APPENDIX E: ARROYO STONE WALLS & STEPS SPECIFICATIONS

The arroyo stone walls and steps throughout the City of Pasadena and especially in the Arroyo Seco are considered an historic resource because many of them were built during the WPA years and in some locations designed by notable architects. Rehabilitation, including maintenance and repair, shall be focused on conservation of this historic resource.

Rehabilitation of this resource is an ongoing process and, as a specific location is designated for maintenance and repair, the contract shall specify a sample test area of the work for review and approval of workmanship and materials by the Pasadena Parks & Natural Resources and Design & Historic Preservation staff before work proceeds on the entire contract.

Standard Specifications: In connection with contracts related to the subject "Bidder's Proposal," and except as otherwise provided below, all work shall be done in accordance with the provisions of the current edition of "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" (popularly known as the "GREENBOOK") including all Supplements and where not provided with relevant specifications in the "Greenbook" the work shall comply with the current code as specified in the latest edition of the California Uniform Building Code.

Mortar: Loose or missing stones shall be reset in new mortar that matches the original mortar as closely as possible in color, texture, and composition. The mortar shall be of standard mix design for masonry walls; see attached Pasadena Standard Plan "Concrete Block Fences" on page E-5. The cement shall be from a consistent local source. The mortar shall have a heavy aggregate content and use water-washed coarse sand. It shall include one half-strength "Fawn" or "Bisk" color additive. Adjust the amount of this color additive with the specific cement used to match as closely as possible the original mortar. A sample of dried mortar shall be given to the Pasadena Parks & Natural Resources Division for approval before work begins on the sample test area.

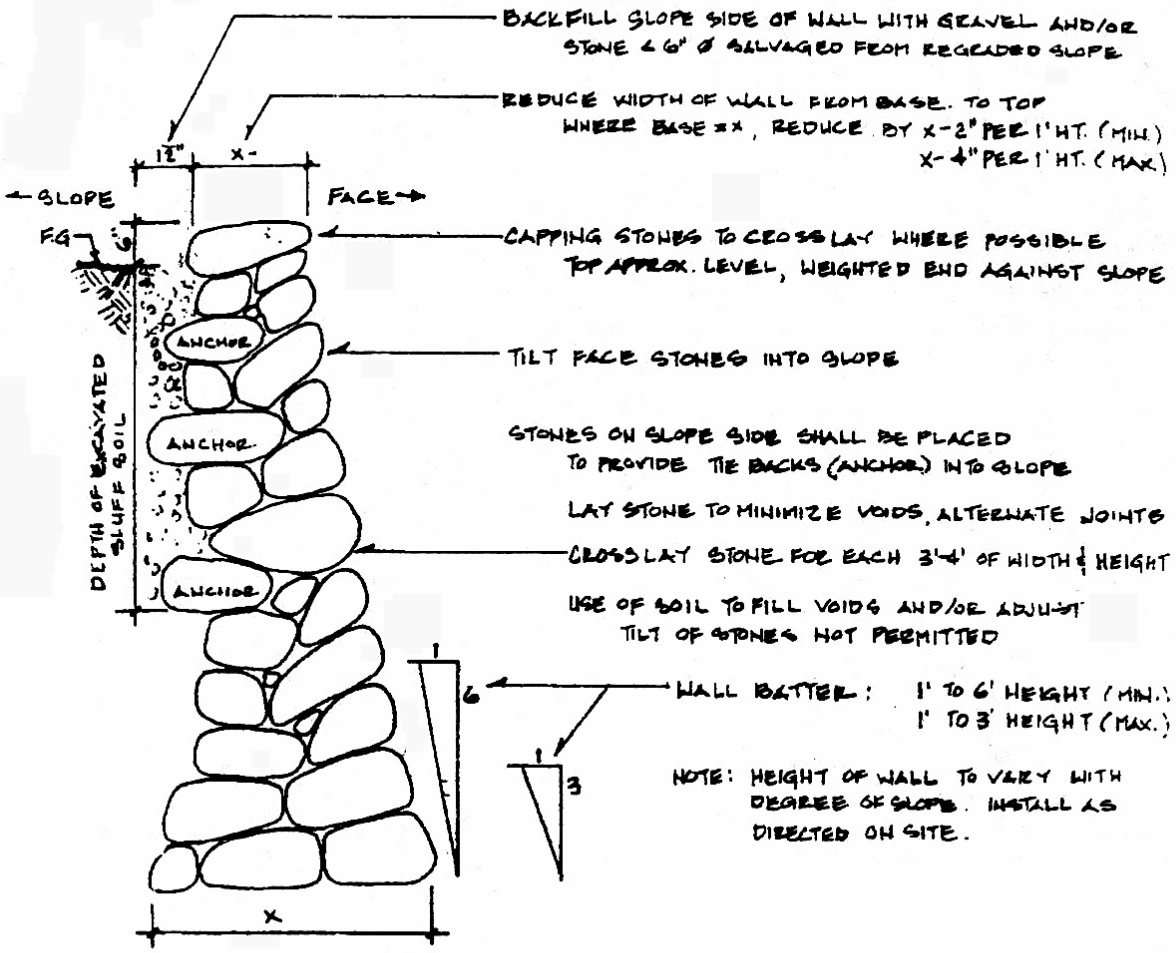
Where the adjacent work has the appearance of "infilling" the openings and joints among the stones, the mortar shall be tooled to match this effect. Where the adjacent work has the appearance of "dry" laid stones without mortar, mortar shall be used in the interior of the wall to give this "dry" laid appearance following detail shown on page E-3. Smearing of mortar over exposed surfaces of the stone is not acceptable. A "flush" surface of stone and mortar is only permitted on stair tread or path surfaces. Stones shall be chosen and mortar tooled to minimize the mortar surface area. For stair tread and path surfaces, apply white concrete glue to the stone where mortar thins to give a safe "flush" surface and include the recommended amount of concrete glue in the mortar mix. Mortar shall have a washed sand finish to match existing mortar surfaces.

***Stones*:** In places where the stones are missing, shall be replaced with new stones similar in color, size and finish to the adjacent stones. Surface stones shall be placed on fully

compacted base soil in a mortar base course. If the repair is six feet or greater in length at the footing, then a concrete footing with reinforcing steel bars shall be placed as specified in the attached exhibits on pages E-4 and E-5. During the restoration, the shape and size of a stone shall be chosen for the appropriately shaped exposed surface as well as fit the adjacent stones for structural integrity and match the adjacent appearance and function. A stockpile of stones will be provided by the City, at a location adjacent to the contract work. Should additional stones be needed from which to choose, they will be available from several locations in the Arroyo Seco. All stones moved to the work site and not used to complete the contract shall be returned to the stockpile and remain the property of the City of Pasadena.

Mortar Cap: The free form mortar cap shall be of a thickness and water-washed coarse sand finish to match the early mortar caps adjacent to the area to be restored. If the cap is one to two inches thick, expanded metal lath shall be imbedded in the mortar cap. The formed cantilevered cap shall be three to four inches thick to match formed caps in the area. The cantilevered cap shall have a number three reinforcing bar continuous in the nose, one and one half inches from any surface and be tied to 6x6 – 10/10 WWF reinforcing the total formed cap area. The cantilevered cap shall be formed to allow the nose face form to be removed at the proper time to receive a water-washed coarse sand finish. Mortar caps with metal lath or welded wire fabric for reinforcing shall have the cap structurally tied to the mortared interior of the rebuilt stone wall using galvanized metal seismic ties sixteen (16) inches on center, each way. See attached plan “Low Stone Walls” on page E-4.

Reinforcing & Footings: When rebuilding a free standing stone wall up to four feet in height or retaining stone wall up to three feet high with no surcharge or six feet or greater in length at the footing use reinforcing steel bars, galvanized seismic ties and footings size as specified on the attached City Standard Plan for “Concrete Block Fences” and “Low Stone Wall.” When rebuilding any stone wall or steps use galvanized seismic metal ties at sixteen inches on center, each way, each face. Retaining walls greater than three feet in height shall be engineered with a six or eight inch reinforced block wall on a footing engineered to support an Arroyo Stone veneer anchored to the block wall. The retaining wall details and specifications for each particular site shall be provided in the “Scope of Work”. Freestanding stone walls greater than four feet in height shall be engineered with reinforcing and footing details and specifications for each particular site provided in the “Scope of Work.”

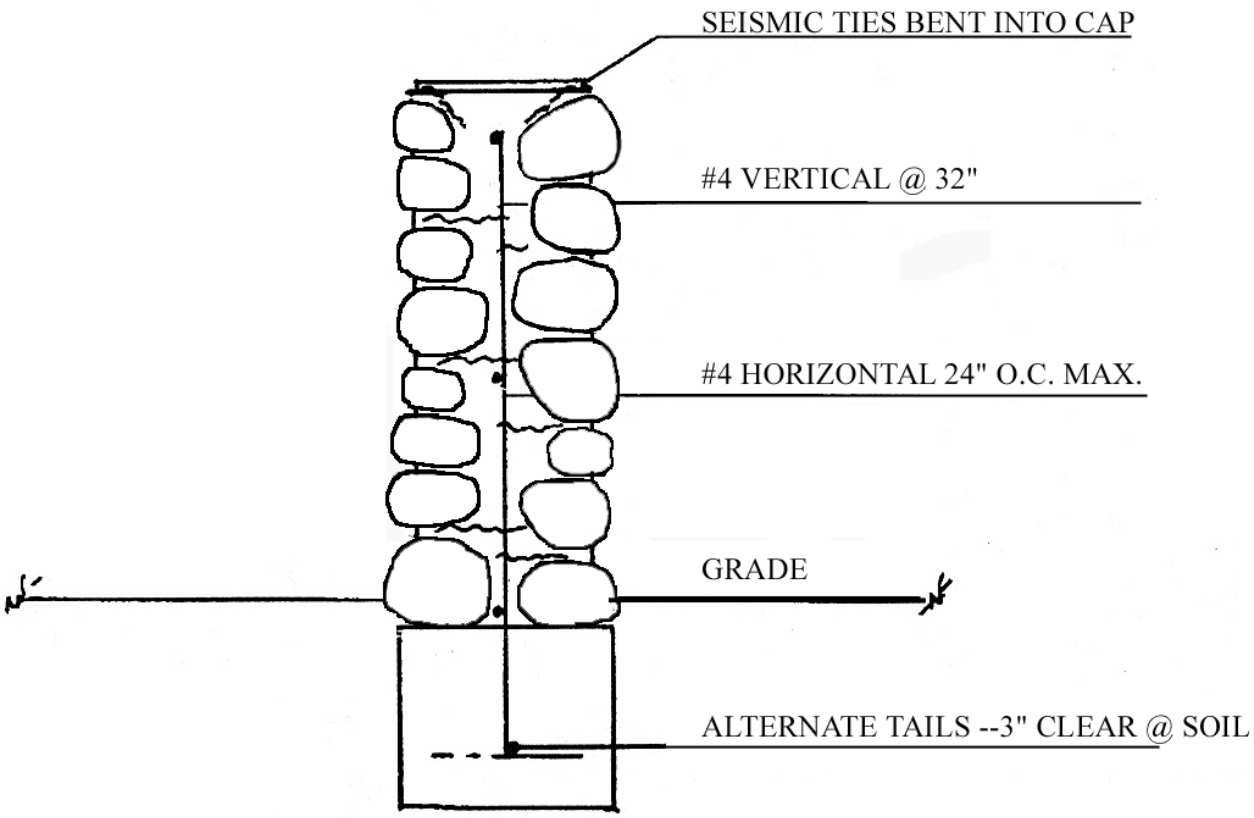


A **DRY LAID STONE WALL**

NO SCALE

LOW STONE WALL -- RETAINING THREE FEET MAX.

1. FOOTING: 14" X 12" THICK CONCRETE
2. VERTICAL #4 AT 32" O.C. -- ALTERNATE TAILS
3. ONE HORIZONTAL #4 IN FOOTING
4. HORIZONTAL STEEL AT WALL IN THREE PLACES (MAX. 24" O.C.)
5. GALVANIZED SEISMIC TIES AT 16" O.C. EACH WAY, EACH FACE
6. FOR SAND CAP BEND TIES UP INTO CAP



NOTE:

1. Fence height is measured from the top of the footing to the top of the wall.
2. All cells of concrete hollow units containing reinforcing must be solid grouted.
3. Concrete units shall be laid in running bond and no cold joint at any intersections.

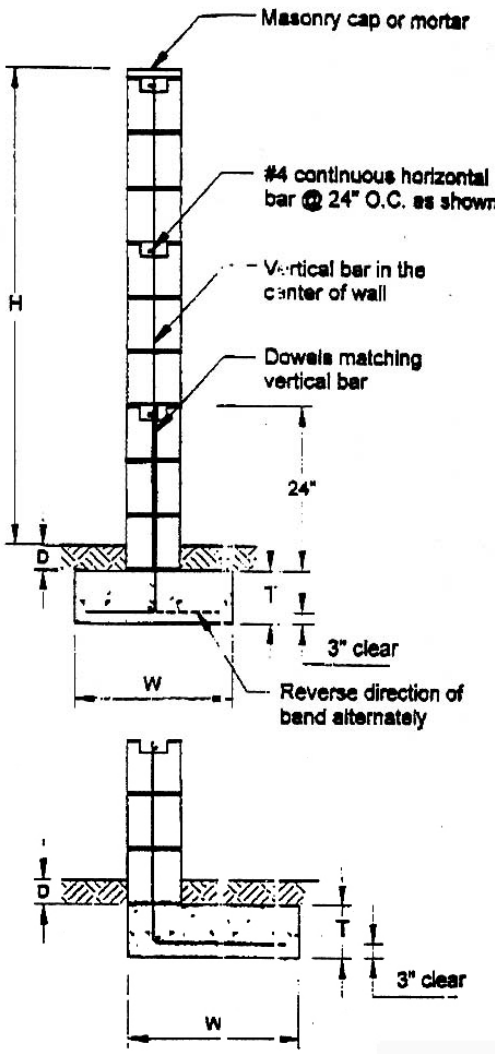
CONCRETE BLOCK FENCE SPECIFICATION:
Use the following specifications when constructing a concrete block fence.

1. **Concrete Mix:**
   1 part Portland cement conforming to ASTM C150, type I or II, low alkali.
   2 ¼ parts sand
   3 ½ parts ¾ inch maximum-size gravel
   Not more than 7 gallons of water per sack of cement.
   The minimum compressive strength shall not be less than 2000 psi.

2. **Hollow Block Units:**
   Hollow block units shall be medium-weight, grade "N", conforming to ASTM C90 with an average compressive strength of 1900 psi.

3. **Grout Mix:**
   Grout shall be of fluid consistency, conforming to ASTM C476.
   1 part Portland cement
   3 parts sand
   2 part pea gravel
   The minimum compressive strength shall not be less than 2000 psi.

   Mortar Mix:
   Mortar shall be type "S", conforming to ASTM C270.
   1 part Portland cement
   3 part sand
   ½ part lime putty or hydrated lime
   The minimum compressive strength shall not be less than 1800 psi.



Wall Height	Block Thickness	W (Invert T shape) inches	W (L shape) inches	T inches	D inches	Reinforcing Steel
4'-0"	6"	12	12	8	4	#4 @ 32" O.C.
	8"	12	12	8	4	#4 @ 32" O.C.
5'-0"	6"	12	18	8	4	#4 @ 32" O.C.
	8"	18	18	10	2	#4 @ 24" O.C.
6'-0"	6"	18	24	10	2	#4 @ 24" O.C.
	8"	24	24	10	2	#4 @ 24" O.C.

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