

TECHNICAL SPECIFICATIONS
FOR
SIMULATED STONE SURFACES

1. Description

- (a) This work shall consist applying a specified pattern to the surface of cast-in-place concrete retaining walls, headwalls, bridge rails, bridge abutments, etc. through the use of manufactured form liners during wall construction, and color staining the finished surface.
- (b) Concrete structures specified to have a simulated stone surface in the plans shall comply with Technical Specification 15.0, Concrete.
- (c) The work covered by this item shall consist of developing, furnishing, and placing simulated stone masonry form liners in accordance with these Specifications and in reasonably close conformity with the lines, patterns, textures, grades, and dimensions as shown on the Plans or established by the Engineer.

2. Materials

Simulated Stone Form Liners

Simulated stone form liners shall be used which will result in the finish detail indicated in the Plans and approved by the Engineer. Samples shall be submitted by the Contractor for approval by the Engineer. Three manufacturers of simulated stone masonry form liners are HUNT VALLEY CONTRACTORS, INC., 11460 Cronridge Drive, Suite 132; Owings Mills, MD 21117; Telephone: 410-356-9677; ENCO MATERIALS, 4615 Coster Road; Knoxville, TN 37912; Telephone: 865-687-7220; BOMANITE OF EAST TENNESSEE; P.O. Box 53197-37950; Knoxville, TN 37950; Telephone: 865-588-7591; and names of the manufacturers are provided here for information purposes only.

Simulated stone form liners shall be a high quality re-usable product manufactured of high-strength urethane which attaches easily to the forming system and shall not compress more than .021' when poured at a rate of 10 vertical feet per hour.

For each pattern required, five (5) different form liners with a minimum size of eight (8) square feet (2'-0" x 4'-0") with the capability of being turned 180 degrees to result in a minimum of ten different pattern combinations shall be provided. None of the individual combinations shall be repeated side by side. The minimum area for each pattern combination shall be 40 square feet.

Form oil shall be a non-staining petroleum distillate free from water, asphaltic and other insoluble residue or equivalent product. The form oil shall be worked into all areas, especially pattern recesses.

Color and Surfacing Materials

The coloration of the simulated stone surfaces shall be hand applied to match the appearance, texture and the full range of colors present in the stone work in East Tennessee. These colors shall include the range of browns, tans, buffs, grays, whites, and blacks.

Penetrating Stain shall maintain the following minimum standards:

- (1) Mildew Resistance: In accordance with Fed. Test Method Std. 144, Method 6271.
- (2) Weatherometer: Base material tested in accordance with ASTM G-26, 1000 hours.
- (3) Non Volatile Vehicle: 73.4% of the total N.V.
- (4) Viscosity: 58" 2KU
- (5) Solids Content: 40.3%
- (6) Form: viscous, opaque liquid
- (7) Specific gravity: 1.17
- (8) Weight Solids: 40.3%
- (9) Volume Solids: 29.5%
- (10) Lb/gallon: 9.8
- (11) VOC: 170 g/l
- (12) Viscosity (77 deg. F): 58 RU"2
- (13) Hardness: H-2H
- (14) Abrasion resistance (Tabor/CF-10) 500 cycles: 17 gram loss
- (15) Gloss 60 deg.: low luster
- (16) Coverage: 250 sq. ft./gallon
- (17) Scrub Test (1000 revolutions): pass
- (18) Ultraviolet Resistance QUV 1000: no effect
- (19) Alkali Resistance: excellent
- (20) Acid Resistance: good - excellent

3. Construction

(a) Simulated Stone Form Liner System and Surface Finish

Shop drawings and sample panels: Prior to beginning any work, representative shop drawings shall be provided for each form liner pattern and wall. The shop drawings shall represent the average full height of the wall to be constructed for a 90 foot length. For each wall type, one shop drawing shall be provided which indicates the layout of the finish pattern and shall be drawn at a scale sufficient to show the detail of all stone and joint patterns. For each wall type, a shop drawing shall be provided which indicates the specific form liner arrangement, which exactly correlates to the pattern indicated on its companion pattern shop drawing. The form liner shall be patterned so that long continuous horizontal or vertical lines do not occur on the finished exposed surface. The line pattern shall be of a random nature.

The shop drawings shall be submitted to the Engineer for review and approval. If necessary, the shop drawings shall be revised by the Contractor, at no additional cost to the City, until the proposed form liner patterns and arrangement receive the approval of the Engineer.

Once the representative shop drawings have been approved, the Contractor shall then provide and erect on-site, sample panels of the simulated stone masonry form liner patterns and coloration for each pattern type. The size of the sample panels shall be 6 in. thick, 4 ft. wide and 4 ft. high. Sample panels shall also demonstrate the pattern continuing through the expansion joint.

The location of the sample panels shall be readily visible from the proposed work where possible and placed as approved by the Engineer. The Contractor is required to receive approval of sample panels by the Engineer 14 days prior to wall construction starting. The sample panels approved by the Engineer shall remain on the site as a basis for comparison for the work constructed on the project. These sample panels shall serve as “referee walls” and shall be duplicated in form and appearance (texture, size, joint dimension, stone size, and coloration) by all work constructed on the project. Any sample rejected by the Engineer shall be removed from the project and a new sample submitted at no additional cost to the City. Sample panels shall be made until approved by the Engineer.

The architectural surface treatments and patterns of the finished work shall achieve the same final effect as demonstrated on the approved sample panel or panels.

The simulated stone form liner used shall produce the same pattern that is intended for use on the finished structure and shall be incorporated into final work. The test panels shall be unreinforced, vertically cast, concrete constructed to determine the surface texture resulting by use of simulated stone form liner. Unsatisfactory panels shall be removed and replaced with satisfactory panels. Dispose of test panels when all wall construction, finishing, and review is complete, in accordance with the Engineer.

In contracts which specify a special surface finish continuing over the top of poured structures, the sample panel shall demonstrate the final effect as described in this special provision. In wall situations where the rock surface texture is to continue across the top of the wall pour, the simulated stone form liner system supplier shall instruct and supply Contractor with adequate material, training and/or manpower to achieve a realistic simulation of stone texture and patterning. The finish will be achieved at the time the walls are being poured, by hand carving and embossing the still wet, pliable concrete. All rustication joints that are carved in the wet concrete will align with the joints coming from the vertically formed concrete and create natural-looking stone shapes. Great care will be taken to achieve as much relief as possible on all embossed surfaces as per approved test panel/sample. The special simulated stone surface finish continuing over horizontal surface of the top of wall structures shall have a smoother texture and the minimum specified reveal for the pattern.

The simulated stone form liners shall be capable of withstanding anticipated concrete pour pressures without leakage causing physical or visual defects. The simulated stone form liners shall be removable without causing concrete surface deterioration or weakness in the substrate. Form release agents, form stripping methods and patching materials, as well as related construction shall be mutually compatible with Special Surface Finish and Color System to be applied.

Liner butt joints shall be carefully blended into the approved pattern and finished off the final concrete surface. No visible vertical or horizontal seams or conspicuous form marks created by butt joining simulated stone masonry form liners will be allowed.

If form ties (wall ties) are used which result in a portion of the tie permanently embedded in the concrete, the Contractor shall submit the type of form ties to the Engineer for approval prior to use in this work. Form tie holes shall be placed in the high point of the rustication or mortar joint. As described elsewhere in this Specification, the ties shall be so designed that all material in the device to a depth of at least one inch (1") back of the concrete face (bottom of rustication groove or joint) can be disengaged and removed without spalling or damaging the concrete. Form tie holes shall be finished in accordance with standard concrete practices and acceptable to the Engineer. All patching material shall exactly match the color and appearance of the poured concrete wall surface.

When using simulated stone masonry form liners, form designs for the retaining walls shall be sufficient to allow minimum 4-foot on center form ties (wall ties).

Simulated stone masonry form liners shall be installed, prepared, stripped, handled, or otherwise utilized in accordance with the manufacturer's recommendations, or as directed by the Engineer.

(b) Surface Finish

Concrete surfaces as shown in the Plan documents and constructed under this Contract shall receive Special Surface Finish and Color System.

Manufacturer's Technical Representative shall be available for recommendations to the Contractor prior to and during work under this Section. Application test areas for each color will be required prior to beginning the project work as follows:

- 1) Test (sample) areas shall be located on the test panels in the areas designated by the Engineer and shall include all operations and preparations.
 - a. Retesting will be required where results do not meet requirements of these special provisions.
 - b. The sample panels shall be finished with the approved finish.
 - c. All subsequent work shall conform to the approved test panel.

Special surface color system shall be performed using approved stains suitable for the purpose intended and applied in a manner consistent with the design intent of the project. The approved sample shall be the basis for determining the appropriate color/stain application.

- 2) The coloring agent shall be a penetrating stain mix, compatible color finish designed for exterior application on new or old concrete with field evidence of resistance to moisture, alkali, acid and mildew, mold and fungus discoloration or degradation. The coloring agent shall be breathable, allowing moisture and vapor transmission.
- 3) Final stain colors require approval by the Engineer. Multiple colors will be required, so as to give the appearance of the full range of colors present in the stone work in East Tennessee. These colors shall include the range of browns, tans, buffs, grays, whites, and blacks.
- 4) All materials shall be furnished, prepared, applied, cured, and stored according to Product Manufacturer directions specified for use intended as specified herein, with special attention given to recommended temperature range.
- 5) Special Surface Preparation

Work under this Section shall include surface cleaning preparation to assure the surface is free of all latency, dirt, dust, grease, efflorescence, paint, and any foreign material prior to the stain application in accordance with the manufacturer's recommendations. The Contractor shall correct, at his own cost, any surface problems created as a direct result of the surface preparation methods used.

The Contractor is advised that sandblasting will not be allowed for cleaning concrete surfaces, as it will reduce the special surface texture specified elsewhere herein. Pressure washing with water (minimum 3000 psi) is the preferred method of removing latency. If cleaned by pressure washing, a pressure of 3000 psi is a rate of three to four gallons per minute using a fan nozzle held perpendicular to the surface at a distance of one to two feet. The completed surface shall be free of blemishes, discolorations, surface voids, and conspicuous form marks to the satisfaction of the Engineer.

- 6) Special surface finish shall be applied to all exposed simulated stone formed concrete surfaces except the cap stones, which shall be left unfinished and sealed with a matte finish transparent waterproofing coating, as detailed in the Plan documents.

As may be required on the project, at boundaries between two color tones or between surfaces receiving color at different times, care shall be taken and protection provided to avoid color overlap.

Any areas lacking a uniform appearance (consistent with the approved sample) shall be re-coated to the satisfaction of the Engineer with no additional cost to the City.

- 7) Grout pattern joints shall have the appearance of mortared joints in a laid up masonry wall. This appearance may be created by spraying a base color over the entire wall. All other colors shall then be hand applied; only the base color may be sprayed.
- 8) The expansion joints shown on the Plan details shall be finished so as to visually continue the simulated stone pattern uninterrupted. A sample of the colored expansion joint material shall be included in the test panel for approval.

3. Measurement and Payment

Simulated stone surfaces, unless otherwise stipulated, will be measured for payment by the square yard. Computations of the quantities will be based on the dimensions shown on the plans or as ordered in writing by the Engineer. The areas allowed for payment shall include only the areas constructed in accordance with the Plans and Specifications and accepted by the Engineer.

Payment shall be full compensation for the development and preparation of shop drawings, the development and furnishing of all form liners, the construction and finishing of all test panels and all equipment, labor, materials and incidentals necessary to complete the work as specified above and in the Plans.