Honeycombing in concrete | Types, Effects, and Remedies of Honeycomb

What is honeycombing in concrete?

Honeycombing in concrete is a rough surface that contains voids in the concrete as a result of incomplete filling of the concrete against the formwork. It is also known as hollow cavities found in the concrete mass where concrete is not reached.

The surface having honeycomb defect looks extremely rough. They have voids and gaps between the concrete and the reinforcement.

In some cases, it is seen that concrete has not even reached below the reinforcement. If the honeycomb is not treated properly then the whole structure will be weak.
Honeycombing in concrete looks like the honeycomb (honey bees nest).

If the honeycomb is present in the surface of the structure, then it can be detected as soon as we remove the shuttering and if the honeycomb is present inside the mass concrete, then it requires advanced techniques like ultrasonic testing for its detection.

**Types of honeycombing in concrete**

- Small size honeycomb: This type of honeycomb has a depth of less than 25 mm.
- Medium size honeycomb: This type of honeycomb is deeper than 25 mm but in which steel bar is not exposed.
- Large size honeycomb: This type of honeycomb is deeper than 25 mm and in which steel bar has come out.
Where does the honeycombs form?

1. Columns
2. Beams
3. Walls
4. Footings
5. Slabs

Causes of honeycomb in concrete

- Improper work-ability of concrete

Improper workability of concrete means using stiff concrete which is tough to pour in formwork. This type of concrete may not reach every part of reinforcement in the structure like a beam, column, slab, etc. A slump test should be done for the proper workability of concrete.

- Addition of water than the allowable limit
The surplus amount of water-cement ratio will lead to the separation of aggregates from the mortar.

If the concrete is poured after the setting time of the concrete, then it will not reach at all the places resulting in honeycombs.

- If the concrete is not cohesive then honeycomb in concrete may occur. It happens due to the use of outdated cement.

- Improper compaction or vibration of the concrete

When excess vibration is applied through the frameworks, it’ll lead mortar to leak through frameworks and leaves the aggregates to settle down.

- Pouring concrete from a height

When the concrete is poured from a specific height, then the aggregates and mortar get separated. They will then partly settle down causing honeycombs in concrete.

- Typical spots

Places like beam to beam or beam to column joints should be taken extra care while placing concrete because lapping of one or more layers of reinforcements makes the concrete hard to penetrate through them.
- Presence of coarse aggregates

When the improper bigger size of aggregates is employed within the concrete, it makes the smaller particles hard to penetrate through them leaving voids within the concrete.

- Movement of form works also results in a honeycomb formation.

- If formwork is not water-tight, it results in a honeycomb formation.

- If reinforcement congestion is normal, then 75 mm and if congestion is more, then 150 mm slump should be maintained this helps in concrete penetration but when it is not maintained honeycombs are formed.

- Improper placement of bars in beams and columns

If steel bars in beams and columns are placed horizontally and vertically in an improper manner, then it will not allow concrete to reach everywhere causing honeycombs in the concrete.

Effects of honeycombs in concrete

1. Reduces the load-bearing capacity eventually affecting the strength of the structure.
2. Water and air penetrate inside the structure.
3. Rusting and corrosion of reinforcement occur. This results in losing grip between rods and concrete, which can be very dangerous.
4. Honeycombing in concrete reduces the durability of the structure. Hence resulting in great loss of lives and property.

How to prevent honeycombing in concrete?

There are various ways which help us to from formation of honeycombs at a glance. They are given below,

1. At places of the junction of columns and beams, concrete should be of aggregates whose size is less than or equals to 20 mm. This should be used with slightly more water and cement to avoid honeycombs.
2. During concreting and vibrating, the sides of shuttering should be taped with a wooden hammer from outside. This will help to minimize honeycombs to great extent.
3. In the case of columns and beams, thinner needles say 25 mm or less should be used with vibrator at intricate places of concreting will also help in reducing honeycomb.
4. Concrete should be cohesive so this factor should be taken into account forever and whenever it comes to concrete production.
5. The slump should be maintained during the production and pouring phase as well. This will help reduce honeycomb.
6. In fixtures and connections, concrete should be penetrated properly. This will help reduce honeycomb.
7. Proper methods of placing concrete should be used such as proper segregation, avoiding delays, and pouring by layers.

8. Formworks should be leak-proof, rigid enough and proper supports should be provided to the formwork.

**Remedies for honeycombing in concrete**

If you see honeycomb on concrete, don’t try to hide this with cement paste as it won’t rectify the problem. Rather after years, it starts to deteriorate. Therefore, proper advice should be taken from the designer regarding the problem.

If it is not possible to hire a professional, then affected concrete should be partly broken. It should then be treated with adhesive chemicals and then be recast. At last, curing should be done.
Conclusion

Honeycombing in concrete is a serious problem. It not only reduces the durability and strength of the concrete but also makes the reinforcement vulnerable.

If not given proper care or treated on time, it can turn into deadly disasters that could take thousands of lives and cause thousands of dollars’ loss. It is also environmentally unfriendly.

Note: Due to 5% of honeycomb present in the concrete, the strength of the concrete can reduce up to 30%.

I hope this article remains helpful for you.

Happy Learning – Civil Concept

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