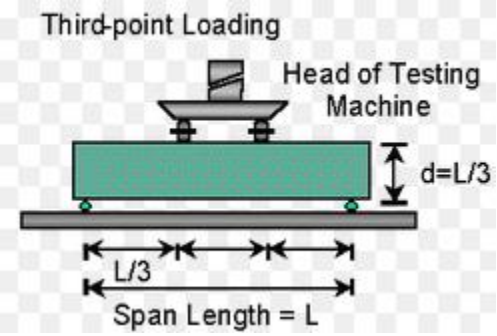
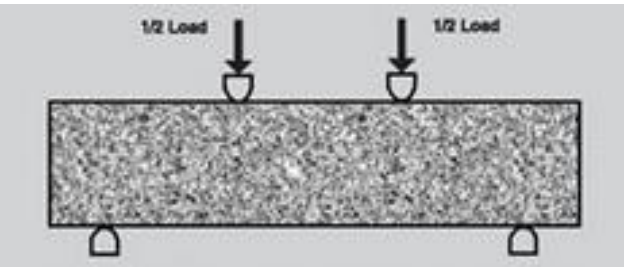
Flexural Test by Third Point Loading

****Note:** If further information is needed, please refer to ASTM C-78.

Summary: This test method consists of a simply supported beam where a force is applied across a plate that contacts the specimen at two points to determine the flexural strength of concrete. Results are calculated and reported as the modulus of rupture.





Procedure:

1. Take the test specimen (4” x 4” x 14”) out of the rectangular wooden mold using a screwdriver
    a. Screwdriver is used to take out screws holding mold together
        i. Screws need to be saved so the mold can be reused
    b. **Remember:** Moist-cured test specimens shall be tested as soon as possible after removal from moist storage. Surface drying of the specimen results in a reduction in the measured flexural strength
    c. All test specimens shall be broken within the permissible time tolerances as follows:

Test Age	Permissible Tolerance
24 h	± 0.5 h or 2.1 %
3 days	2 h or 2.8 %
7 days	6 h or 3.6 %
28 days	20 h or 3.0 %
90 days	2 days 2.2 %

2. Weigh the test specimen once removed from the mold as soon as possible
    a. Density is then calculated because the volume is already known(Density= Mass/Volume)
3. Insert the proper top plate into the machine using 2 people
    a. One person holding the top plate in position while the other connects it to the machine
4. The bottom plate should be placed on the testing machine bed and be centered with the top plate
    a. The test specimen can then be placed on the bottom plate and centered on the support blocks
        i. Measure the distance of overlap of the specimen from where it hangs over the support blocks to make sure they are equal distances
5. Turn on the machine and bring the top plate down fast (0.02”-2”)
6. Move the top plate down so it is just touching the specimen

a. Verify the top plate is centered on the specimen as well as the bottom plate by measuring distances
b. Any gaps can be closed using shims if the specimen and top plate don't sit parallel with each other

7. Set the loading rate of the machine at 0.002 in/second
    a. The specimen should be loaded continuously and without shock
8. The load should be applied at a constant rate until the breaking point
    a. Breaking point is defined as the maximum value before the load drops off
    b. Maximum load applied before rupture will be saved in the machine and should be recorded
9. Measure the specimen after the test
    a. Determining dimension of cross section for use in calculating modulus of rupture
        i. Take measurements across one of the fractured faces after testing
            1. Width and depth measured with the specimen as oriented for testing
            2. For each dimension: take one measurement at edge and one at the center of the cross section
            3. Use the 3 measurements to determine the average width and average depth
        ii. Inspect the fractured cross section
            1. Make note of any unusual observations including cracks, voids, etc.
10. Flexural strength is measured by modulus of rupture
    a. Equation to calculate this is as follows:

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

where:

R = modulus of rupture, MPa [psi],

P = maximum applied load indicated by the testing machine, N [lbf],

L = span length, mm [in.],

b = average width of specimen, mm [in.], at the fracture, and

d = average depth of specimen, mm [in.], at the fracture.

11. Make sure you clear the storage of the maximum applied load of the machine before you start the next test and repeat the procedure