**DESIGN STANDARDS FOR: OLMSTED BENCH - Wood & Concrete**

Scope: Under this item, the Contractor shall furnish and install wood and concrete benches as shown on the SPR Design Standards Images and as specified herein. The number and locations shall be as shown on plans or directed by the Park Engineer.

Bench Supports: Bench supports shall be constructed of colored cast concrete.

Cast Concrete: The cast concrete shall be fabricated by a manufacturer approved by SPR, having facilities for furnishing the quality of cast concrete required.

Composition: The cast concrete shall be composed of Portland cement, stain, crushed marble aggregate and "Fiber-mesh" (polypropylene additive) or approved equal, combined to provide concrete of maximum density and strength.

Portland Cement: Portland Cement shall consist of equal parts of White Portland Cement and Light Gray Portland Cement. The cement shall fulfill the specification requirements of the City of Seattle Standard Specifications for Road, Bridge, and Municipal Construction (most recent edition).

Aggregate: The aggregate shall be hard white crushed marble graded as follows:

| Weight Passing | Retained On | Volume |
|---|---|---|
| 1000# l/4" mesh | 1/8" mesh | 10 cu. ft. |
| 500# 10 mesh | #20 mesh | 5 cu. ft. |
| 300# 20 mesh | #40 mesh | 3 cu. ft. |
| 100# 40 mesh | #60 mesh | 1 cu. ft. |
| 100# 60 mesh | #100 mesh | 1 cu. ft. |

2000# = one ton = 20 bags = 20 cu. ft.

The combined aggregate shall be mixed with Portland cement in the following proportions:

l/2 part White Portland Cement
1/2 part Light Gray Portland Cement
2 parts of the Combined Aggregate

Polypropylene: The polypropylene shall be "Fiber-mesh" or approved equal. The fiber length shall be l/2" - 3/4" minimum. The fiber to concrete ratio shall be 1.6 pounds of fiber per cubic yard of concrete.

Percentage of Water: The percentage of water to concrete shall be no more than .40.

Color: The finished color shall be approved by the Park Engineer. The contractor shall provide color samples for the Park Engineer's review and approval prior to pouring.

Air Entrainment: Air entrainment shall be to 4 to 5 percent.

Finishing: After the forms have been removed, all exposed polypropylene fibers will be burned off, and then all exposed surfaces shall be rubbed with carborundum bricks and clear water only to a uniform color and finish, satisfactory to the Engineer. Fill in all holes and irregularities to a smooth uniform color and finish.

After the cast concrete standards have been removed from the forms, they shall be cured for a period of at least seven (7) days before being removed from the original pallet. Curing shall be done in a closed room, which can be maintained at an even temperature. Cast concrete shall be moistened every four (4) hours during the period of curing.

Contractor shall not commence quantity production on the cast concrete bench standards until a finished sample has been approved by the Park Engineer.

Reinforcement: The reinforcement shall be deformed steel bars. It shall be bent and fastened together to form a frame that will not be displaced during the pouring. It shall be accurately maintained in place. No portion of the reinforcement shall be less than one inch (l") from the exterior surface of the stone. Reinforcement shall fulfill the specification requirements for steel bars of the "1989 Seattle Standard Specifications" City of Seattle Standard Specifications for Road, Bridge, and Municipal Construction).

Mixing: Cement, polypropylene, water and aggregates shall be carefully weighed or measured; after mixing, they shall be kept constantly agitated by machinery until deposited into the molds.

Casting: The cast concrete shall be made according to the wet-poured process in sand molds or according to the wet-puddled process in rigid molds. The use of glue molds will not be permitted. It must be the same composition throughout and not faced. The concrete shall remain in the molds at least twenty-four (24) hours and shall be protected from changes in temperature for at least forty-eight (48) hours. The contractor shall pour one bench support for the review and approval of the Park Engineer prior to proceeding.

Tests: All cast concrete furnished shall be subject to random tests. No cast concrete will be accepted which does not show a compression test of at least 5,000 pounds per square inch and must not show over seven percent (7%) absorption by weight after forty-eight (48) hours immersion in water. Test for absorption shall be made on a specimen after it has been boiled for five (5) hours, to assure the City that no waterproofing admixture has been added. The Engineer shall have the privilege of taking one or several pieces of plain cast concrete (not in excess of 10 cubic feet) from any of the cast concrete delivered to the project, for the City to use as it may determine in its testing laboratory. All pieces of cast concrete taken for testing purposes shall be replaced immediately by the cast concrete contractor at no expense to the City. Contractor shall provide the City with a certificate of testing described above. No chipped, broken or checked cast concrete will be accepted.

Bench Slats:

A. All wood shall be vertical grain or flat grain Grade C, industrial clear Douglas Fir or better, graded in accordance with West Coast Lumber Inspection Rules No. 16, paragraph 152C.

B. All wood surfaces shall be sanded smooth.

C. All wood members shall receive l/4 inch, 45 degree chamfer on all sides. Chamfering shall be true, sanded smooth, with no application marks.

D. All wood shall be stained with one coat of Parker Paints' Weather Shield semi-transparent stain "Spring." Spray and dry brush or roll as per manufacturer's specifications.

Slat Installation: The slats shall be attached to the supports with 2-1/2" stainless steel expansion anchors cast in the supports and 3/8" diameter bolts of 18-8 stainless steel with side slot, truss type vandalproof heads.

Assembly: The bench supports shall be set in five inch (5") slabs with 3/4" diameter bars in the concrete slab. Supports shall be vertical and true to line and position as shown. The work shall be done as shown on the plans and described above and/or as directed by the Park Engineer.

END OF SECTION