



**SCOTT SYSTEM, INC.**

**SECTION 03 11 16.13**

**CONCRETE FORM LINERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fabrication, attachment, handling and maintenance of textured form liners for cast-in place concrete retaining walls.
- B. Form ties for cast-in-place concrete retaining walls with textured form liners.
- C. Release agent for use with textured form liners.
- D. Form stripping.

**1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION**

- A. Section 03 31 00 – Cast-In-Place Concrete

**1.03 RELATED SECTIONS**

- A. Section 01 31 19 – Project Meetings.
- B. Section 01 33 01 - Submittals.
- C. Section 01 45 16 – Field Quality Control Procedures.
- D. Section 01 35 02 - Material and Equipment.
- E. Section 03 21 00 - Concrete Reinforcement.
- F. Section 03 31 00 – Cast-in-Place Concrete.

G. Section 05 12 23 - Structural Steel for Buildings.

#### 1.04 REFERENCES

- A. ACI 301 CH 13 – Specifications for Structural Concrete.
- B. ACI 318 – Building Code Requirements for Reinforced Concrete.
  - 1. ACI 347 1978 CH 5.2 - Recommended Practice for Concrete Formwork.
  - 2. ACI 117 “Standard Tolerances for Concrete Construction and Materials”
  - 3. ACI 303R-91 “Guide to Cast-in-Place Architectural Concrete”
  - 4. ACI 309 1972 [78] CH.7; “Recommended Practice for Consolidation of Concrete”
  - 5. PS-1 - Construction and Industrial Plywood.

#### 1.05 DESIGN REQUIREMENTS

- A. Design, engineer and construct custom design molds, working master molds and textured form liners to conform to shape, line and dimensions indicated for specific locations as indicated in drawings.
- B. Contractor shall be responsible for design of formwork and backup of panels containing form liners to meet structural stability and sufficiency.

#### 1.06 SUBMITTALS

- A. Submit under provisions of Section 01 33 01.
- B. Shop Drawings: Indicate textured form liners, layout, jointing and termination reveal, and chamfer strip details.
- C. Product Data: Provide manufacture’s installation instructions and product data related to all materials to be incorporated in master molds and textured form liners.
- D. Samples: 1’-0” x 1’-0” examples of each pattern and reveal strip indicated.
- E. Compliance certification by release agent manufacturer for local conformance with controlling of VOC’s.

F. Architect/Engineers review for conformance to plans for aesthetic criteria.

1.07 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 117, 301, 303R, 309 CH. 7, 347, 301, and 318.

1. Maintain one copy of each document on site.

1.08 QUALIFICATIONS

A. The Contractor shall as a part of his work employ a firm specializing in the fabrication of custom design master molds and working master molds and production of architectural quality finish textured form liners. Acceptable firms shall have at least 5 years of specialized experience in the fabrication of custom molds and textured form liners. As a submittal within the bid process the bidder shall provide the name of the firm, along with a summary of the firm's experience including photographs and description of at least 5 custom form liner production projects of similar size successfully completed in the last 3 years.

1.09 REGULATORY REQUIREMENTS

A. Conform to applicable local, city and state code for design, fabrication, erection and removal of formwork.

1.10 FIELD SAMPLES and MOCK-UPS

A. Provide under provisions of Section 01 45 16. Coordinate with requirements stated in Section 01 33 23.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 35 02.

B. Provide mock-up as described elsewhere in this section.

C. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

D. Protect form liners from oil, dirt, and UV exposure.

## 1.12 COORDINATION

- A. Coordinate Work under provisions of Section 01 31 19.
- B. Coordinate this Section with other Sections of Work, which require attachment of components to formwork.
- C. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request concurrence from Construction Manager with corrective action proposed.
- D. In the event there are conflicting statements between the various references ACI 303R shall govern on issues related to quality control in casting of architectural finished concrete surfaces.

## PART 2 PRODUCTS

### 2.01 TEXTURED FORM LINER MATERIALS

- A. Textured Form Liner Materials: Polyurethane elastomeric materials, which accurately transfers a detailed replication of textures contained in the working master molds.
- B. Working master molds (those that will be used for producing elastomeric liners) and textured form liners shall be constructed of 100% polyurethane materials equal to or exceeding the following criteria:

Tensile Strength (PSI), D412	970
Shore A Hardness	50-55
Elongation	300-350 (%), D412
Tear Resistance	160-170 (lb./in), D624

- C. All materials, fabrication of masters and textured form liners to be provided by Scott System, Inc. 10777 E. 45<sup>th</sup> St., Denver, CO 80239. Phone: 303-373-2500. Website: [www.scottsystem.com](http://www.scottsystem.com).

### 2.02 FORMLINER ACCESSORIES

- A. Form Release Agent: Textured form liners shall be treated with release agents, which are non-staining, compatible with the elastomeric liner materials and approved for use by the form liner fabricator.

- B. Adhesive Binder: Epoxy adhesive as supplied by the textured form liner manufacturer for attachment of liners to formwork.

## **PART 3 EXECUTION**

### **3.01 TEXTURED FORM LINER FABRICATION**

#### **A. Custom Design Master Mold Construction**

1. The Contractor as a part of the scope of work shall have project-specific custom design master molds and project-specific working master molds constructed which will be used to produce the textured form liners for cast-in-place or precast concrete wall texture.
2. Custom design master mold shall be constructed from materials approved by master mold manufacturer. Mold will be produced by staff at fabricators facility or other approved location. Parties shall meet when necessary to review master mold progress and adjust design as needed.
3. Upon acceptance by the design team and owner the working master molds shall remain in the custody of the manufacturer where they shall be stored, protected and maintained at the production facility for a period of one year after form liner ship date. At that time, a determination will be made if the working master mold shall be destroyed or stored at the manufacturers production facility for an additional charge.
4. The cost of the custom design master molds and working master molds shall be included in the Bid Price.
5. The Contractor will be supplied an AutoCAD drawing which delineates the shapes and patterns of the textured surfaces desired. The fabricator shall review and prepare scaled shop drawings reflective of the shapes and patterns of the original design drawings.
6. The shop drawings shall conform to the original drawings in all respects except in locations where in the opinion of the mold fabricator the design cannot be successfully accomplished without modification. The mold fabricator via the shop drawing process shall identify these areas of concern.
7. The Contractor shall conduct a working session with all involved parties where collaboratively the modifications will be approved.

8. The working master mold shall be constructed of polyurethane elastomeric materials, capable of molding elastomeric textured form liners, which are true to the original approved shop drawings within 3/8" in the vertical and horizontal axis.
9. The working master molds shall utilize texture-forming materials, which accurately replicate the textures indicated on the drawings, resulting in continuous uninterrupted patterns to the shape and dimensions as indicated on the approved shop drawings. Reveal and chamfer strips surrounding and within the textured panel design shall be uniform, smooth and continuous throughout the entire panel with no breaks, seams or joints.

#### B. FABRICATION OF TEXTURED FORM LINERS

1. The fabrication of and application of textured form liners for use in cast-in-place concrete retaining walls.
2. The Contractor shall have the right to use the working master molds for the production of sufficient textured form liners, as he deems most effective to meet the overall construction schedule of this contract section.
3. The Contractor will not be allowed to have additional liners produced beyond those required for the job.
4. The custom-designed textured panel design is owned by the project owner and as such the Contractor, in whole or in part at any other location, may not reuse the liners without expressed consent of the project owner.
5. The textured form liners produce for this contract shall not be reused on any other subsequent segment of the project. The cost of the textured form liners shall be included in the bid price.
6. Upon review and approval of the working master mold by the artist/designer, the fabricator shall cast a prototype textured form liner at a size to be determined. The textured form liner shall utilize texture-forming polyurethane materials, which accurately replicate the textures contained within the working master molds and capable of 40 pours. Upon review and approval of the form liner, the Contractor may proceed to prepare the full size mock-up.

#### C. FINISH



1. The final textured wall finish shall be that finish which is transferred to the concrete from the textured form liners materials.
2. Minor rubbing of the surface with a stone to remove small burrs or non-form liner projections shall be allowed as long as the surface textures transferred from the form liner to the concrete are not damaged.
3. Bug holes shall be kept to the absolute minimum but in no case will bug holes larger than a 3/8" in diameter be allowed. In the event that larger than acceptable bug holes occur, they may be patched and hand surfaced to match the form liner to the satisfaction of the owner or the designer.
4. The Contractor shall use identical materials to fill bug holes. Patching materials and techniques shall be tested in inconspicuous areas for approval before repairs in highly visible areas are made.
5. Bug holes and voids, which are unacceptable due to concerns regarding the structural integrity of the wall, are not covered by this section.

### 3.02 MOCK UP

- A. Using the full-size prototype textured form liner, the Contractor shall attach the liner to formwork and construct a full size mockup of the wall section.
- B. All materials and techniques to be used on the actual construction shall be employed to produce the wall mock up. This is to include the construction of the forms, attachment of the liner, form release agent, form ties, chamfer strips, concrete mix design, aggregate size, water ratio, slump, bracing and shoring, placement rate, form pressures, joint sealing, vibrating and stripping practices.
- C. Upon review of the full size cast mock-up, the Contractor will be given direction regarding the acceptance of or rejection of the mold and textured form liners for use on the project.
- D. Rejected mock-ups shall be removed from the site. The Contractor shall cast additional mockup panels as required until the quality desired for the project can be achieved with the textured form liners fabricated for the job.

- E. Upon approval of the full size mockup, the Contractor may engage the fabricator in the completion of the remainder of the working master molds and textured form liner panels. The remainder of the working master mold sections and textured form liners shall be equal or better in quality to the approved prototype materials.
- F. The accepted mockup shall be the standard by which the subsequent textured walls shall be reviewed and accepted.
- G. The approved mock-up shall remain in place until such time as the Contractor has sufficient wall constructed to serve as the standard for overall quality.

### 3.03 FORM LINER ATTACHMENT AND MAINTENANCE

- A. Textured form liners shall be attached to formwork per the manufacturer's instruction and under the supervision of manufacturer's representative.
- B. Formwork shall be cleaned and prepared per adhesive manufacturer's instructions. Textured form liners shall be thoroughly and securely attached to the formwork using epoxy adhesive specifically supplied by or approved in writing by the form liner manufacturer such that the liners are held true to the form and design of the pattern as indicated in the approved shop drawings to within 3/8' in the horizontal and vertical plain of the pattern.
- C. Care and maintenance of the textured form liners is required to insure that the textured form liners remain in good condition throughout the duration of the project. The Contractor shall use all means at his disposal to protect the textured form liners from damage due to construction activity, including erection, pouring, curing, stripping, movement and storage on the site. The textured form liner shall be cleaned and maintained per the manufacturer's instructions.
- D. Contractor shall seal joints between form liners and adjacent formwork and accessories to prevent concrete paste from bleeding.
- E. Drill or pierce liner to accommodate form ties.
- F. Provide openings, offsets keyways, recesses, chamfers, blocking, and screeds as required to achieve architectural concrete textured finish.
- G. In the event a form liner panel is damaged, the Contractor shall consult with the form liner manufacturer and make necessary repairs per the

manufacturer's instructions. The CM will review the repair and approve the continued use conditional upon acceptable results.

- H. Damaged and improperly maintained or repaired textured form liner will be rejected. The Contractor shall replace all the damaged form liner panels at no additional cost to the Agency.

#### 3.04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Keep surfaces coated prior to placement of concrete.

#### 3.05 TEXTURED FORM LINER CLEANING

- A. Clean and remove foreign matter within forms prior to erection.
- B. Clean textured surfaces and formed cavities of debris after removal from concrete and before reinstallation on subsequent uses.
- C. Elastomeric form liners should be cleaned with approved release agent and a stiff brush when the liner begins to resist stripping.
- D. Flush with water or use compressed air to remove remaining foreign matter.

#### 3.07 TEXTURED FORM LINER TOLERANCES

- A. Construct textured form liners to within 3/8" in both horizontal and vertical plans to the dimensions indicated on the plans.
- B. Location of cast impressions from textured form liners in finished wall shall not vary more than 0.1 Foot from the vertical grades indicated on walls elevations.

#### 3.08 FIELD QUALITY CONTROL

- A. Attach textured form liners to formwork as specified above. Inspect erected formwork, shoring, and bracing to ensure that Work is in

accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

- B. Textured form liners may be used on this contract repeatedly, provided the following criteria are met:
  - 1. Textured form liners have been properly stripped, cleaned, maintained, and stored between uses.
  - 2. The textured form liners continue to produce acceptable quality textures when compared to the approved mockup.
  - 3. The textured form liners have not been patched other than by means and methods as recommended by the manufacturer and repairs approved by the GC.

### 3.09 FORM REMOVAL

- A. Forms containing textured form liners shall be removed in accordance with the manufacturer's recommendations and procedures, after a minimum of 12 hours and stripped preferably within 24 hours of concrete placement. However, do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads (75% of 28-day strength).
- B. Begin stripping at the top of the formwork. Separate the form from the concrete slightly. Hold in this position for several minutes to allow the induced stress in the form to diminish. Continue to separate the formwork from the concrete in stages until final separation.
- C. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finished concrete surfaces scheduled for exposure to view.
- D. Store removed forms in a manner that the liner surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

**END OF SECTION 03 11 16.13**