

Grout

1. WHAT is Grout?

ACI defines grout as "mixture of cementitious material and water, with or without aggregate, proportioned to produce a pourable consistency without segregation of the constituents. Grout may also contain fly ash, slag and liquid admixtures.

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 space whereas mortar bonds elements together, as in masonry construction.

Grout is often identified by its application. Some examples are: bonded pre-stressed tendon grout, auger cast pile grout, masonry grout, and preplaced aggregate grout. Controlled low strength material (flowable fill) is a type of grout.

2. 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 improve the thermal mass properties of the building elements. In projects where small quantities of grout are required, it is proportioned and mixed on site. The ready mixed concrete producer is generally called upon when large quantities are needed.

3. HOW to Specify Grout.

CSA 179 for masonry grout dictates proportions by loose volumes and is convenient for small quantities of grout mixed on site. These grout mixtures have high cement contents and tend to produce much higher strengths than specified in ACI 530 or Model Codes.

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 meter 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.

Specifications for Masonry Structures (ACI 530.1-05/ASCR 6-05/TMS 602-05) ACI/ASCE Standards American Concrete Institute/ American Society of Civil Engineers/The Masonry Society, 2005.
7. NCMA TEK 9-4A, Grout for Concrete Masonry, TEK 3-2A, Grouting Concrete Masonry Walls and TEK 18-8B, Grout Quality Assurance, National Concrete Masonry Association, Herndon, VA., www.nmma.org
8. CIP 22 Grout, NRMCA with permission, Silver Spring, MD. Reviewed and Revised 2015.

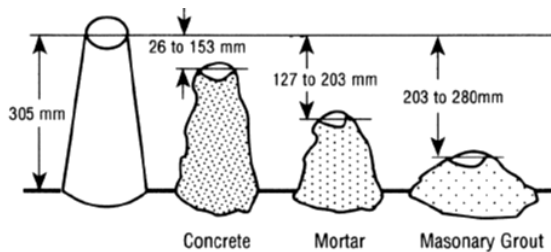
References
1. "Cement and Concrete Terminology", ACI Committee 116R, ACI Manual of Concrete Practice Part 1
2. Cementitious Grouts and Grouting, S.H. Kostmalka, Portland Cement Association, 1990.
3. CSA A23.2-14 Test Methods and Standard Practices for Concrete, The CSA Group, Mississauga, ON, Canada.
4. CSA A179-14 Mortar and Grout for Unit Masonry, The CSA Group, Mississauga, ON, Canada
5. Hedstrom, E.G. and Hogan M.B., "The Properties of Masonry Grout in Concrete Masonry", Masonry Components to Assemblages, ASTM S TP 1063, ed. John H. Matthews, 1990, p. 47-62.
6. "Building Code Requirements for Masonry Structures (ACI 530.1-05/ASCR 6-05/TMS 602-05) and

4. 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 with a slump cone (CSA A23.2-5C), and slumps of 200-250 mm are suggested. This is particularly applicable for grouts containing 25mm or smaller coarse aggregate.

For grouts without aggregate, or only fine aggregate passing a No. 2.5mm sieve, consistency is best determined with a flow cone (CSA A23.2-1B). For flow values exceeding 35 seconds, use the flow table in CSA A179, so modified to use 5 drops in 3 seconds.

Masonry grout ("block fill") for 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 A179). Never use non-absorbent cube or cylinder molds for this purpose.



Comparison of Typical Slumps

Strength of other types of grout is determined using 50mm cubes per CSA A23.2-1 B. This method allows for field preparation, recognized fluid consistency and also affords a means for determining compressive strength of grouts that contain expansive agents or grout fluidifiers. This is extremely important, since "expansive" grouts can lose substantial compressive strength if cubes are not confined. However, cylindrical specimens 150 x 300 mm or 100 x 200 mm may give more reliable results for grouts containing coarse aggregate.

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 the job.

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