GDT 29

A. Scope

For a complete list of GDTs, see the Table of Contents.

Use this test method to determine the flexural strength of concrete by using a simple beam with third-point loading.

B. Apparatus

The apparatus consists of the following:

1. Beam Breaker: Use third-point loading to make flexure tests of concrete. The method employs bearing blocks that ensure the forces applied to the beam will be vertical only and applied without eccentricity.

   The apparatus design for making flexure tests of concrete should incorporate the following principles:

   a. Keep the distance between supports and points of load application constant for a given apparatus.
   b. Be able to apply the load normal to the loaded surface of the beam without eccentricity of loading.
   c. Keep the direction of the reactions parallel with the direction of the applied load at all times during the test.
   d. Apply the load at a uniform rate without shock.
   e. Maintain the ratio of distance between point-of-load application and the nearest reaction to the depth of the beam as 1:1.

      Keep the directions of loads and reactions parallel by judiciously using linkages, rocker bearings, and flexure plates. Avoid loading eccentricity with spherical bearings.

C. Sample Size and Preparation

1. Give the test specimen a span that is three times its depth as tested.
2. Make the specimen in accordance with GDT 35.

D. Procedures

1. Turn the test specimen on its side with respect to its position as molded. Center it on the bearing blocks.
2. Bring the load-applying blocks in contact with the upper surface at the third points between the supports.
3. If the load-applying blocks and supports do not make full contact with the specimen because the surfaces of the specimen are out of plane, cap the specimen according to the requirements given in AASHTO T 126.

   Sulfur mortar and neat hydraulic cement paste are recognized as suitable for capping hardened concrete specimens.

   a. Allow sulfur caps to harden for at least one hour before applying load.
   b. Allow cement caps to harden for a sufficient time (depending on the type of cement) to prevent cracking or flowing under the applied load.
4. Apply the load rapidly up to approximately 50 percent of the breaking load.
5. Slow the load application so that the increase in extreme fiber stress does not exceed 150 psi (1034 kPa) per minute.
6. Measure to the nearest 0.1 in (2.5 mm) to determine the average width and average depth of the specimen at the section of failures.

E. Calculations

1. If the fracture occurs within the middle third of the span length, calculate the modulus of rupture as follows:
2. If the facture occurs outside the middle third of the span length by not more than 5 percent of the span length, calculate the modulus of rupture as follows:

   where:

$$R = \frac{P_1}{bd^2}$$

R = Modulus of rupture, in pounds per square inch (MPa)

P_1 = Maximum applied load indicated by the testing machine, in pounds (newtons)

l = Span length, inches (millimeters)

b = Average width of specimen, inches (millimeters)

d = Average depth of specimen, inches (millimeters)

a = Distance between line of fracture and the nearest support, measured along the center line of the beam's bottom surface, inches (millimeters)

Note: The beam's weight is not included in the calculation.

3. If the fracture occurs outside the middle third of the span length by more than 5 percent of the span length, discard the results of the test.

F. Report

Include the following information on the Rainhart Recording Chart (78C16):

1. Identification number
2. Average width to the nearest 0.1 in (1mm)
3. Average depth to the nearest 0.1 in (1 mm)
4. Span length in inches (millimeters)
5. Maximum applied load in pounds (newtons)
6. Modulus of rupture calculated to the nearest 5 psi (1 MPa)
7. Defects in specimen
8. Age of specimen