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onesteel market mills

Span Tables for Simply Supported Composite Beams

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1. Introduction

This design note contains span tables covering various primary and secondary beam spans with common design floor loadings. It is intended that these tables will be used by Engineers to assist in the preliminary design of a composite steel and concrete floor system. The solutions provided may be conservative, but can be refined during the final design process.

2. Design Criteria

These Tables were generated using COMPBEAM™ version 2.0 Software. This software assists in the design of simply supported beams in accordance with Australian Standard AS2327.1: 2003.

2.1 Design Variables

The following factors represent the variables in the design charts

- **Design Loads**
  - Standard offices
  - Premium offices
  - Standard retail
  - Premium retail
  - Plant rooms
  - Compactus areas
  - Carparking
- **Secondary Beam Spans** from 8 to 17m
- **Primary Beam Spans** from 8 to 12m

2.2 Fixed Design Variables

The design variables that have been fixed in these tables are:

- **300PLUS®** Grade beams - as these are widely recognised as being the most economical
- **Re-entrant profiled steel decking** – as trapezoidal decks are not permitted by AS2327.1: 2003
- **1.0mm decking** - as this is commonly available and generally result in more economical floor system than 0.75mm thick decking
- **2.8m secondary beam spacing -** common span for 1.0mm re-entrant decking
- **Slab thickness –** the slab thickness tabulated for each load condition is considered the most economical for that particular design load
- **Deflection criteria –** the criteria adopted is that commonly required in practice for the design loading. Eg a premium retail has incremental deflection criteria of span/500 while a standard retail has an incremental deflection criteria of span/300.
- **Incremental Deflection –** is the sum of the creep and In-service shrinkage based on 300μ strain and the short term live load (γ_s.Q).
- **Maximum Camber of 50mm –** The camber is determined by summing the deflection due to self weight of the wet concrete, ponding and steel beam and rounding down to the nearest 5mm
- **No Propping** – to maximise speed of construction

These criteria will suit preliminary design for most applications. However should the design variables be significantly different from those available in the tables the preliminary design should be produced from first principles using AS2327.1 and design tools such as CompPanel™[1] and COMPBEAM™[2].

3. Design Charts

The design information provided by the charts in Table 1 to Table 4 include the following:

- Secondary & Primary beam sizes
- No of 19mm diameter shear studs
- Beam camber
- Slab thickness
- Concrete strength
- Natural frequency of the beam

These values will enable a designer to develop a preliminary design suitable for costing typical bays.

4. Supporting Design Aids and Tools

Numerous design aids and tools are available to support these charts including CompPanel™ COMPBEAM™ and CompSelector™ which are available from OneSteel Market Mills.

4.1 CompPanel™ and COMPBEAM™

CompPanel™ and COMPBEAM™ are analysis software that have the capacity to check other design options not covered by these tables including, edge beams, non prismatic sections, varying slab widths, propped construction and load combinations.

4.2 CompSelector™

Spreadsheet software that reads these tables and selects the beams for preliminary design.

4.3 Floor Vibrations

While these tables provide a value for natural frequency of the secondary beam and the secondary/primary beam combination, a check on acceptability is still required. Users of this technical note are directed to the ASI Publication on “Floor Vibrations in Composite Steel Office Buildings” [3] for guidance on how this may be done and software contained in CompPanel™

Table 1 - Office Floors

Span (m)	Spacing (m)	Standard Offices Q = 3 + 1.5				Premium Offices Q = 4 + 1.5			
		Beam 300PLUS®	Camber (mm)	Nos studs per beam	Nat. Fn Hz	Beam 300PLUS®	Camber (mm)	Nos studs per beam	Nat. Fn Hz
Secondary Beams									
8	2.8	310UB40.4	30	21	6.4	310UB40.4	30	21	6.4
9	2.8	360UB44.7	35	23	5.8	360UB44.7	35	23	5.8
10	2.8	360UB50.7	45	26	5.0	360UB56.7	35	26	5.2
11	2.8	410UB53.7	45	28	4.6	410UB53.7	45	28	4.6
12	2.8	460UB67.1	45	32	4.7	460UB67.1	45	32	4.7
13	2.8	460UB82.1	50	34	4.3	460UB82.1	50	34	4.3
14	2.8	530UB82.0	50	36	4.2	530UB82.0	50	36	4.2
15	2.8	610UB101	45	39	4.4	610UB101	45	39	4.4
16	2.8	610UB113	50	41	4.1	610UB113	50	41	4.1
17	2.8	700WB115	45	44	4.1	700WB115	45	44	4.1
Primary Beams									
8	8	460UB74.6	20	34	4.8	460UB82	20	38	4.9
8	9	530UB82.0	0	38	4.8	530UB82.0	0	38	4.8
8	10	530UB92.4	0	42	4.3	530UB92.4	0	42	4.7
8	11	530UB92.4	0	42	4.2	610UB101	0	46	4.3
8	12	610UB101	0	46	4.2	610UB101	0	46	4.2
8	13	610UB101	0	46	4.2	610UB101	0	46	4.2
8	14	610UB101	0	46	3.9	610UB113	0	48	4.0
8	15	610UB113	0	48	3.9	610UB125	0	54	4.0
8	16	610UB125	0	54	3.8	700WB115	0	52	3.9
8	17	700WB115	13	52	3.7	700WB115	0	52	3.7
8.4	8	460UB82.0	25	38	4.7	530UB82.1	0	38	4.9
8.4	9	530UB82.0	20	38	4.6	530UB92.4	0	42	4.7
8.4	10	610UB101	0	46	4.3	610UB101	0	46	4.3
8.4	11	610UB101	0	46	4.2	610UB101	0	46	4.2
8.4	12	610UB101	0	46	4.0	610UB101	0	46	4.0
8.4	13	610UB101	20	46	4.1	610UB113	0	48	4.2
8.4	14	610UB113	0	48	3.9	610UB125	0	54	3.9
8.4	15	610UB125	0	54	3.9	700WB115	0	52	3.9
8.4	16	700WB115	0	52	3.8	700WB115	0	52	3.8
8.4	17	700WB115	0	52	3.7	700WB130	0	60	3.7
9	8	530UB82.0	25	38	4.6	530UB92.4	20	42	4.7
9	9	530UB92.4	25	42	4.4	610UB101	0	46	4.6
9	10	610UB101	20	46	4.2	610UB101	20	46	4.4
9	11	610UB101	20	46	4.0	610UB113	20	48	4.1
9	12	610UB125	0	54	4.0	610UB125	0	54	4.0
9	13	610UB125	20	54	4.0	700WB115	0	52	4.1
9	14	700WB115	0	52	3.8	700WB130	0	60	3.9
9	15	700WB130	0	60	3.9	700WB130	0	60	3.9
9	16	700WB130	0	60	3.7	700WB130	0	60	3.7
9	17	700WB130	20	60	3.6	700WB150	0	64	3.6
10	8	610UB101	20	46	4.4	610UB101	20	46	4.4
10	9	610UB101	25	46	4.1	610UB113	20	48	4.3
10	10	610UB125	20	54	4.2	610UB125	20	54	4.2
10	11	610UB125	25	54	3.8	700WB115	20	52	3.9
10	12	700WB115	20	52	3.8	700WB130	20	60	3.9
10	13	700WB130	20	60	3.9	700WB130	20	60	3.9
10	14	700WB130	20	60	3.6	700WB150	0	64	3.7
10	15	700WB150	0	64	3.7	700WB150	20	64	3.7
10	16	800WB146	0	62	3.6	800WB146	0	62	3.6
10	17	800WB146	20	62	3.5	700WB173	20	66	3.5
11	8	610UB113	30	48	4.1	610UB125	25	54	4.2
11	9	700WB115	25	52	4.0	700WB115	25	52	4.0
11	10	700WB115	25	52	3.7	700WB130	0	60	3.9
11	11	700WB130	25	60	3.7	700WB130	25	60	3.7
11	12	700WB130	25	60	3.5	700WB150	0	64	3.7
11	13	700WB150	25	64	3.7	700WB150	25	64	3.7
11	14	800WB146	20	62	3.5	800WB146	20	62	3.5
11	15	800WB146	25	62	3.5	800WB168	0	66	3.6
11	16	800WB168	0	66	3.5	800WB168	0	85	3.5
11	17	900WB175	0	66	3.5	900WB175	20	66	3.5
12	8	700WB130	25	60	4.1	700WB130	25	60	4.1
12	9	700WB130	30	60	3.8	700WB150	25	64	4.0
12	10	700WB150	25	64	3.6	700WB150	25	64	3.6
12	11	800WB146	25	62	3.6	800WB146	25	62	3.6
12	12	800WB146	25	62	3.5	800WB146	25	62	3.5
12	13	800WB146	30	62	3.5	700WB173	30	70	3.5
12	14	700WB173	30	66	3.2	900WB175	20	66	3.5
12	15	900WB175	25	66	3.5	900WB175	25	66	3.5
12	16	900WB218	0	68	3.5	900WB218	0	68	3.5
12	17	900WB218	0	68	3.4	900WB218	0	68	3.4

Assumptions: 120mm Slab, F'c =25 MPa, 2400 kg/m2 on decking with pan width 200mm, Un-propped, 12.5mm ponding allowance
Incremental Defl limit < Span / 300, Total Defl limit < Span / 250
sdl + live for frequency calc = 0.54 kPa,

Table 2 - Retail Floors

Span (m)	Spacing (m)	Standard Retail Q = 5 + 1, non reducible				Premium Retail Q = 5 + 2.5, non reducible			
		Beam 300PLUS®	Camber (mm)	Nos studs per beam	Nat. Fn Hz	Beam 300PLUS®	Camber (mm)	Nos studs per beam	Nat. Fn Hz
Secondary Beams									
8	2.8	310UB40.4	30	21	6.4	360UB44.7	20	22	6.5
9	2.8	360UB44.7	35	24	5.8	410UB53.7	20	26	6.2
10	2.8	410UB53.7	30	26	5.6	460UB67.1	20	32	6.0
11	2.8	410UB59.7	40	34	4.9	460UB82	25	36	5.4
12	2.8	460UB67.1	45	35	4.7	530UB82.0	25	36	5.1
13	2.8	460UB82.1	50	36	4.3	610UB101	25	36	5.3
14	2.8	530UB82.0	50	39	4.2	610UB113	30	36	4.8
15	2.8	610UB101	45	39	4.4	700WB115	30	39	4.7
16	2.8	610UB113	50	41	4.1	700WB130	30	41	4.4
17	2.8	700WB115	45	44	4.1	800WB122	35	44	4.2
Primary Beams									
8	8	530UB92.0	0	42	5.2	610UB101	0	46	5.3
8	9	610UB101	0	46	5.0	610UB113	0	48	5.1
8	10	610UB101	0	46	4.8	610UB113	0	67	4.9
8	11	610UB101	0	69	4.3	610UB125	0	75	4.5
8	12	610UB125	0	54	4.3	700WB115	0	75	4.5
8	13	610UB125	0	105	4.3	700WB130	0	60	4.6
8	14	700WB115	0	95	4.1	700WB150	0	60	4.3
8	15	700WB130	0	60	4.1	700WB150	0	103	4.2
8	16	700WB150	0	60	4.0	800WB146	0	103	3.9
8	17	800WB146	0	60	3.7	800WB168	0	60	3.9
8.4	8	610UB101	0	46	5.3	610UB113	0	48	5.2
8.4	9	610UB101	0	46	4.9	610UB125	0	54	5.0
8.4	10	610UB101	0	63	4.7	700WB115	0	52	4.9
8.4	11	610UB125	0	54	4.2	700WB115	0	75	4.4
8.4	12	610UB125	0	103	4.1	700WB130	0	60	4.4
8.4	13	700WB130	0	60	4.2	700WB150	0	62	4.6
8.4	14	700WB130	0	69	4.0	800WB146	0	62	4.3
8.4	15	800WB146	0	62	4.0	800WB168	0	62	4.3
8.4	16	800WB146	0	62	4.0	800WB168	0	91	4.0
8.4	17	800WB146	0	123	3.8	800WB192	0	62	3.9
9	8	610UB101	0	46	5.0	700WB115	0	52	5.1
9	9	610UB113	0	49	4.7	700WB115	0	52	4.8
9	10	610UB125	0	57	4.6	700WB130	0	60	4.8
9	11	700WB115	0	63	4.2	700WB130	0	79	4.4
9	12	700WB130	0	60	4.1	700WB150	0	71	4.3
9	13	700WB130	0	115	4.2	800WB146	0	89	4.5
9	14	700WB150	0	101	4.0	700WB173	0	119	4.5
9	15	800WB146	0	107	4.0	800WB192	0	66	4.2
9	16	800WB168	0	69	3.9	800WB192	0	79	4.0
9	17	900WB175	0	66	3.7	900WB175	0	66	3.8
10	8	610UB125	0	54	4.7	700WB130	0	60	4.8
10	9	610UB125	20	103	4.3	800WB122	0	59	4.6
10	10	700WB130	0	60	4.4	800WB146	0	62	4.6
10	11	700WB130	0	117	4.0	800WB146	0	93	4.2
10	12	700WB150	0	123	3.9	800WB168	0	81	4.2
10	13	700WB173	0	71	4.1	800WB192	0	66	4.3
10	14	800WB168	0	117	3.9	900WB175	0	66	3.9
10	15	900WB175	0	66	3.9	900WB175	0	87	3.8
10	16	900WB175	0	66	3.8	900WB218	0	68	3.7
10	17	900WB175	0	81	3.6	900WB218	0	68	3.7
11	8	700WB130	0	60	4.5	800WB146	0	62	4.7
11	9	700WB130	0	63	4.2	800WB146	0	62	4.4
11	10	700WB150	0	77	4.1	800WB168	0	66	4.4
11	11	800WB146	0	109	3.9	900WB175	0	66	4.1
11	12	800WB192	0	66	3.9	900WB175	0	66	4.0
11	13	900WB175	0	66	4.0	900WB175	0	91	4.0
11	14	900WB175	0	66	3.8	900WB218	0	68	3.8
11	15	900WB175	0	113	3.7	9000WB218	0	68	3.8
11	16	900WB218	0	68	3.7	1000WB215	0	68	3.5
11	17	900WB218	0	68	3.7	1000WB215	0	117	3.5
12	8	800WB146	0	62	4.5	900WB175	0	66	4.7
12	9	800WB146	0	66	4.2	900WB175	0	66	4.5
12	10	900WB175	0	66	4.3	900WB218	0	68	4.5
12	11	900WB175	0	66	3.9	900WB218	0	68	4.2
12	12	900WB175	0	66	3.7	900WB218	0	68	3.9
12	13	900WB218	0	68	3.9	900WB218	0	86	3.9
12	14	900WB218	0	68	3.7	900WB257	0	70	3.8
12	15	900WB218	0	110	3.6	900WB257	0	80	3.7
12	16	1000WB215	0	94	3.5	1000WB258	0	80	3.6
12	17	1200WB249	0	66	3.6	1200WB249	0	68	3.6

Assumptions: 120mm Slab, F'c =25 Mpa, 2400 kg/m2 on decking with pan width 200mm, Un-propped, 12.5mm ponding allowance

Standard Grade Retail: Incremental Defl limit < Span / 300, Total Defl limit < Span / 250
sdl + live for frequency calc = 0.54 kPa

Premium Grade Retail: Incremental Defl limit < Span / 500, Total Defl limit < Span / 300,
sdl + live for frequency calc = 1.5 kPa

Table 3 - Plant Room & Compactus Floors

Span (m)	Spacing (m)	Plant Room Q = 7.5 + 1, non reducible				Compactus / Library Q = 10 + 1, non reducible			
		Beam 300PLUS®	Camber (mm)	Nos studs per beam	Nat. Fn Hz	Beam 300PLUS®	Camber (mm)	Nos studs per beam	Nat. Fn Hz
Secondary Beams									
8	2.8	360UB50.7	20	22	7.6	410UB53.7	20	26	8.0
9	2.8	410UB53.7	25	26	6.7	410UB67.1	20	30	7.6
10	2.8	460UB67.1	25	30	6.4	460UB74.6	20	34	6.4
11	2.8	460UB82	30	36	5.8	530UB82.0	20	36	6.1
12	2.8	530UB92.0	25	40	5.7	610UB101	20	44	6.2
13	2.8	610UB101	30	44	5.6	610UB101	30	44	5.3
14	2.8	610UB113	35	46	5.1	700WB115	25	50	5.5
15	2.8	610UB125	40	52	4.6	700WB130	25	56	5.0
16	2.8	700WB130	35	56	4.6	800WB122	30	72	4.7
17	2.8	700WB130	45	56	4.1	700WB150	40	90	4.2
Primary Beams									
8	8	610UB113	0	46	6.2	700WB115	0	50	6.5
8	9	610UB125	0	52	5.7	700WB130	0	56	6.3
8	10	700WB130	0	56	5.7	700WB130	0	73	5.6
8	11	700WB130	0	56	5.2	800WB146	0	60	5.5
8	12	700WB150	0	62	5.2	700WB173	0	70	5.5
8	13	800WB146	0	60	5.1	800WB168	0	89	4.9
8	14	800WB168	0	66	4.7	900WB175	0	76	5.0
8	15	800WB168	0	66	4.4	900WB175	0	76	4.7
8	16	900WB175	0	76	4.4	900WB218	0	90	4.5
8	17	900WB175	0	76	3.9	900WB218	0	90	4.0
8.4	8	610UB125	0	52	6.0	700WB130	0	56	6.4
8.4	9	700WB115	0	50	5.6	700WB130	0	65	6.1
8.4	10	700WB130	0	56	5.5	700WB150	0	75	5.5
8.4	11	700WB150	0	62	5.2	700WB173	0	70	5.4
8.4	12	800WB146	0	60	5.1	800WB168	0	95	5.5
8.4	13	800WB168	0	66	5.1	900WB175	0	76	4.9
8.4	14	800WB168	0	69	4.7	900WB175	0	76	4.9
8.4	15	900WB175	0	76	4.3	900WB218	0	90	4.7
8.4	16	900WB175	0	76	4.3	900WB218	0	90	4.5
8.4	17	900WB175	0	76	3.9	900WB218	0	90	4.0
9	8	700WB115	0	50	5.8	700WB130	0	65	6.0
9	9	700WB130	0	56	5.4	700WB173	0	70	6.0
9	10	700WB150	0	62	5.4	700WB173	0	73	5.4
9	11	800WB146	0	60	5.1	800WB192	0	74	5.4
9	12	800WB168	0	66	5.0	800WB192	0	93	5.3
9	13	800WB192	0	74	5.0	900WB175	0	77	4.8
9	14	900WB175	0	76	4.6	900WB218	0	90	4.9
9	15	900WB175	0	76	4.3	900WB218	0	90	4.6
9	16	900WB218	0	90	4.3	1000WB215	0	90	4.4
9	17	900WB218	0	90	3.9	900WB257	0	102	4.0
10	8	700WB130	0	57	5.3	800WB146	0	73	5.7
10	9	800WB146	0	60	5.3	800WB168	0	91	5.6
10	10	800WB168	0	66	5.2	900WB175	0	76	5.2
10	11	800WB192	0	74	4.9	900WB175	0	79	5.0
10	12	900WB175	0	76	4.8	900WB218	0	90	5.2
10	13	900WB218	0	90	4.8	900WB218	0	90	4.6
10	14	900WB218	0	90	4.5	1000WB215	0	90	4.7
10	15	900WB218	0	90	4.2	1000WB258	0	104	4.5
10	16	1000WB215	0	90	4.2	1200WB249	0	102	4.3
10	17	1000WB258	0	104	3.8	1200WB249	0	102	3.9
11	8	800WB146	0	60	5.2	800WB168	0	110	5.4
11	9	800WB168	0	66	4.9	900WB175	0	76	5.3
11	10	900WB175	0	76	4.9	900WB175	0	123	4.8
11	11	900WB175	0	76	4.6	1000WB215	0	90	4.9
11	12	900WB218	0	90	4.7	1000WB215	0	90	4.9
11	13	900WB218	0	90	4.5	1000WB258	0	104	4.5
11	14	1000WB258	0	104	4.4	1200WB249	0	102	4.6
11	15	1000WB258	0	104	4.1	1200WB249	0	102	4.4
11	16	1200WB249	0	102	4.1	1200WB278	0	114	4.2
11	17	1200WB249	0	102	3.8	1200WB278	0	114	3.8
12	8	900WB218	0	90	5.5	900WB175	0	80	5.2
12	9	900WB218	0	90	5.0	900WB218	0	90	5.2
12	10	900WB257	0	104	4.9	1000WB215	0	90	4.7
12	11	900WB218	0	90	4.4	1200WB278	0	114	5.0
12	12	1000WB296	0	120	4.7	1200WB278	0	114	5.0
12	13	1000WB296	0	120	4.5	1200WB317	0	126	4.5
12	14	1200WB278	0	114	4.3	1200WB317	0	126	4.5
12	15	1200WB317	0	126	4.1	1200WB342	0	126	4.3
12	16	1200WB317	0	126	4.1	1200WB342	0	126	4.1
12	17	1200WB317	0	126	3.7	1200WB392	0	130	3.8

Assumptions: 150mm Slab, F'c =32 Mpa, 2400 kg/m2 on decking with pan width 200mm, Un-propped, 12.5mm ponding allowance

Plant Room: Incremental Defl limit < Span / 300, Total Defl limit < Span / 250, sdl + live for frequency calc = 0.8 kPa

Compactus / Library: Incremental Defl limit < Span / 300, Total Defl limit < Span / 250, sdl + live for frequency calc = 1.3 kPa

Table 4 - Carparks

Span (m)	Spacing (m)	Carparks Q = 2.5 + 0.1 Beam 300PLUS	Camber (mm)	Nos studs per beam	Nat. Fn Hz
Secondary Beams					
8	2.8	310UB40.4	25	21	6.7
9	2.8	360UB44.7	30	23	6.0
10	2.8	360UB50.7	40	26	5.2
11	2.8	410UB53.7	45	28	4.8
12	2.8	460UB67.1	40	31	4.9
13	2.8	460UB82.1	45	36	4.5
14	2.8	530UB82.0	50	36	4.4
15	2.8	610UB101	40	44	4.6
16	2.8	610UB113	45	46	4.3
17	2.8	610UB125	55	52	3.9
Primary Beams					
8	8	460UB67.1	20	30	5.0
8	9	460UB67.1	25	30	4.6
8	10	460UB82.1	0	36	4.3
8	11	460UB82.1	25	36	4.1
8	12	530UB82.0	20	36	4.2
8	13	530UB92.4	20	40	4.0
8	14	610UB101	0	44	4.1
8	15	610UB101	0	44	4.1
8	16	610UB101	0	44	3.9
8	17	610UB113	0	46	3.8
8.4	8	460UB67.1	25	30	4.7
8.4	9	460UB82.1	20	36	4.6
8.4	10	530UB82.0	20	36	4.3
8.4	11	530UB92.4	20	40	4.1
8.4	12	530UB92.4	20	40	4.1
8.4	13	610UB101	20	44	3.8
8.4	14	610UB101	20	44	4.0
8.4	15	610UB101	20	44	4.0
8.4	16	610UB113	20	46	3.9
8.4	17	610UB125	0	52	3.8
9	8	460UB82.1	30	36	4.6
9	9	530UB82.0	25	36	4.5
9	10	530UB92.4	25	40	4.2
9	11	610UB101	20	44	4.1
9	12	610UB101	20	44	4.1
9	13	610UB113	20	46	3.9
9	14	610UB113	25	46	3.9
9	15	610UB125	20	52	3.9
9	16	700WB115	20	50	3.8
9	17	700WB130	0	56	3.7
10	8	530UB82.0	35	36	4.2
10	9	530UB92.4	35	40	4.1
10	10	610UB101	30	44	4.0
10	11	610UB113	25	46	3.8
10	12	610UB125	25	52	3.9
10	13	700WB115	25	50	3.7
10	14	700WB115	25	50	3.7
10	15	700WB130	25	56	3.8
10	16	700WB130	25	56	3.7
10	17	700WB150	20	62	3.6
11	8	610UB101	30	44	4.1
11	9	610UB101	35	44	3.9
11	10	610UB125	30	52	3.8
11	11	610UB125	35	52	3.6
11	12	700WB115	30	50	3.6
11	13	700WB130	30	56	3.5
11	14	700WB130	30	56	3.5
11	15	700WB150	25	62	3.6
11	16	800WB146	25	60	3.6
11	17	800WB146	25	72	3.4
12	8	610UB125	35	52	4.0
12	9	700WB115	35	50	3.8
12	10	700WB130	30	56	3.6
12	11	700WB130	35	56	3.5
12	12	700WB150	30	62	3.5
12	13	700WB150	35	62	3.3
12	14	800WB146	30	60	3.4
12	15	700WB173	35	70	3.3
12	16	800WB168	30	72	3.4
12	17	900WB175	25	76	3.4

Example
Refer to pages 6 & 7

← Select for B1

← Select for B2

← Select for PB1

← Select for PB2

← Select for PB3

Assumptions:
120mm Slab, F'c =40MPa, 2400 kg/m2 on decking with pan width 200mm,
Un-propped, 8 mm ponding allowance
Incremental Defl limit < Span / 300, Total Defl limit < Span / 250.
sdl + live for frequency calc = 0.34 kPa

5. Example

The following example illustrates how the preceding tables can be used for preliminary designs.

Consider the carpark layout below, using Table 4 determine preliminary beam sizing for both the primary and secondary beams

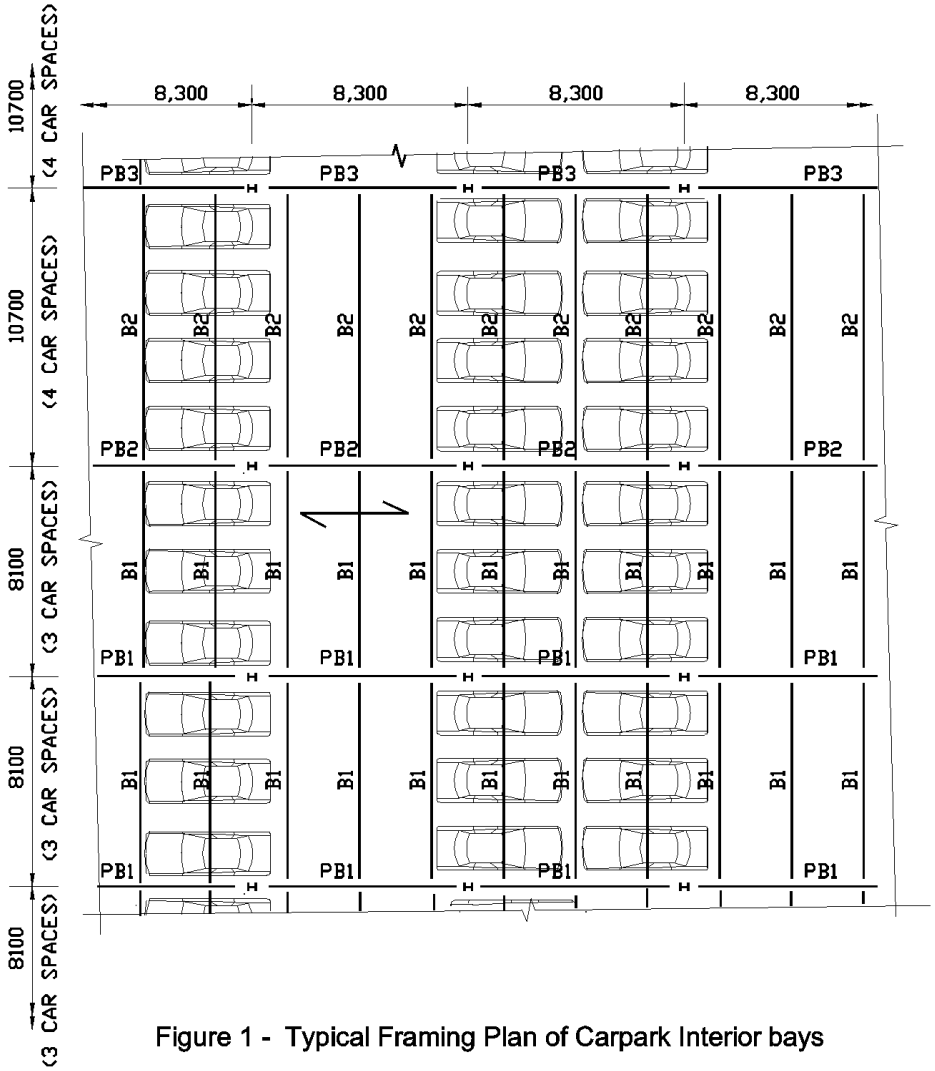

Figure 1 - Typical Framing Plan of Carpark Interior bays

Summary of beam designs

Beam Mark	300PLUS® Beam Size	No. of Studs	Camber mm
B1	310UB40.4	21	25
B2	410UB53.7	28	45
PB1	460UB67.1	30	30
PB2	530UB82.0	36	25
PB3	530UB92.4	40	20

5.1 Selecting the beams

Determine the most appropriate table for the floor usage/loading. In this case it is obviously Table 4. Beam sizes can be determined by reading directly off the span and spacing. Interpolation and engineering judgment should be exercised to obtain the appropriate preliminary design.

Secondary Beams:

B1 : Span = 8.1m, spacing = 2.8 m
Therefore read for 8m span –
310 UB 40.4 with 21 studs and 25mm camber.

B2 : Span = 10.7m, spacing = 2.8 m
Therefore read for 11m span –
410 UB 53.7 with 28 studs and 45mm camber.

Primary Beams:

PB1 : Span = 8.3m, spacing = 8.1 m
Therefore read for 8.4m span & 8 m spacing
460 UB 67.1 with 30 studs and 30mm camber.

PB2 : Span = 8.3m

$$\text{Spacing} = \frac{8.1 + 10.7}{2} = 9.4\text{m} \quad \text{say } 10\text{m}$$

Therefore read for 8.4m span & 10m spacing

530 UB 82.1 with 36 studs and 25mm camber.

PB3 : Span = 8.3m, spacing = 10.7 m
Therefore read for 8.4m span & 11 m spacing

530 UB 92.1 with 40 studs and 20mm camber.

5.2 Comments

5.2.1 Primary beams

The primary beam sizes have been determined by applying the point loads from the secondary such that they are symmetrical about the center-line. In most cases this will give a conservative result which can be refined in the final design.

5.2.2 Secondary Edge beams

The design of secondary edge beams where decking is perpendicular to the beam, is usually more economical as a non-composite beam.

The use of a non-composite beam eliminates shrinkage and creep deflection in consideration of the more onerous Total deflection limit of - Span/500 and also avoids the additional transverse reinforcement required to prevent type 4 shear failure. The savings in shear studs and additional reinforcement usually outweighs the cost of the heavier beam required.

5.2.3 Primary Edge beams

Primary edge beams where the decking is parallel to the beam are usually designed as composite edge beams, with reduced effective width of the concrete flange.

These beams have not been included in these tables because of the varying façade load due to many different systems and materials.

Design tools such as CompPanel™ and COMPBEAM™ can readily check such beams with point and uniformly distributed loads.

5.2.4 Moment Capacity

The bare steel section moment capacity ΦM_s has been used for the strength check during this construction stage. It is the responsibility of the user to ensure that lateral restraint is available to allow the beam under consideration to achieve this value or that the member capacity ΦM_b is not exceeded.

5.2.5 Natural Frequency

While these tables provide a value for natural frequency of the secondary beam and the secondary/primary beam panel, a check on acceptability is still required depending on the panels location relative to other items such as a concrete core or floor edge. The frequencies tabulated are based on the equivalent point loads uniformly distributed on the primary beams.

6. References

[1] CompPanel™ Software – OneSteel Market Mills
[2] COMPBEAM™ Software – OneSteel Market Mills
[3] CompSelector™ Software – OneSteel Market Mills
[3] Floor Vibrations in Composite Steel Office Buildings. Steel Construction, Journal of the Australian Institute of Steel Institute Vol. 39 No. 1 March 2005.

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