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# COMPARATIVE ANALYTIC STUDY ON CONVENTIONAL SLAB AND CELLULAR SLAB

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## ABSTRACT

**A hollow core slab is a precast prestressed concrete member with continuous voids provided to reduce weight and cost. They are primarily used as a floor deck system in residential and commercial buildings as well as in parking structures because they are economical, have good fire resistance and sound insulation properties, and are capable of spanning long distances with relatively small depths. Structurally, a hollow core slab provides the efficiency of a prestressed member for load capacity, span range, and deflection control. Hollow core slabs can make use of prestressing strands, which allow slabs with depths between 150 and 260 mm to span over 9 meters. When used in buildings, several hollow core slabs are placed next to each other to form a continuous floor system. The small gap that is left between each slab is usually filled with a non-shrink grout. To give the floor a smooth finished surface, a topping slab overlay, typically 5cm deep is poured on the top surface of the hollow core slabs. The design concepts, manufacture and the erection techniques of Hollow core slabs are discussed in detail.**

**KEYWORDS:** Conventional Slab, Box Cellular Slab, Round Cellular Slab.

Flooring units are widely used in reinforced concrete moment-resisting frame buildings, yet their behavior under fire has not received much attention. This is because large scale fire tests are difficult and expensive, leaving computer analysis as the only alternative. However, the currently available computer analysis methods are neither accurate nor easy to use. This paper describes a simple yet reliable computational method to be used in design for modeling the structural behavior of hollow-core prestressed concrete slabs exposed to fires. The model has a major limitation of not being able to model shear or tensile failure in the webs of the hollow-core units, but the simulation outcomes show reasonably good agreement with experimental fire tests of hollow-core slab units, thereby verifying the reliability of the model.

## CONVENTIONAL SLAB

A concrete slab may be prefabricated or on site. Prefabricated concrete slabs are built in a factory and transported to the site, ready to be lowered into place between steel or concrete beams. They may be pre-stressed (in the factory), post-stressed (on site), or unstressed. It is vital that the wall supporting structure is built to the correct dimensions, or the slabs may not fit (figure 1).

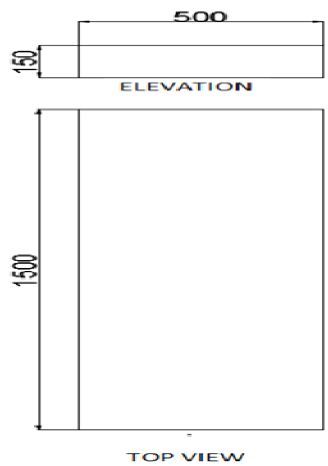



**Figure 1: Conventional Slab**

## ROUND CELLULAR SLAB

A hollow core slab, also known as a voided slab, hollow core plank or simply a concrete plank is a precast slab of prestressed concrete typically used in the construction of floors in multi-story apartment buildings. The slab has been 3 especially popular in countries where the emphasis of home construction has been on precast concrete, including Northern Europe and former socialist countries of Eastern Europe. Precast concrete popularity is linked with low-seismic zones and more economical constructions because of fast building assembly, lower self weight (less material), etc (figure 2).

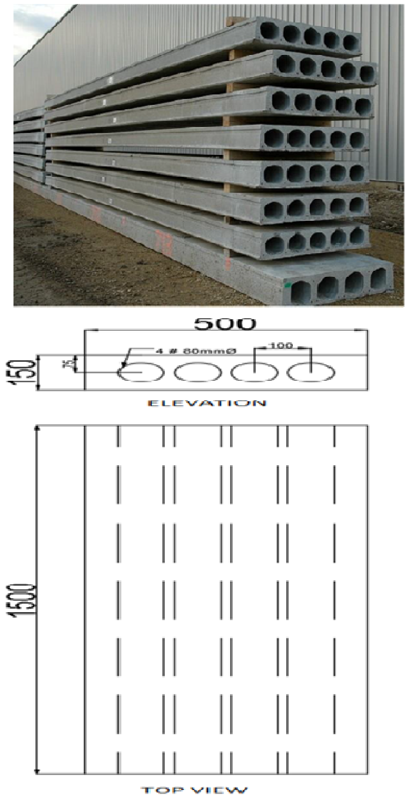



**Figure 2: Round Cellular Slab**

## BOX CELLULAR SLAB

The floors made of cellular concrete are multi-functional. Cellular Fibro Concrete is a reliable and long lasting material for floors with its water resistance, sound and thermo-insulation qualities and lightweight. Floors of CFC are free of harmful to man's health components. They are second after wood in hygienic properties. They are heat and fire resistant and at 1000 Grad C they last quite long and do not produce harmful gases. Floors of Cellular Fibro Concrete are easily repaired, encapsulating pipeline, electric and other communications. Besides that cellular concrete of CFC dry mix allows to complete in just a few working cycles the traditional multiple cycles needed to complete the multi-layer floor constructions, and at much lower cost (figure 3).

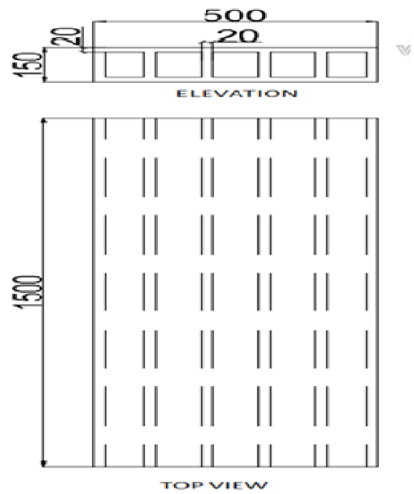
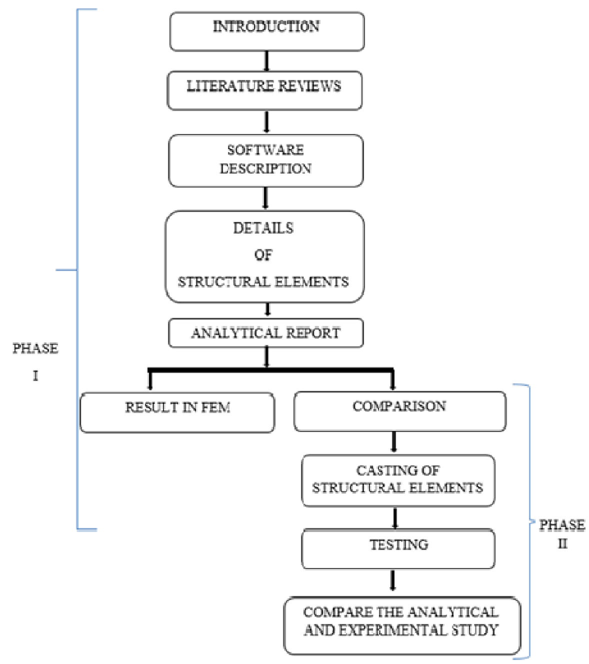



**Figure 3: Box Cellular Slab**

## METHODOLOGY




## ANALYSIS REPORT

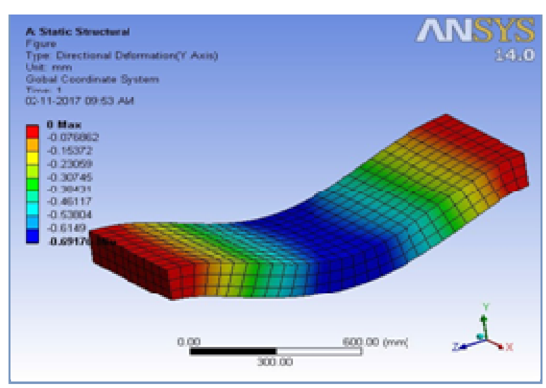



**Figure 4: Conventional Slab**

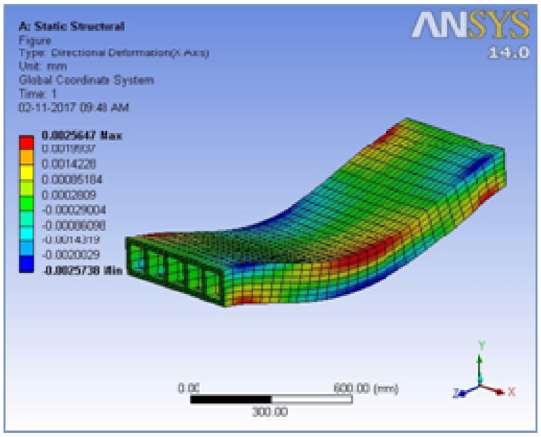



**Figure 5: Round Cellular Slab**

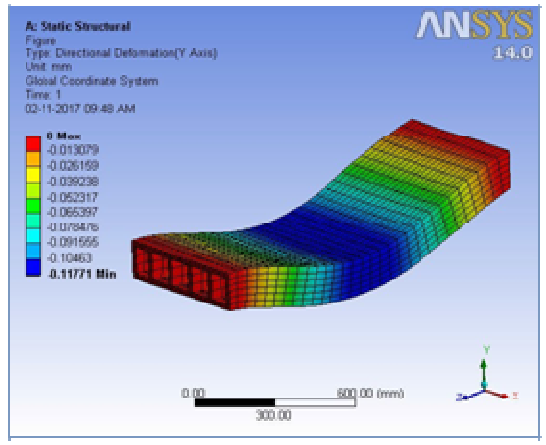



**Figure 6: Box Cellular Slab**

## RESULTS AND DISCUSSION

**Table 1: Comparison**

| Sl. No. | Parameters | | Conventional Slab | Rounded Cellular Slab | Box Cellular Slab |
|---|---|---|---|---|---|
| 1 | Equivalent Stress in MPa | Max | 129.09 | 169.17 | 28.929 |
| | | Min | 1.1865 | 2.2071 | 0.337 |
| 2 | Equivalent Strain | Max | 0.000645 | 0.00084 | 0.000128 |
| | | Min | 0.0000273 | 0.000017 | 0.0000025 |
| 5 | Deformation of x-axis in mm | Max | 0.021948 | 0.01957 | 0.00256 |
| | | Min | -0.021948 | -0.0205 | -0.00257 |
| 6 | Deformation of y-axis in mm | Max | 0 | -0.0908 | -0.013 |
| | | Min | -0.6917 | -0.81732 | -0.11771 |
| 7 | Deformation of z-axis in mm | Max | 0.0944 | 0.106 | 0.01399 |
| | | Min | -0.0944 | -0.106 | -0.01399 |
| 8 | Total Deformation in mm | Max | 0.6917 | 0.81733 | 0.1046 |
| | | Min | 0 | 0 | 0 |

## CONCLUSION

The analytical investigation presented in this paper is intended to provide a better understanding of the concentric load behaviour of ductile and nominally ductile structures. The ductile frame performed very well under pushover loading. This was due to weak beam- strong column considerations. The response showed that the capacity design philosophy and ductility level as applied in current Canadian standards are effective. The nominally ductile frame was stronger than the ductile frame due to larger member sizes, but the results showed lower ductility capacity.

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