St. Mary Street Maghtab
NXR 6515, Malta
Tel: + 356 2143 4682 | Mob: + 356 9943 7538 |Email: gmf@gmfprecast.com

GUIDELINES TO USING GMF PRECAST HOLLOWCORE 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 $1/6^{th}$ 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. Alternatively; 200-350mm sections – all holes are infilled to a length from the face of the support of 450mm; 450-525mm sections – all holes are infilled to a length of 600mm.

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. To obtain this rigid diaphragm flooring, the varying of plank depths, within the same floor area, is to be properly detailed not to effect the load distribution characteristic as outlined in F02.

04. Increased loading due to topping

The recommended topping of 10cm (4 inches) 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 - 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 mosty uniformly distributed loading, such as roof loading only. In these instances no distribution of loading is necessary, hence topping may be considered to be superflous only adding to the dead load on the plank.

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 as noted for warehousing, where the live load is predominant over the dead load.

---

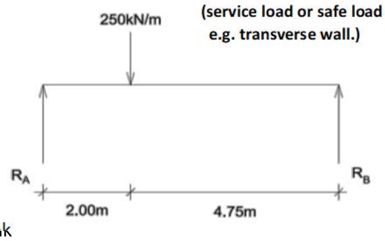
job No.: TYPICAL CALS	sheet No.: F01
member / location.:	POINT LOAD ON PLANKS
drg ref.:	ESTABLISHING SAFE LOADS & SHEAR FORCES SLS
made by: GMF	date.: Apr-21

job title.: LOADINGS ON PRESTRESSED PLANKS

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.

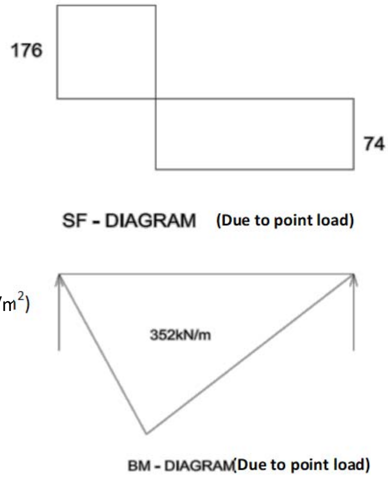
BM = 250 x 2 x 4.75/6.75 = 352kN -m /m

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)



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

Est 1990 GMF Precast Ltd	job No.: TYPICAL CALS	sheet No.:	F02
	member / location.:	PARTIAL UDL ON PLANKS	
	drg ref.:	ESTABLISHING SAFE LOADS & SHEAR FORCES SLS	
job title.: LOADINGS ON PRESTRESSED PLANKS	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

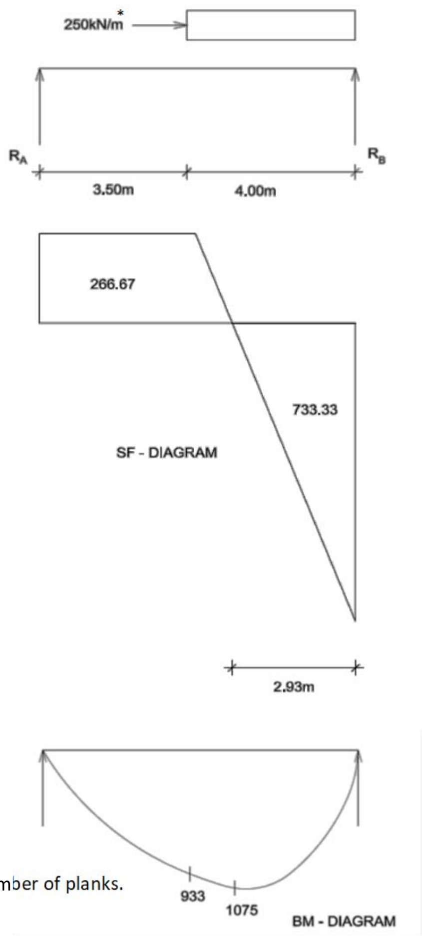
BM_{MAX} = 266.67 x (7.5-2.93) - 250 x $(4-2.93)^2$ / 2
= 1,075.57kN -m

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

equivalent uniform load w

w = 8x1,075.57 / 7.5^2

= 153kN/m



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

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)*

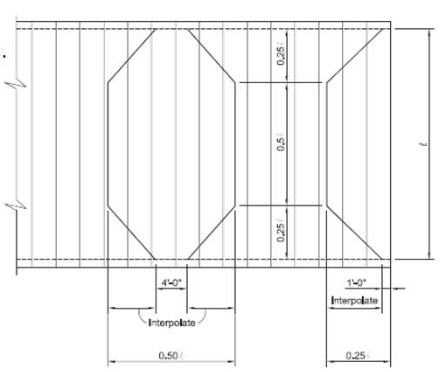
*this dispersion width is not to be greater than the centre to centre distance between partitions, or an unsupported edge.

- 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)



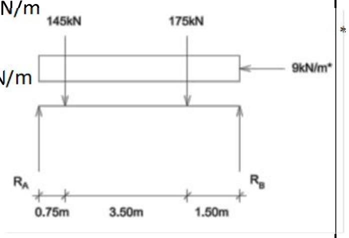
Effective width of solid slab carrying a concentrated load near un unsupported edge

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

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



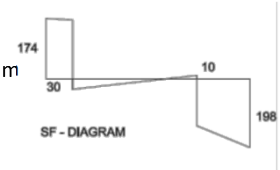
* This UDL is for the loading directly on the plank, which excludes for its self-wt.

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

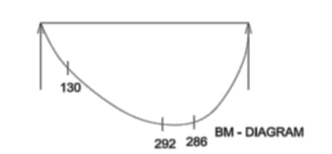


equivalent uniform load w

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