

**SECTION 01800S**  
**MEASUREMENT AND PAYMENT**

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**PART 1 GENERAL**

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**1.01 SECTION INCLUDES**

**A. Measurement and Payment for BASE BID include:**

1. MOBILIZATION
2. CONSTRUCTION SURVEY
3. CLEARING AND GRUBBING (PLAN QUANTITY)
4. GRANULAR BORROW (PLAN QUANTITY)
5. ROADWAY EXCAVATION (PLAN QUANTITY)
6. UNTREATED BASE COURSE (PLAN QUANTITY)
7. HMA – 1/2 INCH
8. CONCRETE DRIVEWAY FLARED, 6 INCH THICK (NOT USED)
9. FENCE
10. THREE RAIL WOOD FENCE
11. SAFETY RAIL
12. BOARDWALK
13. REMOVE CONCRETE (NOT USED)
14. REMOVE ASPHALT PAVEMENT
15. REMOVE FENCE
16. REMOVE ROCK WALL
17. REMOVE TREE
18. RELOCATE MAILBOX (NOT USED)
19. RELOCATE UTILITY BOX (NOT USED)
20. RELOCATE IRRIGATION BOXES
21. PEDESTRIAN ACCESS RAMP
22. CONCRETE CURB AND GUTTER (NOT USED)
23. CONCRETE SIDEWALK (NOT USED)
24. 2" THICK – 3/4" WASHED AGGREGATE (NOT USED)
25. BORROW (PLAN QUANTITY)
26. SOLAR RRFB
27. SW END SIGN
28. PI SERVICE LATERAL (NOT USED)
29. LANDSCAPE ROCK WALL
30. MODULAR BLOCK MSE WALL
31. MODULAR BLOCK GRAVITY WALL
32. SWPPP (CONTRACTOR TO PROVIDE FINAL PLAN, NOI, AND INSPECTIONS)

**1.02 MEASUREMENT AND PAYMENT**

**Base Bid**

**1. Mobilization**

**Reference**

**Basis of Measurement**

Lump Sum

**Basis of Payment**

Includes all costs for bonds, Contractor's safety program, insurance, permits, moving equipment and temporary facilities to, from and around the sites, securing permits, establishment of offices at the site, preparation of submittals & manuals, project sign, as-constructed plans, and all other work required by the Drawings and Specifications which is not specifically set for in the Bid Form as a pay item.

Payment will be made on a percentage basis as follows.

<b>Percent of Original Contract Amount Earned</b>	<b>Percent of Amount Bid to be Paid</b>
5	40
15	20
40	30
50	10

2. **Construction Survey**

**Reference**

APWA Standard Specification 01 71 23

**Basis of Measurement**

Lump Sum

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to conduct construction surveying and staking as required within the limits of construction as shown on the project plans. Includes staking utility relocation and reconstruction locations for third party utilities. Payment will be made on a prorated percentage basis for actual work completed as a percent of the original contract amount. The final 10 percent will be held until all as-built documents and plans are received.

Preparation and submittal of 1 set of electronic plans, plus versions in PDF and the most recent AutoCAD formats. As-builts will include XYZ coordinates to 0.01 foot accuracy for any deviations from plan lines and grades, and coordination with Highland City crews that will obtain GIS open trench shots on all pipes and conduits, valves, manholes, tees, bends, alignment changes, existing utility crossings encountered, catch basins, junction boxes, future use conduits, and utility stub ends, and daily at the beginning and end of work for longitudinal installations; and electrical / ATMS / street lighting schematics and circuit diagrams.

3. **Clearing and Grubbing**

**Reference**

APWA Standard Specification 31 11 00

**Basis of Measurement**

Acre

**Basis of Payment**

Includes clearing and grubbing the work areas as defined in the project plans, as required, to remove existing top soil, vegetation, trees, rubbish, debris and related items; separating unacceptable material from acceptable material, as indicated and as directed; loading and placing acceptable materials in stockpile if it is to be re-used; removing excess and unsuitable material from work areas and disposing of the material in an acceptable manner. Payment includes all labor, materials, and appurtenances to complete the work.

**4. Granular Borrow (Plan Quantity)****Reference**

APWA Standard Specification 31 05 13

**Basis of Measurement**

Cubic Yard

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to place Granular Borrow (meeting A-1-a requirements or better) to the lines and grades shown on the project plans. Price includes compaction.

**5. Roadway Excavation (Plan Quantity)****Reference**

APWA Standard Specification 31 11 00 & 31 23 16

**Basis of Measurement**

Cubic Yard

**Basis of Payment**

Includes all costs associated with all labor, materials, equipment, excavation, saw cutting as needed, break-up, transportation (trucking), and appurtenances required to clear and properly dispose of all plant life onsite, root systems, shrubs, rocks, pavement, and excess materials regardless of size or thickness in the right-of- way not incorporated in the work or called out for removal or the be protected in place.

**6. Untreated Base Course (Plan Quantity)****Reference**

APWA Standard Specification 32 11 23

**Basis of Measurement**

Cubic Yard

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to furnish (import), haul, and place Untreated Base Course (meeting standards) to the lines and grades at all locations shown on the project plans. Price includes compaction.

**7. HMA – 1/2 Inch****Reference**

UDOT Section 02743

**Basis of Measurement**

Ton

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to furnish, haul, and place the top layer of the pavement section to the lines and grades shown on the project plans.

8. **Concrete Driveway Flared, 6 Inch Thick (NOT USED)**

**Reference**

UDOT Section 02776

**Basis of Measurement**

Square Foot

**Basis of Payment**

Includes all costs for labor, materials, equipment, tools, forms, grading, and appurtenances required to furnish and place Concrete Driveway Flared, 6 Inch thick to the lines and grades shown on the project plans. Price includes concrete testing, UTBC, and testing of UTBC directly under concrete driveway.

9. **Fence**

**Reference**

Special Provision 02824S

**Basis of Measurement**

Foot

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to furnish and install Fence as shown on the plans.

10. **Three Rail Wood Fence**

**Reference**

Special Provision 02823S

**Basis of Measurement**

Foot

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to furnish and install Three Rail Wood Fence as shown on the plans.

11. **Safety Rail**

**Reference**

Special Provision 02826S

**Basis of Measurement**

Foot

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to furnish and install Safety Rail as shown on the plans.

**12. Boardwalk**

**Reference**

Special Provision 03320S

**Basis of Measurement**

Foot

**Basis of Payment**

All costs for labor, materials, equipment, incidentals, and appurtenances required to furnish and install boardwalk pathways over wetlands including, but not limited to: Foundations, Concrete pathways, steel supports.

**13. Remove Concrete (NOT USED)**

**Reference**

APWA Standard Specification 02 41 14

**Basis of Measurement**

Square Feet

**Basis of Payment**

Includes all costs for labor, materials, and equipment required to saw-cut as needed, break-up, excavate, and dispose of existing concrete material regardless of thickness.

**14. Remove Asphalt Pavement**

**Reference**

APWA Standard Specification 02 41 14

**Basis of Measurement**

Square Yard

**Basis of Payment**

Includes all costs for labor, materials, and equipment required to saw-cut as needed, break-up, excavate, and dispose of existing asphalt material regardless of thickness.

**15. Remove Fence**

**Reference**

APWA Standard Specification 31 11 00

**Basis of Measurement**

Foot

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to remove fence, posts, appurtenances, and miscellaneous objects according to the plans, details, and specifications.  
Coordinate with property owners for approval of planned modifications.

**16. Remove Rock Wall**

**Reference**

APWA Standard Specification 31 23 16

**Basis of Measurement**

Feet

**Basis of Payment**

Includes all costs for labor, materials, equipment, appurtenances and miscellaneous items required to remove rock walls according to the plans, details, and specifications.

**17. Remove Tree**

**Reference**

APWA Standard Specification 31 11 00

**Basis of Measurement**

Each

**Basis of Payment**

Includes all costs for labor, materials, equipment, appurtenances and miscellaneous items required to remove trees of 2" caliper or greater according to the plans, details, and specifications.

**18. Relocate Mailbox (NOT USED)**

**Reference**

APWA Standard Specification 32 01 07

**Basis of Measurement**

Each

**Basis of Payment**

Includes all costs for labor, material, equipment, and appurtenances required to relocate existing mailbox.

**19. Relocate Utility Box (NOT USED)**

**Reference**

APWA Standard Specification 34 41 13

**Basis of Measurement**

Each

**Basis of Payment**

Includes all costs for labor, material, equipment, and appurtenances required to relocate existing utility box, including but not limited to: excavation, temporary shoring, dewatering if necessary, disconnecting the line from the main utility line and shut off the corporation stop, approved bedding, imported backfill

within the utility line zone, and backfill up to finished grade in landscaped areas, and compaction. Price includes potholing and protecting existing utility facilities revealed by blue stake, and coordinating with the conflicting utility for needed removals, and bypass pumping and dewatering if necessary.

**20. Relocate Irrigation Boxes**

**Reference**

APWA Standard Specification 32 84 23

**Basis of Measurement**

Each

**Basis of Payment**

Includes all costs for labor, material, equipment, and appurtenances required to relocate existing irrigation box, including but not limited to: excavation, temporary shoring, dewatering if necessary, disconnecting the line from the main utility line and shut off the corporation stop, approved bedding, imported backfill within the utility line zone, and backfill up to finished grade in landscaped areas, and compaction. Price includes potholing and protecting existing utility facilities revealed by blue stake, and coordinating with the conflicting utility for needed removals, and bypass pumping and dewatering if necessary.

**21. Pedestrian Access Ramp**

**Reference**

APWA Standard Specification 03 30 10

**Basis of Measurement**

Each

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to furnish and install ADA accessible curb ramps to the lines and grades shown on the project plans. Price includes concrete testing, UTBC, and testing of UTBC directly under curb ramp.

**22. Concrete Curb and Gutter (NOT USED)**

**Reference**

APWA Standard Specification 32 16 13

**Basis of Measurement**

Foot

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to furnish and install concrete curb and gutter to the lines and grades shown on the project plans. Price includes concrete testing, UTBC, and testing of UTBC directly under concrete curb and gutter.

**23. Concrete Sidewalk (NOT USED)**

**Reference**

APWA Standard Specification 32 16 13

**Basis of Measurement**

Square Feet

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to furnish and install concrete sidewalk to the lines and grades shown on the project plans. Price includes concrete testing, UTBC, and testing of UTBC directly under concrete sidewalk.

**24. 2" Thick – 3/4" Washed Aggregate (NOT USED)****Reference**

APWA Standard Specification 31 05 13

**Basis of Measurement**

Square Feet

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to install 2" Thick – 3/4" Washed Aggregate (Gravel – Sewer Rock ASTM Size No. 5) as shown on project plans.

**25. Borrow (Plan Quantity)****Reference**

APWA Standard Specification 31 05 13

**Basis of Measurement**

Cubic Yard

**Basis of Payment**

Includes all costs for labor, materials, equipment, and appurtenances required to place Borrow (meeting A-1-a requirements or better) to the lines and grades shown on the project plans. Price includes compaction.

**26. Solar RRFB****Reference**

FHWA Standard Specification Reference: IA-21

**Basis of Measurement**

Each

**Basis of Payment**

all costs for labor, materials, equipment, appurtenances, and miscellaneous items required to furnish and install rectangular rapid-flashing beacon (RRFB) including, but not limited to: LED arrays, solar powered system, and connection to new or existing electric utilities according to plans.

**27. SW End Sign****Reference**

APWA Standard Specification 32 01 06

**Basis of Measurement**



Each

**Basis of Payment**

Includes all costs for labor, material, equipment, and appurtenances required to install SW End Sign as required by the plans and city engineers. Payment includes sign post, foundation, and sign face per project plans and city standards.

28. **PI Service Lateral (NOT USED)**

**Reference**

APWA Standard Specification 33 12 33

**Basis of Measurement**

Lump Sum

**Basis of Payment**

Includes all costs for labor, material, equipment, and appurtenances required to furnish and install pressurized irrigation service lateral, including but not limited to: excavation, temporary shoring, dewatering if necessary, approved bedding, imported backfill within the pipe zone, and backfill up to finished grade in landscaped areas, and compaction. Price includes potholing and protecting existing utility facilities revealed by blue stake, and coordinating with the conflicting utility for needed removals, and bypass pumping and dewatering if necessary.

29. **Landscape Rock Wall**

**Reference**

Special Provision 02378S

**Basis of Measurement**

Square Feet

**Basis of Payment**

Includes all costs for labor, material, equipment, and appurtenances required to install landscape rock wall as required by the plans and city engineers.

30. **Modular Block MSE Wall**

**Reference**

UDOT Standard Specification 02835

**Basis of Measurement**

Square Feet

**Basis of Payment**

Includes all costs for labor, material, equipment, and appurtenances required to install modular block MSE wall as required by the plans and city engineers.

31. **Modular Block Gravity Wall**

**Reference**

UDOT Standard Specification 02839

**Basis of Measurement**

Square Feet

**Basis of Payment**

Includes all costs for labor, material, equipment, and appurtenances required to install modular block gravity wall as required by the plans and city engineers.

**32. SWPPP (Contractor to Provide Final Plan, NOI, and Inspections)**

**Reference**

APWA Standard Specification 01 78 39

**Basis of Measurement**

Lump

**Basis of Payment**

Includes all costs for Storm Water Pollution Prevention Plan (SWPPP) (SWPPP Plan Submittal Required). Submittal plan and report shall include detailed protection of sediment erosion control – on and off site, inlet protection measures, dust control, etc.

**1.02 RELATED SECTIONS**

See appropriate sections of the Contract Documents for criteria applicable to Work performed under a unit price or lump sum price payment method.

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**PART 2 PRODUCTS - NOT USED**

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**PART 3 EXECUTION - NOT USED**

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**END OF SECTION**

August 25, 2025

**SPECIAL PROVISION**

**MITCHELL HOLLOW TRAIL**

**SECTION 02378S**

**LANDSCAPE ROCK WALL**

**Add Section 02378**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. This work consists of constructing landscape rock walls at the locations and to the dimensions shown on the plans. Rock walls are formed of interlocking, dry-stacked rocks without reinforcing steel, mortar, or concrete. Rock walls may be constructed as either single structures or in tiers.

**1.2 RELATED SECTIONS**

- A. Section 02056: Embankment, Borrow, and Backfill
- B. Section 02075: Geotextiles
- C. Section 03055: Portland Cement Concrete

**1.3 REFERENCES**

- A. AASHTO T 85: Specific Gravity and Absorption of Coarse Aggregate
- B. AASHTO T 96: Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

- C. AASHTO T 103: Standard Method of Test for Soundness of Aggregates by Freezing and Thawing
- D. AASHTO T 104: Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
- E. AASHTO T 210: Standard Method of Test for Aggregate Durability Index

#### **1.4 DEFINITIONS**

- A. Base Rock: The base rock is the lowermost rock in the rock wall and bears directly on the foundation fill.
- B. Facing Rock: The facing rock comprises the bulk of the rock wall and rocks used in the face are stacked above the base rock.
- C. Cap Rock: The cap rock is the uppermost rock in the rock wall section and “caps” the rock wall.

#### **1.5 SUBMITTALS**

- A. Submit References citing satisfactory completion of at least three (3) rock walls of similar height and face area. Include photographs of completed rock walls.
- B. Submit a summary of the experience of the primary equipment operator responsible for placement of base, facing, and cap rocks.
- C. Submit provisions for facilities which penetrate the wall face or free draining granular backfill (including, but not limited to, drainage catch basins, piping, foundation elements, guard-rail posts, and other buried facilities).
- D. Submit a grout mix design for a mix meets all the requirement of this Section, Article 2.5.
- E. Submit at least three 12-inch, minimum dimension in any direction, representative rock samples for acceptance by the Engineer. Furnish

rocks with a color indigenous to the area. Furnish rocks free of machine-made scratches, mars, or other damage to the visible face.

- F. Allow up to two weeks for the Engineer's review. Within this time, the Engineer will provide either written acceptance of the submittals with any exceptions noted or notification the submittals are insufficient.
  - 1. Upon receiving notification the submittals are insufficient, provide new submittals and allow another two-week period for the Engineer's review.
  - 2. Do not start wall construction until receiving full written acceptance by the Engineer.

## **PART 2 PRODUCTS**

### **2.1 BASE ROCK, FACING ROCK AND CAP ROCK**

- A. Furnish on site, hard, angular, and durable rock that consists of intact blocks without open fractures, foliation, or other planes of weakness as directed by the Engineer. Do not furnish rock with rounded surfaces.
- B. Sizes and shapes: Furnish angular rocks that are generally cubical, tabular, or rectangular in shape. Conform to the following:
  - 1. Rock length: 24 inch minimum.
  - 2. Rock width/breadth: 18 inch minimum.
  - 3. Rock thickness: 12 inch minimum.
  - 4. Cap rock mass: 200 lb minimum.
- C. Color: Furnish rocks with a color that has been accepted by the Engineer. Furnish rocks free of machine-made scratches, mars, or other damage to the visible face.

### **2.2 GRANULAR BORROW**

- A. Refer to Section 02056.

### **2.3 FREE DRAINING GRANULAR BACKFILL**

- A. Refer to Section 02056.

## **2.4 SEPARATION GEOTEXTILE**

- A. Refer to Section 02075.

## **2.5 GROUT**

- A. Provide grout that meets the following requirements
  - 1. Minimum 28-day compressive strength of 3,000 psi, conform to strength testing requirements of Section 03055.
  - 2. Minimum air content of 5 percent.
  - 3. Use the approved mix design desired by the contractor.
  - 4. Use a minimum of six sacks of type II portland cement per cubic yard of grout.
  - 5. Add 1½ pounds of fiber mesh or equivalent per cubic yard of grout.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Rock Wall Foundation Excavation and Preparation:
  - 1. Excavate and grade foundation area to the lines and grades shown on the drawings, or as directed by the Engineer.
    - a. Excavate a foundation trench at least 12 inch below the bottom of the rock wall, running the full length of the proposed rock wall.
    - b. Deeper embedment may be required where a toe slope is present or where a leveling pad is specified.
    - c. Excavate the foundation to a minimum width equal to the specified base rock width, 18 inch minimum, plus 12 inch to include the Free Draining Granular Backfill drain behind the rock wall.
    - d. Conform to the following:
      - 1) Excavate the foundation in sections such that the rock wall can be constructed in one shift or one day's work, unless shoring is provided for the purpose to support the excavation.

- 2) Exercise care during excavation of the back cut (temporary cut slope).
2. Compact the foundation using at least three passes of a lightweight, steel, smooth-drum vibratory roller, or as otherwise determined by the Engineer before the wall construction.
3. Remove unsuitable foundation soils and replace with Granular Borrow, or with other suitable material determined by the Engineer, placed and compacted according to Section 02056.

B. Rock Wall Erection:

1. Place the first course of rock (base rock) on prepared foundation. As the rock wall is constructed, place the rocks so that there are no continuous joints in either the vertical or lateral direction.
2. Avoid placing rocks which have shapes that create voids with a linear dimension greater than 12 inch.
3. Except in isolated cases, place each rock so that it bears on at least two rocks below it. Locate at least one bearing point a distance no greater than 6 inch from the average face of the rock wall.
4. The allowable tolerance for base rock widths is 6 inch; however, do not place two or more consecutive base rocks with a width less than specified on the plans.
5. Slope the top surface of each rock towards the back of the rock wall at an inclination of at least 5 percent.
6. Construct the exposed face of the rock wall with a face batter of 6V:1H.
7. Securely place rocks so that they are unable to be moved with a pry bar after the rock wall is complete.

C. Voids:

1. Where voids with a linear measurement of 6 inch or greater, in any dimension, exist in the face of the rock wall, chink the voids with smaller rock.
2. If there is no rock contact within the rock wall thickness, chink the void with a smaller piece of rock.
3. Chinking rocks do not provide primary structural support for the overlying rock.

4. Grout chinking rocks that are able to be moved or removed by hand. Do not allow grout to be readily visible from the face of rock wall.

D. Rock wall Drainage:

1. Install the free draining granular backfill drain between the rock wall and the back cut face being supported. The Free Draining Granular Backfill drain layer is at least 12 inch thick, measured horizontally from the back of the base rock to the face of the back cut. Place free draining granular backfill drain concurrent with rock wall so that at no time is either more than 24 inch higher than the other.
2. Separate the free draining granular backfill drain from the back of rock wall by separation geotextile. Overlap the separation geotextile at least 12 inch at all seams.
3. Cap the free draining granular backfill drain with at least 12 inch of native, relatively impermeable soil. Place separation geotextile between the native, relatively impermeable soil and the free draining granular backfill drain.

END OF SECTION



**SPECIAL PROVISION**  
**MITCHELL HOLLOW TRAIL**

**SECTION 02823S**  
**THREE RAIL WOOD FENCE**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Provide a three rail wood fence.

**1.2      RELATED SECTIONS**

- A.      Section 06055: Timber and Timber Treatment

**1.3      REFERENCES**

- A.      American Wood-Preservers' Association (AWPA) Book of Standards
- B.      AASHTO Standards:  
M133Preservatives and Pressure Treatment Process for Timber.

**1.4      DEFINITIONS                      Not Used**

**1.5      SUBMITTALS                      Not Used**

**PART 2      PRODUCTS**

**2.1      UNTREATED WOOD POSTS FOR LINES, GATES, ENDS, AND CORNERS**

- A.      Native juniper or approved equal.
- B.      Line posts must have a diameter of at least 6 inches.
- C.      All posts must be sound, free of decay or defects, and structurally suitable.

**2.2      TREATED WOOD POSTS AND WOOD POLE RAILS**

- A.      Sound Douglas-fir, hemlock, cedar or pine that is free from decay, splits,

multiple cracks, any other defect, and structurally suitable.

- B. Round posts and pole rails
  - 1. Round posts must have a diameter of at least 6 inches.
  - 2. Round pole rails must have a diameter of at least 3 inches and no greater than 6 inches.
  - 3. No post or pole rail may deviate from a straight edge placed along its length by more than  $\frac{1}{2}$  the diameter of the post or pole rail.
  - 4. Taper (diameter differential) in round members must not exceed 2 inches in 10 ft.
  - 5. Fabricate posts and pole rails before pressure treatment of the wood members.
  - 6. Treat posts and pole rails according to Section 06055.
  - 7. Apply field treatment preservatives according to AWPA Standard M4 after field drilling or cutting. Refer to AWPA Standard M4, Section 7 for accepted field treatment preservative systems.
  - 8. Keep round posts and pole rails free of bark, protruding knots, or other irregularities.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- A. Clear and grade a minimum area to permit proper fence installation.

### **3.2 INSTALLATION**

- A. Install three rail wood fence according to contract plans.
- B. Compact backfill material around post to the density of the surrounding ground.

END OF SECTION

**SPECIAL PROVISION**  
**MITCHELL HOLLOW TRAIL**

**SECTION 02824S**

**FENCE**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Provide a 6-foot horse fence.

**1.2      RELATED SECTIONS**

- A.      Section 06055: Timber and Timber Treatment

**1.3      REFERENCES**

- A.      American Wood-Preservers' Association (AWPA) Book of Standards
- B.      AASHTO Standards:  
M133Preservatives and Pressure Treatment Process for Timber.

**1.4      DEFINITIONS                      Not Used**

**1.5      SUBMITTALS                      Not Used**

**PART 2      PRODUCTS**

**2.1      WIRE MESH FENCING, STAPLES, AND BOLTS**

- A.      72 inch Class 1 galvanized square deal non-climb horse fencing with 12 ½ minimum gauge wire or approved equal. Minimum roll length of 100 feet.
- B.      Barbed staples: 1" length, 9 gauge wire, galvanized.
- C.      Carriage Bolts: ½ inch diameter galvanized bolts with galvanized washers, galvanized lock washer, and galvanized acorn cap nuts.

**2.2      TREATED WOOD POSTS AND WOOD POLE RAILS**

- A. Sound Douglas-fir, hemlock, cedar or pine that is free from decay, splits, multiple cracks, any other defect, and structurally suitable.
- B. Posts and rails
  - 1. Round posts must have a diameter of at least 6 inches.
  - 2. Rails must have a minimum thickness of 1 ½ inches and minimum height of 5 ½ inches.
  - 3. No post or rail may deviate from a straight edge placed along its length by more than ½ the diameter of the post or pole rail.
  - 4. Taper (diameter differential) in round members must not exceed 2 inches in 10 ft.
  - 5. Fabricate posts and rails before pressure treatment of the wood members.
  - 6. Treat posts and rails according to Section 06055.
  - 7. Apply field treatment preservatives according to AWPA Standard M4 after field drilling or cutting. Refer to AWPA Standard M4, Section 7 for accepted field treatment preservative systems.
  - 8. Keep round posts and rails free of bark, protruding knots, or other irregularities.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- A. Clear and grade a minimum area to permit proper fence installation.

### **3.2 INSTALLATION**

- A. Install fence according to contract plans with smooth side of square deal knot facing the trail side.
- B. Predrill all bolt holes in rails and post before carriage bolt installation. Install carriage bolts with head on trail side of rail and acorn cap nut, lock washer on back side of post.
- C. Compact backfill material around post to the density of the surrounding ground.

END OF SECTION

**SPECIAL PROVISION**  
**MITCHELL HOLLOW TRAIL**  
**SECTION 02826S**

**SAFETY RAIL**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Materials and procedures for fabrication and installation of safety rail including posts, rails, cables, base plates, bolts, anchor bolts, finish, and incidentals to rail.

**1.2      RELATED SECTIONS**

- A.      Section 03055: Portland Cement Concrete
- B.      Section 05120: Structural Steel
- C.      Section 09972: Painting for Structural Steel

**1.3      REFERENCES**

- A.      ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
- B.      ASTM A492: Standard Specification for Stainless Rope Wire
- C.      AASHTO M 232: Zinc Coating (Hot Dip) on Iron and Steel Hardware
- D.      ASTM B117-03 Standard Practice for Operating Salt Spray (Fog) Apparatus
- E.      AASHTO LRFD Guide Specifications for The Design of Pedestrian Bridges, 2nd Edition with 2015 Interim Revisions.

- F. AASHTO LRFD Bridge Design Specifications of Highway Bridges, 9th Edition, 2020.

#### **1.4 DEFINITIONS Not Used**

#### **1.5 SUBMITTALS**

- A. Working Drawings
1. Detailed shop drawings for fabricated materials for review.
  2. Include design calculations for rail, posts, base plates and all other elements.
    - a. Certify that the design has been checked according to UDOT Quality Control/Quality Assurance (QC/QA) Procedures.
  3. Include geometry verification stating that the dimensions and layout are consistent with the boardwalk system post connection locations.
  4. Include anchor bolt diameter and layout compatible with the boardwalk design.
  5. Provide a Professional Engineer (PE) or Professional Structural Engineer (SE) seal and signature on shop drawings and calculations.
  6. Do not deviate from the accepted shop drawings unless authorized in writing. Contractor is responsible for costs incurred due to faulty detailing or fabrication.
  7. Do not order materials or begin work until receiving final acceptance of the shop detail drawings and calculations

#### **1.6 MANUFACTURER'S WARRANTY**

- A. Provide manufacturer's warranty that the fence system is free from defects in material and workmanship including cracking, peeling, blistering, and corroding for a period of no less than ten (10) years from the date of installation for galvanized systems. Provide manufacturer's warranty for a period of no less than three (3) years from the date of installation for painted systems.

### **PART 2 PRODUCTS**

#### **2.1 MATERIALS**

- A. Steel Members:

1. Provide steel members having a minimum yield strength of 45,000 psi.
  2. Use structural steel conforming to AASHTO M 270 Grade 36 for base plates.
  3. Provide post, base plates, rub rail, kicker plate, welds, anchor bolts, anchor bolt washers, and anchor bolt nuts as shown on the Working Drawings.
  4. Provide additional fence hardware as needed per manufacturer's recommendations and design.
  5. Demonstrate the ability to endure a salt-spray resistance test in accordance with ASTM B117 for all galvanized steel members.
  6. Design rub rail and kicker plate in accordance with current AASHTO LRFD Bridge Design Specifications and current Interims with a minimum dimension of 1-3/8" and a minimum thickness of 3/16".
  7. Design the post in accordance with current AASHTO LRFD Bridge Design Specifications and current Interims with a minimum dimension of 2-3/8" and a minimum thickness of 3/16".
  8. Design the post base plates in accordance with current AASHTO LRFD Bridge Design Specifications and current Interims with a minimum dimension of 6" and a minimum thickness of 3/8".
  9. Design connecting brackets for the member design loads and in accordance with the current AASHTO LRFD Bridge Design Specifications and current Interims.
- B. Stainless Steel Rope Wire (Cable)
1. Use 1/4" diameter 1x19 stainless steel rope wire meeting ASTM A492.
  2. Use stainless steel terminal tuner turnbuckles or approved equal on each end of the rope wire.
- C. Molded Fabric Bearing Pads:
1. Use Molded Fabric Bearing Pads under all post base plates.
  2. Use 1/8" thick Molded Fabric Bearing Pads made of virgin rubber and unused fabric in proper proportions to maintain strength and stability.
  3. Use rubber with a surface hardness of 80 shore (Durometer  $\pm 10\%$ ).
  4. Ensure the ultimate breakdown limit of the pad under compression is less than 7 ksi for the 1/8" thickness without extrusion or detrimental reduction in thickness.
  5. Furnish pads with all bolt holes accurately located.
  6. Detailer: Ignore the thickness of the pad when accounting for the geometry of the fence to allow for adjustment of rotation and alignment in the field.

## **2.2 FINISH**

- A. Galvanized Surface
  - a. Hot dip galvanize all steel members (i.e., rails, posts, base plates, caps, connecting brackets, etc.) with a minimum thickness of 3 mils meeting the requirements of ASTM A653 with a minimum zinc coating weight of 1.85 oz/ft<sup>2</sup>, Coating Designation G185.
  - b. Final Installation: Set steel features accurately into position, plumb, level, and true in accordance with the plans and these specifications. Touch up all bare surfaces with spray galvanizing or per manufacturer's recommendations or Engineer's instructions. These surfaces include but are not limited to: chips, blemishes, exposed material, bolt threads, bolt heads, nuts, washers, and scratches.
  - c. Refinish or replace, to the satisfaction of the Engineer, all surfaces with stains that cannot be removed by cleaning.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Place all members in accordance with the accepted working drawings.

END OF SECTION



**SPECIAL PROVISION**  
**MITCHELL HOLLOW TRAIL**  
**SECTION 03320S**  
**CONCRETE BOARDWALK**

**Add Section 03320S:**

**PART 1      GENERAL**

**1.1    SECTION INCLUDES**

- A.    Precast concrete boardwalk used for trails or shared use paths including steel connections, precast tongue and groove treads, precast concrete beams, precast concrete foundations (when applicable), helical pier foundations, bracing, helical pier caps, and hardware. Requirements are based upon products designed and supplied by PermaTrak North America LLC or approved equal.

**1.2    RELATED SECTIONS**

- A.    Section 02826S: Safety Rail
- B.    Section 03055: Portland Cement Concrete
- C.    Section 03211: Reinforcing Steel and Welded Wire
- D.    Section 03310: Structural Concrete
- E.    Section 05120: Structural Steel

**1.3    REFERENCES**

- A.    ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
- B.    AASHTO M 232: Zinc Coating (Hot Dip) on Iron and Steel Hardware

- #### 1.4 DEFINITIONS Not Used

- A. Contractor performing the installation of the boardwalk and helical pier foundation qualifications for review. Include at least the following:
  - 1. Demonstrate a minimum of three (3) years experience prior to the bid date for this project. Submit a list containing at least three (3) projects completed in the last three (3) years on which the contractor has installed precast boardwalk and helical piers of a size and length similar to those shown on the plans. Provide names and phone numbers of owner's representatives who can verify the Contractor's participation on those projects.
- B. Manufacturer Qualifications: Not less than 5 years or 50 boardwalk projects in the actual production of precast products as described below.
  - 1. Fabricate boardwalk components, with exception of helical piers, helical pier caps, and safety rail, in a an approved precast facility, certified by PCI or NPCA, registered to do business in the State of Utah.
  - 2. Provide in-house precaster color mixing facilities for color pigmentation.
  - 3. Fabricate precast components with the use of hot rolled steel skin in reinforced steel forms. Temporary (i.e., Timber) and/or single use forms are unacceptable unless approved in writing by the Engineer.
- C. Acceptability Criteria for Treads and Curbs (if applicable): Provide a finished visible (in the final installed position) surface free from obvious imperfections other than minimal color or texture variations from the approved samples. Do not evaluate appearance of the surface when light

is illuminating the surface from an extreme angle as it tends to accentuate the minor surface irregularities. If repairs are identified when viewed in good typical daylight illumination with the unaided naked eye at a 20 ft. viewing distance, repair or replace defective elements. Properly repair the following finish defects, if obvious when viewed at a 20 ft. distance. Patching (by a trained skilled concrete repair person) is an acceptable repair method as accepted by the Engineer. Submit repair procedures for approval.

1. Ragged or irregular surfaces.
  2. Excessive air voids (commonly called bug holes) larger than ¼ in. evident on the top surface of the tread or curbs (if applicable).
  3. Adjacent flat and return surfaces with greater texture and/or color differences than the approved samples or mockups.
  4. Casting and/or aggregate segregation lines evident from different concrete placement lifts and consolidation.
  5. Visible mold joints or irregular surfaces.
  6. Rust stains on exposed surfaces.
  7. Units with excessive variation in texture and/or color from the approved samples, within the unit or compared with adjacent units.
  8. Blocking stains evident on exposed surfaces.
  9. Areas of backup concrete bleeding through the facing concrete.
  10. Foreign material embedded in the surface.
  11. Visible repairs at a 20 ft. viewing distance.
  12. Reinforcement shadow lines.
  13. Cracks visible at a 20 ft. viewings distance.
- D. Installer Qualifications: Firm with 3 years of experience in installation of systems similar in complexity to those required for this Project.
- E. Mock-Up: Provide, if required by Architect/ Engineer, a mock-up for evaluation of the boardwalk showing the surface preparation techniques and application workmanship.
1. Finish areas designated by Architect / Engineer.
  2. Do not proceed with remaining work until mock-up is accepted by Architect / Engineer.
  3. Refinish mock-up area as required to produce acceptable work.

## **1.6 DESIGN**

- A. The minimum standards are as follows:
1. Design the precast system as a modular flexible system allowing a prescribed settlement at helical pier locations. Design joints for

such movement to occur without damage to the structural integrity of the system.

2. Use a reinforced precast concrete boardwalk system (beams, treads, and curbs if applicable). Material change, including cast-in-place concrete, is not considered equal to the design shown on the bid documents.
3. Use a reinforced precast concrete walking surface (treads) supported by reinforced precast concrete beams. Edges of treads will receive a safety rail bolted to the precast treads. Coordinate safety rail post locations, bolt pattern and bolt sizing with the safety rail manufacturer.
4. Provide form liner finish on walking surface (finish) of top surface of treads with one of following standard textures (sandblast, slate or barnwood). Provide integral texture with original casting. Application of a post pour wearing surface is not allowed.
5. Design precast concrete treads to be structural load bearing elements, interlocking with one another via a “tongue and groove” connection.
6. Provide precast elements with an integrally colored concrete in a color selected by the owner from one of manufacturers “standard colors”.
7. DESIGN LOADS: Designed for the following live loads:
  - a) Pedestrian live load of 90 psf.
  - b) H-10 Design Truck – 20,000 lbs. total vehicular load
8. Provide treads with a “boardwalk appearance”, specifically meaning each tread having a width: length ratio ranging from a minimum of 3:1 to a maximum of 14:1. Width is defined as the tread dimension perpendicular to the normal direction of travel. Length is defined as the tread dimension measured in the direction of travel.
9. Define tread width on the working drawings and define layout of full boardwalk meeting the horizontal and vertical alignment requirements shown on the contract plans.
10. Provide non-corrosive tread-to-beam connectors which are hidden from view. Metallic tread-to-beam connectors are not acceptable for this project.

11. Provide a boardwalk supplier field representative on site for a minimum of 2 days who are knowledgeable in the installation of precast concrete boardwalks.
- B. For applications requiring minimum disturbance due to wetlands, tree roots or other existing objects specified by the Owner to be avoided during construction, the Boardwalk Manufacturer requires the Contractor or Engineer/Architect to provide a survey of the proposed boardwalk location identifying items of interest including tree roots that cannot be disturbed per the Owner.
- C. Provide a designer of the boardwalk and foundation who is a qualified registered Professional Engineer licensed in the State of Utah and having a minimum of 5 years of experience in the design of concrete structures and foundation.
- D. The foundation design shown on the boardwalk drawings are based on recommendations found in the project geotechnical report including all amendments to the report.
- E. DESIGN CRITERIA: Design of the boardwalk to comply with the following guidelines:
  1. AASHTO LRFD Guide Specifications for The Design of Pedestrian Bridges, 2nd Edition with 2015 Interim Revisions.
  2. AASHTO LRFD Bridge Design Specifications of Highway Bridges, 9th Edition, 2020.

## **1.7 SUBMITTALS**

Prior to the start of construction, submit to the Engineer a design package, which includes, but is not limited to, the following:

- A. Working Drawings
  1. Detailed shop drawings for fabricated materials for review.
  2. Include design calculations for treads, beams, supports, abutments, helical piers, bracing, helical pier caps, and all other elements.
    - a. Certify that the design has been checked according to UDOT Quality Control/Quality Assurance (QC/QA) Procedures.
  3. Include geometry verification stating that the dimensions and layout are consistent with the safety rail system post connection locations.
  4. Include blockouts for anchor bolt meeting diameter and layout compatible with the safety rail design.

5. Provide a Professional Engineer (PE) or Professional Structural Engineer (SE) seal and signature on shop drawings and calculations.
6. Do not deviate from the approved shop drawings unless authorized in writing. Contractor is responsible for costs incurred due to faulty detailing or fabrication.
7. Do not order materials or begin work until receiving final acceptance of the shop detail drawings and calculations.
8. Shop Drawing detail requirements include but are not limited to:
  - a. Include a full plan view drawing to scale in project survey X,Y,Z coordinates which reflect the proposed horizontal and vertical geometry, and situation layout. Provide both a PDF copy and a CAD file copy in a format that can be imported directly into Bentley Microstation for reference and accuracy checks.
  - b. PLAN VIEW: Full plan view of the boardwalk, helical pier foundations and safety rail connections drawn to scale. The plan view must reflect the proposed horizontal alignment as shown on the contract plans.
  - c. ELEVATION VIEW: Full elevation view of the boardwalk, safety rail connection locations and helical pier foundations drawn to scale which reflect the actual vertical profile as shown in the contract plans. Indicate the elevation at the top and bottom of the boardwalk and helical pier components, horizontal and vertical break points, and location of the finished grade.
  - d. DETAILS: Details of all boardwalk system components and their connections such as the length, size and where changes occur; connections; safety rail connection locations; etc. Show actual field conditions and true elevation and location supplied after field verification. Clearly detail reinforcement in piers, treads and curbs including clear dimension from concrete edge, size and amount of rebar. Clearly state concrete reinforcement strength and epoxy coating where required as well as component weight and lifting locations.
  - e. CODE REFERENCE: Design parameters used along with AASHTO LRFD Bridge Design Specifications references.
9. Design Calculations:
  - a. Clearly refer to the applicable AASHTO LRFD Bridge Design Specifications code requirements with references.

- b. Include documentation of computer programs including all design parameters.
- c. Clearly show that all reinforced precast treads and beams meet AASHTO LRFD Bridge Design Specifications load requirements for loading in additions to those noted in Section 1.6.
- d. Include diagrams of reinforcement in treads and beams, shear and moment diagrams, and all equations used. Reference applicable codes.

10. Construction Specifications/Manufacturer's Installation Documents:

- a. Provide construction methods specific to the boardwalk system. Submit requirements such as certification, quality and acceptance/rejection criteria. Provide instructions on connection of boardwalk units and foundation system to ensure uniform load transfer through the system.
- B. FINAL SUBMISSION: Once a boardwalk and helical pier system design has been reviewed and accepted by the Owner, submit the final plans. The designer of the boardwalk and foundation is responsible for the review of any drawings prepared for fabrication. Submit one set of all approved shop drawings to the Engineer's permanent records.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Field Measurements: Where safety rails are indicated to fit to precast tread construction, check actual dimensions with safety rail fabricator and other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings:
  - 1. Where safety rail measurements cannot be made without delaying the fabrication and delivery, obtain guaranteed dimensions in writing by the Contractor and proceed with fabrication of products so as not to delay fabrication, delivery and installation.
- C. Coordinate fabrication and delivery schedule of any missing or damaged components to avoid delay of boardwalk system.
- D. Coordinate fabrication and delivery schedule of safety rail with construction progress and sequence to avoid delay of railing installation.

## **1.9 WARRANTY**

- A. Contractor will be responsible for installation defects associated with the boardwalk and abutment components, and foundation system, for a period of 12 calendar months from the date of final acceptance by the Owner.
- B. Boardwalk manufacturer: Provide 10 year warranty on all precast concrete components against defects in material and workmanship.

## **PART 2 PRODUCTS**

### **2.1 PRECAST CONCRETE**

- A. Use Class AA(AE) according to Section 03055.
- B. Use fiber reinforcing as well as structural steel reinforcement as designed by the Engineer of record.
- C. Replace any chipped, broken, damaged, or otherwise deemed unacceptable precast elements at no extra charge. This includes components damaged during transport, handling, and installation.

### **2.2 REINFORCING STEEL AND WELDED WIRE**

- A. Refer to Section 03211.

### **2.3 STRUCTURAL STEEL**

- A. Refer to Section 05120.
  - 1. Stock steel purchased from a warehouse can be used in the fabrication of brackets and plates.
  - 2. Use high strength fasteners for mounting bolts.
  - 3. Hot dip galvanize all steel members (i.e., bolts, helical piers, bracing, helical pier caps, base plates, caps, and connecting brackets.) with a minimum thickness of 3 mils meeting the requirements of ASTM A653 with a minimum zinc coating weight of 1.85 oz/ft<sup>2</sup>, Coating Designation G185.

### **2.4 HELICAL PIERS**

- A. As recommended by boardwalk fabricator.



## **PART 3      EXECUTION**

### **3.1      PRECAST CONCRETE BOARDWALK**

- A.      Perform bottom-up installation of the precast concrete boardwalk system and foundations in accordance with the approved plans and manufacturers installation instructions. Install adjacent boardwalk elements from adjacent roadways or previously installed boardwalk sections.
- B.      Disturbance of area under and adjacent to the boardwalk is not allowed. Areas of disturbance are limited to excavation/fills at cast-in-place abutments and local zone at helical pier foundation. No other areas of disturbance will be allowed.
- C.      Boardwalk manufacturer field representative to review installation instructions with the Contractor and Engineer and to certify that the installation has been performed according to the approved drawings and manufacturer's instructions.

END OF SECTION