inside seams are a paintable caulk.
5. Outside seams will use a caulk in a coordinating building color or clear.
6. Walls and roof are joined with weld plates, 3" x 6" at each building corner.
7. The joint between the floor slab and walls are joined with a grout mixture on the inside, a matching colored caulk on the outside and two (2) weld plates 6” long per wall.

B. Painting/Staining

1. An appropriate curing time is allowed before paint is applied to concrete.
2. Some applications may require acid etching. A 30% solution of hydrochloric acid are used, flushed with water, and allowed to thoroughly air dry.
3. Painting will not be done outside in cold, frosty, or damp weather.
4. Painting will not be done outside in winter unless the temperature is 50ºF or higher.
5. Painting will not be done in dusty areas.
6. All surface voids are filled prior to painting

7. Schedule of finishes.

a. Inside concrete surfaces.

i. Inside floors – one (1) coat of 1-part water based chemical resistant urethane.

ii. Interior walls and ceilings – two (2) coats of a modified acrylic, water repellent penetrating stain, followed

by one (1) coat of clear sealer.

b. Exterior concrete surfaces.
i. Exterior walls – two (2) coats of water repellent penetrating stain in the same color as the walls or roof followed by one (1) coat of clear acrylic anti-graffiti sealer.

c. Metal surfaces (both inside and out).
i. Two (2) coats of DTM ALKYD.

8.0 TESTING
A. Testing will only be performed by qualified individuals who have been certified ACI Technician Grade 1.

B. Sampling is in accordance with ASTM C172.

C. The following tests are performed on concrete used in the manufacture of toilets.
1. Air content – checked per ASTM C231 on the first batch of concrete. The air content is in the range of 5.0% +/- 1.5%.
2. Compressive strength of the cylinders – tested to ASTM C39.
a. Two (2) are tested at release (minimum strength of 2500 psi).
b. One (1) is tested at seven (7) days (minimum strength of 4500 psi).
c. Two (2) are tested at 28 days (minimum strength of 5000 psi).

D. A copy of all test reports are available to the Contractor as soon as 28-day test results are available.

9.0 INSTALLATION
A. Scope of Work 1. Work specified under this section relates to the placement of the unit by Contractor or Building Manufacturer on **Contractor-prepared foundation**. *See Installation Specifications by building manufacturer.*

B. Location
1. It is the responsibility of the Contractor to:
a. Provide exact location by stakes or other approved method.
b. Provide clear and level site free of overhead and/or underground obstructions.
c. Provide access to the site for truck delivery and sufficient area for the crane to install and the equipment to perform the contract requirements.
d. Water, electrical, and sewage site floor penetrations & connections to be placed per project drawings. Must be placed to easily connect to the building.

C. Compacting
1. The bottom of the area must be compacted after it has been dug out. After the base has been placed, it must be compacted as well. The bearing of the soil and base should be a minimum of 1,500 pounds per square foot.

D. Base
1. After compacting the bottom of the area, a minimum of 6” thick and consist of ¾” minus crushed rock (i.e. road base material) compacted to 95% of optimal density in accordance with ASTM D1557. Finished surface of sub-base shall be flat and level, with a maximum deviation of -½”, +0” from a true horizontal plane.
2. The base should be placed for support, leveling and drainage purposes and also to limit frost action. The base must be confined so as to prevent washout, erosion, or any other undermining.

E. Access to Site

1. Delivery to site made on normal highway trucks and trailers. If at the time of delivery conditions of access are hazardous or unsuitable for truck and equipment due to weather, physical constraints, roadway width or grade, building manufacturer may require an alternate site with better access provided to ensure a safe and quality installation. In any such case, additional costs for cranes, trucking, etc. will be charged to the account of the Contractor.

10.0 WARRANTY—PRECAST DIVISION

Building manufacturer must provide a minimum one (1) year warranty; all parts and labor included.

SECTION 02770 –5,000 GALLON TRAFFIC-RATED HOLDING TANKS (2)

PART 1 - GENERAL

1.1 DESCRIPTION

This work is the procurement and installation of two (2) 5,000 gallon traffic-rated, pre-cast concrete holding tanks; including pre-cast deadmen, deadmen anchors, all piping from building and dump station, internal piping, lids, risers, floats, alarm panels, electrical components, excavation, backfill, compaction, watertight testing, and all other related items necessary to complete the installation.

1.2 REGULATORY REQUIREMENTS

A. The Montana Department of Environmental Quality's Circular DEQ-4, 2013 Edition, shall apply as follows:

1. The holding tank shall meet the materials and installation requirements of DEQ-4, Section 8.1 guidelines for holding tanks.

B. The Contractor is responsible for coordinating all required inspections of the sanitarian or other designated County Health Department representative. The Contractor shall obtain a "Wastewater Treatment System Installer's License" from the County in which the project is located prior to commencing any work on the holding tank system.

1.3 PROTECTION OF THE SITE: Upon the completion of the work, the Contractor shall restore the site as nearly as possible to its original condition, including the replacement, at the Contractor's sole expense, of any existing or newly constructed facility or landscaping, which has been destroyed.

1.4 BOUNDARIES OF WORK: The Owner shall provide land or rights-of-way for the work specified in this contract and make suitable provisions for ingress and egress. The Owner shall not cause the Contractor to enter or occupy with personnel, tools, equipment or material, any ground outside the property of the Owner without the written consent of the owner of such ground. The Contractor shall conduct his work so as not to impede unnecessarily any work being done by others on or adjacent to the site.

1.5 SUBMITTALS

A. Shop Drawings:

1. Shop drawings shall accompany submittals on all equipment associated with the installation. The Contractor shall supply the Owner and Engineer with the copies of each submittal in accordance with Section 01300.

2. If the Contractor deems departures from the Contract Documents necessary, details of such departures, including changes in related portions

of the work and the reasons for such changes shall be submitted with shop drawings. Approved departures shall be made at no additional cost to the Owner.

B. Owner's Manuals: The Contractor shall provide the Engineer with the Operation and Maintenance Schedule, the Owner's Manuals, then Instruction Booklets and al Warranty Information for all equipment associated with the project in accordance with Section 01300.

PART 2- PRODUCTS

BRAND NAME DISCLAIMER
The use of a brand name item is to set a standard of quality and is not intended to restrict the Contractor from offering an item from other source(s) of supply as approved by the Engineer.

2.1 HOLDING TANK: The Holding Tank shall be a concrete tank meeting the general requirements of this article.

A. General: Two (2) traffic-rated, pre-cast concrete Holding Tanks with 5,000-gallon capacity each, and designed for storage of non-potable water; as supplied by Three Forks Ready Mix & Precast of Three Forks Montana, or an Engineer Approved Equal. The tank walls and base sections shall be constructed as a single pour, with no seams or cold joints.

B. Structural Design: Walls, bottom, and top of reinforced concrete tank shall be designed across the shortest dimension using one-way slab analysis. Tank walls, floors and lids shall be sized and reinforced to support their own weight, the weight of the liquid contents, and soil pressure including six feet of soil cover. Steel reinforcing shall meet or exceed HS20 loading certification.

C. Concrete: Concrete shall be ready-mix with cement conforming to ASTM CI50, Type II. It shall have a cement content of not less than six (6) sacks per cubic yard and maximum aggregate size of ¾ inch. Water / cement ratio shall be kept low (0.35±), and concrete shall achieve a minimum compressive strength of 4000 psi in 28 days. Concrete the tank shall be resistant to the corrosive environment found in Oil/Water Separators, and shall be made with sulfate-resistant cement with a tricalcium aluminate content of less than 8 percent. The Contractor shall submit a concrete mix design to the Engineer for review and approval. Three (3) concrete sample cylinders shall be taken and tested for each tank manufactured until the manufacturer and Engineer are satisfied that the minimum compression strength is being obtained. To ensure compliance, the manufacturer shall then make and set three (3) sample cylinders for a minimum of 20% of the remaining tanks at the discretion of the Engineer. If the minimum compressive strength is not being obtained, the manufacturer shall be required to make and test sample cylinders for each tank manufactured. Calcium chloride will not be allowed in the mix design. The cost of testing cylinders shall be the tank manufacturer's

responsibility. The tank manufacturer may supply a Swiss hammer for compressive testing in the field in lieu of sample cylinder.

D. Tank Reinforcement: Reinforcing steel shall be ASTM A-615 Grade 60, fy = 60,000 psi. Details and placement shall be in accordance with ACI 315 and ACI 318.

E. Tank Coatings: Tanks must be protected by applying a heavy cement-base waterproof coating, on both inside and outside surfaces, in compliance with the Council of American Building Officials (CABO) report #NRB-168; 6181, however the tanks should be watertight without the addition of seal coatings.

The exterior of the holding tank shall be sealed with a water-based acrylic waterproof coating; such as Concrete Sealants Inc. CS-55® (black), or approved equal. Additionally, the tank joint shall be sealed using Concrete Sealants Inc. CS-212® Polyolefin backed external joint wrap. The joint wrap shall be installed with the recommended primer such as Concrete Sealants Inc. CS-50® liquid butyl primer, or approved equal.

F. Tank Form Release: Form release used on tank molds shall not be diesel or other petroleum products.

G. Tank Handling: Tanks shall not be moved from the manufacturing site to the job site until they have cured for a minimum of seven (7) days or have reached two-thirds of their design strength.

H. Tank Sealant: Tank sections shall be sealed with a pre-formed flexible plastic gasket or two (2) continuous strips of flexible butyl resin sealant (Conseal®) and shall conform to federal specifications SS-S-00210(2iOA) and AASHTO M-198. Joint wrap shall be installed with the recommended primer such as Concrete Sealants Inc. CS-50® liquid butyl primer, or approved equal.

I. Access Hatch: Access Openings, PVC Risers, and Fiberglass Lids: Three (3) access openings shall be cast into the top of each holding tank, with minimum size of 24 inch diameter. A riser tank adapter shall be cast into the tank around each access opening. One PVC riser is required over each access opening and riser tank adapter. The PVC risers shall have a minimum diameter of 24 inches, and shall provide a water tight seal to the tank opening. The risers shall each be fitted with a fiberglass lid of similar dimension. The lids shall be gasketed, insulated with a minimum of 2 inches of high-density polyurethane, and bolted to the riser with stainless steel lag bolts.

J. Internal Piping and Related Items: All piping and fittings within the tank shall be Schedule 40 PVC. Water-tight 4 inch diameter cast-in connectors shall be used on wall pipe entry & exit points. All pipe shall be solvent-welded, bell end pipe. Every precaution shall be taken to prevent foreign material from entering the pipe

while it is being installed. The pipe shall have all sand, gravel, concrete and cement grout removed that has entered the lines during construction.

K. Float Switch Assembly (High Level Alarm Float): High level alarm float shall be an Orenco Model MF1A or equal with one switch float. The float must be adjustable and removable without entering the tank. The float must be attached to a 1-inch diameter PVC float tree or directly to the effluent filter via. a factory installed mounting bracket. The float shall be installed at the elevation shown on the project drawings. The float lead shall be secured with a nylon strain relief bushing at the splice box. The float shall be UL or CSA listed and shall be rated for a minimum of 5.0A @ 120VAC.

L. Electrical Splice Box: Splice box shall be Orenco Model SB4 or equal; equipped with one to four electrical cord grips and a 1-inch PVC outlet fitting. The splice box shall be UL listed and approved for wet locations. UL listed waterproof but connectors shall be used. The splice box shall be connected to the alarm panel using 1" diameter PVC electrical conduit. Entire electrical components shall comply with UL508.

M. Alarm Panel: Panel shall be UL 508 listed and shall be Orenco Model AMAHW, or engineer approved equal. The alarm panel shall include an audio and visual alarm with automatic resets. The panel enclosure shall be NEMA 4X rated, constructed of UV-resistant fiberglass, with conduit coupling provided.

PART 3 - EXECUTION

3.1 HOLDING TANK:

A. General: The Holding Tank and appurtenances shall be installed as shown on the Project Drawings and as recommended by the manufacturer. Excavation shall be performed to the lines, grade, and elevations shown on the Drawings. The Engineer reserves the right to make minor adjustments or revisions in lines or grades. Perform all excavation regardless of the type, nature, or condition of the material encountered. The method of excavation used is optional; however, no equipment shall be operated within 5 feet of existing structures or newly completed construction. Excavation that cannot be accomplished without endangering present or new structures shall be done with hand tools. The Contractor is responsible for field staking the earthwork and tank location. No excavation shall be started until the staking is complete. Should the Contractor excavate below the designated lines through fault or negligence, the Contractor shall replace such unauthorized over-excavation with approved materials in an approved manner at his own expense. All electrical components shall be installed by a qualified electrician with a minimum 5 years of experience installing similar systems. An installer holding a valid County Wastewater Treatment System Installer's License shall install holding tank and related components. **Installer shall not proceed with backfill of the holding tank without inspection and approval by the Engineer and County Sanitarian's office.**

B. Tank Bedding: Tank bedding shall be placed as recommended by manufacturer. Place a minimum 6-inch lift of compacted base course gravel bedding under the holding tank, unless otherwise indicated on the Project Drawings. Place bedding material free of roots, organic matter, trash, and rocks larger than ¾ inch diameter.

C. Native Backfill around Tanks: Deposit material in horizontal lifts of maximum 8-inch non-compacted depth and compact each lift to not less than 90 percent of maximum ASTM D698 dry density. Maintain material at optimum moisture content, plus or minus 2 percentage points. Place backfill material free of roots, organic matter, trash, and rocks larger than 3-inch diameter. Stop backfill at specified grade. Make allowance for topsoil where required. Any subsequent damage to piping, concrete structures, facilities, or other structures caused by settlement of fill material shall be corrected and repaired by the Contractor at the Contractor's sole expense.

D. Tank Sealants: Tank sections shall be sealed with sealants listed in Products above. Sealants shall be applied in accordance with manufacturer's recommendations. Surfaces shall be clean and free of debris. Sealant shall not be applied when temperature is less than 40 degrees F. Sealant shall provide a uniform and watertight seal.

E. Tank Handling: Tank shall be handled with care so as not to damage. If tank sections do become damaged, notify Engineer prior to installation. Tanks shall be installed as per manufacturer's recommendation.

F. PVC Access Risers and Fiberglass Lids: The PVC access risers shall be installed to three inches (3") above finished grade and provide a watertight seal with the tank. Sealants shall be applied in accordance with manufacturer's specifications. The fiberglass lids shall provide a watertight seal to the riser and shall be bolted to the riser with stainless steel lag bolts.

G. Internal Piping: All internal piping shall be of size and lengths shown, and shall be Schedule 40 PVC. All fittings shall be solvent welded or threaded with sealant. All internal piping and related parts shall be removable from the access hatch without entering the tank.

H. Float Switches: High level alarm float located in the Holding tank shall be installed so that it is removable from the access hatch without entering the tank. Float assembly must be removable without removing the effluent filter. Float elevation shall be as shown on the drawings. Floats shall be securely fastened with stainless steel hose clamps to a 1-inch PVC pipe. Electrical components shall be located only in the splice box. Adequate electrical cord length shall be provided so the floats can be removed from the tank without breaking electrical connection with the splice box.

I. Splice Box: Install splice box securely to the inside of the riser as shown on the Drawings. Ensure splice box is accessible from the access riser without entering the tank. Coat all connections with corrosion protection sealant and ensure box has a water and gas -tight seal at the cord grips and lid.

J. Testing: The Holding tank shall be tested for water tightness. All testing shall be at the Contractor's expense. A water test or vacuum test shall be used as outlined below.

1. Water Testing: Water testing shall be conducted by sealing the outlet, filling the tank to its operational level, and allowing the tank to stand for at least 8 hours. If there is a measurable loss (2 inches or more), the tank shall be refilled and the above procedure repeated. If a measurable loss is detected again, the tank shall be rejected and replaced at Contractor's expense.

2. Vacuum Testing: Vacuum testing shall be conducted by sealing all inlets, outlets and accesses, then introducing a vacuum of 4 inches of mercury. If the vacuum drops in the first 5 minutes, it shall be brought back up to 4 inches of mercury. If the tank fails to hold the vacuum at 4 inches of mercury for a second 5-minute period, the tank must be rejected and replaced at Contractor's expense.

END OF SECTION 02770

Section 02801
General Electrical Requirements

1. General

The Contractor shall provide the complete electrical system needed for proper operation of the human waste disposal system at Eden Bridge, Montana as described within the Plans and these Specifications. All electrical work shall be completed by a licensed electrician.

Owner has coordinated with the local utility provider and a separate electrical service and temporary meter base will be provided by owner. The temporary meter base will be removed by Contractor and the meter/disconnect will be relocated to the Contractor-provided structure. Regardless of the service location, the contractor is responsible for providing a separate service disconnect, to be mounted where shown on the *Plan Sheets*.

The Contractor shall provide all labor, materials, tools, equipment and services required to complete the furnishing, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical equipment and components necessary to complete the human waste disposal improvements project.

2. Source Power

Power supply will be single-phase, 240V.

3. Electrical Equipment

It will be the Contractors responsibility to supply and install all required conduits, meters, service disconnects/breakers, as well as the high-water alarm panel for the holding tanks.

4. Junction Boxes & Wiring

All junction boxes shall be located outside of the tank risers and shall be housed within fiberglass irrigation control boxes. The splice boxes shall be UL listed and approved for wet locations. UL listed waterproof butt connectors shall also be used. Coat all connections with corrosion protection sealant and ensure box has a water and gas-tight seal at the cord grips and lid. The splice boxes shall be connected to the pumps, floats, and/or panels using individual 1" diameter PVC electrical conduits.

Septic tank gasses must be sealed out of the splice boxes and conduit. Conduit shall be gas sealed in accordance with Engineer Representative's instructions. All wire shall be color coded; tagging of wire is not an acceptable equal. The Contractor shall provide a wiring schematic for each tank upon project completion. This schematic will be integrated within the Operation & Maintenance Manual.

Entire electrical components shall comply with UL508. Adequate electrical cord length shall be provided so the floats can be removed from the tanks without breaking electrical connection with the splice box.

5. Standards and Codes

A. Permits, licenses, approvals and other arrangements for work shall be obtained and paid for by the Contractor and included in the bid price.

B. Electrical work shall be executed in strict accordance with the latest edition of the National Electrical Code and local ordinances and regulations.

C. All electrical equipment, materials, construction methods, tests and definitions shall be in strict conformity with the established standards of the following in their latest adopted revision:

1. Underwriters' Laboratories, Inc. (UL)
2. National Electrical Manufacturers Association (NEMA)
3. Canadian Standards Association (CSA)
4. Electrical Testing Laboratories (ETL)
5. Factory Mutual (FM)

D. All materials and equipment specified herein shall, within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

E. All materials shall be new, free from defects, of current manufacture, of quality specified or shown. Each type of material shall be of the same manufacturer throughout the work.

SECTION 02810 FENCING

PART 1 GENERAL

1.1 DESCRIPTION

A. This work consists of furnishing, erection, and placement of new fencing per the drawings and specifications.

PART 2 PRODUCTS

BRAND NAME DISCLAIMER
The use of a brand name item is to set a standard of quality and is not intended to restrict the Contractor from offering an item from other source(s) of supply as approved by the Engineer.

2.1 GENERAL

A. Barbed wire shall be zinc-coated, steel barbed wire meeting the requirements of ASTM A-121. Breaking strength of strand wire shall be not less than 950 pounds. Barbs shall be uniformly spaced from 4 to 5 inches apart. Minimum weight of zinc coating shall be Class I. Wire shall consist of two twisted strands of 12 ½ gauge wire. "Red Brand" and “OK Brand Premium” are examples of wire that meet ASTM A-121. **Wire breaking strength and coating certification shall be provided to the Project Manager.** Install all wire on non-FWP owned parcel side of posts.

B. Barbless wire shall be two smooth twisted strands of 12 ½ gauge wire: zinc coated steel meeting requirements of ASTM A-121 or equal. Breaking strength of a strand of wire shall be not less than 950 pounds, minimum weight of zinc coating shall be Class I. Install all wire on non-FWP owned parcel side of posts.

C. Woven wire shall have metallic coating Type Z, Class 1 and be No. 12 ½ Grade 60, or, have metallic coating Type Z, Class 3 and be No 14 Grade 125. All woven wire shall meet or exceed the requirements of ASTM A116. Install all wire on non-FWP owned parcel side of posts.

D. Brace panel wire shall be barbless, smooth 9 gauge **soft** wire meeting requirements of ASTM A-641. It will be used for constructing braces and panels, tying to anchors, etc.

E. Staples. Wire staples of the barbed U-shaped type shall be used to fasten the wire fencing to the wooden posts. They shall be not less than 9 gauge galvanized, 1-3/4 inches long.

F. Nails. Shall be 40 d common galvanized.

G. Fence clips shall be not lighter than 12 ½ gauge, galvanized. They shall be used to fasten the wire to metal posts.

H. Where designated, stays shall be 30" long twisted wire fence specifically manufactured for use as fence stays and made from #9 gauge galvanized smooth wire.

I. Metal Posts. Metal posts shall meet the requirements of ASTM A-702 and be American manufactured. Painting shall be in accordance with good manufacturing practice. Same paint pattern shall be used throughout project site requiring installation of new metal posts. **Posts shall be 5½ feet long.** The metal shall be good commercial quality steel with maximum carbon content of 0.82%. Posts shall be tee section and shall have corrugations, knobs, notches, holes, or studs so placed and constructed as to engauge a substantial number of fence line wires in proper position.

Each line post shall have a steel anchor plate weighing not less than 0.67 pounds, tapered to facilitate driving and securely fastened in such a position that its top edge will be two to three inches below ground when the post is driven to the prescribed depth. **Post shall weigh 1.33 lbs. per L.F. of post.**

J. Wood Posts and Brace Rail. Posts and brace rail shall be made from western larch, lodgepole pine, ponderosa pine, or douglas-fir. They shall have the bark removed, be well seasoned, sound, and straight-grained. They shall be finished round. **Panel posts** shall be **6** inch minimum diameter and **8** feet in length. **Line posts** shall be **6** inch minimum diameter and **8** feet in length, or as specified in the project drawings. All posts shall be treated with a solution conforming to AWPA standards. Penetration shall be at least ½ inch. Post shall be fully treated. Posts that are to be driven shall be tapered and treated. **Brace rail** shall be a minimum **4** inch diameter by **8** feet long, or as specified in the project drawings. All brace rail shall be fully treated conforming to AWPA standards. **Certification of AWPA treatment shall be provided to the Project Manager.**

K. Wood Split Rails. Wooden split rails shall be made from western larch, lodgepole pine, ponderosa pine, or douglas-fir. They shall have the bark removed, be well seasoned, sound, and straight-grained. They shall be finished half round. **Wood rails** shall be **4½** inch minimum diameter and **8** feet in length. All rails shall be treated with a solution conforming to AWPA standards. Penetration shall be at least ½ inch. All wood rail shall be fully treated conforming to AWPA standards. **Certification of AWPA treatment shall be provided to the Project Manager.** Fasten rails to posts with 8" TimberLok® screws, or approved equal.

L. Brace Panels. Brace panels shall be placed at corners, endpoints and when run exceeds **30 rods or 500 feet**. Where the run requires a single brace, it shall be placed to split the difference when appropriate. Brace panels shall be constructed as depicted in drawings and shall provide for strong anchorage points and shall be aligned with fence line within a tolerance of 2 degrees.

M. Gates and Steel Panels. Wire gates shall be 12' (minimum) in width , or as designated on the project drawings. Gates shall be located in the field by the Engineer. Posts and brace rails shall be the same as specified for line fence panels and corners.

Where designated, wire gates and associated panels shall have the same number of strands of barbed wire as the fence line they are in, with a vertical spacing the same as the fence line they are in. Gates 14' wide and less shall have 2 wood stays, and gates over 14' wide shall have 3 wood stays, equally spaced across the gate. Stays shall be minimum 2½" diameter treated wood, and shall be tall enough to support all the fence wires at the correct height. Each gate shall have a new single panel on each side of wire gate and a mechanical over-center gate closer. Wire gates in jackleg fences shall have four strands of barbed wire.

Where designated, install pre-fabricated steel panel gates (various lengths) as shown on the project drawings. Panel gates shall be brown or green in color. Provide galvanized chain long enough to wrap around gate and adjacent brace panel for locking closure.

N. Stream Crossings. Stream crossings shall be minimum 20’ wide and located 4’ minimum on each side of the top of stream bank. Post and brace rail shall be the same as specified for line fence panels and corners. Stream crossings shall have 5 strands of smooth wire with a minimum of 6 metal stays per rod, spaced equally along the length of the PVC pipe described below. Stays shall be 30” long twisted wire specifically manufactured for use as fence stays and made from #9 gauge galvanized smooth wire.

Extend stays down past bottom wire attached to posts, creating a hinge point to pass debris. Thread bottom ends of stays though 1½” diameter PVC pipe suspended parallel to bottom wire. Bottom wire to be 1 foot above water surface.

Each stream crossing shall have a new single panel and mechanical over-center closure on each side.

O. Minor Drainage Channels are differentiated from depressions by having sandy gravel or cobble bottoms. Such channels may or may not have flowing water year round. Minor channels may be fenced over without a stream crossing gate at the discretion of the Project Manager. Such channels shall have NO POSTS placed in the channel, and posts on either side shall be equally spaced from the edge of the channel. PVC pipe

shall be hung under the fence at the channel in the same manner as described in Stream Crossings, to prevent livestock passage.

P. Deadmen anchors shall be used at grade depressions. They shall consist of a plate or disc of 10 gauge or thicker mild steel of 12-inch diameter. A No. 5 rebar shall be welded in the center and a loop formed in the other end to accept the tie wire. Rebar length shall be 30 inches after the loop is formed.

Alternately, two steel fence posts may be driven in the ground at an angle such that the ends above the ground cross at the low point. Wire shall be securely attached to the two posts and used to anchor the fence. Duckbill anchors are also approved. Other anchor types may be accepted upon approval of the Engineer or Project Manager.

Anchor wires shall be tied such that all wire is above the soil surface. No anchor wire shall be buried. If any part of the deadman projects out from the fence line above ground, it shall be cut off no more than 4" from the anchor wire attachment. No sharp edges shall remain on cut ends.

PART 3 EXECUTION

3.1 CLEARING AND GRUBBING

A. "Clearing" shall consist of the falling of trees greater than 3 inches diameter at chest height, delimbing them, and cutting into six-foot sections. Clearing shall also include the disposal of stumps, brush, windfalls, limbs, sticks, piles of sawdust, rubbish, debris, vegetation, and other objectionable material occurring within the clearing limits or which interfere with excavation or embankment.

B. "Grubbing" shall consist of the removal from the ground and the disposal of roots, stumps, together with duff, matter, roots, and debris from the grubbing limits.

C. Construction methods for clearing and grubbing operations are as follows:

1. No stumps or roots shall remain more than 4 inches above the ground along the fence line.

2. Low hanging branches and unsound or unsightly branches on trees or shrubs designated to remain shall be removed as directed. Branches of trees extending over the fence line shall be trimmed to give a clear height of 8 feet above the ground along the fence line. Width of clearing for fence line shall be 4 feet.

3.2 FENCE INSTALLATION

A. Post holes and excavations for footings and anchors shall be excavated on the lines established by the Engineer to the depths and cross-sections shown on the standard drawings. **All fence post hole excavations shall be on FWP property or easement, 12" from the surveyed property boundary line, marker, or monument.** Do not disturb any survey property corner monument or marker during fence installation. Leave all line-of-sight survey marker t-posts in place.

B. Wooden posts may be driven when so prepared and any damaged posts shall be repaired or rejected at the discretion of the Project Manager. In all cases where posts are repaired, the damaged area or split shall be given **two coats of preservative material** approved by the Project Manager. Posts shall be plumb when set.All posthole filling and backfilling work shall be in six-inch layers and each layer shall be solidly tamped and compacted as it is placed.

C. Posts that are cut or trimmed for any valid reason shall be given **two coats of preservative material** approved by the Engineer. Braces shall be securely nailed to terminal and brace posts. **Brace to post joint shall be coped or notched.** No square to round joint accepted.

D. Deadmen or anchors will be used at grade depressions or other places where the vertical space from the ground to the bottom fence wire has exceeded the design value within a one rod distance.

In such situations where the bottom of the depression is an intermittent stream channel with a sandy gravel or cobble bottom or an active ditch, the depressions shall be treated as a Minor Drainage Channel. Such channels shall have NO POSTS PLACED IN THE CHANNEL, and posts on either side shall be equally spaced from the edge of the channel. PVC pipe shall be hung under the fence at the channel in the same manner as described in Stream Crossings, to prevent livestock passage.

E. Brace panels shall be installed at angle points, corners, gates, or wherever a break in the terrain occurs. However, in no case shall brace panels be more than **30 rods or 500 feet apart**. See Table 1 for brace panel installation requirements. Brace wire shall be tight when twisted. Double wrap the wire at brace post tie-off. Cross the braces with the end of the wires to be tied off. **Barbed wire fence wire shall be tied off at each brace.**

F. Wood line posts shall be installed every tenth post or evenly spaced on **runs longer than 15 rods (165 feet).** In no case shall a line post be used as a substitute in a situation that would typically require a single, or double, brace.

Table 1. Brace Panel Installation Requirements

Panel Type	No. of Panels	Location Applications	
		Horizontal	Vertical
Single	1	In Line, Each side of gates	Constant Grade
Double	2	Angle points < 90°	Grade Breaks < 45°
Corner	4	90° Corners	Grade Breaks > 45°

G. All posts shall be plumb and solidly set in place after backfilling or driving has been completed.

H. Stretching by a motor vehicle will not be permitted; the power must be by or through a mechanical stretcher or device designed for such use.

I. Fence line shall be straight and square between corner points.

J. Fence clips shall be hooked and both ends twisted all the way around fence wire.

K. Tension shall be applied in accordance with wire manufacturer's recommendations.

L. Fence wire shall be wrapped around terminal posts and fastened to itself with at least four turns. Fence wire, in general, shall be placed on the side of the post opposite the site but on curves shall be placed so the force is against the post. At grade depressions and alignment angles, where stresses tending to pull posts from the ground are created, the wire fence shall be snubbed or guyed at the critical points by brace wire attached to each horizontal line of fence wire and the end of the combined strands being firmly attached to a "deadman" buried not less than two feet in the ground, or to an approved "anchor" at a point which will serve best to resist the pull of the wire fence. "Deadmen" also may be fastened to posts. Fence wire and brace wire shall be installed without nicks or significant abrasions. Nicks or abrasions that may lead to pre-mature wire breaks shall be rejected by the Project Manager and replaced at no cost by the Contractor.

M. U-shaped staples shall be driven diagonally across the wood grain so that both points do not enter between the same grain. In depressions where wire up-lift occurs, staples shall be sloped slightly upward, against the pull of the wire. On level ground and over knolls, staples shall be sloped slightly downward. Wire shall be stapled tightly at corner, end, and pull posts. In no case shall staples be driven so tight as to damage the wire.

N. A cross-fence, not the property of the Owner, shall **not** be fastened to the Owner's fence but shall be terminated, in a workmanlike manner, adjacent thereto.

O. Upon completion, the fence shall be true to line and grade; **all posts shall be vertical and firm** and all wire shall be taut and the completed fence shall be completely acceptable in all respects. No openings shall be left that will permit stock to pass through the fence.

P. Exterior boundary fences shall have owner-supplied 4" x x12" boundary signs attached no more than 500 feet apart and 2 at every corner panel. Signs shall be securely fastened to posts, rails or between fence wires as determined by the Project Manager.

Additional owner-supplied 12" x 18" aluminum signs shall be installed at all exterior gates and corners where designated by the Project Manager. The cost of installing such signs shall be subsidiary to the project and shall not constitute a pay item and shall be considered incidental thereto and no payment shall be made for it.

Q. Weed Control: All equipment used during construction shall be thoroughly washed both inside, outside and underneath of all pickup boxes, trailers, trucks, etc. before entrance to the project area. Vehicles used to commute to and from job site shall be kept clean so as not to transport weed seed to project area. This cost shall be subsidiary to the project and shall not constitute a pay item and shall be considered incidental thereto and no payment shall be made for it.

PART 4 MEASUREMENT AND PAYMENT

4.1 BASIS OF MEASUREMENT

A. All types of fence will be measured by the linear foot (or rod) complete in place, on its actual alignment, **inclusive** of brace panels, and corners, and **exclusive** of gates and associated gate panels. The measurement will be made on the fence line along the ground, from end post to end post, less the length of gates and gate panels, the intent being to measure the actual length of fence in place.

If it is necessary, in crossing depressions, to install a double section of fence, vertically, this extra section will be measured for payment.

B. Gates will be measured on a per each basis, **including 2 single panels.** In the case of double wildlife gates, this shall include both gates and three single braces as a single unit.

C. Stream Crossings shall be paid as wire gates.

D. Deadmen anchors, minor drainage channels, tree anchors, and any line clearing required **shall be subsidiary to the fence and shall not constitute pay items and shall be considered incidental to fence construction.**

E. For the purpose of change orders to the contract, individual unit prices shall be provided for single (two-post) braces, double (three post) braces, two panel corners, four panel corners, and wire gates.

4.2 BASIS OF PAYMENT

A. All types of fence shall be paid for per foot (or rod) basis, measured as specified above.

B. Gates will be paid for on a unit price per each basis.

END OF SECTION 02810