

UNIT - II

Slump flow test :-

The slump flow test is done to assess the horizontal flow of concrete in the absence of obstructions. It is a most commonly used test and gives good assessment of filling ability. It can be used at site. The test also indicates the resistance to segregation.

Equipments: The usual slump cone having base diameter of 200mm, top diameter 100mm and height 300mm is used.

• A stiff base plate square in shape having at least 700mm side. Concentric circles are marked around the center point where the slump cone is to be placed.

* A towel

- Scoop
- Measuring tape
- stop watch

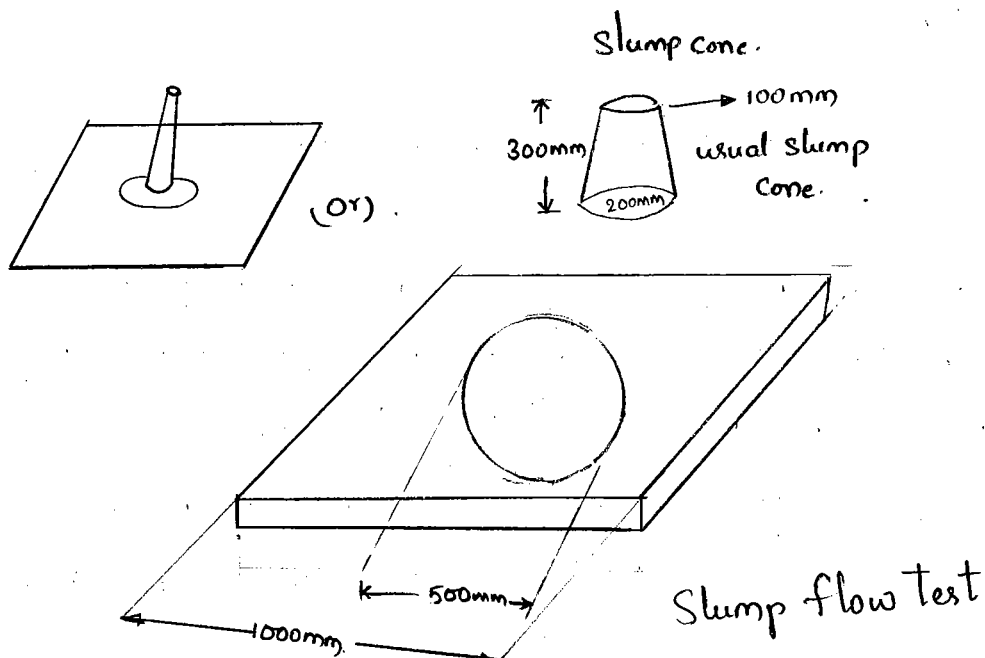
Procedure: 1) About 6 litre of concrete is needed for this test.

2) Place the baseplate on level ground. Keep the slump cone centrally on the base plate. Fill the cone with the scoop. Do not tamp.

3) Simply strike off the concrete level with the towel. Remove the surplus concrete lying on base.

- (4) Raise the cone vertically and allow the concrete to flow freely.
- (5) Measure the (field) final diameter of the concrete in two perpendicular directions and calculate the average of the two diameters.
- (6) This is the slump flow in mm. Note that there is no water (or) cement paste (or) mortar without coarse aggregate is seen at the edge of the spread concrete.

The higher the flow value, the greater its ability to fill formwork under its weight. A value of at least 650mm is required for SCC. In case of Severe Segregation most coarse aggregate will remain in the center of the pool of concrete and mortar and paste at the periphery of concrete.



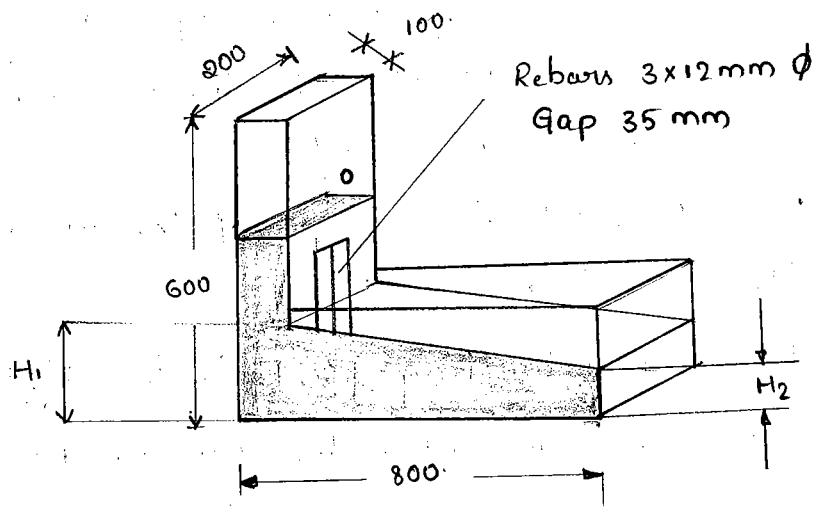
L-box test method :-

This method is developed in Japan. The test assesses the flow of concrete, and also the extent to which the concrete is subjected to blocking by reinforcement.

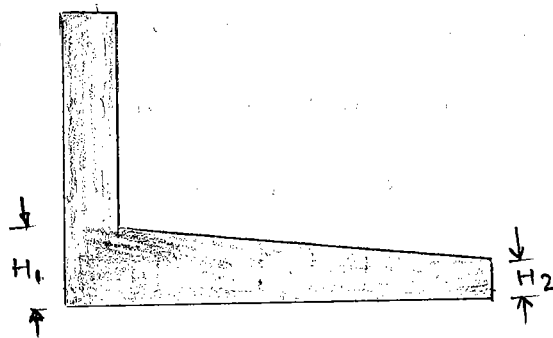
- Procedure :-
- 1) About 14 litres of concrete is required for this test.
 - 2) Ensure that sliding gate can open freely and then close it. Moisten the inside surface, remove all surplus water.
 - 3) Fill the vertical section of the apparatus with concrete.
 - 4) leave it standing for 1 minute. Lift the sliding gate and allow the concrete to flow out into the horizontal section.
 - 5) Simultaneously start the stopwatch and record the time taken for the concrete to reach 200 and 400 mm marks.
 - 6) When the concrete stops flowing, the height H_1 and H_2 are measured.
 - 7) Calculate H_2/H_1 , the blocking ratio.
 - 8) The whole test has to be performed within 5 minutes.

Interpretation of result :-

- If the concrete flows as freely as water, at rest it will be horizontal
- Therefore H_2/H_1 will be equal to 1.



(Or)



L-box

U-box test method :-

The test was developed in Japan. This test is used to measure the filling ability of self compacting concrete. This apparatus consists of vessel that is divided by a middle wall into two compartments.

An opening with a sliding gate is filled between the two compartments. Reinforcing bars with nominal dia. of 13mm are installed at the gate with center to center distance of 50mm. This creates a clear spacing of 35mm b/w the bars. The left hand section is filled with about 20lit. of concrete. The gate is then lifted and the concrete flows to the other section. The height of concrete in both the section is measured.

Equipment :-

- 1) U-box of a stiff non absorbing material
- 2) Trowel
- 3) Scoop
- 4) Stopwatch.

Procedure :-

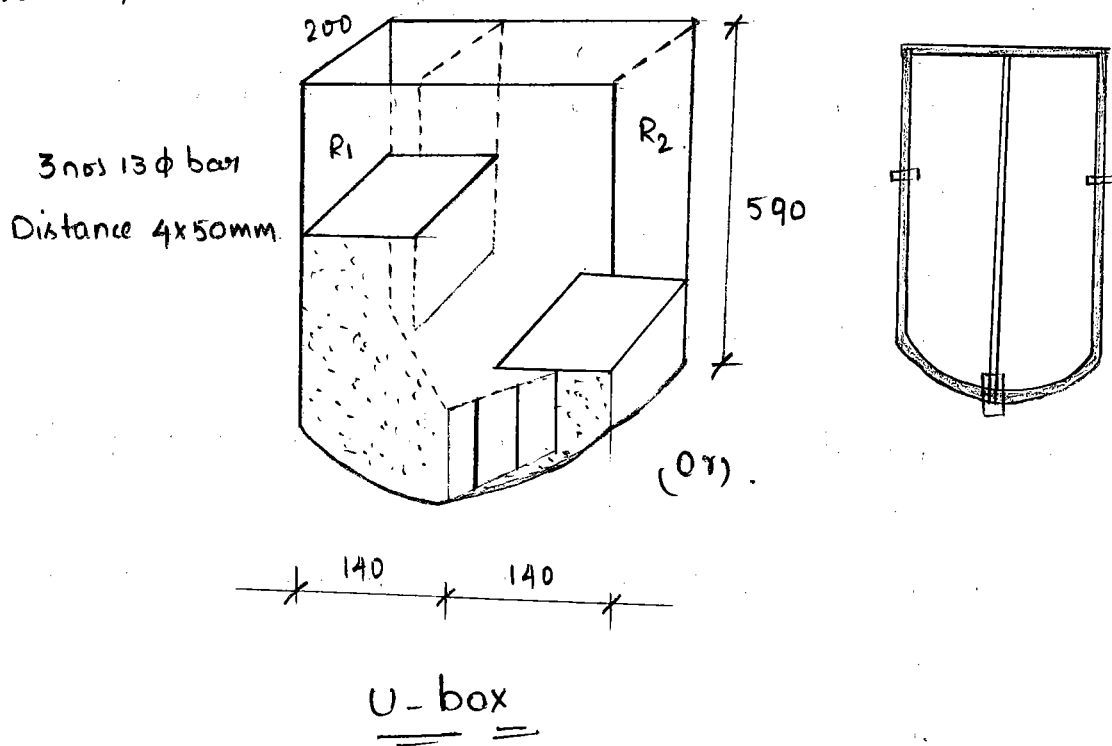
- 1) About 20 litre of concrete is needed for this test.

- 2) Ensure that crete is needed to this test.

Ensure that sliding gate can open freely and then close it.

- 3) Moisten the inside surface and remove any surplus water. Fill the one compartment of the apparatus with about 20 litre concrete.
- 4) Leave it to stand for 1 minute. lift the sliding gate and allow the concrete to flow to the other compartment.
- 5) Once the concrete has come to rest, measure the height of concrete in the second compartment in two places.
- 6) Calculate the mean. let it be H_2 . The height of concrete in the 1st compartment be H_1 .

Interpretation of result:- If the concrete flows as freely as water, at rest it will be horizontal. So $H_1 - H_2 = 0$.



V-funnel test :-

This test was developed in Japan. The equipment consists of a V-shaped funnel shown in the figure. The V-funnel test is used to determine the filling ability (flowability) of the concrete with maximum size of aggregate 20mm size. The funnel is filled with about 12 litres of concrete. Find the time taken for it to flow down.

After this the funnel can be filled, can be filled with concrete and left for 5 minutes to settle. If the concrete shows segregation then the flow time will increase significantly.

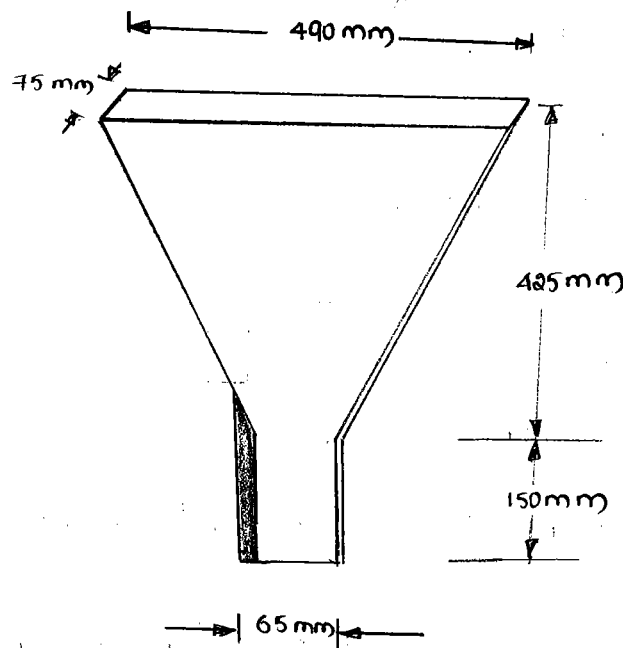
Equipment :-

- 1) V-funnel
- 2) Bucket 12 litres
- 3) Trowel
- 4) Scoop
- 5) Stopwatch

Procedure :-

- 1) About 12 litres of concrete is needed for the test.
- 2) Set the V-funnel on firm ground. Moisten inside of the funnel.
- 3) Keep the trap door open to remove any surplus water.

- 4) close the trap door and place a bucket underneath fill the apparatus completely with concrete.
- 5) No compaction or tamping is done. strike off the concrete level.
- 6) Open within 10 sec the trap door and record the time taken for the concrete to flow down.
- 7) Record the time for emptying.
- 8) This can be judged when the light is seen when viewed from top.
- 9) The whole test is to be performed within 5 min.



V - test Equipment

J-Ring:- J-Ring test denotes the passability of the concrete. The equipment consists of a rectangular section of 30mm x 25mm open steel ring drilled vertically with holes to accept threaded sections of reinforcing bars 10mm diameter 100mm in length. The bars and sections can be placed at different distances apart to simulate the congestion of reinforcement at the site. Generally, these sections are placed 3x maximum size of aggregate. The diameter of the ring formed by vertical section is 300mm and height 100mm.

Equipments :-

- Slump cone without foot pieces
- Base plate at least 700mm squares
- Trowel
- Scoop
- Tape
- J-ring

Procedure :-

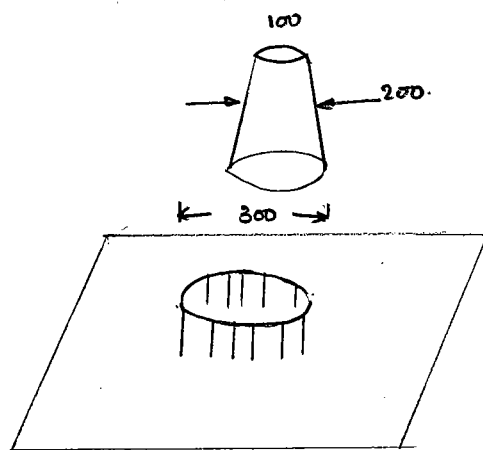
- 1) About 6 litres of concrete is needed for the test.
- 2) Moisten the inside of the slump cone and base plate.
- 3) Place the J-Ring centrally on the base plate and the slump cone centrally inside the J-ring.

4) Measure the difference in height between the concrete just inside J-Ring bars and just outside the J Ring bars.

(5) Calculate the average of the difference in height at four locations in mm.

(6) Note any border of mortar (or) Cement paste without coarse aggregate at the edge of the Cement concrete.

(7) The acceptable difference in height between inside and outside should be between 0 and 10 mm.



GTM Screen stability test :-

This test was developed by french contractor GTM, to assess segregation resistance. It consists of taking a sample of 10 litre of concrete allowing it to stand for a period to allow any lateral Segregation occur.

Equipments :-

- 10 litre bucket with lid
- 5mm sieve 350 mm dia.
- Sieve pan
- Stop watch
- Balance, accuracy 20gm min. Capacity 20 Kg.

Procedure :-

- 1) About 10 litre of concrete is needed. Allow the concrete to stand in a bucket for 15 minutes
- 2) Cover the concrete with the lid. Determine the weight of empty sieve pan.
- 3) Inspect the surface of concrete, if there is any bleeding water and note it.
- 4) Pour the top 2 litre (or) approximately 4.8 ± 0.2 Kg of concrete into a pouring container.
- 5) Determine the weight of filled pouring container.

- 6) Weigh the Empty pouring Container.
- 7) Calculate the weight of concrete poured sieve M_A .
- 8) Allow the mortar fraction of the sample to flow through the sieve pan for a period of 2 minutes.
- 9) Remove the sieve and determine the weight of filled sieve pan.
- 10) Calculate the weight of sample passing sieve, M_B .
- 11) by subtracting the empty sieve pan weight from the filled sieve pan weight.
- 12) Calculate the percentage of sample passing sieve, the Segregation ratio is $\frac{M_B}{M_A} \cdot 100$.

Result :- The value should not exceed 0-15%.

Oximet test :- It was developed at the university of Paisley as method for assessment of highly workable, flowing fresh concrete mixes on construction sites.

Equipment :-

- Oximet device of a stiff non-absorbing material
- Bucket Apprx. 10 litre
- Towel
- Scoops
- Stop watch

- Procedure :-
- 1) About 8 litre of concrete is needed for the test.
 - 2) Set the rimet on a firm ground.
 - 3) Moisten the inside of pipe and the orifice
 - 4) Keep the trap door open to drain of surplus water
 - 5) close the trap door and place a bucket underneath
 - 6) Fill the apparatus completely. Do not compact or tap the pipe. strike off the the concrete level with top by trowel.
 - 7) Open the trap door within 10 seconds after filling and allow the concrete to flow out.
 - 8) Find the time taken for complete discharge
 - 9) The whole test has to completed with 5 min.

Result :- → This test measures the ease of flow.

→ For SCC a flow time of 5 sec or less is considered appropriate

