

500 STRUCTURES

ITEM 520 - PNEUMATICALLY PLACED MORTAR

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520.01 Description. This item applies to the surface repair of concrete structures using pneumatically placed mortar, where the depth of repair generally will be less than 6 inches (150 mm). This item consists of the removal of all loose, soft, honeycombed and disintegrated concrete, the removal of sound surface concrete in areas designated for repair, the preparation of the surface, the furnishing and placing of reinforcing steel including wire fabric, dowels, and/or expansion anchor bolts, mixing and applying pneumatically placed mortar composed of portland cement and sand, to the areas shown or noted on the plans or where directed by the Engineer. The thickness of pneumatically placed mortar shall be not less than 1 1/2 inches (38 mm) except on top horizontal surfaces where it shall be not less than 3/4 inches (19 mm). Mortar repairs shall be finished flush with the original masonry surface, except as noted below for areas of exposed reinforcing steel.

520.02 Materials. Materials shall conform to the following:

Fine aggregate	703.02, 703.03
Portland cement	701.01 through 701.06
Reinforcing steel.....	509
Welded steel wire fabric	709.10 or 709.12
Mixing water	499.02

520.03 Removal of Concrete. In areas to be repaired, all loose, soft, honeycombed, and disintegrated concrete plus a 1/4 inch (6.4 mm) depth of sound concrete, shall be removed. Additional concrete shall be removed where necessary to permit the placement of the minimum specified mortar thickness. All work shall be done in such manner as not to damage or shatter the concrete that is to remain. Square or preferably slightly undercut shoulders shall be made at the edges of all repair areas.

Reinforcing bars exposed after concrete removals, as required above, shall be encased with pneumatically placed mortar. Where such bars would be less than 1 inch (25 mm) from the proposed finished surface of mortar, they shall, if practicable, be driven back into recesses cut in the masonry to obtain that coverage, but if this is impracticable, because of large concentrations of reinforcing bars, the minimum specified mortar coverage shall be provided by such modification of the finish surface as approved by the Engineer.

Where the bond between the concrete and a primary reinforcing bar has been destroyed, or where more than one half of the periphery of such a bar has been exposed, the adjacent concrete shall be removed to a depth that will provide a minimum 3/4 inch (19 mm) clearance around the bar except where other reinforcing bars make this impracticable. Reinforcement which has become loose shall be adequately supported and tied back into place. Reinforcement that is damaged during the Contractor's operations shall be replaced at no cost to the City.

Only pneumatic or hand tools that will give results satisfactory to the Engineer shall be used in the removal of concrete and in preparing and shaping the areas to be repaired.

Care shall be used in working around reinforcing steel so as not to loosen the steel, or to shatter the concrete around it, beyond the repair area

520.04 Reinforcement. Where pneumatically placed mortar is specified to repair areas of unsatisfactory concrete, or for surface coverage of exposed reinforcing steel, wire fabric shall be placed in all areas where the thickness of the mortar patch is 1 1/2 inches (3.8 mm) or more. For areas where the thickness of the mortar patch exceeds 4 inches (102 mm), a single layer of wire fabric shall be used to reinforce each 4 inch (102 mm) thickness of patch or fractional part thereof. Fabric shall be either 2 inch (50 mm) by 2 inch (50 mm) using wire size No. W O.9, or 3 inch (76 mm) by 3 inch (76 mm) using wire size No. W 1.4. All fabric shall be placed parallel to the proposed finished surface. Each layer of fabric shall be completely encased in mortar which has taken its initial set, before the succeeding layer of fabric is applied. Fabric supported adjacent to the prepared masonry surface shall be no closer than about 1/2 inch (13 mm) to said surface. Adjacent sheets of fabric shall be lapped 6 inches (152 mm) and securely tied together. Fabric shall be carefully prebent before installation to fit around corners and into re-entrant angles, and shall in no case be sprung into place.

All steel items, including reinforcing bars and wire fabric, shall be no closer than 1 inch (25 mm) to the proposed finished surface of mortar.

Wire fabric shall be supported by anchor bolts except where existing reinforcing steel in the repair area is considered by the Engineer to be satisfactory for this purpose. Anchors shall consist of 1/4 inch (6.4 mm) minimum diameter expansion hook bolts, each of which shall have sufficient engagement in sound masonry to resist a pull of 150 pounds

(68 kilograms) applied parallel to the axis of the bolt. For repairs that are generally 4 inches (102 mm) thick or less, anchors shall be spaced not more than 12 inches (305 mm) and 18 inches (457 mm), center to center, on overhead and vertical surfaces respectively, and 36 inches (0.9 mm), center to center, on top horizontal surfaces. For repairs that exceed 4 inches (102 mm) in thickness, anchor bolts shall be capable of supporting 3 times the weight of suspended mortar and 2 times the weight of mortar on vertical surfaces. No less than 3 anchors shall be used for each patch.

Reinforcing exposed in the original structure, or exposed after removals as required above, shall be thoroughly cleaned and any appreciable reduction in steel area restored as directed by the Engineer.

520.05 Preparation of Repair Area. After all unsatisfactory concrete has been removed, the sound concrete surface properly shaped, dowels and/or expansion hook bolts placed, the existing reinforcing steel cleaned and steel area restored as directed, the concrete surfaces shall be thoroughly cleaned of all dirt, dust and other foreign materials by the use of water or air under pressure and such other methods as are necessary to secure satisfactory results. Where a bonding compound is not specified the following shall be strictly adhered to: The prepared masonry surface shall be drenched with water and wet during the 2 hours preceding the placement of the mortar. All surfaces shall be damp, without free water, as mortar is placed. Preparation and condition of all surfaces shall be approved by the Engineer immediately prior to the application of the mortar.

520.06 Mixing. The materials shall be thoroughly mixed dry in a batch mixer. Before placing the mixture in the hopper of the cement gun, all material and lumps over 1/4 inch (6.4 mm) in size shall be removed by screening.

The screened sand and cement shall be applied to the masonry surface within 1 hour after being combined.

520.07 Proportions. The mixture as placed in the hopper shall be one volume of Portland cement to three volumes of sand.

520.08 Pressures. Not less than 35 pounds pneumatic pressure per square inch (240 kPa) at the cement gun shall be used in placing the mixed material. If more than 100 feet (30 m) of hose or a greater lift than 25 feet (7.5 m) is used the pressure must be increased proportionately. The water shall be maintained at a uniform pressure of not less than 25 pounds (170 kPa) above the pressure of the air on the gage at the cement gun.

520.09 Placing. The premixed, dry cement and sand shall be placed by pneumatic equipment with the proper amount of water applied in the mixing nozzle for the correct placement consistency. The mortar shall be applied as dry as practicable to prevent shrinkage cracks. Shooting strips shall be employed to insure square corners, straight lines and a plane surface of mortar, except as otherwise permitted by the plans or approved by the Engineer. They shall be so placed as to keep the trapping or rebound at a minimum. At the end of each day's work, or similar stopping periods requiring

construction joints, the mortar shall be sloped off to a thin edge. In shooting all surfaces, the stream of flowing material from the nozzle shall impinge as nearly as possible at right angles to the surface being covered, and the nozzle should be held from 2 to 4 feet (0.6 to 1.2 m) from the working surface.

A sufficient number of mortar coats shall be applied to obtain the required thickness. On vertical and overhead surfaces, the thickness of each coat shall be not greater than 1 inch (25 mm), except as approved by the Engineer, and shall be so placed that it will neither sag nor decrease the bond of the preceding coat. Where a successive coat is applied on mortar which has set for more than 2 hours, the mortar surface shall be cleaned and dampened as required in 520.05 for the prepared masonry surface. Deposits of rebound from previous shooting, whether loose or cemented, shall be removed.

After mortar has been placed to desired thickness, all high spots shall be cut off with a sharp trowel, or screeded to a true plane as determined by the Engineer. Screeds, where used, shall be lightly applied to all surfaces so as not to disturb the mortar for an appreciable depth and they shall be worked in an upward direction when applied on vertical surfaces. After curing and before final acceptance, all patched areas shall be sounded. All unsound and cracked areas shall be removed and replaced at no cost to the City. Unless otherwise directed, the finished mortar surface shall be given a flash coat, about 1/8 inch (3.2 mm) thick. Special care shall be taken to obtain a slightly smooth to textured appearance on all exposed surfaces consistent with surrounding materials.

The pneumatically placed mortar patches shall be covered with burlap or cotton mats and kept wet for 7 days after placing, but where not practicable to use mats, it shall be kept wet by sprinkling for the same length of time. Where the Engineer determines that the above curing procedures are impracticable, because of the inaccessibility of isolated repair areas, the final mortar surface may be cured according to Section 511.14, Method (b). No pneumatically placed mortar may be placed when the air temperature is below 50° F (10° C) or against a surface in which there remains any frost. All mortar shall be protected against cold weather according to the requirements of Section 511.11.

After curing and before final acceptance, all patched areas shall be sounded. All unsound and cracked areas shall be removed and replaced at no cost to the City.

520.10 Method of Measurement. The quantity shall be the area in square feet (square meter) as determined under Method (a) unless Method (b) or another method is specified.

Method (a). The actual area of exposed surfaces of all completed patches, irrespective of depth or thickness of the patch; if a patch includes corners or edges of such members as beams, columns, curbs, etc., all of the exposed surfaces shall be included, or if a patch extends completely through a member or a slab, both exposed surfaces shall be included.

Method (b). For nonreinforced mortar repairs, the actual area of the exposed surfaces of all complete patches, irrespective of depth or thickness of patch; if a patch includes corners, or edges of such members as beams, columns, curbs, etc., all exposed surfaces shall be included. For fabric reinforced mortar repairs, the actual surface area of fabric closer than 2 1/2 inches (63 mm), center to center of layer, shall be considered as a single layer in area measurements. The measured area of wire fabric shall be agreed upon by the Contractor and Engineer before said fabric is encased in mortar, otherwise the area of the patch for pay purposes shall be obtained as described for nonreinforced mortar repairs.

520.11 Basis of Payment. Payment will be made at the contract price for:

Item	Unit	Description
520	Square Foot (Square Meter)	Pneumatically Placed Mortar, Method (___)
520	Square Foot (Square Meter)	Nonreinforced Pneumatically Placed Mortar, Method (___)