

- Do not subsequently disturb units that have been placed.
- Moist-cure the masonry (refer to Chapter 15).

There are also several basic rules of thumb. Use mortar with the lowest compressive strength which meets structural requirements, because the lower the compressive strength, the more flexible the mortar in accommodating movements in the wall. In areas exposed to significant freeze-thaw cycling, and in particular for horizontal applications in those areas, specify mortars with a higher cement content or entrained air. For low-suction clay masonry units, use mortars with a lower lime content, and for high-suction clay masonry units, use mortars with a higher lime content.

*For most projects, a Type N mortar is not only adequate in compressive and bond strength, it is the best choice for the compromise among various properties. On multi-story projects where higher wind loads at upper stories increase lateral loads, a Type S mortar will provide higher flexural bond strengths regardless of whether it is made from a masonry cement or from a*

ASTM C270 Recommended Mortar Type Applications			
Location	Building Segment	Mortar Type	
		Recommended	Alternative
Exterior, above grade	Loadbearing walls	N	S or M
	Non-loadbearing walls	O <sup>§</sup>	N or S
	Parapet walls	N	S
Exterior, at or below grade	Foundation walls, retaining walls, manholes, sewers, pavements <sup>†</sup> , walkst and patio <sup>†</sup>	S	M or N
Interior	Loadbearing walls	N	S or M
	Non-loadbearing partitions	O <sup>§</sup>	N

<sup>§</sup> Type O mortar is recommended for use where the masonry is unlikely to be frozen when saturated and unlikely to be subjected to high winds or other significant lateral loads. Type N or S should be used in other cases.

<sup>†</sup> Masonry exposed to weather in a nominally horizontal surface is extremely vulnerable to weathering. Mortar for such masonry should be selected with due caution.

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#### RULE OF THUMB

Always select the mortar type with the lowest compressive strength appropriate to its location and use.

- Type N is most appropriate 95% of the time
- Type O mortar is most appropriate 80% of the time
- Type S is most appropriate 5% of the time
- Type M is most appropriate only 1% of the time.

(Statistics from Dr. John H. Matthys, Construction Research Center, University of Texas at Arlington.)

**Figure 6-7** Mortar types and recommended applications.

portland cement and lime mix. The unnecessary specification of a Type S mortar when a Type N is adequate in strength sacrifices workability in the wet mortar and a degree of elasticity in the finished wall.

### 6.3.7 Proportion versus Property Method of Specifying Mortar

Conformance with ASTM C270 may be based either on volume proportions or on minimum property requirements (see Fig. 6-8). The *proportion specification*

Mortar Proportions (by Volume)												
Mortar	Type	Portland Cement or Blended Cement	Masonry Cement Type			Mortar Cement Type			Hydrated Lime or Lime Putty	Aggregate (Sand) Measured in a Damp, Loose Condition		
			M	S	N	M	S	N				
Cement-Lime	M	1							$\frac{1}{4}$ over $\frac{1}{4}$ to $\frac{1}{2}$ over $\frac{1}{2}$ to $1\frac{1}{2}$ over $1\frac{1}{4}$ to $2\frac{1}{2}$	not less than $2\frac{1}{4}$ and not more than 3 times the sum of the separate volumes of cement and lime		
	S	1										
	N	1										
	O	1										
Mortar Cement	M	1						1			not less than $2\frac{1}{4}$ and not more than 3 times the sum of the separate volumes of cement and lime	
	M	$\frac{1}{2}$				1			1			
	S						1		1			
	S							1				1
	N								1			1
O									1			
Masonry Cement	M	1			1					not less than $2\frac{1}{4}$ and not more than 3 times the sum of the separate volumes of cement and lime		
	M	$\frac{1}{2}$	1									
	S			1								
	S			1								
	N				1							
O					1							

Mortar Properties<sup>§</sup> (ASTM C270 Test Methods)

Mortar	Type	Minimum Average Compressive Strength at 28 Days (psi)	Minimum Water Retention (%)	Maximum Air Content†(%)
Cement-Lime	M	2500	75	12
	S	1800	75	12
	N	750	75	14
	O	350	75	14
Mortar Cement	M	2500	75	12
	S	1800	75	12
	N	750	75	14
	O	350	75	14
Masonry Cement	M	2500	75	18
	S	1800	75	18
	N	750	75	20
	O	350	75	20

<sup>§</sup> The aggregate ratio, measured in a damp, loose condition, shall not be less than  $2\frac{1}{4}$  and not more than 3 times the sum of the separate volumes of cement and lime.

† When structural reinforcement is incorporated in cement-lime or mortar cement mortars, maximum air content shall not exceed 12%. When structural reinforcement is incorporated in masonry cement mortars, maximum air content shall not exceed 18%.

**Figure 6-8** Use either the proportion specification or property specification for mortar. (Copyright ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428. Reprinted with permission.)