CONCRETE SASK

TECH TIP #22

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GROUT

WHAT is grout?

ACI defines grout as a mixture of cementitious material and water, or other binding medium, with fine aggregate. Grout is proportioned to produce a pourable consistency without segregation of the constituents. Grout may contain fly ash, slag cement, and chemical admixtures. For some applications, grout may not contain aggregates.

The terms grout and mortar are frequently used interchangeably but there are clear distinctions. Grout need not contain aggregate whereas mortar contains fine aggregate. Grout is supplied in a pourable consistency whereas mortar is not. Grout fills empty spaces such as voids or ducts whereas mortar bonds units together, such as concrete or clay masonry. Both mortar and grout can encase reinforcement.

Grout is often identified by its application. Some examples are bonded prestressed tendon grout, auger cast pile grout, masonry grout, and pre-placed aggregate grout. Controlled low strength material (flowable fill) can be considered as a type of grout.

WHY is grout used?

Grout is used to fill space or cavities and provide continuity between building elements. In some applications, grout will act in a structural capacity, such as in reinforced masonry construction. In building construction, grout can improve fire ratings, acoustic performance, blast resistance, and the thermal mass properties of the building elements.

In projects where small quantities of grout are required, it is proportioned and mixed on site. When larger quantities of grout are needed, it is supplied by a ready mixed concrete producer.

HOW is grout specified?

CSA A179 for masonry grout dictates proportions be loose volumes and is convenient for small quantities of grout mixed on site. When grout is ordered from a ready mixed concrete producer, the specifications should be based on consistency and compressive strength. Converting loose volume proportions into batch weights per cubic metre is subject to errors and can lead to controversies on the job.

Specifications should address the addition of any required admixtures for grout. Conditions of delivery should be specified, such as temperature, time limits, and policies on job site addition of water. Testing frequency and methods of acceptance must be covered in specifications. Conditions of delivery, such as temperature, time limits, and policies on job site addition of water, should be specified. The contractor will need to ensure that the grout consistency is sufficiently flowable. Testing frequency and methods of acceptance must be covered in specifications.

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HOW to test grout?

The consistency of grout affects its strength and other properties. It is critical that grout consistency permit the complete filling of void space without segregation of ingredients.

Consistency of grout may be measured either by slump cone (CSA A23.2-5C) with slumps of 200mm to 275mm generally required for both fine and coarse grout. The consistency of self-consolidating grout is determined by the flow test (CSA A23.2-19C). Spreads of 600mm to 750mm are generally required, with an additional requirement for visual stability Index (VSI), which evaluates the grout's ability to maintain well-dispersed aggregate with minimal segregation and bleeding.

For other types of grouts without aggregate, or only fine aggregate finer than a 2.5mm sieve, consistency is best determined with a flow cone (CSA A23.2-1B). This test is intended to be used for grouts with a flow of less than 35 seconds.

For masonry grout, often referred to as blockfill, strength tests specimens should be cast in molds formed by masonry units having the same absorption characteristics and moisture content as the units used in construction (CSA 179). Do not use non-absorbent cube or cylinder molds for this purpose. The water absorbed from this grout provides a better representation of the strength in the masonry units.

Compressive strength of grouts is determined following the procedures outlined in accordance with CSA A179 or CSA A23.2-1B. Mortar specimens shall be 50mm cubes. Grout specimens shall be cylinders 100mm diameter by 200mm in length. The specimen moulds shall be non-absorbent. Moulding of mortar specimens shall follow the procedure for moulding cube test specimens described in CSA Test Method A3004-C2. Moulding of grout specimens shall follow the procedure for moulding concrete cylinder specimens described in CSA Test Method A23.2-3C.

Special application grouts often require modification of standard test procedures. All such modifications should be noted in the specifications and discussed prior to the start of a project or placement.

References:

1. *CAN CSA A23.1-24/A23.2-24.*
2. *CAN CSA A179-14 (reaffirmed in 2019).*
3. *Concrete in Practice (CIP22 - Grout), National Ready Mix Concrete Association*