ITEM 555.73xx--06 – ARCHITECTURAL TREATMENT OF VERTICAL CONCRETE SURFACES

DESCRIPTION

This work shall consist of furnishing and installing Architectural Treatment of Vertical Concrete Surfaces with a designated pattern, texture and color in accordance with the contract documents.

MATERIALS

Formliner Panels.

General Requirements:
Formliners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating, recognizable shadow patterns shall be prevented by proper casting of formliner patterns. Contractor shall plan on having sufficient liners available to minimize pattern repeat. Formliners shall not compress more than 6mm when concrete is poured at a rate of 3 vertical meters per hour. Formliners shall be removable without causing deterioration of the surface or underlying concrete.

Premanufactured formliner panels:
Premanufactured formliner panels shall be capable of imprinting the surface of the concrete with a uniform and aligned pattern and texture. The panels shall be composed of elastomeric urethane, polyvinyl chloride (PVC) or ABS plastic material designed for their intended shape and number of reuses to achieve the desired effects established in the approved sample panel(s).

Custom formliners:
Custom built formliners shall have form facing materials (material in contact with concrete) consisting of plywood, tempered concrete-form-grade hardboard, metal, plastic or other acceptable materials capable of producing a smooth, uniform texture on the concrete. Contractor shall not use form facing materials with raised grain, torn surfaces, worn edges, patches, dents, or other defects that will impair the texture of concrete surfaces.

The final concrete appearance shall be attained by using formliners that achieve the following finish types as indicated in the contract documents:

Type 1: Simulated “dry stacked” stone masonry for abutments, walls and bridge parapets as shown in the contract documents that replicates the following criteria:

- Maximum Relief 35mm
- Average Relief 22mm
- Liner Thickness 60mm
- Stone Size 75mm to 600mm

The Type 1 formlined finish shall be stained using three different colors in accordance

with these specifications. The finish product shall have the appearance and texture of natural rock.

Type 2: "V-GROOVE" Text custom formliner with recessed lettering for plaza walls as shown in Contract Documents. The Type 2 formlined finish shall be a natural concrete grey color.

Type 3: "Logging Scene" as shown in the contract documents. The logging scene image shall be imprinted into a precasted Single Slope (Half Section) Concrete Bridge Barrier on the Robert Dann Drive Bridges over Hamilton St. The Type 3 formlined finish shall be a natural concrete grey color.

Releasing Agents. When the manufacturer requires the use of an agent to facilitate the release of the formliner panel from the concrete, or when its use is specified on the plans, such agent shall be non-staining and evenly spread over the entire liner surface. Formwork for custom formliners shall also be treated as needed. Form release material shall be on the NYSDOT's Approved List of Manufacturers and compatible with the formliner material and color stain system to be applied to the surface.

Form Ties. Plastic tie cones shall be used with ferrous form ties and shall be designed to separate at least 40mm back from deepest reveal of formed surface, leaving only a neat hole that can be plugged with patching material. Fiberglass ties shall be colored gray to match concrete and shall be ground off to finished surface.

Caulking Compound. A polyurethane caulking compound color-matched to the final stained concrete shall be used to seal construction joints. Caulking shall meet the requirements of Subsection 705-06, Calking Compound for Structures.

Patching Material. The patching material, technique, and match with adjacent surfaces shall be approved by the Engineer prior to any patching. Plastering of surfaces will not be allowed.

Color Staining. The staining used for formlined walls under this specification shall be a penetrating stain mix designed especially for cementitious type surfaces. The 3 different color stains used for Type 1 formlined walls shall achieve color variations present in natural stone being simulated for this project as approved by the Engineer and Regional Landscape Architect.

Stain shall create a surface finish that is breathable (allows water vapor transmission without blistering or peeling), and resists deterioration from water, acid, alkali, fungi, sunlight or weathering. Stain mix shall be a water borne, low V.O.C. material, less than 289 grams/liter. In addition, the following requirements shall be met:

- Weathering resistance: 2000 hours accelerated exposure measured by weather-o-meter in accordance with ASTM g-23
- Scrub test: 1000 revolutions

- Abrasive resistance (Tabor-CF-10): 500 cycles
- Adhesion ASTM D-3359 1.00MM cross cuts on glass pass 3 or higher on a scale of 1 to 5

For the proposed stain material, the contractor shall supply information pertaining to chemical resistance per ASTM D-1308 to 87.

Stain material shall be obtained from the same source to maintain a high degree of consistency in workmanship throughout the project. Stain shall be delivered to the job site in original unopened packaging and stored in dry conditions.

After applying stain to the walls, the Contractor shall apply a clear water-based, penetrating water repellant, approved by the stain manufacturer, to the stained vertical concrete surfaces.

CONSTRUCTION DETAILS

General. The process of formlining and texturing of the concrete shall be performed in strict accordance with the manufacturer's recommendations, the contract documents and as approved by the Engineer and Regional Landscape Architect.

Patterning of simulated stone masonry shall appear natural and non-repeating. Seam lines or match lines caused from two or more molds coming together will not be apparent when viewing final wall. No visible vertical or horizontal seams or conspicuous marks created by butt joining form liners will be allowed. Final coloration of cast stone concrete surface shall accurately simulate the appearance of natural stone including the multiple colors, shades, flecking, and veining that is apparent in natural stone.

Upon approval by Engineer and Regional Landscape Architect, the sample panels constructed prior to start of patterning walls and in accordance with these specifications, shall serve as the quality standard for the project. The completed formed concrete surfaces shall match the color and texture of the approved sample panels.

Quality Assurance. Manufacturer of pre-fabricated formliners – five years experience making simulated stone masonry molds, imprinted text molds or other detailed images in concrete to create textured concrete surfaces as specified in Contract Documents. Submit documentation of experience along with shop drawings.

Contractor/Subcontractor (installer) shall have a minimum of five years experience pouring vertically formed architectural concrete walls and columns and shall be trained in manufacturer's special techniques (formliner assembly, corner forming, coloration of concrete surfaces, etc.) in order to achieve realistic surfaces. Prior to commencing with the work, the Contractor shall submit resumes, references, and photographs/locations of prior work examples of color-stained simulated stone masonry concrete surfaces and imprinted text or graphics in concrete surfaces for approval by the Engineer and Regional Landscape Architect.

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Pre-Installation Meeting – schedule meeting with manufacturer's representative, installer, Engineer and Regional Landscape Architect to assure understanding of proposed formlined concrete construction, requirements for construction of sample panels, and to coordinate the work.

Submittals. Contractor shall submit for approval:

1. Catalog cuts, manufacturer's literature, and technical data for the materials specified herein, including but not limited to:
   - Sample of Formliner to be used for
     a) Simulated stone mold pattern
     b) V-Groove Text pattern
     c) Logging Scene
   - Release agent
   - Concrete patching material
   - Pigment and Stain Manufacturers color chart and sample color chips to select stain for Type 1 Formlined areas

2. Photographs – color photographs of three similar past projects of the manufacturer and installer;

3. Samples – form ties, sample and description, showing method of separation when forms are removed;

4. Shop Drawings – plans, elevations, and details to show overall stone, text or logging scene pattern layout, joint locations, form tie locations, and end, edge, column and other special conditions;

5. A table or schedule indicating the reuse cycle and sequence of the work for each cast-in-place wall system. Formliner forms shall remain in place after the pour for approximately the same amount of time for each pour to keep rates of cure and color uniform and consistent for each treatment area.

The general construction details of subsection 555-3 shall apply along with the following:

Sample Panel. At least 60 days prior to placing any architectural treatment on vertical concrete surfaces, the Contractor shall construct three vertical sample panels, on-site for the Engineers approval, using the contemplated materials, work force and construction techniques.

Sample Panel #1 shall include the Type 1 formliner and display the "Dry Stacked" stone masonry pattern specified in the contract documents. The panel shall measure a minimum of 1.5 m in height, 1.5 m in width, and 0.3 m in thickness.

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Sample Panel #2 shall include the Type 2 formliner and display the configuration of the formliner with the word "Gang Mills" as shown in the contract documents. The panel shall measure a minimum of 0.6 m in height, 3.0 m in width and 0.3 m in thickness.

Sample Panel #3 shall include the Type 3 formliner and display a sampling of the "Logging Scene" as shown in the contract documents. The panel shall measure a minimum of 1.5 m in height, 1.5 m in width and 0.3 m in thickness.

After constructing the sample formlined panels, the surfaces should be power washed or rubbed clean after curing. Snap-tie holes and other blemished areas shall be patched on the sample panels to develop an acceptable patch texturing treatment. After inspection by the Engineer and the Regional Landscape Architect, the Contractor may dispose of the approved sample panel or the sample panel may become part of the final vertical surface if considered feasible and acceptable by the Engineer. When the sample panels are not part of the final product, they shall not be removed and disposed of until after all of the architecturally treated concrete work has been completed. If the Engineer determines that the sample panel does not meet the requirements, the Contractor shall remove and dispose of the panel from the site, and cast another panel that meets the Engineers approval.

Forming. Joints between panels, tie-hole penetrations, and joints between liner panels and rustications shall be sealed, taped or fused to form a watertight seam in accordance with the manufacturer's instructions. Unless specified on the plans, texturing is not required on surfaces below finished grade. Plastic snap tie cones are to be of the non-leaking type. Metal form ties are not to be placed closer than 40 mm to the interior surface.

Construction joints shall extend to the full depth of the concrete at the locations shown on the plans. When the locations of the joints are not specified on the plans, the Contractor and the Engineer shall agree on the proper locations of such joints so as to not distract from the appearance of the stone patterning or 'V-groove' lettering and to minimize the possibilities of cracking.

Form ties shall be located to the greatest extent possible to fall within the simulated grout lines.

Contractor shall securely attach formliners to forms with wood or sheet metal screws; threaded inserts added to the back of the formliner for bolts to fasten the formliner through the forms; or bolted through the face of the formliner with flat head bolts inserted in a pattern joint and through the formliner forming system. Construction adhesives may be used, but not on reusable forms. Place adjacent formliners with less than 6mm separation between formliners.

Only manufacturer recommended and NYSDOT approved form release agents shall be utilized and shall be applied to the formliners before the concrete is poured. Release agents shall be applied in strict accordance with release agent manufacturer recommendations. Hand-charged sprayers will only be allowed if a thin uniform coating of release agent is obtained on the form,

and with Engineer approval.

Construction of Formlined Corners. The contractor shall construct corners for formlined columns and ends of formlined walls to provide a seamless transition between intersecting stone masonry faces. The joints and stone patterns must line up on both faces, and the corners shall be as uniform as the face of the vertical concrete surface. This shall require the use of pre-manufactured corner forms provided by the supplier or construction of custom corner forms.

Curing. Liquid curing membranes will not be allowed on formlined surfaces to receive staining. Only burlap, plastic or water will be allowed for proper curing.

Finishing and Patching. After removal of the formwork, all vertical surfaces shall be power washed to remove minor form marks and colored residue resulting from release agents, or water and cement migrating (bleeding) toward the surface during concrete placement and compaction.

Patchwork shall be completed at all snap-tie holes and other blemished areas larger than 12mm (1/2 inch) in greatest principal direction, unless otherwise specified on the plans or as directed by the Engineer. Patching shall not take place until the entire vertical surface is cleaned. Patchwork shall then be completed using approved patching material such as Tamms Speed-crete or equal mixed with latex or acrylic bonder, with texturing treatments deemed acceptable on the sample panel. All honeycombed areas shall be filled and textured to match surrounding areas.

Seam lines and other unnatural protrusions shall be ground down to match adjacent areas with a hand-held power grinder using discs made for concrete. Grinding of seams shall be performed immediately after removal of the formliners. Perform final bush hammering to blend defects and ground areas into the final rock texture. All areas requiring patchwork shall first be thoroughly moistened and treated with a concrete bonder. In particular, the process of wall patching and preparation will be subject to approval of the manufacturer and Engineer.

All construction joints shall be sealed with a color-matched polyurethane caulking compound applied in accordance with the manufacturer's instructions.

Produce a smooth-rubbed finish on newly hardened concrete. The smooth-rubbed surface shall be completed no later than the day following formwork removal. Wet the surface and rub it with carborundum brick or other abrasive material until uniform color and texture are produced. Cement grout shall not be used other than cement paste drawn from the concrete itself by the rubbing process. All construction joints shall be sealed with a color-matched polyurethane caulking compound applied in accordance with the manufacturer's instructions.

Color Staining Procedures.
A minimum of 14 days after the concrete placement, the contractor shall apply a stain to the Type 1 Formlined concrete surfaces as indicated in the Contract Documents. The actual stain

colors shall be approved by the Engineer and the Regional Landscape Architect during the sample panel review.

Prior to application of stain, the contractor shall stir product for 5 to 10 minutes using a low speed agitation mixer. When multiple containers are going to be used for a larger portion of vertical concrete surface, the containers shall be blended together as needed to insure uniform color throughout the job.

Due to the various substrates and application procedures, two thin coats shall be required in order to provide a finished appearance with uniform color without streaks or thin spots and shall be consistent with the quality and appearance of the approved sample. All foreign matter, form oils, waxes, curing compounds, efflorescence, dirt, and any previous coatings must first be removed by power washing with a minimum pressure of 20 MPa (2900 psi) or greater. The contractor shall conduct a field test to determine if the prepared surface will readily accept stain by spraying a small amount of water on the surface of the concrete. If the concrete surface immediately turns dark, absorbs water at a rapid rate without resistance or shows any water droplets, then the surface is ready to accept a stain.

Areas not to receive stain shall be masked. The concrete penetrating stain shall be spray applied using conventional or airless spray. If an airless sprayer is to be used, a tip size of 0.381 – 0.457mm (0.015-0.018 in) with a 40° degree to 60° fan should be used. Contractor shall not be permitted to apply stain in direct sunlight or during extremely hot or windy conditions as defined by the stain manufacturer.

Stain should only be applied to dry, sound, frost-free surfaces. The air temperature should be consistently above 7° C (45° F) with no chance of frost, rain or fog for a period of 48 hrs prior to and following application.

If the finish stained concrete surface displays unevenness in color, lines of work termination, etc., the Engineer may require all such surfaces to be resprayed at the Contractor's expense. Respraying, if required, shall be carried to a natural break-off point. If approved by the Engineer, stain may be brushed or roller applied only at locations where overspray would affect adjacent materials and where not practical for spray application.

METHOD OF MEASUREMENT

This work will be measured as the number of square meters of Architectural Treatment of Vertical Concrete Surfaces furnished and installed.

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BASIS OF PAYMENT

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work including sample panels as required.

Concrete and reinforcement will be paid for separately under appropriate items to the pay limits shown on the contract drawings.

Payment will be made under:

Item No.	Description	Pay Unit
555.7301--06	Architectural Treatment of Vertical Concrete Surfaces – Type 1	SM
555.7302--06	Architectural Treatment of Vertical Concrete Surfaces – Type 2	SM
555.7303--06	Architectural Treatment of Vertical Concrete Surfaces – Type 3	SM