

- 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 [§] | N or S |
| | Parapet walls | N | S |
| Exterior, at or below grade | Foundation walls, retaining walls, manholes, sewers, pavements [†] , walkst and patio [†] | S | M or N |
| Interior | Loadbearing walls | N | S or M |
| | Non-loadbearing partitions | O [§] | N |

[§] 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.

[†] 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 | | | | | | | ¼ over ¼ to ½ over ½ to 1½ over 1¼ to 2½ | not less than 2¼ 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 | 1 | | | |
| | M | ½ | | | | 1 | | 1 | | | |
| | S | | | | | | 1 | 1 | | | |
| | S | | | | | | | 1 | | | 1 |
| | O | | | | | | | | | | 1 |
| Masonry Cement | M | 1 | 1 | | 1 | | | | | | |
| | M | ½ | | | 1 | | | | | | |
| | S | | | 1 | | | | | | | |
| | S | | | 1 | | | | | | | |
| | O | | | 1 | | | | | | | |

| Mortar Properties [§] (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 |

[§] The aggregate ratio, measured in a damp, loose condition, shall not be less than 2¼ 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.)