

Endurance Polaris CE Seawall Specification

1.0 Materials

1.1 Endurance Composite Sheet Piling

Sheet pile profile shall be manufactured with an interlocking feature that ensures adjacent panels maintain alignment. The sheeting material shall be an engineered composite material pultruded from a resin and glass reinforcement fiber matrix having the following properties. The sheet pile shall be free from visible cracks and other injurious defects. An acceptable supplier of the composite sheet piling is Gulf Synthetics, LLC, 7774 McGinnis Ferry Rd, Suite 240-104., Suwanee, GA 30024, (678) 584-9309. Other composite sheet piling may be used if it meets the following properties and is approved by the engineer in writing.

1.1.1 Resin System – shall be a high Polyurethane based performance resin exhibiting low water absorption, high UV resistance, high heat distortion temperature, high elongation, and high impact strength.

1.1.2 Minimum average physical properties(unless otherwise note) of the finished sheet pile material shall be:

• Charpy Impact (MD)	60 ft-lbs/inch	ASTM D-6110*
• Izod Impact (XMD)	30 ft-lbs/inch	ASTM D-256*
• Peak Tensile Stress (MD)	83,000 psi	ASTM D-638*
• Peak Tensile Stress (XMD)	6,000 psi	ASTM D-638*
• Peak Compressive (MD)	65,000 psi	ASTM D-790
• Peak Compressive (XMD)	23,000 psi	ASTM D-790
• Modulus of Elasticity (MD)	4,400,000 psi	ASTM D-638
• Modulus of Elasticity (XMD)	1,300,000 psi	ASTM D-638
• 24 Hour Water Absorption	<0.35 %	ASTM D-570

MD = Machine Direction

XMD = Cross Machine Direction

*Properties shall be verified by an ISO certified laboratory on every 42,000 lbs of finished sheet pile material. Results of verification shall be made available to owner's engineer upon request.

1.1.3 Minimum average geometric properties of the finished sheet pile material shall be:

• Moment of Inertia	51.5 in ⁴ /ft
• Section Modulus	12.8 in ³ /ft
• Weight	6.1 lbs/ft

1.2 Wales - wales for support of composite sheet piling shall be one of the following:

- Composite wale meeting the same properties(1.1.2) as the composite sheet piling
- Double Steel Channel as noted on the plans and coated with 21 POLY PLUS
- SYP Timber as noted on the plans and coated with 21 POLY PLUS

1.3 Structural Cap - top cap for support of composite sheet piling shall be one of the following:

- Composite cap meeting the same properties(1.1.2) as the composite sheet piling
- Steel Channel as noted on the plans and coated with 21 POLY PLUS
- SYP Timber as noted on the plans and coated with 21 POLY PLUS
- CIP Concrete as noted on the plans

1.4 Tie-back System

Anchors used to tieback the bulkhead shall be as noted on the drawings. Otherwise, the following anchor types are acceptable:

- Platipus Earth Anchors
- Chance Earth Anchors
- Reinforced Concrete Deadmen
- Composite deadman meeting the same properties(1.1.2) as the composite sheet piling
- Composite sheet piling with wale stiffener meeting same properties(1.1.2) as composite sheet piling

1.5 Tie Rods and Miscellaneous Hardware

- All steel not entirely encased in concrete shall be either all stainless steel(SS 304 or SS 316) or all hot dip galvanized(A 136) steel(A36 or 572). This includes tie rods, all threads, couplers, washers, nuts, carriage bolts, and lag screws. No mixing of steel types will be allowed.
- Composite tie-rod having an ultimate tensile stress of 100 ksi and maximum water absorption of 0.25%(ASTM D-570)

1.6 Backfill

Backfill material placed behind the sheeting shall be free draining and restricted to GW, GP, SW, or SP per ASTM D-2487. Other backfill materials may be used if approved by the engineer.

2.0 Delivery and Storage

Upon delivery of materials to the site, contractor shall visually inspect all materials for defects or damage. If serious defect or damage is detected, contractor shall notify engineer immediately. Store bundled sheet piling on relatively level surface with a slight pitch to allow water to drain. Contractor should not break bundled sheets until ready for immediate installation.

3.0 Submittals

- 3.1 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.
- 3.2 Material Certification - manufacturer shall provide Letter of Certification from a registered professional engineer assuring that the sheet pile meets requirements set forth in Section 1.1.

4.0 Installation

- 4.1 Install driving guide, template, or wale system to aid in driving a straight and plumb wall. A “two level” template as well as front and rear wale/bracing system is strongly suggested for tough and/or deep driving situations.
- 4.2 Drive sheet piling(preferably in pairs) by “Driving in Steps” or “Gang Driving”. Direction of installation should be with the male side of the sheet when possible. Mandrel or helmet may be required if driving through hard soil strata or obstructions. Water jet by displacing of soil shall only be used with non-cohesive soils(sands and gravels). Water jet shall not be used if driving through clay, silts, or immediately adjacent to an existing structure without the written approval from the engineer. Water may be introduced to induce lubrication and liquifaction during installation. It is very important that contractor drive sheets to required embedment depth. Under no circumstances shall the contractor cut-off or install shorter sheets without written authorization from engineer or the owner. Adequate precautions shall be taken to insure that piles are driven plumb. Sheet piling shall not be driven more than 1/2-inch per foot out of plumb in the plane of the wall, nor more than 1/16-inch per foot “out” of plumb perpendicular to the plane of the wall, nor more than 1-inch per foot “in” of plumb perpendicular to the plane of the wall.
- 4.3 Piles driven out of interlock with adjacent piles or otherwise damaged shall be removed and replaced by new piles at the contractors expense
- 4.4 Install wales, tie rods, and deadman as noted on the project plans.
- 4.5 Install drainage system and weep holes(if required).
- 4.6 Backfill behind sheet pile in level compacted lifts (12” maximum lift thickness). Compaction of backfill shall be 95% based on ASTM D-698. Maintain heavy equipment at least four feet from back of sheeting.

5.0 Payment

Payment of composite sheet pile wall shall be based on linear foot of bulkhead acceptably installed. Payment shall be full compensation for supply and installation of sheet pile, wales, cap, hardware, tie rods, anchoring system, and backfill.