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GUIDELINES FOR PERITI (STRUCTURAL) TO USING GMF PRECAST HOLLOWCORE CONCRETE SLABS

01. General

A plank should be chosen to satisfy the required safe load and 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.

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 using C 30 concrete.

a) Infilling to achieve UDL

- For planks having a span of 6m or less, infilling should be 1m.
- For planks having a span greater than 6m, infilling should be up to 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), in the case of a flexible support, **deflection of the beam supporting the planks should be limited to span/1000.**
- It is recommended that half the holes are infilled for a depth equal to the width of the supporting beam or the plank depth, whichever is the greater.
  Alternatively; 200-350mm sections – half the holes are infilled to a length of 450mm from the face of the support;
  450-525mm sections – half the holes are infilled to a length of 600mm from the face of the support.

- **A rigid support** refers, to when planks are supported on walls fully reinforced into a reinforced concrete capping **(ring)** beam.
- **A flexible support** refers to when planks are supported on beams (concrete or steel).

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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. To obtain this rigid diaphragm flooring, the varying of plank depths, within the same floor area, is to be properly detailed not to affect the load distribution characteristic.

04. Planks bearing

The minimum bearing for different types hollow core planks and spans as specified in the load tables is to be observed during the installation. Dry pack mortar is to be continuously placed on the supports, creating a level surface once the planks are in place.

05. Grouting between planks

On site hollow core planks must be grouted (C30) immediately after installation and should be wetted & cleaned from any debris prior to grouting. Provided proper connections and details exist, the grouted slab assembly provides a basic diaphragm for resisting lateral loads. In most hollow core slab deck applications, non-uniform loading occurs in the form of line loads or concentrated loads. The ability of individual grouted slabs to interact allows these load concentrations to be shared by several slabs.

06. Increased loading due to topping

The recommended topping of 10cm (4 inches) using C30 concrete adequately vibrated with A 252 mesh is taken to increase the loading of the slab by 10%. This is limited on longer spans as follows:

Plank type 200	10% increase up to 8.5m span - above no increase
Plank type 250	10% increase up to 9.5m span - above no increase
Plank type 350	10% increase up to 10.0m span - above no increase
Plank type 450	10% increase up to 12.5m span - above no increase
Plank type 500	10% increase up to 12.5m span - above no increase
Plank type 525	10% increase up to 12.5m span - above no increase

On the longer spans, it is not anticipated that the planks will be loaded with partition loading, but mostly uniformly distributed loading, such as roof loading only. In these instances, no distribution of loading is necessary, hence topping may be considered to be superfluous only adding to the dead load on the plank.

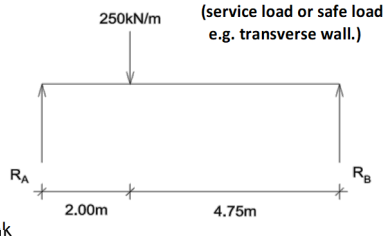
Prior to laying a structural topping the top surfaces of the precast planks should be thoroughly cleaned and free from any debris and then they should be wetted approximately 30 minutes before laying the topping. The precast surfaces should be saturated but free of surface water.

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-24

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.

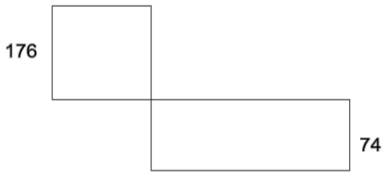
BM = 250 x 2 x 4.75/6.75 = 352kN -m /m

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

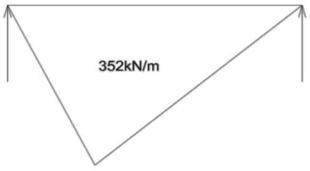
equivalent uniform load w = 8 x BM/ l^2

= 8 x 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

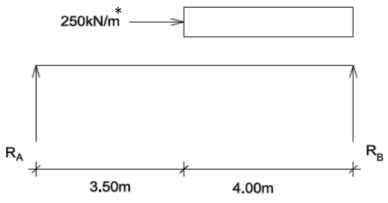
Note:
1,000kg = 1 ton = 10,000N = 10kN

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-24	

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

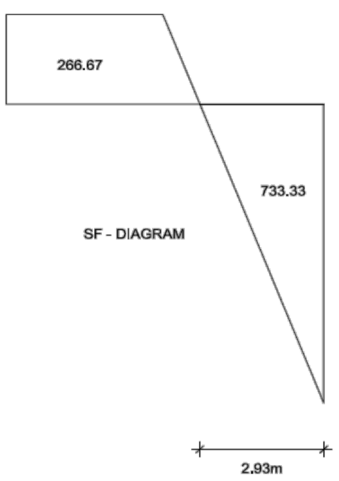
BM_{MAX} = 266.67 x (7.5-2.93) - 250 x (4-2.93)^2 / 2
= 1,075.57kN -m

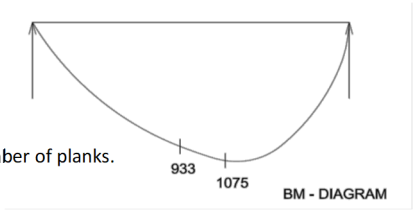
BM(equivalent uniform load) = $wL^2 / 8$

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)*

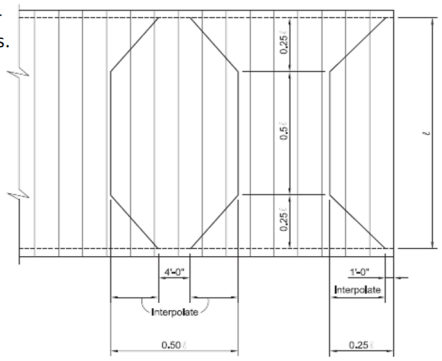
*this dispersion width is not to be greater than the centre to centre distance between partitions, or an unsupported edge.

- 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

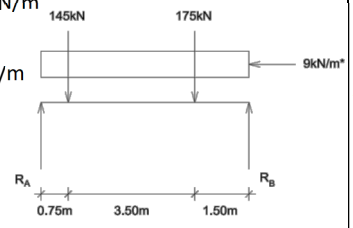
* e.g. partial partition in the direction of the span.

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-24	

Ref. Case No. 3	Calculations	Outputs

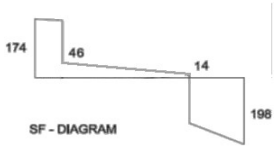
$R_A = \frac{(145x0.75 + 175x4.25)}{5.75} + \frac{9x5.75}{2}$ = 198kN/m

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



BM under the 175 kN load

BM = $174x1.5 - 9x1.5^2 / 2$ = 251 kN -m / m

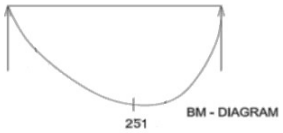


equivalent uniform load w

Safe Load **w -** 8 X $251/5.75^2$ = 60.73kN/m^2 (6,073kg/m^2)

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

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



BM - DIAGRAM

Note:
1,000kg = 1 ton = 10,000N = 10kN

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