2.2.1 FLOORS

2.2.1.2 HOLLOWCORE PLANKS

GENERAL DESCRIPTION

Hollowcore floor planks are precast, prestressed units produced on long-line beds using slide forming or extrusion methods. Planks are usually 1200-mm wide, though some manufacturers can produce 2400-mm wide units. These wider units may require increased crane capacity but offer greater speed of placement, less joints, grouting and sealing.

Thicknesses vary from 150–400 mm, in 50-mm increments, the thickness being determined by span, loading, fire rating and cover to reinforcement to satisfy exposure conditions. As a general rule, simply-supported floors should be limited to a span-to-depth ratio of less than 35:1. Instances where slenderness ratios fall between 35:1 and 45:1 should be checked for resonance effects. Spans exceeding 45:1 should not be used. Design charts used here are generic, actual capacities should be obtained from the manufacturer.

Planks may be used as plain sections or topped to give a composite unit. The topping increases plank capacity and fire rating. It provides a level surface or drainage falls.

Hollowcore floor planks are ideal for single or multi-storey commercial or residential buildings, satisfying requirements for span, fire rating, sound transmission class, exposure and durability, while attaining significantly reduced construction times.

They can also be used as an energy-saving floor system. Air can be circulated through the cores so that the planks are used as a thermal battery to cool and heat the building. This results in a significant energy saving, reduction of CO_2 emissions and a stable flow of circulated fresh air.

COMPONENT DETAILS

Precast Prestressed Hollowcore Floor Planks

For economy, the structure should be dimensioned to accommodate the 1.2- or 2.4-m modular plank width. If this is not possible, planks can be sawn longitudinally by the manufacturer, or partial-widths wet cast. Planks can be supplied with block-outs and cored holes to suit columns, services etc.

The core hole shape and number in a plank vary with the depth and the particular proprietary forming machine. Profiled edges form shear keys between units.

Concrete used in the planks is typically Special Class Concrete, strength grade S40. Prestressing strand varies in diameter and number, but is typically 9.5- and 12.7-mm diameter. Planks may be left plain, given a self-levelling screed or topped with concrete after erection.

Fire rating is a function of the effective concrete thickness and the concrete cover to strand. Fire rating can be increased by the addition of a concrete topping and cover increased by application of insulating material to the soffit. In practice, however, all planks with usual topping thicknesses (except 150-mm thick plank at 240 minutes FRP) meet fire rating requirements.

Topping Concrete

The usual strength grade for topping concrete is N32. The plank surface should be wetted just prior to pouring the insitu concrete but without pooled water. Standard curing practice should then be followed.

Shrinkage-control reinforcement should be provided in the topping to control cracking. It should be noted that a crack of visible size usually develops at the joint between planks due to the change in section. Location of contraction joints at plank supports will be determined by the overall structure and are usually at every third or fourth support in longer structures.

Structural-continuity reinforcement may be required in both longitudinal and transverse directions. This may be placed in the topping concrete and/or the shear keys.

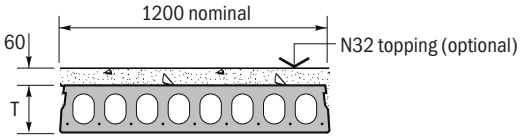
Shear Keys

These should be grouted with a 3:1 mortar mix thoroughly compacted to remove all air. Alternatively, they may be filled concurrently with the topping concrete, using a 14-mm or less aggregate.

PLANK IDENTIFICATION (Example)

Number of strands — Strand diameter (mm)
Plank thickness (mm) — **200/7-12.7/25** — Concrete cover (mm)

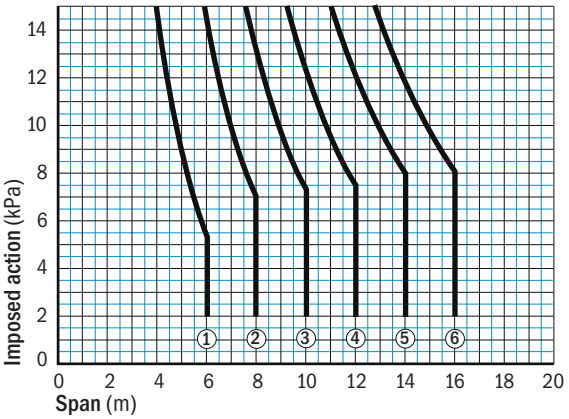
IMPOSED ACTION CAPACITY OF HOLLOWCORE PLANKS



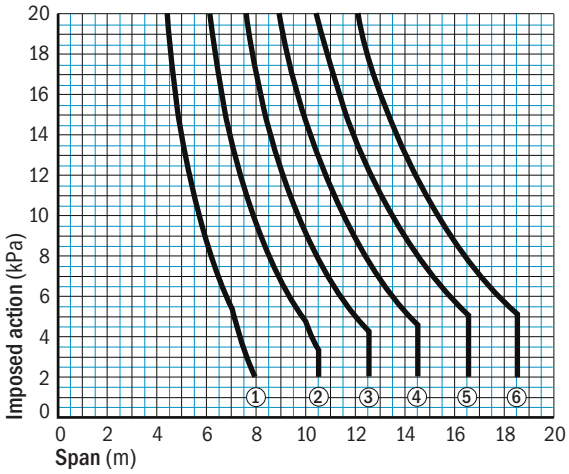
Key to Curves in Imposed Action Capacity Charts (see Plank Identification for explanation)

① **150**/8-9.5/40
② **200**/7-12.7/40
③ **250**/9-12.7/40
④ **300**/11-12.7/40
⑤ **350**/13-12.7/40
⑥ **400**/16-12.7/40

FLOOR PLANKS WITHOUT TOPPING



FLOOR PLANKS WITH 60-mm TOPPING



NOTES:

Cross sections vary between manufacturers and capacities vary accordingly. The curves are indicative of the typical maximum capacity for each section depth. Stresses at release may govern the minimum span for a particular strand arrangement.

Fire resistance level and exposure classification are the primary determinants of the required axis distance to the strand.

In addition to other locations, flexure-shear capacity checks should be carried out in the prestress transmission zone where strand anchorage and prestress are not fully developed. The capacity is also influenced by the position of the bearing reaction, the shape of the cores and net web width.

See also the *Hollowcore Flooring - Technical Manual*, available for download from the NPCAA website: ***www.npcaa.com.au***