MATERIALS AND METHOD

Material and Equipment

Material

1. Concrete

The target compressive strength of concrete for column was 320 kg/cm^2. The maximum size of coarse aggregate was 10mm. (3/8in.), since the smallest longitudinal spacing of WWR was only 7.50 cm. The fine aggregate was natural river sand. The cement was type I Portland cement and the water cement ratio was 0.60 without admixtures. The mix proportion of cement : water : coarse aggregate : fine aggregate in 0.14 m^3 is 45:96:118:27 by weight, expressed in kilogram. As described subsequently, the specimens were cast in six different batches for each of eighteen specimens, resulting in a total 6 batches. For each batch, three standard cylinders were also cast and tested in compression at the time the specimen were tested according to ASTM 14 C192, typically around 28 days. The average compressive strength, fc' of the three cylinders are given in Table2.

2. Steel reinforcement

2.1 Deformed bars (12 mm diameter grade SD 30) were used for longitudinal reinforcement and tested according to ASTM A370.

2.2 Round bars (6 mm diameter grade SR 24) were used for transverse reinforcement and tested according to ASTM A370.

2.3 Welded wire reinforcements (6 mm diameter) were used for transverse reinforcement and tested according to ASTM A185.

3. Steel formwork

Equipment

1. PC Computer
2. Load Cell capacity 100 Tons
3. Data logger
4. Strain gauges
5. Standard Cylindrical Molds Ø 15cm. x 30cm.
6. Universal Testing Machine
7. Bearing Plate size 20cm x 20cm x 0.30 cm. thickness with ball bearing Ø20cm.
8. LDVT and electrical transducer
9. Concrete mixing machine
10. Digital Camera

Experimental Research

The experimental research consisted of 18 square columns with different parameters of confinement. Specimen would be tested under concentric uniaxial compression to failure, the cross section of specimens were 0.15m x 0.15m and height 0.75 m. Figure 9 shows two different types of transverse reinforcement used while the compressive strength of concrete was 320 kg/cm^2 (cylinder) at 28 days.

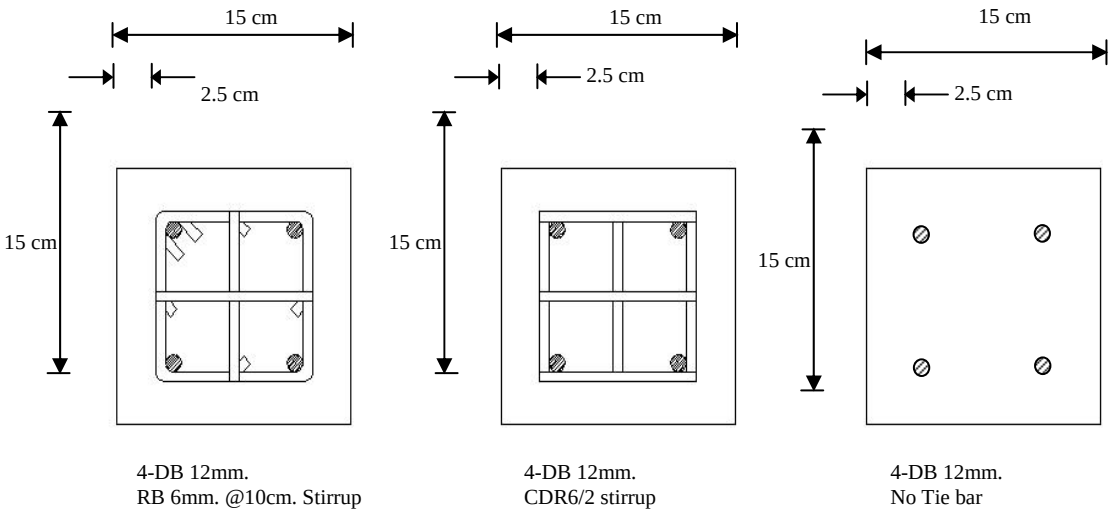

Figure 9 Cross section of column specimens

Table 1 Detail of reinforced concrete column test specimens

Specimen Designation	Type of tie bar	Grid Number	Longitudinal spacing (cm.)	Number of Specimens	Remark
RB6(7.5)	RB6	2x2	7.5	3	
RB6(10)	RB6	2x2	10	3	Strain gages
CDR6/2(7.5)	CDR6	2x2	7.5	3	
CDR6/1(10)	CDR6	1x1	10	3	
CDR6/2(10)	CDR6	2x2	10	3	Strain gages
No Tie bar	-	-	-	3	

Remark: RB6 is round bar diameter 6mm with 2 grids and CDR6/2 is welded wire reinforcement diameter 6mm with 2 grids.

Specimen preparation

1. Round bar diameter 6mm can be bent up to requirement. Welded wire reinforcement can not be bent normally, therefore electric welding is used to weld and built up the section as required.

2. Longitudinal reinforcement and transverse tie bar are built up as required then strain gages are installed at transverse reinforcement at middle of column to investigate the strain of transverse reinforcement during testing.

3. Six sets of steel formwork are used to cast the specimens in a single concrete batch. Each form consisted of three chambers for three equal-size specimens to be cast horizontally with an open surface on top.

4. Placing concrete in formwork. Vibration for compaction is required after placing and concrete will be touched up on surface for smoothness.

5. After concrete setup of about 1 day the formwork is taken off and specimens are cured by spraying water then all specimens are covered by fabric or plastic sheets.

6. Strain gages are tested by electrical resistance (Ohm meter) after taking off formwork.

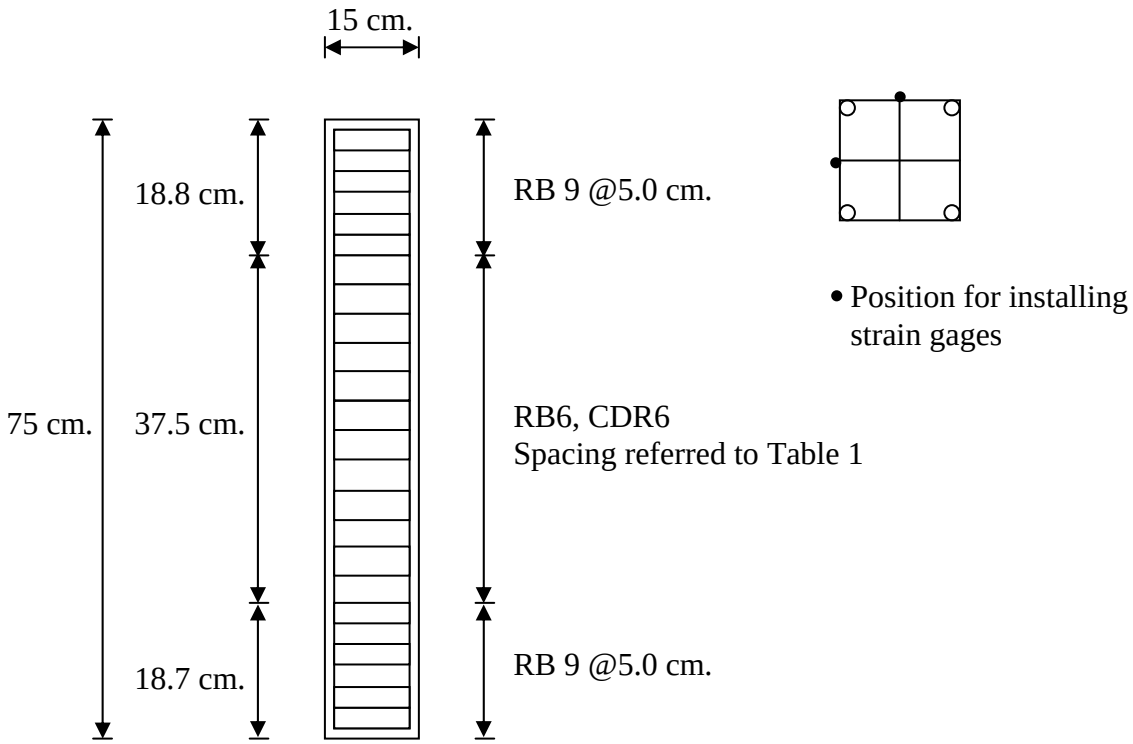

Figure 10 Detail section of specimen

Testing

After the specimen has been cured for about 28 days, it is ready for testing uni-axial compression.

1. Set up specimens on the Universal machine, put steel plate size 15x15x2.5 cm together with ball bearing at both ends for simulated pin support at the end of column.

2. Set up LDVT with transducer for measurement over all axial deformation at the middle of height of columns and connect to PC Computer.

3. After setting up the specimen and all instruments as required then apply compression force to specimen slower and observe behavior of each stage of column. The test is stopped only when the axial stress, after reaching a peak value much earlier, has decreased to small fraction of the ultimate capacity.

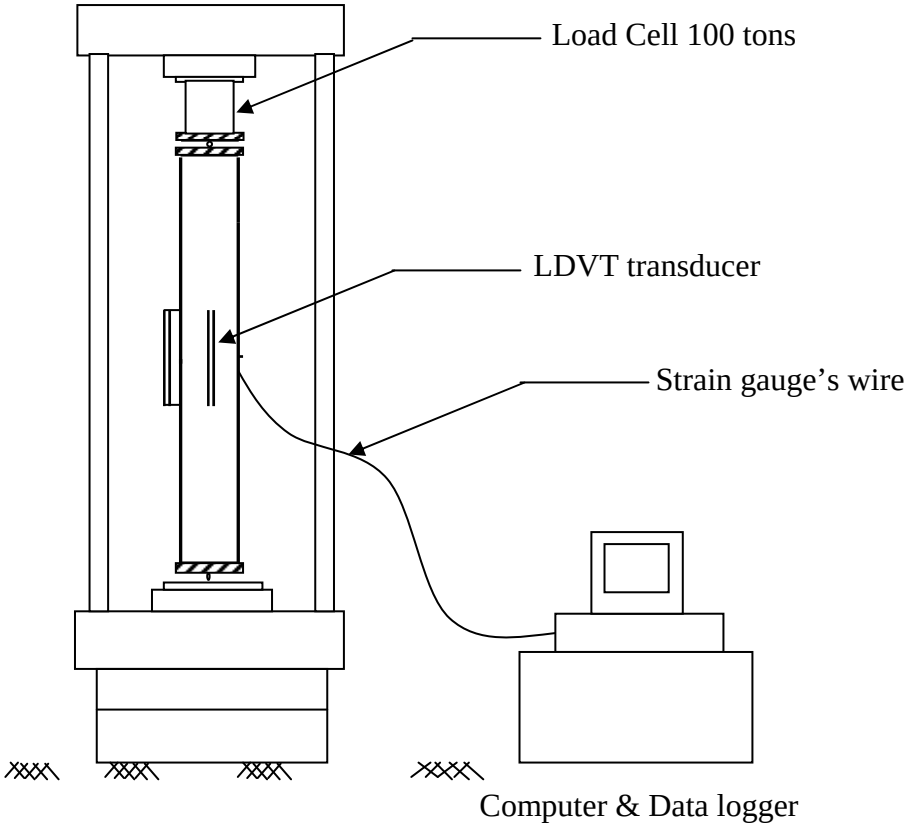

Figure 11 Column testing setup