

Concrete Yield

1. WHAT is Concrete Yield?

Concrete yield is the volume of freshly mixed, unhardened concrete made from a known quantity of ingredients. It is sold on a volume basis, usually in cubic meters (m³).

Since ready-mix concrete is batched by mass it is necessary to convert the plant scale readings to volume for sale. CAN/CSA - A23. 1 states: "The volume of freshly mixed and unhardened concrete in a given batch shall be determined from the total mass of the batch divided by the density of the concrete ... The density shall be determined in accordance with CSA Test Method A23.2-6C."

2. WHY Do Yield Problems Occur?

Most yield problems concern a real or imagined under-yield in concrete volumes. Actual yields can be corrected using unit weight measurements and yield calculations. In addition, apparent yield shortages are sometimes caused by the following:

- Miscalculating form volumes or slab thicknesses. A fractional error may result in more concrete being used than was originally ordered.
- Form deflection or distortion under the weight of the fresh concrete.
- Irregular subgrades which require extra concrete, or subgrade settlement under pressure from the fresh concrete.
- Waste, spillage, loss of some entrained air, settlement of wet mixes and use of excess concrete in incidental mud sills or footings are some other reasons why concrete shortages have been reported..



CSA A23.2-6C Density, and yield of plastic concrete

REFERENCES
CSA A23.1 Concrete Materials and Methods of Concrete Construction. The CSA Group, Mississauga, Ontario, Canada.
CSA A23.2 Test Methods and Standard Practices for Concrete. The CSA Group, Mississauga, Ontario, Canada.
ASTM C 94, Standard Specification for Ready-Mixed Concrete, American Society for Testing Materials, West Conshohocken, PA.
ASTM C 138, Standard Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete, American Society for Testing Materials.

Ready-Mixed Concrete. Gaynor, R.D. NRMCA Publication 186, NRMCA, Silver Spring, MD.
No Minus Tolerance on Yield. Majisch, W.R. and Suprenant, B.A., Concrete Producer, May 1998.
Causes for Variation in Concrete Yield. Suprenant, B.A., The Concrete Journal, March 1994.
An Analysis of Factors Influencing Concrete Paving Cost, by Harold J. Halm, Portland Cement Association, Skokie, IL.
CIP #8 Discrepancies in Yield. Concrete in Practice NRMCA, Silver Spring, MD.
Reviewed and revised 2016.

1. Select a representative concrete test sample and fill an appropriate unit weight measure in accordance with CSA A23.2-6C.

2. Weigh the concrete filled measure and determine the following:

$$\text{Density kg/m}^3 = \frac{\text{net concrete mass kg}}{\text{volume of measure m}^3}$$

$$\text{Yield m}^3 = \frac{\text{Mass of all Materials Batched kg}}{\text{Density kg/m}^3}$$

3. HOW are Yield Problems Prevented?

- a. In general, avoid all of the causes of apparent yield discrepancies listed above.
- b. Check concrete yields by performing CSA Test Method A23.2-6C early in the job. Repeat periodically and especially if problems arise.
- c. The mixer truck can be weighed empty and full as a rough check. Care should be taken to ensure that such things as fuel, water and mud do not adversely affect the two weights.
- d. Measure form work carefully. Near the end of a pour, carefully estimate balance load requirements to avoid shortages or overages.
- e. Forms should be constructed to withstand the pressure of fresh concrete without deflection or distortion.
- f. Ensure that subgrade is level and well compacted for slabs on grade.
- g. Include sufficient concrete volumes to account for waste, spillage, over excavation and other factors. Some jobs may require a larger allowance for contingencies than others.