

# TECHNICAL ADVISORY NOTE

## #205

### IRA, MORTAR AND WORKMANSHIP

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Strong and water resistant joints between mortar and masonry units can be achieved with brick of all IRA values. Laboratory and field investigations indicate that performance of any masonry wall depends on wall design, selection of materials, construction practices, and weather conditions. For example, mortar can stiffen during brick laying because of excessive loss of mixing mortar to a strong suction unit. When this happens, the mortar may not make a complete or intimate bond with the surrounding units, resulting in low strength, or water permeable, joints. The cause of this would be poor selection of mortar, or incorrect construction practices. Both of those issues are addressed in this paper.

**The Most Important Factor; Design** - The design of masonry as part of a wall system is critical to masonry performance. Wall design must account for the fact that a single wythe of brick masonry can **never** be considered a water barrier. To create a barrier, the “collar” behind the brick wythe must be filled solid with a water resistant grout or some other water barrier. The most common and sensible way to make a masonry wall “water proof” is to create a drainage cavity behind the brick wythe, with flashing and weep holes wherever the cavity is interrupted.

**Recommended Construction Practices - General** - The following practices may be utilized to achieve optimum bonding strength and water resistance of brick masonry. The recommendations in Table I are based IRA values at the time of brick laying, which are usually lower values than the Laboratory Test values, due to absorption of moisture in the field. These values are seldom known on the job site, while Laboratory values are available from our independent testing program. The ASTM C67 IRA Field Test can be used to estimate actual field IRA values.

(see Table I on page 2)

#### ***Recommended Practices For Category X (IRA 5 and under):***

Method 1 – When cold, keep brick dry, and heat them to a temperature above 50° F (10° C) for laying. Caution; never heat materials to above 80° F.

Method 2 – Adjust (lower) the amount of mixing water quantity to create mortar with a lower range of flow consistent with good construction practice.

Method 3 – When using Portland cement lime mortar, use the least amount of masonry lime allowed by C270

#### ***Recommended Practices For Category Y (IRA 5 to 30) in hot weather, And Category Z (IRA over 30):***

Method 4 – Lay one brick at a time (“pick and dip” method) rather than stringing out bed mortar ahead of the unit being laid.

Method 5 – Use admixtures in mortar that increase water retentivity and comply with the requirements of ASTM C1384.

Method 6 – Adjust (increase) mixing water quantity to create mortar with an upper range of flow consistent with good construction practice.

Method 7 – When using Portland cement lime mortar, within the limits allowed in ASTM C270, increase the amount of hydrated lime in the mortar.

(continued on page 2)



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**Table I: Recommended Mortar Types<sup>A,B</sup> and Construction Practices For Optimum Bonding**

<b>Field (job site) IRA g/min/30 in<sup>2</sup> (g/min/194 cm<sup>2</sup>)</b>	<b>Cold Weather Below 40° F (4° C)</b>	<b>Moderate Weather</b>	<b>Hot Weather Above 90° F (32° C)</b>
Category X – 5 and under	Type S mortar Method 1, 2, or 3	Type S mortar	Type N mortar
Category Y – 5 to 30	Type N mortar	Type N mortar	Type N mortar Method 4, 5, 6 or 7
Category Z – Over 30	Type N mortar Method 4, or none	Type N mortar Method 4, 5, 6, or 7	Type N mortar Method 4, 5, 6, or 7
			Type O mortar Method 4, 5, or 6

<sup>A</sup> - ASTM C270 – Mortars for Unit Masonry

<sup>B</sup> - Structural or other requirements, such as high wind speed or seismic design requirements, may dictate the use of different mortar types than recommended in the Table. Consult the Appendix of ASTM C270 for guidance.

Care should be taken in using Table I for units that exhibit IRA values close to the boundary of a given range. Experience shows that some brick with IRA values in Category X will provide good masonry performance without using any of the suggested construction practices. Similarly, experience shows that some brick with IRA values in Category Z will provide good masonry performance without using any of the suggested construction practices.

Caution should be used in combining more than one method.

When specifying PCL mortars, always specify by the Proportion Specification Requirements, not Property Specification Requirements, of C270. Further, Type N should be specified as 1:1:6 proportions, and Type S as 1:1/2:4 1/2 proportions. C270 allows for variations from these proportions, while these proportions are the only proportions recommended by Redland Brick, except as modified when Methods 3 and 7 above are used.

**Pre-wetting Category Z brick prior to laying is NOT recommended. This has been shown to be impractical, inconsistent, and counterproductive. Methods 4, 5, 6 and 7, as described, are more suitable to achieve the desired results.**

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