

Concrete

Lecture - 4

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Compressive Strength Test

2

Split Tensile Strength

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Flexural Strength

4

Bond Strength

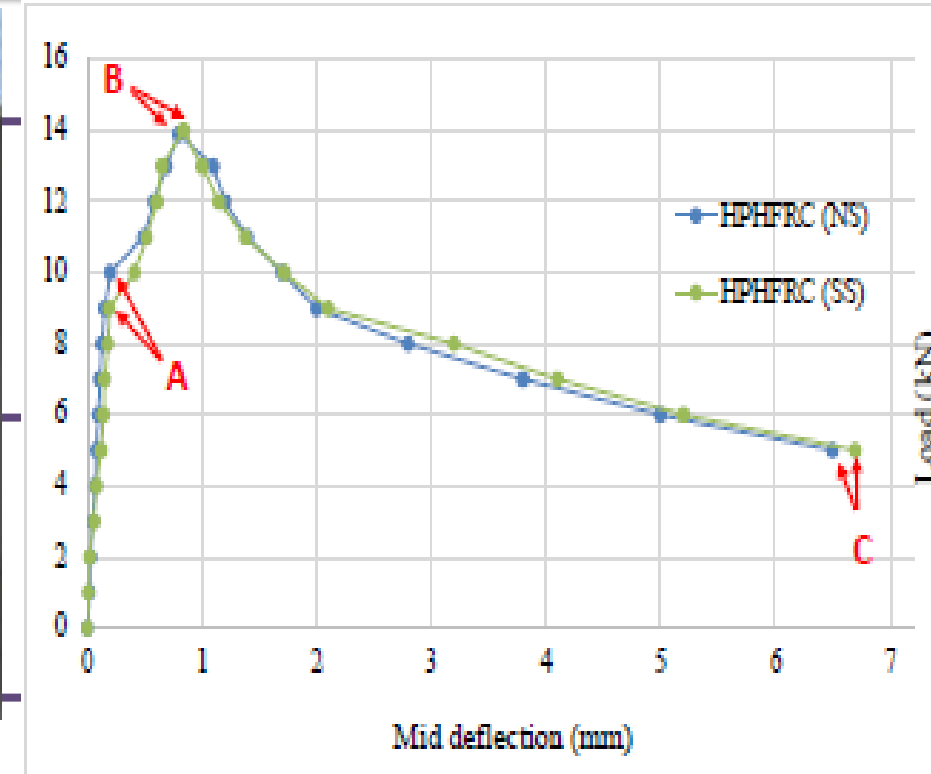
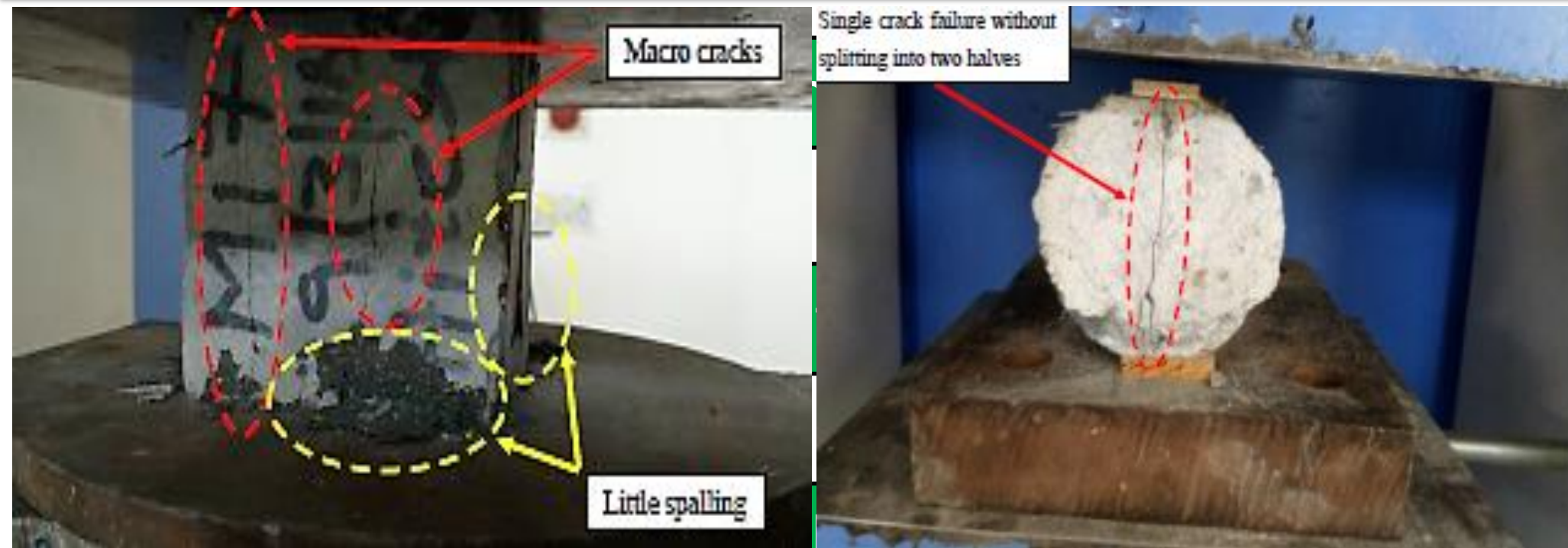
5

Shear Strength



**Hardened
Property Test**

Properties of Concrete in hardened State



IS Code 516:1959



Compressive Strength



IS : 516 - 1959
(Reaffirmed 1999)
Edition 1.2
(1991-07)

Indian Standard
**METHODS OF TESTS FOR
STRENGTH OF CONCRETE**

(Incorporating Amendment Nos. 1 & 2)

UDC 666.97 : 620.17

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Clause 2.8

150 x 150 x 150 mm, if the Maxi. Agg. Size < 20mm, 10 cm Cube may be used as an alternative, Cylinder size specimen can be used (150 diameter x 300 mm length)

Clause 5.3

Test Age
7 Days, 28 Days, 1 Year
if test at greater ages are
required

Clause 5.4

Number of Specimen
At lease 3 specimen,
preferably from different
Batch

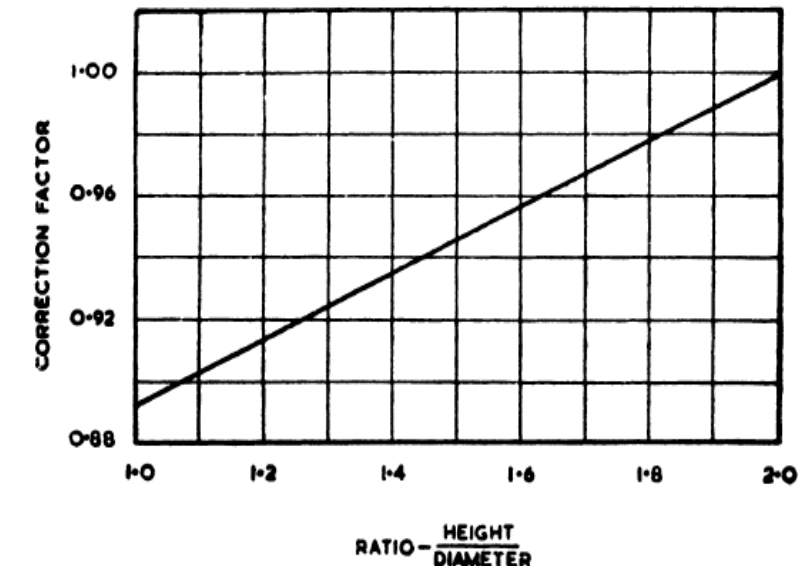
Clause 5.5.1

Rate of loading 140 kg/sq
cm/min

Clause 5.6

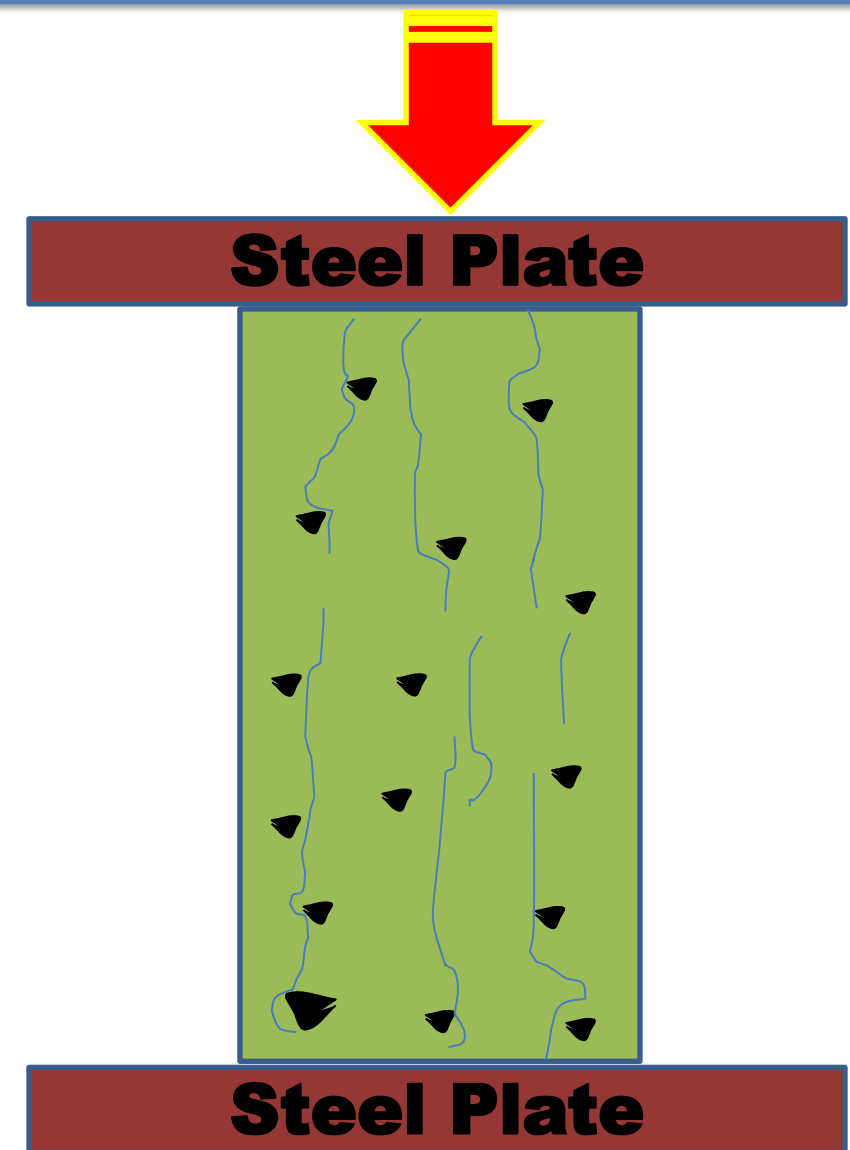
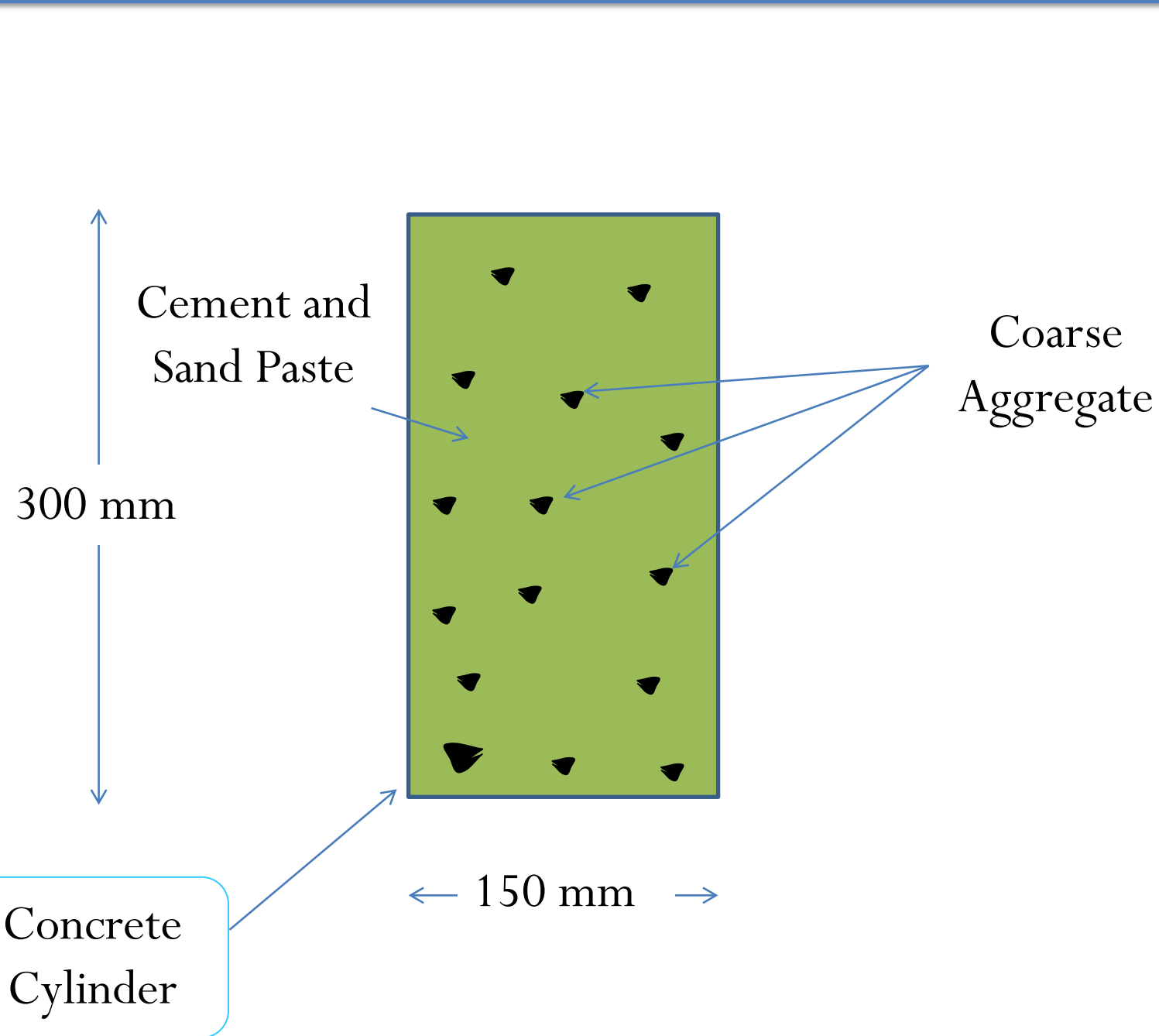
Calculation
Maximum Load/Cross-
section Area

Clause 5.6.1 Correction Factor



The product of this correction factor and the measured compressive strength shall be known as the corrected compressive strength, this being the equivalent strength of a cylinder having a height/diameter ratio of two. The equivalent cube strength of the concrete shall be determined by multiplying the corrected cylinder strength by 5/4.

Failure in Concrete Cylinder

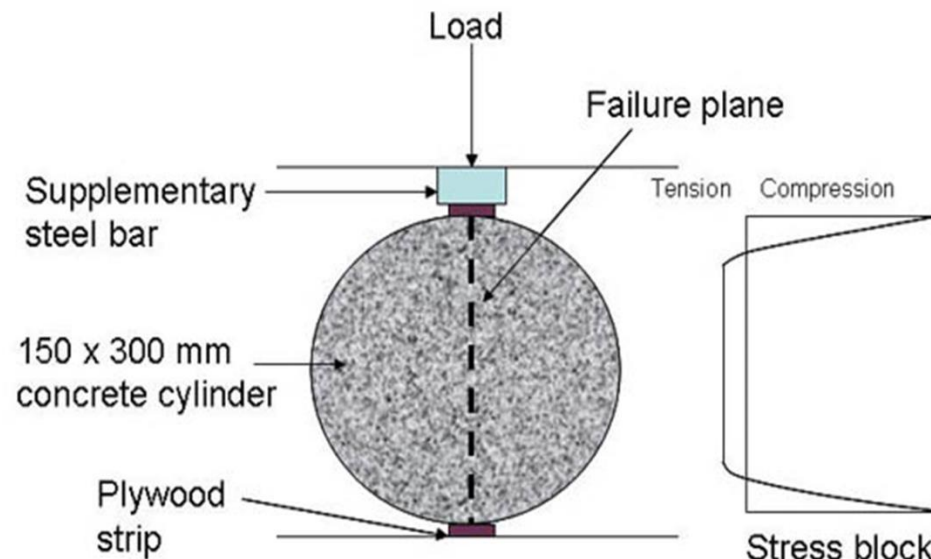


Split Tensile Strength

IS 5816 : 1999
(Reaffirmed 2004)

भारतीय मानक
कंक्रीट की खंडित तनन सामर्थ्य — परीक्षण पद्धति
(पहला पुनरीक्षण)

Indian Standard
SPLITTING TENSILE STRENGTH OF CONCRETE —
METHOD OF TEST
(First Revision)



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NEW DELHI 110002

July 1999

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Clause 3.1

Cube specimen shall be of size not less than four times the maximum size of the coarse aggregate and not less than 150 mm.

Clause 3.2

☞ The cylindrical specimen shall have diameter not less than four times the maximum size of the coarse aggregate and not less than 150 mm

☞ The length of the specimens shall not be less than the diameter and not more than twice the diameter.

☞ e.g. 150 mm dia. × 300 mm length

Clause 7.6

Rate of loading 1.2 N/(mm²/min) to 2.4 N/(mm²/min)

Rate of increase of load may be calculated from the formula:

$$(1.2 \text{ to } 2.4) \times \pi/2 \times l \times d \text{ N/min}$$

Clause 5.6

Calculation

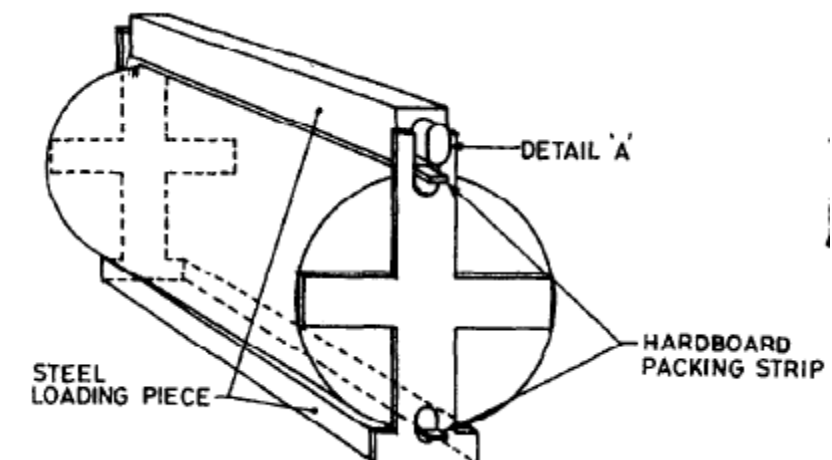
$$F_{ct} = (2 \times P) / (\pi \times l \times d)$$

Clause 5

Test Age
7 Days, 28 Days,

Clause 6

Number of Specimen
At least 3 specimen for
each age of test



Flexural Strength Test



IS : 516 - 1959
(Reaffirmed 1999)
Edition 1.2
(1991-07)

Indian Standard
METHODS OF TESTS FOR
STRENGTH OF CONCRETE
(Incorporating Amendment Nos. 1 & 2)

UDC 666.97 : 620.17

If 'a' is < 170 mm for a 150 mm specimen, or less than 110 mm for a 100 mm specimen, the results of the test is discarded

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Clause 7.2

150 x 150 x 700 mm. Alternatively if the Maxi. Agg. Size < 19 mm (100 x 100 x 500 mm) may be used

Clause 8.3.1

Rate of loading

400 kg/min for 150 mm
size specimen
180 kg/min for 100 mm
size specimen

Modulus of Rupture $f_b = \frac{pxl}{bxd^2}$

When 'a' > 200 mm for 150 mm specimen, or greater than 133 mm for a 100 mm specimen

Clause 8.4

Calculation

$$f_b = \frac{3pxa}{bxd^2}$$

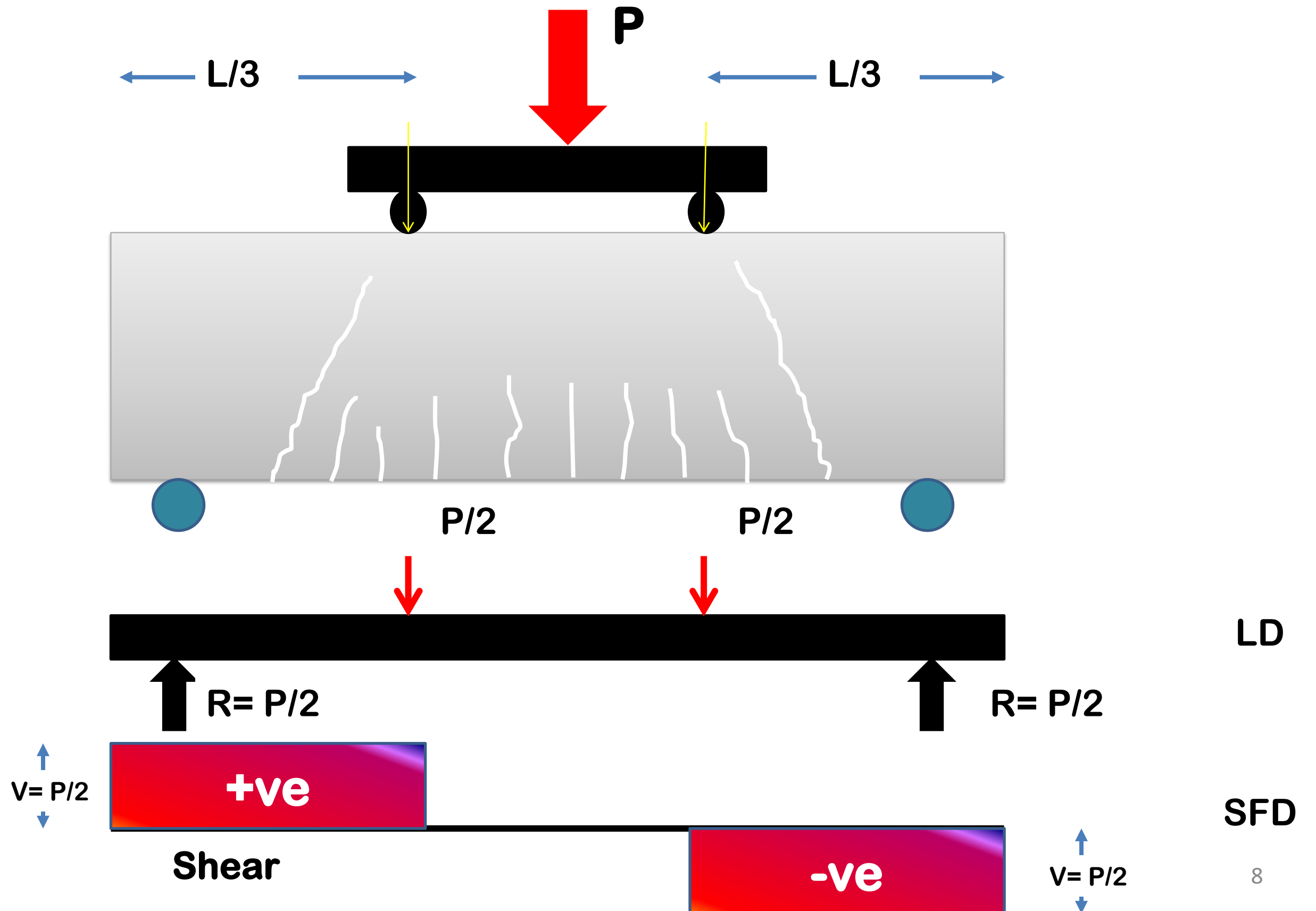
When 'a' < 200 mm but > 170 mm for 150 mm specimen, or less than 133 mm but > 110 mm for a 100 mm specimen

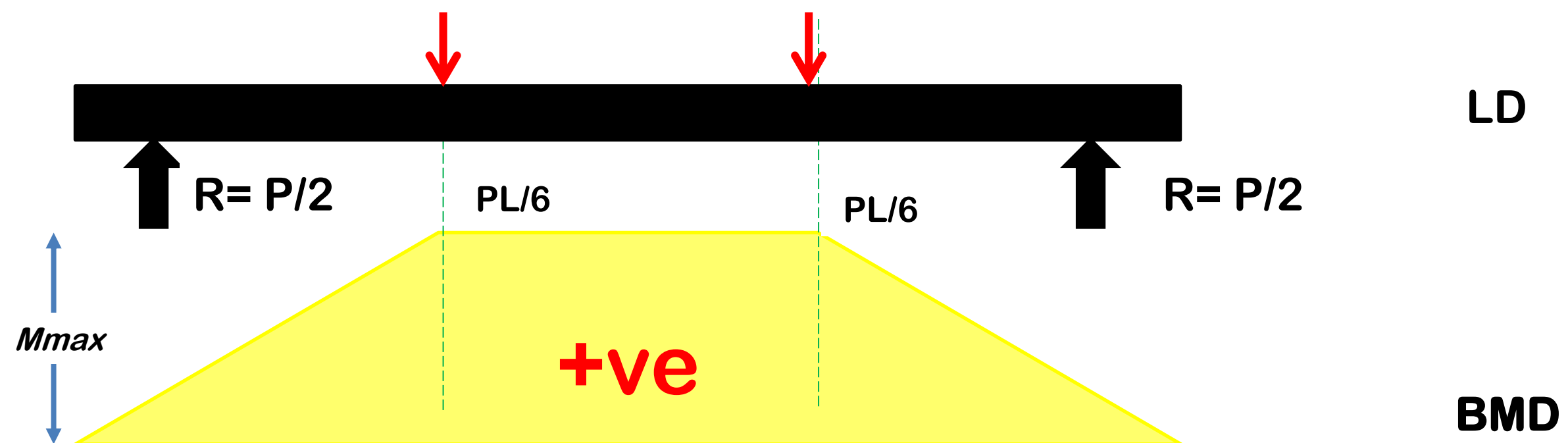
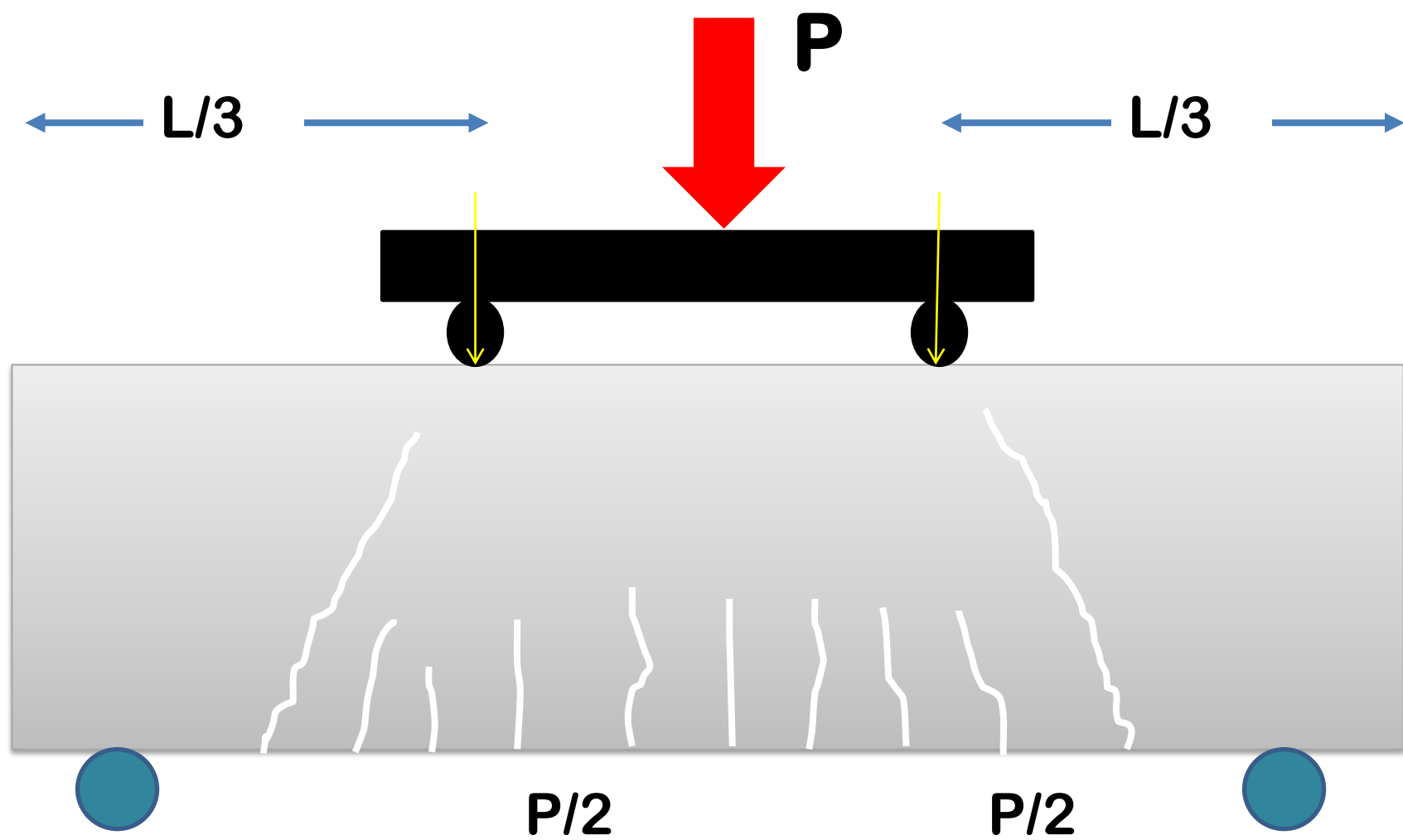
b = measured width of the specimen

D = measured depth of the specimen at the point of failure

L = length of the span on which the specimen was supported

P = maximum load in kg applied to the specimen



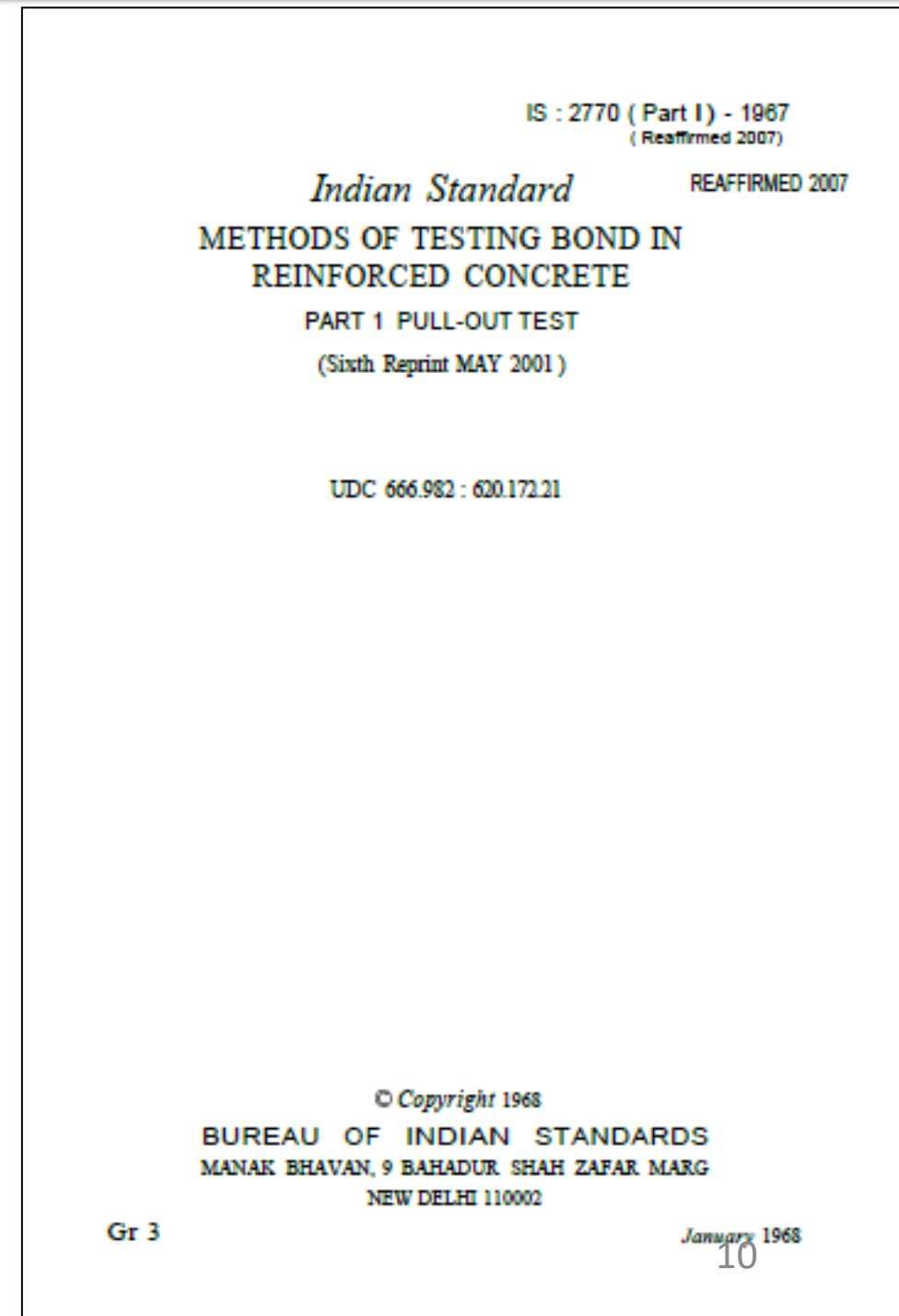


Bond Strength



When concrete surrounds steel as in the case of reinforced concrete, it firmly grips the steel. This property of adhesion between steel and concrete is called Bond Strength. The bond strength can be increased by using deformed bars instead of plain bars in concrete mix and decreasing water-cement ratio. On an average bond strength is taken approximately as 10% of compressive strength.

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Bond Strength

Clause 3.1

Size of cube is 100mm to test the bond strength up to and including 12 mm diameter reinforcement

Size of cube is 150mm to test the bond strength over 12 mm up to and including 25 mm diameter reinforcement

Size of cube is 225mm over 25 mm diameter reinforcement

Clause 3.3

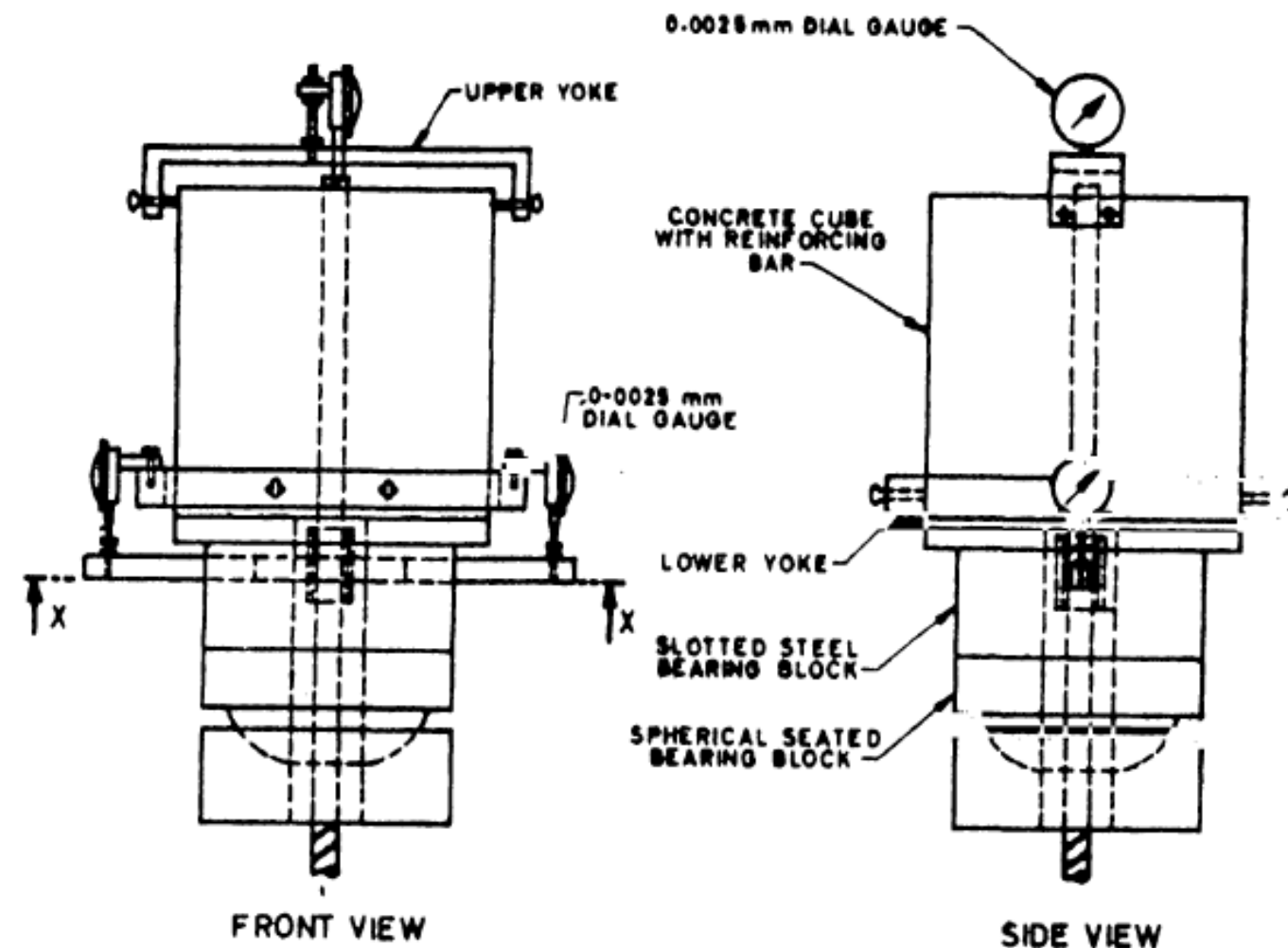
Number of Specimen

At least 3 specimen of
deformed bars

And 3 for plain bars for the
comparison

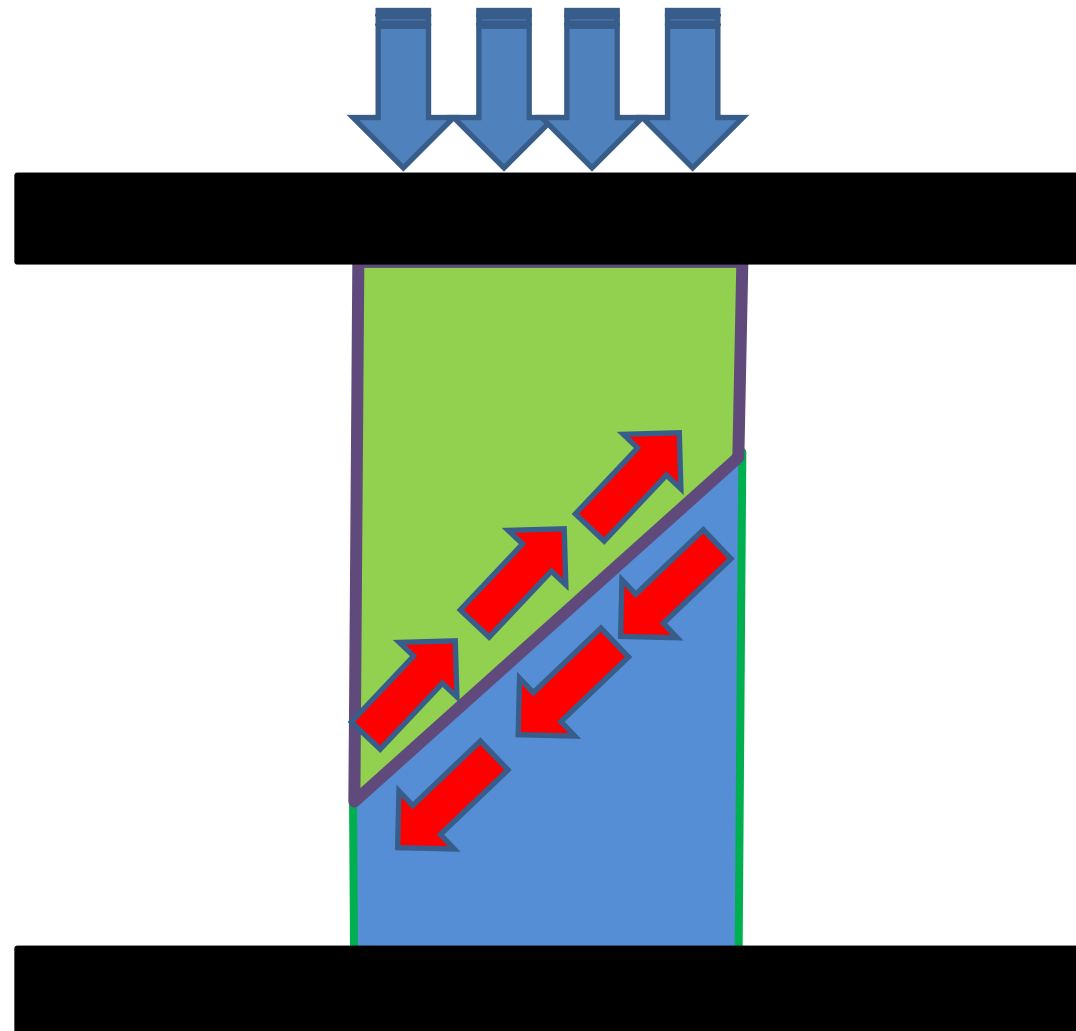
Clause 4.4.2

Rate of loading 2250
kg/min



Shear Strength

The shear strength of concrete is always accompanied by tension and compression due to bending. Shear strength is 10 to 12% of compressive strength. Concrete fails in shear due to diagonal tension.



Summary



👉 *Compressive Strength Test*

👉 *Split Tensile Strength Test*

👉 *Flexural Strength Test*

👉 *Bond Strength*

👉 *Shear Strength*

THANK YOU