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GUIDELINES TO USING GMF HOLLOWCORE PRECAST CONCRETE SLABS

01. General

A plank should be chosen to satisfy the required shear force, whether a uniformly distributed load (udl) or a point load/s. If this is not satisfied a higher sized plank, that satisfies all conditions (namely **safe** load & shear, satisfying **Serviceability Limit State SLS** criteria to MSA EN1992) is to be chosen. A 100mm C30 concrete topping is recommended, with A 252 mesh.

- **A rigid support** refers, to when planks are supported on walls
- **A flexible support** refers to when planks are supported on beams (concrete or steel).

02. Further guidelines for Infilling of Holes

When infilling of holes is required, recommended that the 2 middle holes are infilled. Infilling is done onsite by the client in C 30 concrete.

a) Infilling to achieve UDL

- Length of infill should not be more than 1/6th of the length of the slab.

b) Infilling for point loads

- When infill is used to meet shear requirements because of point loads, then the length of infill should extend an effective depth beyond where the safe shear value is achieved in the shear force diagram (vide Note 1 in calc F01).
- Alternatively, a higher sized slab (if available) that satisfies all criteria is to be used.

c) Infilling of planks resting on beams

- When design shear is greater than 0.35 of the resistant shear (as quoted in tables: (vide Note 2 in calc F01), deflection of the beam supporting the planks should be limited to span/1000,
- It is recommended that all holes are infilled for a depth equal to the width of the supporting beam or the plank depth, whichever is the greater.

03. Tying of planks

Tying requirements in the vertical & horizontal (internal/peripheral) directions are to be undertaken according to MSA EN 1991-1-7 Annex A. Calculation sheet F02, then provides guidance on the distribution characteristics for this tied rigid diaphragm for loaded longitudinal walling.

04. Increased loading due to topping & grouting between planks

The recommended topping of 10cm (4 inches) with A 142 mesh is taken to increase the loading of the slab by 10%. On site hollow core planks must be grouted (minimum C20/25) immediately after installation. Prior to laying a structural topping the top surfaces of the precast planks should be thoroughly cleaned and free from any debris and then they should be wetted approximately 30 minutes before laying the topping. The precast surfaces should be saturated but free of surface water.

05. Safe Shear Values

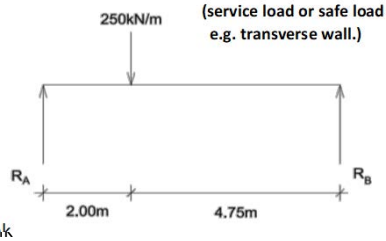
These has been guided by Eq. 6.10b as noted in table A1. 2(B) of EN 1990, whereby the safety factor for dead load has been reduced by 0.85. Where equation 6.10b is not applicable values are to be adjusted accordingly. This is noted for warehousing, where the live load is predominant over the dead load.

job title.: LOADINGS ON PRESTRESSED PLANKS	job No.: TYPICAL CALS	sheet No.:	F01
	member / location.:	POINT LOAD ON PLANKS	
	drg ref.:	ESTABLISHING SAFE LOADS & SHEAR FORCES SLS	
	made by: GMF	date.:	Apr-21

Ref. Case No. 1	Calculations	Outputs

R_A = 250 x 4.75 /6.75 = 176kN/m

R_B = 250 - 176 = 74kN/m *



Safe shear 176kN/m x 1.2m = 21 tonf/ plank
74kN/m x 1.2m = 8.88 tonf/ plank

Note 1 - if the resistant shear for the 21tonf/plank is achieved via infilled holes, then the infilling should extend an effective depth beyond the 2m mark, in the Shear Force diagram.

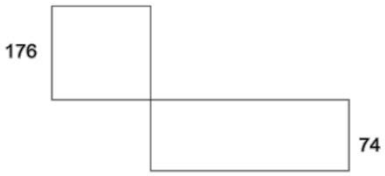
BM = 250 x 2 x 4.75/6.75 = 352kN -m /m

BM (equivalent uniform load) = $wl^2 / 8$

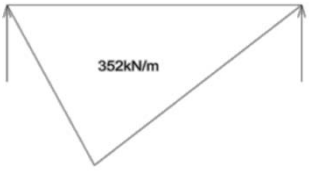
equivalent uniform load w = $8 \times BM / l^2$

= $8 \times 352 / 6.75^2$

= 61.8kN/m^2 (6,180kg/m^2)



SF - DIAGRAM (Due to point load)



BM - DIAGRAM(Due to point load)

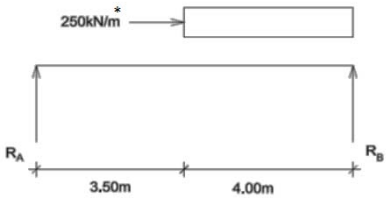
Note 2 - If R_B is supported on a flexable support & the shear of 8.88 tonf /plank is less than 0.35 of the resistant shear of the plank, then no further considerations come into play. Otherwise the supporting beam has to be designed for its deflection not to exceed span/1,000

job title.: LOADINGS ON PRESTRESSED PLANKS	job No.: TYPICAL CALS	sheet No.: F02	
	member / location.: PARTIAL UDL ON PLANKS		
	drg ref.: ESTABLISHING SAFE LOADS & SHEAR FORCES SLS		
	made by: GMF	date.: Apr-21	

Ref. Case No. 2	Calculations	Outputs

R_A = (250x4)x2/7.5 = 266.67kN

R_B = 250x4 - 266.67 = 733.33kN



N.B. BM_{MAX} occurs where SF is 0

i.e. at 2.93m from B, as obtained by similar triangles . or otherwise

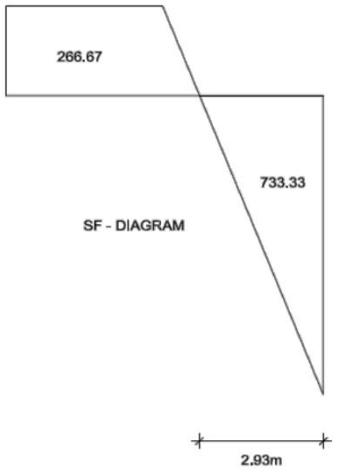
BM_{MAX} = 266.67 x (7.5-2.93) - 250 x (4-2.93)^2 / 2
= 1,075.57kN -m

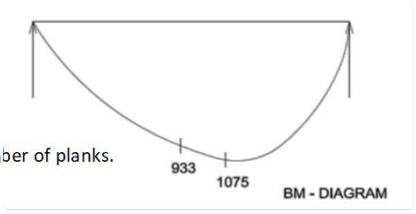
BM(equivalent uniform load) = $wL^2 / 8$

equivalent uniform load w

w = 8x1,075.57 / 7.5^2

= 153kN/m





For this particular loading type, the above equivalent safe load & shear force may be distributed onto a number of planks.

Guidance may be sought from: BS 8110

LOAD BEARING TRANSVERSE PARTITION LOADING DISTRIBUTION ONTO PRE-STRESSED SLABS

- No topping – less of 3 pre-cast units or span/4 on either side (Cl 5.2.2.2.BS8110:Pt:1985)*
- Structural topping – less of 4 pre-cast units or span/4 on either side (Cl 5.2.2.3)*

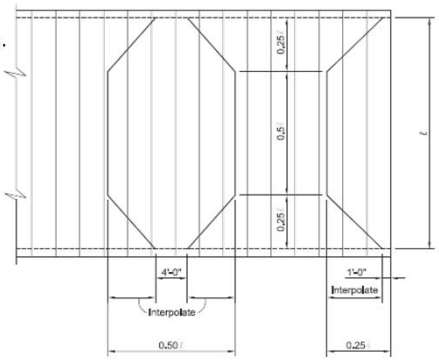
*this dispersion width is not to be greater than the centre to centre distance between partitions, or an unsupported edge.

- It is advisable to use structural topping with light structural mesh on pre-cast floors, so that risk of cracking in screed and finishings is minimized & diaphragm action ensured.
- the following diagram as accessed from the PCI Manual 2015, is applicable also for concentrated loads, including line loads from partitions in the direction of the span.

LOAD BEARING PARTITION LOADING ONTO PRE-STRESSED

Noting above guidance:
Distribution width is 7.5m/4 = 1.875m on either side - hence this load pattern may be supported on 3 planks.
Safe Load = 153kN/m/3.6m = 4,250kg/m^2

EFFECTIVE RESISTING WIDTH OF SLAB FOR LOAD ANYWHERE ALONG SPAN
(source: PCI Manual 2015)



Effective width of solid slab carrying a concentrated load near un unsupported edge

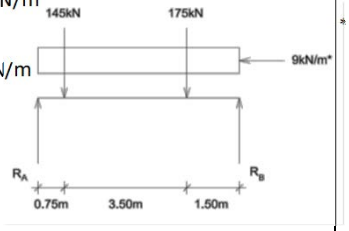
* e.g. partial partition in the direction of the span.

job title.: LOADINGS ON PRESTRESSED PLANKS	job No.: TYPICAL CALS	sheet No.: F03	
	member / location.: POINT LOADS + UDL		
	drg ref.: ESTABLISHING SAFE LOADS & SHEAR FORCES SLS		
	made by: GMF	date: Apr-21	

Ref. Case No. 3	Calculations	Outputs

$R_A = \frac{(145x075 + 175x4.25)}{5.75} + \frac{9x5.75}{2}$ = 174kN/m

R_B = (145+175 + 9x5.75) - 174 = 198kN/m



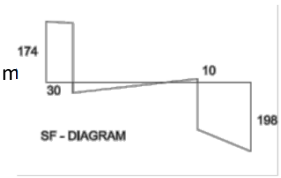
* This UDL is for the loading directly on the plank, which excludes for its self-wt.

BM under the 175 kN load

BM = 198x1.5 - 9x1.5^2 / 2 = 287 kN -m / m

BM under 2nd point of zero shear to obtain max.

BM = 198x2.7 - 9.1x5^2 / 2 = 175.1.2 = 292 kN -m / m

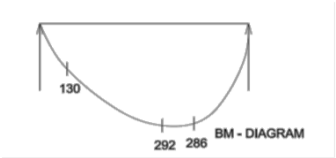


equivalent uniform load w

Safe Load **w -** 8 X 292/5.75^2 = 70.65kN/m^2 (7,065kg/m^2)

Safe Shear/Plank - 198kN/m x 1.2m = 23.76tonf/plank

174kN/m x 1.2m = 20.88tonf/plank



BM - DIAGRAM