

**SECTION 525: MORTAR**

**525.1 DESCRIPTION**

This material may be specified for placement in concrete structures when filling voids or repairing surface defects. The mortar shall be a sand/cement mixture containing Portland cement, sand, water, and other approved additives. No chlorides, fluorides, sulfites, nitrates or gas forming agents will be permitted. Mortar shall be Type S and shall have an average of twenty-eight (28) day compressive strength of 1800 psi unless otherwise noted on plans. Mortar cubes will be sampled, cured, and tested in accordance with AASHTO T 106 and Section 505.30.

**525.2 MATERIALS**

**525.2.1 Mortar Sand**

Sand can be natural or manufactured and shall be free of deleterious materials and organic impurities and shall meet the requirements of ASTM C 144. Sand shall be graded in accordance with the following table:

Table 525.2.1-1 Mortar Sand Gradation Requirements

<b>Sieve Size</b>	<b>Percent Passing</b>	
	<b>Natural Sand</b>	<b>Manufactured Sand</b>
<b>No. 4</b>	100	100
<b>No. 8</b>	95 - 100	95 - 100
<b>No. 16</b>	70 - 100	70 - 100
<b>No. 30</b>	40 - 75	40 - 75
<b>No. 50</b>	10 - 35	20 - 40
<b>No. 100</b>	2 - 15	10 - 25
<b>No. 200</b>		0 - 10

\*Concrete sand shall not be substituted for mortar sand.

**525.2.2 Water**

Water shall be proportioned as required and shall conform to the requirements of ASTM C 94.

**525.2.3 Cement**

Three types of mortar are allowed to be used; Portland cement – ASTM C 150, masonry cement – ASTM C 91, or mortar cement – UBC Standard No. 21-14. Portland cement used in mortar shall be Type I or Type II, low alkali cement.

The cement shall be sampled and tested in accordance with ASTM C 150 and the Contractor shall provide certification of compliance signed by the cement manufacturer identifying the cement and stating that the cement delivered to the batching site complies with the ASTM specifications. When requested by the Project Manager, the Contractor shall furnish three (3) copies of said certification.

**525.2.4 Mix Design Proportions**

1. Mortar shall conform to ASTM C 270 and shall conform to the following proportion specification or property specification.

Table 525.2.4-1 Mortar Types and Proportions

Mortar	Type	Portland cement <sup>a</sup> or blended cement <sup>b</sup>	Masonry cement <sup>c</sup>			Mortar cement <sup>d</sup>			Hydrated Lime <sup>e</sup>	Aggregate Measured in a Damp, Loose Condition
			M	S	N	M	S	N		
Cement- Lime	M	1	-	-	-	-	-	-	¼	Not less than 2 1/4 and not more than 3 times the sum of the separate volumes of cementitious materials
	S	1	-	-	-	-	-	-	Over ¼ - ½	
	N	1	-	-	-	-	-	-	Over ½ - 1 ¼	
	O	1	-	-	-	-	-	-	Over 1 ¼ - 2 ½	
Mortar Cement	M	1	-	-	-	-	-	1	-	
	M	-	-	-	-	1	-	-	-	
	S	½	-	-	-	-	-	1	-	
	S	-	-	-	-	-	1	-	-	
	N	-	-	-	-	-	-	1	-	
Mortar Cement	O	-	-	-	-	-	-	1	-	
	M	1	-	-	1	-	-	-	-	
	M	-	1	-	-	-	-	-	-	
	S	½	-	-	1	-	-	-	-	
	S	-	-	1	-	-	-	-	-	
	N	-	-	-	1	-	-	-	-	
	O	-	-	-	1	-	-	-	-	

- a. Portland cement conforming to the requirements of ASTM C 150.
- b. Blended cement conforming to the requirements of ASTM C 595.
- c. Masonry cement conforming to the requirements of ASTM C 91.
- d. Mortar cement conforming to the requirement of ASTM C 1329.
- e. Hydrated lime conforming to the requirements of ASTM C 207.

2. Mortar shall contain enough water to provide a slump of five to eight (5 – 8) inches.

Table 525.2.4-2 Mortar Property Requirements

Mortar Properties <sup>a</sup>					
Mortar	Type	Avg. Compressive <sup>b</sup> Strength at 28 Days minimum (psi)	Water Retention minimum (%)	Air Content maximum (%)	
Cement-lime	M	2,500	75	12	
	S	1,800	75	12	
	N	750	75	14 <sup>c</sup>	
	O	350	75	14 <sup>c</sup>	
Mortar cement	M	2,500	75	12	
	S	1,800	75	12	
	N	750	75	14 <sup>c</sup>	
	O	350	75	14 <sup>c</sup>	
Masonry cement	M	2,500	75	18	
	S	1,800	75	18	

N	750	75	20 <sup>d</sup>
O	350	75	20 <sup>d</sup>

- a. This aggregate ratio (measured in damp, loose condition) shall not be less than 2 ¼ and not more than 3 times of the sum of the separate volumes of cementitious materials.
- b. Average of three 2-inch cubes of laboratory prepared mortar, in accordance with ASTM C 270.
- c. When structural reinforcement is incorporated in cement-lime or mortar cement mortars, the maximum air content shall not exceed twelve percent (12%).
- d. When structural reinforcement is incorporated in masonry cement mortar, the maximum air content shall not exceed eighteen percent (18%).

### 525.3 CONSTRUCTION REQUIREMENTS

#### 525.3.1 Mixing

1. Measurement of Mortar Materials - The method of measuring materials for mortar must be such that the specified proportions of the mortar materials can be controlled and accurately maintained. A reasonable method to control the mortar proportions is to use full sacks of cement per batch and to use measuring boxes for the proper amounts of lime and sand. Dry pre-blended mixes are also available. Cement that is stockpiled before mixing occurs shall be kept free from contact with soil and moisture and shall not be exposed to weathering for a period longer than twenty-four (24) hours.
2. Job Site Mixed Mortar - Mortar mixing is best accomplished in a paddle type mixer. About one-half (1/2) of the water and one quarter (1/4) of the sand are put into the operating mixer first, then the cement, lime, color (if any), and the remaining water and sand. All materials should mix for three to ten (3 – 10) minutes in a mechanical mixer with the amount of water required to provide the desired workability. Small amounts of mortar can be hand mixed. Dry mixes for mortar which are blended in a factory should be mixed at the job site in a mechanical mixer until workable, but no more than ten (10) minutes.
3. Re-tempering - Mortar may be re-tempered one time with water when needed to maintain workability. This should be done on wet mortar boards by forming a basin or hollow in the mortar, adding water, and then reworking the mortar into the water. Splashing water over the top of the mortar is not permissible.

Harsh mortar that has begun to stiffen or harden due to hydration shall be thrown out. In general mortar shall be used within two (2) hours after the initial water has been added to the dry ingredients at the jobsite. Re-tempering color mortar should be avoided to limit color variations.

### 525.4 METHOD OF MEASUREMENT

Mortar will not be measured separately and shall be considered incidental to the other associated work activities.

### 525.5 BASIS OF PAYMENT

No additional payment will be made for mortar required in the work.