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Technical Bulletin

37 | Epoxy Grouting

Effective Bearing Area of Epoxy Grouts

MEASURING EFFECTIVE BEARING AREA (EBA)

With most manufacturers, ASTM C1339 is the standard test used for measuring the flow and effective bearing area of epoxy grouts. This paper will focus on the effective bearing area portion of this test as it relates to epoxy grouts.

ASTM C1339 is written with polymer based grouts in mind, but can be adapted for cementitious grouts. Essentially a head box hopper is filled with a defined amount of mixed grout. After a resting period of 5 minutes, grout is allowed to flow under only the hydraulic pressure from the head box into a shallow plastic trough with a clear plastic cover plate. The time it takes for the grout to flow and completely contact the cover plate (fill time) and to contact the end plate of the trough (flow time) is measured (Figures 1, 2). This simulates how grout would be installed under a baseplate; the trough represents the area between the foundation and the cover plate acts as the baseplate.

Here are epoxy grout samples after the ASTM C1339 flow box (BASF sample on the far left). Notice some materials never even make it the full length of the box. Visually it is easy to see that the EBA of other materials is less than desirable.

THREE RANGES OF SUPPORT (ASTM C1339)

Once the flow measurements are complete, the grout in the flow box is allowed to harden. It is then removed from the flow box and the grout surface is abraded to open any air bubbles and voids that have formed between the grout and the baseplate. The determination of effective bearing area is a visual assessment to determine what percentage of the grout would actually be supporting the baseplate. ASTM C1339 defines three ranges of support: >85% is high; 70-85% is medium; <70% is low.

A MORE QUANTIFIABLE TEST METHOD

In the ASTM C1339 test, the assessment of bearing area is purely subjective. At BASF we looked for something more scientific, more quantifiable. So we measure bearing area by removing the top Plexiglas plate, wire brushing the grout sample, and then dusting the surface with white powder. We then photograph the surface, and scan the photograph. (Figure 3) Using an off-the-shelf computer program that will display a histogram, we convert the scan to pure black and white, and use functionality within the program to calculate the percentage of light versus dark areas to arrive at a true and accurate percentage, or Effective Bearing Area (Referenced on page 2).

Figure 1: Head box hopper and gate

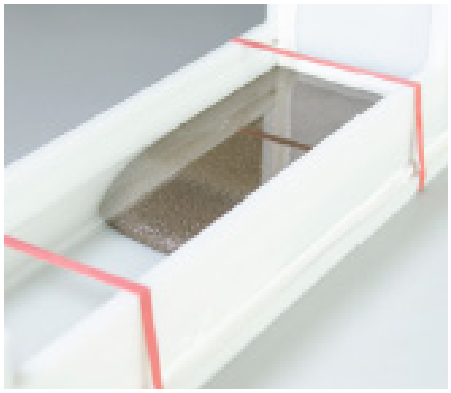


Figure 2: Material flowing through the trough

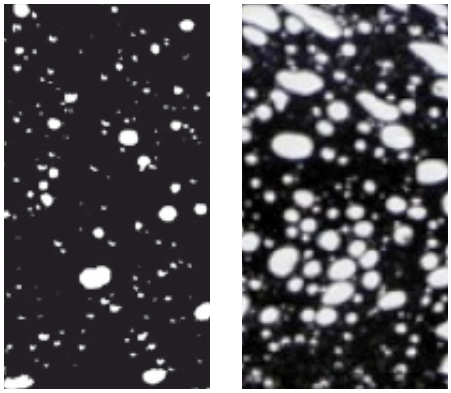


Figure 3: For the measurement of the bearing area a computer analysis is used to generate quantitative results

EXPANSIVE AGENTS IN EPOXY GROUTS

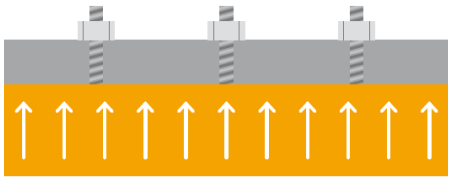
BASF's MasterFlow Epoxy grouts are 100% solids and do not require the use of expansive agents to achieve the best effective bearing area. Some manufacturers add gassing agents to compensate for shrinkage and provide increased volume stability. Unfortunately, use of gassing agents in epoxy grouts often result in a poor bearing area. At BASF we avoid these expansive agents, first because we have a 100% solids material. Secondly under certain conditions humidity, temperature and the depth of the grout pour, can result in excessive out-gassing and a reduction in effective bearing area. If the out-gassing occurs in the plastic state of the epoxy reaction then it results in bubbles being created and entrapped within the solid material. The formation of these bubbles will be detrimental to the effective bearing area and even reduce the compressive strength of the grout.

One manufacturer uses ASTM C827 in reference to effective bearing area and their epoxy grouts. This is the "Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures". The standard was written around cementitious materials, as all cementbased grout contain gassing agents to compensate for early-age shrinkage and this methods affords quanitification of and provides a maximum for this expansion. As stated above, BASF epoxy grouts are volume stable and do not contain gassing agents.

MASTERFLOW EPOXY GROUTS

All of the BASF MasterFlow epoxy grouting products achieve >85% / high effective bearing area in accordance with the ASTM C 1339 test method. By obtaining maximum contact, we ensure that the grouted equipment or rail is stable, and that any imposed loads are evenly distributed, extending the functional service life of equipment, the grout and the foundation.

For more information on the topic of effective bearing area please refer to the article reprint from Concrete Repair Bulletin May/June 2017 "Effective Bearing Area Estimation of Structural Grouts" by Sue Isble and Fred Goodwin.



A stable foundation is required to ensure reliable support.

HEALTH , SAFETY AND ENVIRONMENTAL

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