

TECHNICAL BULLETIN

Shoulder Cracks/ Portland Cement Grouts



Exposed shoulders in portland cement grouts can develop cracks. When shoulder cracks occur

owners, contractors and design professionals understandably have concerns. Exposed grout shoulders are considerably more susceptible to thermal volume change than the grout under the base plate. The grout under the plate is essentially at the same temperature as the base plate whereas the shoulder is at some temperature between that of the baseplate, the concrete foundation and ambient temperature.

All cementitious non-shrink grouts have some degree of expansion designed into them. Some expand only in the plastic state, some after initial set and some both. Grout placed under the base plate is restrained by the fixed zero point of the anchored plate. The shoulder grout is unrestrained and will expand at a different rate, or shrink, depending on the ambient temperature and the drying conditions. Often shoulder cracks are from unrestrained expansion, not shrinkage, although the shoulders are also subject to drying shrinkage.

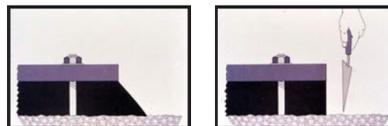
SPECIAL DRYING ENVIRONMENT OF SHOULDERS

The grout in the exposed shoulders is subject to rapid drying, compared to that of the grout under the plate or pre-dampened structure. When wide shoulders exhibit cracking, field examination (coring and lifting of plates), has shown that the cracks typically terminate within 1/8" of the edge of the baseplate. The cracks do not extend below the plate when proper surface preparation, placement, and curing of the grout are achieved.

SOLUTION

Shoulder cracks normally do not affect grout under the plate. Avoiding this problem is best done by using designs with minimum shoulder widths, or employing shoulders which are cut away after initial set but while the grout is still "green". Often just chamfering the shoulder to a 45° angle from the plate to the substrate concrete or foundation is enough. Proper curing with wet rags followed by immediate application of a membrane forming curing compound applied at the proper coverage rate will also minimize cracking.

Non-shrink grouts are designed principally for use in confined areas with the purpose of supporting baseplates, soleplates, structural members, and anchoring. When the grout is properly installed, the impermeable metal plate and the saturated concrete below prevent loss of moisture from the grout under the plate.



FUNCTION OF GROUT SHOULDERS



Shoulders do not serve a structural function for precision grout; they are essentially a construction requirement.

The formed shoulders constitute both an inlet for the grout as well as air release space. When the grout is placed in the formed shoulders to a depth greater than the bottom of the plate the plastic grout serves as a reservoir for the freshly placed grout under the plate. This creates hydrostatic pressure on the grout beneath the plate and prevents settlement shrinkage. Because shoulders are often exposed on both the top surface and on the vertical formed surface the shoulder grout can dry out rather than hydrate. When the forms are removed, the exposed vertical face needs to be cured. If there is a loss of internal moisture, the grout can develop perpendicular cracking due to the tension developed in the grout from the restraint of the substrate, vertical bolts, anchors, or shims within the plate and the shortening caused by differential drying of the top and vertical faces of the grout shoulder.

VOLUME CHANGE TESTING OF "NON SHRINK GROUTS"

"Non-Shrink" grouts complying with ASTM C 1107 are specifically tested for height change, typically using the ASTM C 1090 test procedure. Grouts will attain positive contact under the plate. To function as designed and maintain full bearing, positive placement methods are needed to avoid entrapment of air, and by pre-dampening the substrate to prevent initial loss of moisture from the grout into the substrate. Refer to the specific grout products technical data guide for additional information.

HEALTH , SAFETY AND ENVIRONMENTAL

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