

Experimental Research on the Reinforcement of Cylindrical Concrete Shell with Opening

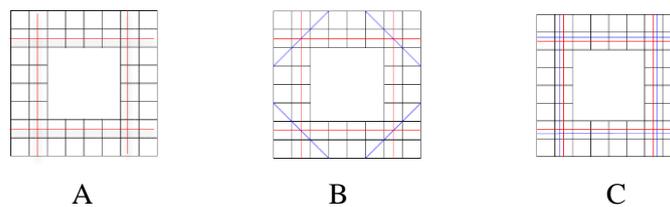
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Abstract

In this paper, the reinforcing method of reinforced concrete cylindrical shell with opening was investigated experimentally. The dimensions of the specimen were 900 mm in the meridian direction, 960 mm in the hoop direction (arc length 1050 mm) on the horizontal projection plane, and the shell thickness was 20 mm. The amount of reinforcing bar is defined by more than 0.2% of the cross section of concrete on both hoop and meridional directions for inner and outer layers. In experiments, a reinforcing bar mesh with a diameter of 3.2 mm, an empty space of 30 mm and a reinforcing ratio of 0.26% was used. The dimensions of the opening provided were set on the horizontal projection plane at the center on the specimens of 240 mm width in the meridian direction and 260 mm height in the hoop direction. In order to compare the reinforcement effect of the openings, the methods of reinforcement are shown below (Fig. 1). All specimens are reinforced around the opening in both hoop and meridional directions instead of the lost reinforcements at the opening (A,B,C). Also, in Pattern B, conventional diagonal reinforcing bars were arranged. In Pattern C, additional hoop and meridional reinforcing bars were arranged instead of diagonal reinforcing bars to prevent the shearing failure around the opening. Using these models, the reinforcement effect at the opening portion was experimented concerning the deformation capacity and the load bearing capacity under axial compression load. In the experiment, the load and the strain relations of R/C shell were measured in each loading stage. Regarding the load carrying capacity evaluation, the compressive failure of the loading part occurred earlier than the failure at the vicinity of the opening and the reinforcing bar buckled. About the stiffening effect due to reinforcing bars, (a) The conventional reinforcement method has sufficient reinforcement effect. (b) The simple reinforcement method proposed in this research shows the reinforcement effect as well but the amount of reinforcing bar is insufficient, because the same effect as the conventional reinforcement method was not obtained.



(Fig. 1)

References

- [1] Sami A. D.A, and Selcuk A ICCT 2016 INTERNATIONAL CONFERENCE ON INDUSTRIAL CHIMNEYS & COOLING TOWERS 2016 An Investigation of Opening Reinforcement Configurations for Reinforced Concrete Chimneys