**SECTION 05200**

**STEEL SHEET PILING**

PART 1 GENERAL

1.0 SCOPE

The work covered by this section consists of furnishing all plant, equipment, labor and materials and performing all operations in connection with the installation of Contractor furnished steel sheet piling in accordance with these specifications and applicable drawings.

* 1. RELATED WORK SPECIFIED ELSEWHERE

Section 05500 MISCELLANEOUS METALWORK

Section 09900 PAINTING AND PROTECTIVE COATING

1.2.0 QUANTITIES

The estimated quantities of sheet piling listed in the unit price schedule of the contract as to be furnished by the Contractor are given for bidding purposes only. Sheet piling quantities for payment shall consist of the square feet of piling acceptably installed. This quantity shall consist of piles driven below the elevations indicated for the top of piles times the length along the wall alignment as shown on the drawings plus any additions thereto resulting from changes in design or alignment as provided in paragraph "Driving."

1.3.0 MEASUREMENT AND PAYMENT

* + 1. Measurement

1.3.1.1 Driven Steel Sheet Piling

Measurement of driven steel sheet piling, except for fabricated piles (special corners, transitions, tee sections, etc.) and rolled corners, will be by the square foot of piling acceptably installed. The length of each pile driven will be measured to the nearest tenth of a linear foot and converted to square feet for payment purposes. The square footage will be determined by multiplying the number of piles times the measured length acceptably driven below the cut-off elevation shown on the drawings times the theoretical driving width of the pile. The number of piles paid for shall not exceed the number of piles indicated on the drawings. When driven piles are directed to be cut off before reaching the penetration depth shown on the drawings, that portion cut off will be measured for payment on the basis of its total length, provided that the length is not greater than the difference between the total length of piles shown on the plans for that location and the length of piles driven below the cut-off elevation. No deduction will be made for holes cut for drains and utilities in computing the area of steel sheet pile structures. The portion of any pile driven below the tip elevation shown on the drawings will not be measured for payment unless overdriving is directed by the Engineer.

1.3.1.2 Pulled Piles

Piles ordered pulled will be measured for payment by the square foot. Square footage will be determined by multiplying the theoretical driving width of the pile by the length pulled above the cut-off elevation shown on the drawings. Redriving of such piles, when required, shall be measured for payment by the square foot, which shall be determined by multiplying the theoretical driving width of the pile by the length redrive below the cut-off elevation shown on the drawings.

1.3.1.3 Miscellaneous Items

No separate measurement for payment will be made for the fabricated piles and rolled corners, sheet piling void backfill, or painting sheet piling.

1.4.0 PAYMENT

1.4.1 Sheet Piling

Payment for steel sheet piling, acceptably installed and measured in accordance with above paragraph "Driven Steel Sheet Piling," will be made at the applicable contract unit price per square foot for "Piling, Steel Sheet, Type PZ-27". Price and payment shall constitute full compensation for fabricating, driving rolled corners, adding cover plates, painting, furnishing, handling, driving, cutting holes, backfilling voids, and all other work incidental to acceptably installing the steel sheet piling.

* + 1. Fabricated Piles and Rolled Corners

No separate payment will be made for the transition piles or the rolled corners and all costs associated with fabricating, furnishing, delivering, and installing them shall be included in the contract unit cost for "Piling, Steel Sheet, Type PZ-27".

1.4.3 Cut-Offs and Splices

Cut-offs and/or splices which are not required under the original terms of this contract but become necessary to construct the sheet pile structures as shown on the drawings and as specified herein, and which are necessitated due to Contractor negligence in any procedure required to install such structures shall be provided at no additional cost to the Government. Cut-offs and/or splices of this type which are required through no fault of the 1.4.4

$10.00 per cut-off and $25.00 per splice. Additionally, the portion of a Contractor furnished pile which is cut off when the Contractor is deemed to be not at fault, shall be paid for at 75 percent of the applicable contract unit price for the amount measured in accordance with above paragraph "Measurement."

1.4.4 Pulled Piles

Piles, which are directed to be pulled and found to be in good condition, will be paid for at the contract price for furnishing and driving the pile in its original position. The cost of pulling will be paid for at 25 percent of the contract unit price and when such piles are redriven, the cost of redriving will be paid for at 25 percent of the contract unit price for that portion of the pile acceptably redriven below the cut-off elevation. When piles are pulled and found to be defective and/or damaged due to Contractor negligence, no payment will be made for originally furnishing and driving such piles, nor for the operation for pulling.

Piles replacing defective or damaged piles will be paid for at the applicable contract unit will be paid for at the applicable contract unit price for originally installing the damaged pile plus 25% of the applicable contract unit price for the cost of pulling.

Subsequently, when a new pile is furnished and driven, it shall be paid for at the applicable contract unit price.

1.5.5 Two existing sheet piles to be removed as shown on Drawings shall not be measured for payment. All costs for pulling existing sheet piles shall be included in the contract unit cost for "Piling, Steel Sheet, Type PZ-27".

1.5.0 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 36/A 36M (2005) Standard Specification for Carbon Structural Steel

ASTM A 328/A 328M (2005) Standard Specification for Steel Sheet Piling

ASTM A 572/A 572M (2006) Standard Specification for

High-Strength Low-Alloy Columbium-Vanadium Structural Steel

ASTM A572/A572M (2018) Standard Specification for

High-Strength Low-Alloy Columbium-Vanadium Structural Steel

1.6.0 QUALITY ASSURANCE

Requirements for material tests, workmanship and other measures for quality assurance shall be as specified herein and in Section 05100 STRUCTURAL STEEL.

1.6.1 Materials Tests

Sheet piling and appurtenant materials shall be tested and certified by the manufacturer to meet the specified chemical, mechanical and section property requirements prior to delivery to the site.

1.7.0 SUBMITTALS

Submit the following in accordance with Section 01340 SHOP DRAWINGS WORK DRAWINGS AND SAMPLES.

1.7.1 SD-02 Shop Drawings: Shop Drawings; G

Shop drawings for sheet piling, including fabricated sections, shall be submitted for approval and shall show complete piling dimensions and details, driving sequence and location of installed piling. Shop drawings shall include details and dimensions of templates and other temporary guide structures for installing piling, and shall provide details of the method of handling piling to prevent permanent deflection, distortion or damage to piling interlocks.

Substitute Sheet Piling Submittals; G S

1.7.2 Product Data

Equipment Descriptions;

Complete descriptions of sheet piling driving equipment including hammers, extractors, protection caps and other installation appurtenances shall be submitted for approval prior to commencement of work.

Driving Records

Records of the sheet piling driving operations shall be submitted after driving is completed. These records shall provide a system of identification which shows the disposition of approved piling in the work, driving equipment performance data, piling penetration rate data, piling dimensions and top and bottom elevations of installed piling. The format for driving records shall be as directed by the Contracting Officer.

1.7.3 Materials Test Certificates

Materials test certificates shall be submitted for each shipment and identified with specific lots prior to installing piling.

Identification data should include piling type, dimensions, section properties, heat analysis number, chemical composition, mechanical properties and mill identification mark.

1.8.0 QUALITY CONTROL

1.8.1 General

The Contractor shall establish and maintain quality control for pile driving records and operations to assure compliance with contract specifications and maintain records of his quality control for all construction operations including, but not limited to, the following:

1. Accurate location, alinement and plumbness of piling.
2. Full and proper engagement of interlocks.
3. Equipment Descriptions of sheet piling driving equipment to be used.
4. Driving (pile hammer and rate of operation).
5. Final position; depth of penetration; tip and cut-off elevations.
6. Uplift and vertical tolerances after driving.
7. Location and elevation of any obstruction encountered and action directed by Engineer.
8. Pulled piles and redriving.
9. Length of cover plate and weld size.

|  |  |  |
| --- | --- | --- |
| (10) | Manufacture | and driving of fabricated sections. |
| (11) | Cutting and | splicing (welding). |
| (12) | Stockpiling | and storage. |
| (13) | Removal and | disposal of damaged piles. |

1.8.2 Reporting

The original and two copies of these records and tests, as well as the records of corrective action taken, shall be furnished the Engineer daily.

.

1.9.0 DELIVERY, STORAGE AND HANDLING

Materials delivered to the site shall be new and undamaged and shall be accompanied by materials test certificates. The manufacturer's logo and mill identification mark shall be provided on the sheet piling. Sheet piling shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks. Storage of sheet piling should also facilitate required inspection activities.

PART 2 PRODUCTS

2.0 STEEL SHEET PILING

Steel for sheet piling shall conform to the requirements of

ASTM A 328/A 328M. Sheet piling, including special fabricated sections, shall be of the type and dimensions indicated on the drawings, and be of a design such that when in place they will be continuously interlocked throughout their entire length. All sheet piling shall be provided with standard pulling holes located approximately 4 inches below the top of the pile, unless otherwise shown or directed. Steel sheet piling shall be hot rolled and shall have the properties equivalent to those listed in the following table:

PROPERTIES OF SECTIONS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Nominal | Section | Moment | Nominal | Minimum | Theoretical |
| Web | Modulus | of Inertia | Section | Interlock | Driving |
| Type of | Thickness | in3/ft | in4/ft | Depth | Strength | Width |
| Section | (inches) | of Wall | of Wall | (inches) | (lbs/lin in.) | inches |
|  |  |  |  |  |  |  |
| PZ 27 | 0.375 | 30.2 | 184.2 | 12 | N/A | 18 |

2..1 Substitute Sheet Pile Sections

The Contractor may elect to substitute for the sheet piling shown on the contract drawings and specified above, in accordance with paragraphs "New

Z-Type Cold Rolled Steel Sheet Piling, ASTM A 572/A 572M". Combinations of substitute piling types shall not be permitted.

2.2 SHEET PILING LENGTHS

All new sheet piling shall be provided in full lengths.

2.3 ROLLED CORNERS

Rolled corners, formed with new sheet piling, shall be of the types and dimensions shown on the drawings. Any proposed variations from the details shown on the drawings shall be submitted for approval of the Engineer. The sheet pile types shall be as required for the corners being manufactured and shall conform to the requirements of ASTM A 328/A 328M and all other requirements stated above for new piling.

2.4 FABRICATED SECTIONS

Fabricated sections, including special corners, transition piles and tee sections, shall conform to the requirements stated herein, the details shown on the drawings and the piling manufacturer's recommendations for fabricated sections. Metalwork fabrication for sheet piling sections shall conform to the requirements of Section 05100 STRUCTURAL STEEL.

Steel plates and angles used to fabricate the special sections shall conform to ASTM A 36/A 36M.

PART 3 EXECUTION

3.0 INSTALLATION

* + 1. Placing and Driving

3.1.1 Placing

Any excavation required within the area where sheet pilings are to be installed shall be completed prior to placing sheet pilings. Pilings shall be carefully located as shown on the drawings or directed by the Contracting Officer. Pilings shall be placed as true to line as possible. Suitable temporary wales, templates, or guide structures shall be provided to insure that the piles are placed and driven to the correct alignment.

Piles shall be placed in a plumb position with each pile interlocked with adjoining piles for its entire length, so as to form a continuous diaphragm throughout the length of each run of piling wall. Interlocks shall be properly engaged. The Contractor's personnel shall not sit or place themselves on top of the sheet piling during the handling, installation, and removal of the piling.

3.1.2 Driving

All piles shall be driven to the depths shown on the drawings and shall extend to the cut-off elevation indicated. A tolerance of 1½ inches above or below the indicated cut-off elevation will be permitted. Pilings shall be driven by approved methods so as not to subject the pilings to damage and to insure proper interlocking throughout their lengths. Pile hammers shall be maintained in proper alignment during driving operations by use of leads or guides attached to the hammer. A protecting cap shall be employed in driving, when required, to prevent damage to the tops of pilings.

Pilings damaged during driving or driven out of interlock shall be removed and replaced. All piles shall be driven without the aid of a water jet, unless otherwise authorized. Adequate precautions shall be taken to ensure piles are driven plumb. Sheet piling shall not be driven more than 1/8-inch per foot out of plumb in the plane of the wall nor more than

1/8-inch per foot out of plumb perpendicular to the plane of the wall. If at any time the forward or leading edge of the piling wall is found to be out-of- plumb more than 1/8-inch per foot in the plane of the wall or

1/8-inch per foot perpendicular to the plane of the wall, the assembled piling shall be driven to the required depth and tapered pilings shall be provided and driven to interlock with the out-of- plumb leading edge or other approved corrective measures shall be taken to insure the plumbness of succeeding pilings. The maximum permissible taper for any tapered piling shall be 1 1/4 inch per foot of length. Unless specifically indicated otherwise, each run of piling wall shall be driven to grade progressively from the start and pilings in each run shall be driven alternately in increments of depth to the required depth or elevation. On each day of sheetpile driving, the Contractor shall stab only the number of piles that can be driven to grade by the end of the day, and all piling stabbed shall be driven to grade by the end of each working day except that the last two piles may remain tapered up to receive the next days piles.

No pile shall be driven to a lower elevation than those behind it in the same run except when the piles behind it cannot be driven deeper or in areas where there will be wall penetrations or obstructions are encountered. In this case, piling will be allowed to remain above final grade until the obstruction is removed or the penetration is completed. Alternately, if it is determined that an obstruction cannot be removed, the Contractor shall make such changes in design alinement of the pile structure as may be deemed necessary by the Engineer to insure the adequacy and stability of the structure. If the piling next to the one being driven tends to follow below final grade, it may be pinned to the next adjacent piling. The Contractor is advised that buried stumps or similar debris may be encountered periodically on the sheet pile wall alinement and appropriate consideration should be given to hard driving conditions should they occur. Piles shall not be driven nor pulled within 100 feet of concrete less than 7 days old nor within 30 feet of concrete less than 28 days old.

3.1.3 Emergency Locking System on Pile Driving Head

All pile driving equipment shall be equipped so as to prevent piles from falling when a single or multiple power failure occurs after the pile driving head is attached to the pile. The jaws of vibratory hammers shall be equipped with devices such that upon loss of hydraulic pressure, the jaws will not release the pile.

3.1.4 Cutting Off and Splicing

Piles extending above grade in excess of the specified tolerance, and which cannot be driven deeper, shall be cut off to the required grade. The Contractor shall also trim the tops of piles excessively battered during driving, when directed to do so, at no cost to the Owner. Cut-offs shall become the property of the Contractor and shall be removed from the worksite. Piles driven below the elevations indicated for the top of piles and piles which, because of damaged heads, have been cut off to permit further driving and are then too short to reach the required top elevation, shall be extended to the required top elevation by welding an additional length, when directed, without cost to the Owner. Should splicing of additional lengths be necessary, the splice shall consist of an approved butt joint with a weld that fully penetrates the web. Welded extensions shall be a minimum of 6 inches in length. Piles adjoining spliced piles shall be full length unless otherwise approved. When piles are to be driven in sections and spliced together, they shall be delivered on site in full lengths and cut for splicing only after delivery. Only those portions of the originally uncut pile shall be spliced together to form the final

in-place full-length pile. Splices for these piles shall conform to the details shown on the drawings. Welding of splices shall conform to the requirements of Section 05 50 03.00 12 MISCELLANEOUS METALWORK. Ends of pilings to be spliced together shall be squared before splicing to eliminate dips or camber. Pilings shall be spliced together with concentric alignment of the interlocks so that there are no discontinuities, dips or camber at the abutting interlocks. Spliced pilings shall be free sliding and able to obtain the maximum swing with contiguous pilings. The Contractor may cut holes in the piles for bolts, rods, drains or utilities at locations and of sizes shown on the drawings or as directed. All cutting shall be done in a neat and workmanlike manner. Bolt holes in steel piling shall be drilled or may be burned and reamed by approved methods, which will not damage the remaining metal. Holes, other than bolt holes, shall be reasonably smooth and of the proper size for rods and other items to be inserted.

3.1.5 Inspection of Driven Piling

The Contractor shall inspect the interlocked joints of driven pilings extending above ground. Pilings found to be damaged or driven out of interlock shall be removed and replaced.

3.1.6 Pulling and Redriving

The Contractor may be required to pull selected piles after driving, for test and inspection, to determine the condition of the piles. Any pile so pulled and found to be damaged to the extent that its usefulness in the structure is impaired shall be removed from the work and the Contractor shall furnish and drive a new pile to replace the damaged pile. Piles pulled and found to be in satisfactory condition shall be redriven.

3.1.7 Void Backfill

Where voids adjacent to the steel sheet piling are induced by pile driving or pulling operations, the Contractor shall pump out all seepage and rain water and backfill with a tremie-placed slurry. The slurry shall consist of one part cement, two parts bentonite, and six parts sand mixed with enough water to produce a slurry viscous enough to thoroughly fill the voids.

3.1.8 Painting

Piling surfaces above ground exposed shall be painted to a depth of 2 feet below ground.as indicated on the drawings. The unpainted portion of sheet piling which are to be embedded in concrete shall be free from surface contaminants such as scale rust, oil, loose particles, or similar debris that would prohibit bonding between the concrete and sheet piling.

SEE SECTION 09900 FOR PAINT SELECTION.

- End of Section -