

Item No. **646S**  
**Tied Precast Concrete Revetment**

**646S.1 Description**

This item shall govern the materials and construction of an Erosion Control System in accordance with these specifications and with the lines, grades, design and dimension indicated on the Drawings or as directed by the Engineer or designated representative.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text, the inch-pound units are given preference followed by SI units shown within parentheses.

**646S.2 Submittals**

The submittal requirements for this specification item shall include:

- A. Source, manufacturer, characteristics and test data for the revetment rope,
- B. PC Concrete mix design information, including mix composition, source, type and gradation of aggregates, sand etc. and proposed admixtures,
- C. Source, manufacturer, characteristics and test data for the filter fabric

**646S.3 Materials**

A. Portland Cement (p.c.) Concrete

The Portland cement concrete shall be Class B and shall conform to Standard Specification Item No. 403S, "Concrete for Structures".

Air entrainment admixtures shall be used in the p.c. concrete mix and shall conform to Standard Specification Item No. 405, "Concrete Admixtures". With prior approval of the Engineer or designated representative, retarding admixtures may be used. Concrete sand and crushed stone or gravel passing 3/8 inch US Standard (SI sieve designation of 9.5 mm) sieve shall be used for the concrete mix design.

B. Revetment Rope

Revetment Rope shall be constructed of high tenacity, low elongation, continuous filament polyester fibers, consisting of parallel core fibers, which are contained within an outer braid jacket or cover.

The outer cover shall consist of an 8, 10, 12 or 16 strand braid covering the core fibers.

The weight (mass) of the core shall be between 65 percent and 75 percent of the total weight (mass) of the rope.

Construction of the rope shall be such that the cover braid is non-load bearing and the rope is torque free.

Minimum average breaking strengths for new, dry rope and the minimum and maximum weights (mass) for the rope are as follows:

Rope Diameter			Circumference		Minimum		Minimum	
Nominal	Actual				Weight, lbs.	Mass, kgs.	Breaking Strength	
inches	Ins.	mm	Ins.	mm	Per 100 ft.	per 100 m	lbs.	kNs.
3/16			.589	15	1.3	1.9	1,600	7.1
1/4	.240	6.1	.754	19	2.1	4.1	2,750	12.2
1/4	.255	6.5	.801	20	2.6	5.0	3,300	14.7
1/4	.280	7.1	.880	22	2.9	5.6	4,000	17.8
1/4	.295	7.5	.927	24	3.1	6.0	4,500	20.0
5/16	.32	8.1	1.005	27	4.2	8.1	6,000	26.7
3/8	.380	9.6	1.194	30	5.0	9.7	8,800	39.1
1/2	.5	12.7	1.571	40	9.4	18.2	14,000	62.3

Elongation requirements specified below are based upon stabilized new, dry rope. Stabilization refers to a process in which the rope is cycled 50 times between a load corresponding to 200D square and a load equal to 10 percent, 20 percent or 30 percent of the rope's approximate average breaking strength. Relevant elongation values are as shown in the table below. The tolerance on these values is plus or minus 5 percent.

	Percent Breaking Strength		
	10%	20%	30%
Permanent Elongation While Working	0.7%	1.8%	2.6%
Elastic Elongation	0.6%	1.4%	2.2%
Total Stretch	1.3%	3.2%	4.8%

The critical temperature, defined as the point at which degradation of the rope occurs due to temperature alone, shall be a minimum of 350<sup>0</sup>F (177<sup>0</sup>C). The melting point of the rope materials shall be a minimum of 480<sup>0</sup>F(249<sup>0</sup>C).

**C. Anchors and Miscellaneous Hardware**

Anchors shall be screw type helix anchors and shall conform to ASTM A-36. Anchor size, length and spacing shall produce a direct pull equivalent to the dead weight (mass) of the mats. The anchors shall be galvanized in accordance with ASTM A-123. Clips, sleeves and other miscellaneous hardware shall be aluminum.

Filter fabric shall be placed below the revetment conforming to Item No. 620S, "Filter Fabric".

**D. Blocks and Mats**

Cellular concrete blocks shall be cast to the dimensions of 4 inches (100 mm) by 11 7/8 (300 mm) inches by 23 7/8 inches (600 mm) nominal, with a minimum weight of 35 to 40 pounds per square foot (170 to 195 kilograms per square meter). (OPTIONAL: Each mattress shall contain a nonabrasive plastic tubing incorporated into the system continuously longitudinally and laterally.) The blocks shall have cells and outer recesses in the vertical direction. (OPTIONAL: Vertical cells may be eliminated in certain specified projects.)

The blocks shall be assembled into mats of length and width to fit the proposed work. The blocks shall be bound into mats by the use of the revetment rope. Two strands

of rope shall extend through each block in a longitudinal direction and 1 strand of rope shall extend through each block in a lateral direction.

Each longitudinal rope will be looped at one end of each row of blocks and the ends bound together at the opposite end of each row. The binding of the rope ends shall be by sleeves. Lateral rope shall extend approximately 6 inches (150 mm) past the outer recesses of the mat and shall be held in place by buttons or similar devices.

Longitudinal ropes shall be a minimum 1/4 inch (6.3 mm) diameter for mats up to 50 feet (15 meters) in length and 5/16 inch (7.8 mm) for mat lengths in excess of 50 feet (15 meters). Rope used in the transverse direction shall be 1/4 inch (6.3 mm) in diameter.

#### **646S.4 Construction Methods**

The slope on which the mats are to be placed shall be constructed according to the lines and grades indicated on the Drawings. Fills shall be placed by pushing embankment material into place with a bulldozer or similar equipment. When the material is high enough above water level to support compaction equipment, the fill shall be compacted by this equipment to an in-place density (TxDoT Test Method Tex-115-E) not less than 95 percent of the maximum density conforming to TxDoT Test Method Tex-114-E.

Additional height of fill will be obtained by adding thin layers of embankment material and walking it down with compaction equipment. The depth of layers and amount of compaction shall be varied to obtain a density equal to or greater than the adjoining natural soil.

An anchor trench shall be constructed at the top of the mat system according to the lines, grades and dimensions indicated on the Drawings. Toe trenches and side trenches, if indicated on the Drawings, will also be constructed.

Woven and/or non-woven filter fabric shall be placed on the slope and in the anchor and trench as indicated on the Drawings.

Prior to placement of the fabric, pieces of wood, rock, concrete, brick or other objects that might puncture the fabric shall be removed.

Fabric shall be placed directly on the ground surface. Longitudinal and transverse joints shall be overlapped at least 3 feet (0.9 meter). Workers placing the fabric may walk on the fabric. However, equipment shall be prohibited from operating on it.

The fabric shall be kept in its protective wrapping until ready for use. Any fabric that has been out of its protective cover for over 72 hours without being covered shall be considered unsatisfactory and shall be removed and replaced with satisfactory fabric.

Torn, punctured or separated sections of fabric shall be repaired by placing a fabric patch over the hole prior to placing the mats. The patch shall be large enough to overlap a minimum of 3 feet (0.9 meter) in all directions.

The mats shall then be attached to a spreader bar or other type device and placed in their proper positions by the use of a crane or other equipment approved by the Engineer or designated representative.

Mats shall be anchored at the top by fastening the rope loop to anchors driven into the anchor trench as indicated on the Drawings. Enough anchors shall be used to support the entire weight (mass) of the mat.

As adjacent mats are placed, they shall be secured to each other from the top down to the water line by fastening the protruding transverse ropes together along each side of the mats. The fastening shall be done with sleeves or clips.

Anchor trenches and side trenches shall be backfilled and compacted flush with the top of the mats from the water line up.

Mats shall be custom fabricated at the plant or cut on the job site to fit irregular configurations.

The entire surface specified for erosion control shall be covered by mats without any vacancies, gaps or holes.

**646S.5 Measurement**

Work and accepted material as prescribed for this item will be measured by the square foot (square meter: 1 square meter equals 10.764 square feet) of surface area and toe trenches covered by mats.

**646S.6 Payment**

Work performed and materials furnished as prescribed by this specification item and measured under "Measurement" will be paid for at the unit bid price per square foot for "Tied Precast Concrete Revetment". This unit bid price shall include full compensation for all surface preparation, furnishing and placing all filter fabric, for furnishing and placing all blocks, rope, anchors, sleeves, clips and buttons and for all manipulation, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

**Pay Item No. 646S:** Tied Precast Concrete Revetment Per Square Foot.

**End**

<b><i>SPECIFIC</i></b> CROSS REFERENCE MATERIALS
Specification 646S, "Tied Precast Concrete Revetment"

City of Austin Standard Specifications

<u>Designation</u>	<u>Description</u>
Item No. 403S	Concrete for Structures
Item No. 406	Concrete Admixtures
Item No. 620S	Filter Fabric

American Society For Testing and Materials (ASTM)

<u>Designation</u>	<u>Description</u>
A-36	Specifications for Structural Steel
A-123	Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

<b><u>SPECIFIC</u> CROSS REFERENCE MATERIALS - Continued</b>
Specification 646S, "Tied Precast Concrete Revetment"

Texas Department of Transportation Manual of Testing Procedures

<u>Designation</u>	<u>Description</u>
Tex-114-E	Laboratory Compaction Characteristics and Moisture-Density Relationship of Subgrade & Embankment Soils
Tex-115-E	Field Method For Determination of In-Place Density of Soils and Base Materials
Tex-616-J	Testing of Construction Fabrics

<b><u>RELATED</u> CROSS REFERENCE MATERIALS</b>
Specification 646S, "Tied Precast Concrete Revetment"

Texas Department of Transportation Manual of Testing Procedures

<u>Designation</u>	<u>Description</u>
Tex-616-J	Testing of Construction Fabrics

American Society For Testing and Materials (ASTM)

<u>Designation</u>	<u>Description</u>
D-1682	Test Methods for Breaking Load and Elongation of Textile Fabrics
D-3786	Test Method for Hydraulic Bursting Strength of Knitting Goods and Non-woven Fabrics: Diaphragm Bursting Strength Tester Method

City of Austin Standard Specifications

<u>Designation</u>	<u>Description</u>
Item No. 101S	Preparing Right of Way
Item No. 102S	Clearing and Grubbing
Item No. 111S	Excavation
Item No. 120S	Channel Excavation
Item No. 401	Structural Excavation and Backfill
Item No. 610S	Preservation of Trees and Other Vegetation