

## TYPE 1045 FLAT BEAM

DESIGN OF PRESTRESS CONCRETE BASS BEAMS TYPE 1045 (FOR USE AS 150 TO 175 mm COMPOSITE SLAB)

### 1. DESIGN CRITERIA

#### 1.2 ULTIMATE LIMIT STATES

The design criteria for prestress beams will be based on serviceability limit states only. Ultimate loads can be used as a check.

#### 1.2 SERVICEABILITY LIMIT STATES

The design of the beams are based on acceptable deflections and cracking as specified in CP110. The different classes of Tables 33,34 and 35 refer.

### 2. DESIGN PROCEDURE FOR SIMPLY SUPPORTED BEAMS

#### 2.1 PROPERTIES

Type 1045 is a flat soffit trapezium shaped beam. The base width is 380 mm wide and the two sides are 100 mm and 25 mm high tapered 10 mm and 5 mm outwards to give an effective width of 395 mm when laid side by side. The beam is used as a permanent shutter and topped with concrete to form a composite slab 150 mm to 175 mm deep.

fcu	60	N/sq mm
fci	35	N/sq mm
E	36	kN/sq mm
Pu	1550	N/sq mm

Table 33 0.2 Limiting crack width 0.1 or 0.2

Table 33 0 Allowed increase in stress

Table 36 0.5 Allow comp stress factor of 0.5 or 0.4 at transfer

	1045	150	175
Depth m	0.100	0.150	0.175
Area sq m	0.0241250	0.0570000	0.0665000
I m x 4	0.0000131	0.0001069	0.0001697
Yt m	0.065	0.075	0.088
Yb m	0.035	0.075	0.088
Zt m x 3	-0.0002026	-0.0014250	-0.0019396
Zb m x 3	0.0003746	0.0014250	0.0019396
b mm	380	380	380
Table 14	1.0	1.0	1.0
Centroid of wires from bottom	0.023	0.023	0.023
e of wires	0.012	0.052	0.065
d	0.077	0.127	0.152

WIRE INFORMATION (Wires are numbered from the 100 mm edge of the beam).

	% Stressed	Dia	Area
Wire No 1	100	5	19.63
Wire No 2	100	5	19.63
Wire No 3	100	5	19.63
Wire No 4	100	5	19.63

Aps 78.54 sq mm

Fpu -121.74 kN

fpi -85.22 kN

fpf -59.65 kN

#### 2.2 TRANSFER

The Bass Beams are limited initially by transfer conditions. Modifications can be made to the reinforcing if transfer conditions are not met.

##### 2.2.1 ASSUMPTIONS

JACK LOSS ASSUMED TO BE BETWEEN 70 AND 80 %

LOSSES DUE TO CREEP ETC ARE ASSUMED TO BE 10 %

(High initial stressing forces and low final losses give the most restriction on the design at transfer)

##### 2.2.2 LIMITS

Allowable comp stress % fci -17.5 N/sq mm

Allowable tensile stress fti 3.5 N/sq mm

##### 2.2.3 EXAMPLES (SEE APPENDIX 27)

APPENDIX 27 4 m Beam 70 % JACK FORCE

It can be seen that the flat soffit shape of the 1045 with a large area under compression and a low eccentricity does not give the same high compression stresses achieved with the T-beams. Stresses at transfer are therefore not critical.

### 2.3 DESIGN OF BASS BEAMS IN POSITION PRIOR TO SCREEDING

The beams in position need only be designed to carry light working loads. Load of screed is dealt with later.

#### 2.3.1 ASSUMPTIONS

JACK LOSS ASSUMED TO BE 70 %

LOSSES DUE TO CREEP ETC ARE ASSUMED TO BE 30 %

CRACK WIDTH 0.1

DESIGN CLASS 3

LIVE LOADS TO BE CARRIED PRIOR TO SCREEDING 1 kN/sq m

#### 2.3.2 LIMITS

Allowable comp stress - 19.8 N/sq mm

Allowable tensile stress 0.0 N/sq mm Allow max 15

Not applicable

#### 2.3.3 EXAMPLES (SEE APPENDIX 28)

APPENDIX 28 4 m Beam

The maximum unproped length is approximately 4 m. Closer prop centres are provided in practice to enable the beams to settle evenly for a better soffit finish.

### 2.4 DESIGN OF BASS BEAMS DURING SCREEDING

The beams are designed to carry the weight of screeding.

Additional propping is used in practice to enable the beams to settle evenly for a better finish.

#### 2.4.1 ASSUMPTIONS

JACK LOSS ASSUMED TO BE 70 %  
 LOSSES DUE TO CREEP ETC ARE ASSUMED TO BE 30 %  
 CRACK WIDTH 0.2  
 DESIGN CLASS 3

#### 2.4.2 LIMITS

Allowable comp stress -19.8 N/sq mm  
 Allowable tensile stress 6.9 N/sq mm Allow max 15  
 Not applicable

#### 2.4.3 EXAMPLES ( SEE APPENDIX 29 AND 30)

APPENDIX 29 3 m 1045 Beam 150 mm Final Depth  
 APPENDIX 30 2.5 m 1045 Beam 200 mm Final Depth

A live load of 1 kN/sq m was used as well as the weight of the wet concrete.

Appendix 29 and 30 provide the limits to propping viz 3 m for the 150 mm composite slab and 2.5 m for the 200 slab. 200 mm is used only as an exercise to determine propping lengths.

#### 2.5 DESIGN OF COMPOSITE SLABS WITH LIVE LOADS

The beams are designed with UDL only to give an indication of its load-span capabilities. Each case needs to be separately checked for specific loadings.

##### 2.5.1 ASSUMPTIONS

JACK LOSS ASSUMED TO BE 70 %  
 LOSSES DUE TO CREEP ETC ARE ASSUMED TO BE 30 %  
 CRACK WIDTH 0.2  
 DESIGN CLASS 3

\*\*\*\*\* FINISHES OF 1 kN/sq m ALLOWED FOR \*\*\*\*\*

##### 2.5.2 LIMITS

Allowable comp stress -19.8 N/sq mm  
 Allowable tensile stress 6.9 N/sq mm Allow max 15  
 Not applicable

##### 2.5.3 EXAMPLES ( SEE APPENDIX 31 AND 32)

APPENDIX 31 4.2 m 1045 150 mm SLAB 1.5 kN/sq m LIVE LOAD  
 APPENDIX 32 3 M 1045 175 mm SLAB 10 kN/sq m LIVE LOAD

The limitation with the 1045 composite slab is the deflections and it can be seen that the tension in the bottom fibres are well below the allowables.

#### 2.6 DEFLECTIONS ( SEE APPENDIX 33)

Only an approximation of deflections are possible as the true values of deflections due to losses are to date not available.

#### 2.7 SHEAR

Extensive shear calculations indicate that shear is not a factor if the above serviceability limits for stressing and deflections are met. Individual cases can be checked conservatively using Table 5 and ignoring the additional shear resistance obtained from the prestressing.

#### APPENDIX 27

##### JOB INPUT INFORMATION

##### VARIABLES

SPAN	4.0 m	BEAM DEPTH	100 mm
		FINAL DEPTH	0 mm
	Dia % Stressed		
Wire Pt 1	5	100	
Wire Pt 2	5	100	
Wire Pt 3	5	100	
Wire Pt 4	5	100	
Wire Pt 5	0	0	
JACK LOSS	70 % (70 TO 80%)	TOP DIA	0 mm
CREEP ETC LOSS	10 % (10 TO 30 %)	DESIGN CLAS	3 (1,2,3)
CRACK WIDTH	0.2 (0.1 OR 0.2)		
UDL kN/sq m	:	UDL kN/m i.e. per beam	
	: BEAM SW	0.58 kN/m	: TOPPING
FINISHES	0.0 kN/sq m	:	FINISHES
	:	:	0.00 kN/m
LIVE	0.0 kN/sq m	:	LIVE
	:	:	0.00 kN/m
	:	:	TOTAL
	:	:	0.58 kN/m

##### DESIGN OF BASS BEAMS AT TRANSFER

BEAM LENGTH 4.0 m

##### SUMMARY OF LOADS AND FORCES

TOTAL SW 2.3 kN  
 LEFT SUPPORT 1.2 kN  
 RIGHT SUPPORT 1.2 kN  
 Allowable comp stress % -17.5 N/sq mm  
 Allowable tensile stress 3.5 N/sq mm

After losses

TOP 1.6 N/sq mm 1.4  
 BOTTOM -6.3 N/sq mm -5.7

SPAN	Pi/A	PIE/Zit	Pie/Zib	SF*X	M SW	MOMENT
0.0	-3.5	5.1	-2.8	0.0	0.0	0.0
0.2	-3.5	5.1	-2.8	0.2	-0.0	0.2
0.4	-3.5	5.1	-2.8	0.5	-0.0	0.4
0.6	-3.5	5.1	-2.8	0.7	-0.1	0.6
0.8	-3.5	5.1	-2.8	0.9	-0.2	0.7
1.0	-3.5	5.1	-2.8	1.2	-0.3	0.9
1.2	-3.5	5.1	-2.8	1.4	-0.4	1.0

1.4	-3.5	5.1	-2.8	1.6	-0.6	1.1
1.6	-3.5	5.1	-2.8	1.9	-0.7	1.1
1.8	-3.5	5.1	-2.8	2.1	-0.9	1.1
2.0	-3.5	5.1	-2.8	2.3	-1.2	1.2
2.2	-3.5	5.1	-2.8	2.5	-1.4	1.1
2.4	-3.5	5.1	-2.8	2.8	-1.7	1.1
2.6	-3.5	5.1	-2.8	3.0	-2.0	1.1
2.8	-3.5	5.1	-2.8	3.2	-2.3	1.0
3.0	-3.5	5.1	-2.8	3.5	-2.6	0.9
3.2	-3.5	5.1	-2.8	3.7	-3.0	0.7
3.4	-3.5	5.1	-2.8	3.9	-3.3	0.6
3.6	-3.5	5.1	-2.8	4.2	-3.8	0.4
3.8	-3.5	5.1	-2.8	4.4	-4.2	0.2
4.0	-3.5	5.1	-2.8	4.6	-4.6	0.0

AFTER LOSSES

	M/zit	M/zib	Top	Bott	Top	Bott
	0.0	0.0	1.6	-6.3	1.4	-5.7
	-1.1	0.6	0.5	-5.7	0.3	-5.1
	-2.1	1.1	-0.5	-5.2	-0.7	-4.5
	-2.9	1.6	-1.4	-4.7	-1.5	-4.1
	-3.7	2.0	-2.1	-4.3	-2.3	-3.7
	-4.3	2.3	-2.7	-4.0	-2.9	-3.3
	-4.8	2.6	-3.2	-3.7	-3.4	-3.1
	-5.2	2.8	-3.6	-3.5	-3.8	-2.8
	-5.5	3.0	-3.9	-3.3	-4.1	-2.7
	-5.7	3.1	-4.1	-3.2	-4.3	-2.6
	-5.7	3.1	-4.2	-3.2	-4.3	-2.6
	-5.7	3.1	-4.1	-3.2	-4.3	-2.6
	-5.5	3.0	-3.9	-3.3	-4.1	-2.7
	-5.2	2.8	-3.6	-3.5	-3.8	-2.8
	-4.8	2.6	-3.2	-3.7	-3.4	-3.1
	-4.3	2.3	-2.7	-4.0	-2.9	-3.3
	-3.7	2.0	-2.1	-4.3	-2.3	-3.7
	-2.9	1.6	-1.4	-4.7	-1.5	-4.1
	-2.1	1.1	-0.5	-5.2	-0.7	-4.5
	-1.1	0.6	0.5	-5.7	0.3	-5.1
	-0.0	0.0	1.6	-6.3	1.4	-5.7

APPENDIX 28

JOB INPUT INFORMATION

VARIABLES

SPAN	4.0 m	BEAM DEPTH	100 mm
		FINAL DEPTH	0 mm
	Dia % Stressed		
Wire Pt 1	5	100	
Wire Pt 2	5	100	
Wire Pt 3	5	100	
Wire Pt 4	5	100	
Wire Pt 5	0	0	
JACK LOSS	70 % (70 TO 80%)		
CREEP ETC LOSS	30 % (10 TO 30 %)		
CRACK WIDTH	0.1 (0.1 OR 0.2)	DESIGN CLAS 3 (1,2,3)	
UDL kN/sq m	:	UDL kN/m i.e. per beam	
	:	BEAM SW	0.58 kN/m
	:	TOPPING	0.00 kN/m
FINISHES	0.0 kN/sq m	FINISHES	0.00 kN/m
	:		
LIVE	1.0 kN/sq m	LIVE	0.38 kN/m
	:	TOTAL	0.96 kN/m

DESIGN OF BASS BEAMS INPOSITION PRIOR TO SCREEDING

SPAN 4.0 m	BEAM LENGTH 4.0 m
CENTROID OF BEAM FROM 2.00 RATIO L	0.50
CENTROID OF BEAM FROM 2.00 RATIO R	0.50
TOTAL W	3.8 kN
LEFT SUPPORT	1.9 kN
RIGHT SUPPORT	1.9 kN
Allowable comp stress %	-19.8 N/sq mm
Allowable tensile stress	6.9 N/sq mm Allow max 15

MAIN	TOP	1.1 N/sq mm	-8.4
SPAN	BOTTOM	-4.4 N/sq mm	0.7
	deflect	1.7	

SPAN	Pf/A	PfE/Zit	Pfe/Zib	SF*X	M	MOMENT
0.0	-2.5	3.6	-1.9	0.0	0.0	0.0
0.2	-2.5	3.6	-1.9	0.4	-0.0	0.4
0.4	-2.5	3.6	-1.9	0.8	-0.1	0.7
0.6	-2.5	3.6	-1.9	1.2	-0.2	1.0
0.8	-2.5	3.6	-1.9	1.5	-0.3	1.2
1.0	-2.5	3.6	-1.9	1.9	-0.5	1.4
1.2	-2.5	3.6	-1.9	2.3	-0.7	1.6
1.4	-2.5	3.6	-1.9	2.7	-0.9	1.7
1.6	-2.5	3.6	-1.9	3.1	-1.2	1.8
1.8	-2.5	3.6	-1.9	3.5	-1.6	1.9
2.0	-2.5	3.6	-1.9	3.8	-1.9	1.9
2.2	-2.5	3.6	-1.9	4.2	-2.3	1.9
2.4	-2.5	3.6	-1.9	4.6	-2.8	1.8
2.6	-2.5	3.6	-1.9	5.0	-3.2	1.7
2.8	-2.5	3.6	-1.9	5.4	-3.8	1.6

3.0	-2.5	3.6	-1.9	5.8	-4.3	1.4
3.2	-2.5	3.6	-1.9	6.1	-4.9	1.2
3.4	-2.5	3.6	-1.9	6.5	-5.5	1.0
3.6	-2.5	3.6	-1.9	6.9	-6.2	0.7
3.8	-2.5	3.6	-1.9	7.3	-6.9	0.4
4.0	-2.5	3.6	-1.9	7.7	-7.7	-0.0

AFTER LOSSES

M/zit M/zib Top Bott			
0.0	0.0	1.1	-4.4
-1.8	1.0	-0.7	-3.4
-3.4	1.8	-2.3	-2.6
-4.8	2.6	-3.7	-1.8
-6.1	3.3	-5.0	-1.1
-7.1	3.8	-6.0	-0.6
-8.0	4.3	-6.9	-0.1
-8.6	4.7	-7.5	0.3
-9.1	4.9	-8.0	0.5
-9.4	5.1	-8.3	0.7
-9.5	5.1	-8.4	0.7
-9.4	5.1	-8.3	0.7
-9.1	4.9	-8.0	0.5
-8.6	4.7	-7.5	0.3
-8.0	4.3	-6.9	-0.1
-7.1	3.8	-6.0	-0.6
-6.1	3.3	-5.0	-1.1
-4.8	2.6	-3.7	-1.8
-3.4	1.8	-2.3	-2.6
-1.8	1.0	-0.7	-3.4
0.0	-0.0	1.1	-4.4

APPENDIX 29

JOB INPUT INFORMATION

VARIABLES

SPAN	3.0 m	BEAM DEPTH	100 mm
		FINAL DEPTH	0 mm
	Dia % Stressed		
Wire Pt 1	5	100	
Wire Pt 2	5	100	
Wire Pt 3	5	100	
Wire Pt 4	5	100	
Wire Pt 5	0	0	
JACK LOSS	70 % (70 TO 80%)		
CREEP ETC LOSS	30 % (10 TO 30 %)		
CRACK WIDTH	0.2 (0.1 OR 0.2)	DESIGN CLAS 3 (1,2,3)	
UDL kN/sq m	:	UDL kN/m i.e. per beam	
: BEAM SW	0.58 kN/m	: TOPPING	0.00 kN/m
150 mm WE 2.1 kN/sq m	:	150 mm WET 0.80 kN/m	
(Effectively 87.5 mm)			
LIVE	1.0 kN/sq m	: LIVE	0.38 kN/m
		: TOTAL	1.76 kN/m

DESIGN OF BASS BEAMS DURING SCREEDING

SPAN	3.0 m	BEAM LENGTH	3.0 m
CENTROID OF BEAM FROM 1.50 RATIO L	0.50		
CENTROID OF BEAM FROM 1.50 RATIO R	0.50		
TOTAL SW	1.7 kN	TOTAL W	5.3 kN
TOTAL SCREED	0.0 kN		
LEFT SUPPORT	2.6 kN		
RIGHT SUPPORT	2.6 kN		
Allowable comp stress %	-19.8 N/sq mm		
Allowable tensile stress	6.9 N/sq mm		
	After losses		
MAIN	TOP	1.1 N/sq mm	-8.7
SPAN	BOTTOM	-4.4 N/sq mm	0.9

SPAN	Pf/A	PfE/Zit	Pfe/Zib	SF*X	M	MOMENT
0.0	-2.5	3.6	-1.9	0.0	0.0	0.0
0.2	-2.5	3.6	-1.9	0.4	-0.0	0.4
0.3	-2.5	3.6	-1.9	0.8	-0.1	0.7
0.5	-2.5	3.6	-1.9	1.2	-0.2	1.0
0.6	-2.5	3.6	-1.9	1.6	-0.3	1.3
0.8	-2.5	3.6	-1.9	2.0	-0.5	1.5
0.9	-2.5	3.6	-1.9	2.4	-0.7	1.7
1.1	-2.5	3.6	-1.9	2.8	-1.0	1.8
1.2	-2.5	3.6	-1.9	3.2	-1.3	1.9
1.3	-2.5	3.6	-1.9	3.6	-1.6	2.0
1.5	-2.5	3.6	-1.9	4.0	-2.0	2.0
1.6	-2.5	3.6	-1.9	4.3	-2.4	2.0
1.8	-2.5	3.6	-1.9	4.7	-2.8	1.9
1.9	-2.5	3.6	-1.9	5.1	-3.3	1.8
2.1	-2.5	3.6	-1.9	5.5	-3.9	1.7
2.2	-2.5	3.6	-1.9	5.9	-4.4	1.5
2.4	-2.5	3.6	-1.9	6.3	-5.1	1.3
2.5	-2.5	3.6	-1.9	6.7	-5.7	1.0
2.7	-2.5	3.6	-1.9	7.1	-6.4	0.7
2.8	-2.5	3.6	-1.9	7.5	-7.1	0.4
3.0	-2.5	3.6	-1.9	7.9	-7.9	0.0

AFTER LOSSES

M/zit M/zib Top Bott

0.0	0.0	1.1	-4.4
-1.9	1.0	-0.8	-3.4
-3.5	1.9	-2.4	-2.5
-5.0	2.7	-3.9	-1.7
-6.2	3.4	-5.2	-1.0
-7.3	4.0	-6.2	-0.4
-8.2	4.4	-7.1	0.0
-8.9	4.8	-7.8	0.4
-9.4	5.1	-8.3	0.7
-9.7	5.2	-8.6	0.8
-9.8	5.3	-8.7	0.9
-9.7	5.2	-8.6	0.8
-9.4	5.1	-8.3	0.7
-8.9	4.8	-7.8	0.4
-8.2	4.4	-7.1	0.0
-7.3	4.0	-6.2	-0.4
-6.2	3.4	-5.2	-1.0
-5.0	2.7	-3.9	-1.7
-3.5	1.9	-2.4	-2.5
-1.9	1.0	-0.8	-3.4
-0.0	0.0	1.1	-4.4

**APPENDIX 30**

**JOB INPUT INFORMATION**

**VARIABLES**

SPAN	2.5 m	BEAM DEPTH	100 mm
		FINAL DEPTH	0 mm
	Dia % Stressed		
Wire Pt 1	5	100	
Wire Pt 2	5	100	
Wire Pt 3	5	100	
Wire Pt 4	5	100	
Wire Pt 5	0	0	
JACK LOSS	70 % (70 TO 80%)		
CREEP ETC LOSS	30 % (10 TO 30 %)		
CRACK WIDTH	0.2 (0.1 OR 0.2)	DESIGN CLAS	3 (1,2,3)

UDL kN/sq m	:	UDL kN/m i.e. per beam
: BEAM SW 0.58 kN/m	:	TOPPING 0.00 kN/m
200 mm 3.3 kN/sq m	:	200 mm WET 1.25 kN/m
(Effectively 137.5 mm)		
LIVE 1.0 kN/sq m	:	LIVE 0.38 kN/m
	:	TOTAL 2.21 kN/m

**DESIGN OF BASS BEAMS DURING SCREEDING**

SPAN 2.5 m	BEAM LENGTH 2.5 m
CENTROID OF BEAM FROM 1.25 RATIO L	0.50
CENTROID OF BEAM FROM 1.25 RATIO R	0.50
TOTAL SW	1.4 kN TOTAL W 5.5 kN
TOTAL SCREED	0.0 kN
LEFT SUPPORT	2.8 kN
RIGHT SUPPORT	2.8 kN
Allowable comp stress %	-19.8 N/sq mm
Allowable tensile stress	6.9 N/sq mm Allow max 15

MAIN TOP 1.1 N/sq mm -7.4  
SPAN BOTTOM -4.4 N/sq mm 0.2

SPAN	Pf/A	PfE/Zit	Pfe/Zib	SF*X	M	MOMENT
0.0	-2.5	3.6	-1.9	0.0	0.0	0.0
0.1	-2.5	3.6	-1.9	0.3	-0.0	0.3
0.3	-2.5	3.6	-1.9	0.7	-0.1	0.6
0.4	-2.5	3.6	-1.9	1.0	-0.2	0.9
0.5	-2.5	3.6	-1.9	1.4	-0.3	1.1
0.6	-2.5	3.6	-1.9	1.7	-0.4	1.3
0.8	-2.5	3.6	-1.9	2.1	-0.6	1.5
0.9	-2.5	3.6	-1.9	2.4	-0.8	1.6
1.0	-2.5	3.6	-1.9	2.8	-1.1	1.7
1.1	-2.5	3.6	-1.9	3.1	-1.4	1.7
1.3	-2.5	3.6	-1.9	3.5	-1.7	1.7
1.4	-2.5	3.6	-1.9	3.8	-2.1	1.7
1.5	-2.5	3.6	-1.9	4.1	-2.5	1.7
1.6	-2.5	3.6	-1.9	4.5	-2.9	1.6
1.8	-2.5	3.6	-1.9	4.8	-3.4	1.5
1.9	-2.5	3.6	-1.9	5.2	-3.9	1.3
2.0	-2.5	3.6	-1.9	5.5	-4.4	1.1
2.1	-2.5	3.6	-1.9	5.9	-5.0	0.9
2.3	-2.5	3.6	-1.9	6.2	-5.6	0.6
2.4	-2.5	3.6	-1.9	6.6	-6.2	0.3
2.5	-2.5	3.6	-1.9	6.9	-6.9	0.0

**AFTER LOSSES**

M/zit M/zib Top Bott

0.0	0.0	1.1	-4.4
-1.6	0.9	-0.5	-3.5
-3.1	1.7	-2.0	-2.7
-4.4	2.4	-3.3	-2.0
-5.5	3.0	-4.4	-1.4
-6.4	3.5	-5.3	-0.9
-7.2	3.9	-6.1	-0.5
-7.8	4.2	-6.7	-0.2

-8.2	4.4	-7.1	0.0
-8.4	4.6	-7.4	0.2
-8.5	4.6	-7.4	0.2
-8.4	4.6	-7.4	0.2
-8.2	4.4	-7.1	0.0
-7.8	4.2	-6.7	-0.2
-7.2	3.9	-6.1	-0.5
-6.4	3.5	-5.3	-0.9
-5.5	3.0	-4.4	-1.4
-4.4	2.4	-3.3	-2.0
-3.1	1.7	-2.0	-2.7
-1.6	0.9	-0.5	-3.5
-0.0	0.0	1.1	-4.4

**APPENDIX 31**

**JOB INPUT INFORMATION**

**VARIABLES**

SPAN	4.2 m	BEAM DEPTH	100 mm
		FINAL DEPTH	150 mm
	Dia % Stressed		
Wire Pt 1	5	100	BEAM SW 0.579 kN/m
Wire Pt 2	5	100	
Wire Pt 3	5	100	
Wire Pt 4	5	100	
Wire Pt 5	0	0	
JACK LOSS	70 % (70 TO 80%)		
CREEP ETC LOSS	30 % (10 TO 30 %)		
CRACK WIDTH	0.2 (0.1 OR 0.2)	DESIGN CLAS	3 (1,2,3)

UDL kN/sq m	:	UDL kN/m i.e. per beam
:	SLAB SW	1.37 kN/m
FINISHES	1.0 kN/sq m	FINISHES 0.38 kN/m
LIVE	1.5 kN/sq m	LIVE 0.57 kN/m
		TOTAL 2.32 kN/m

**DESIGN OF BASS BEAMS WITH LIVE LOADS**

SPAN	4.2 m	BEAM LENGTH	4.2 m
CENTROID OF BEAM FROM 2.10 RATIO L	0.50		
CENTROID OF BEAM FROM 2.10 RATIO R	0.50		
POINT LOAD 1	RATIO L	1.00	
	RATIO R	0.00	
TOTAL SW	5.7 kN	TOTAL DL	7.3 kN
TOTAL SCREED	0.0 kN	TOTAL LL	2.4 kN
TOTAL FINISH	1.6 kN	TOTAL	9.7 kN
TOTAL LIVE LO	2.4 kN		
LEFT SUPPORT	3.7	1.2	0.0 4.9 kN
RIGHT SUPPORT	3.7	1.2	0.0 4.9 kN
Allowable comp stress %	-19.8 N/sq mm		
Allowable tensile stress	6.9 N/sq mm Allow max 15		

MAIN	TOP	1.1 N/sq mm	-2.5
SPAN	BOTTOM	-3.2 N/sq mm	0.4

SPAN	Pf/A	PfE/Zit	PfE/Zib	SF*X	M	UDL POINT
0.0	-1.0	2.2	-2.2		0.0	0.0
0.2	-1.0	2.2	-2.2		1.0	-0.1
0.4	-1.0	2.2	-2.2		2.0	-0.2
0.6	-1.0	2.2	-2.2		3.1	-0.5
0.8	-1.0	2.2	-2.2		4.1	-0.8
1.1	-1.0	2.2	-2.2		5.1	-1.3
1.3	-1.0	2.2	-2.2		6.1	-1.8
1.5	-1.0	2.2	-2.2		7.2	-2.5
1.7	-1.0	2.2	-2.2		8.2	-3.3
1.9	-1.0	2.2	-2.2		9.2	-4.1
2.1	-1.0	2.2	-2.2		10.2	-5.1
2.3	-1.0	2.2	-2.2		11.2	-6.2
2.5	-1.0	2.2	-2.2		12.3	-7.4
2.7	-1.0	2.2	-2.2		13.3	-8.6
2.9	-1.0	2.2	-2.2		14.3	-10.0
3.2	-1.0	2.2	-2.2		15.3	-11.5
3.4	-1.0	2.2	-2.2		16.4	-13.1
3.6	-1.0	2.2	-2.2		17.4	-14.8
3.8	-1.0	2.2	-2.2		18.4	-16.6
4.0	-1.0	2.2	-2.2		19.4	-18.5
4.2	-1.0	2.2	-2.2		20.4	-20.4

**AFTER LOSSES**

Mpt Moment	M/zft	M/zfb	Top	Bott
0.0	0.0	0.0	1.1	-3.2
0.0	1.0	-0.7	0.7	-2.5
0.0	1.8	-1.3	1.3	-1.9
0.0	2.6	-1.8	1.8	-1.4
0.0	3.3	-2.3	2.3	-0.9
0.0	3.8	-2.7	2.7	-0.5
0.0	4.3	-3.0	3.0	-0.2
0.0	4.7	-3.3	3.3	0.0
0.0	4.9	-3.4	3.4	0.2
0.0	5.1	-3.6	3.6	0.3
0.0	5.1	-3.6	3.6	0.4
0.0	5.1	-3.6	3.6	0.3

0.0	4.9	-3.4	3.4	-2.3	0.2
0.0	4.7	-3.3	3.3	-2.1	0.0
0.0	4.3	-3.0	3.0	-1.9	-0.2
0.0	3.8	-2.7	2.7	-1.6	-0.5
0.0	3.3	-2.3	2.3	-1.2	-0.9
0.0	2.6	-1.8	1.8	-0.7	-1.4
0.0	1.8	-1.3	1.3	-0.2	-1.9
0.0	1.0	-0.7	0.7	0.4	-2.5
0.0	0.0	-0.0	0.0	1.1	-3.2

**APPENDIX 32**

JOB INPUT INFORMATION

VARIABLES

SPAN	3.0 m	BEAM DEPTH	100 mm
		FINAL DEPTH	175 mm
Wire Pt 1	Dia % Stressed 5	100	
Wire Pt 2	5	100	BEAM SW 0.579 kN/m
Wire Pt 3	5	100	
Wire Pt 4	5	100	
Wire Pt 5	0	0	
JACK LOSS	70 % (70 TO 80%)		
CREEP ETC LOSS	30 % (10 TO 30 %)		
CRACK WIDTH	0.2 (0.1 OR 0.2)	DESIGN CLAS	3 (1,2,3)
UDL kN/sq m	:	UDL kN/m i.e. per beam	:
	SLAB SW	1.60 kN/m	
FINISHES	1.0 kN/sq m	FINISHES	0.38 kN/m
LIVE	10.0 kN/sq m	LIVE	3.80 kN/m
		TOTAL	5.78 kN/m

DESIGN OF BASS BEAMS WITH LIVE LOADS

SPAN	3.0 m	BEAM LENGTH	3.0 m
CENTROID OF BEAM FROM 1.50 RATIO L	0.50		
CENTROID OF BEAM FROM 1.50 RATIO R	0.50		
POINT LOAD 1	RATIO L	1.00	
	RATIO R	0.00	
TOTAL SW	4.8 kN	TOTAL DL	5.9 kN
TOTAL SCREED	0.0 kN	TOTAL LL	11.4 kN
TOTAL FINISH	1.1 kN	TOTAL	17.3 kN
TOTAL LIVE LO	11.4 kN		
LEFT SUPPORT	3.0	5.7	0.0 8.7 kN
RIGHT SUPPORT	3.0	5.7	0.0 8.7 kN
Allowable comp stress %	-19.8 N/sq mm		
Allowable tensile stress	6.9 N/sq mm Allow max 15		

MAIN	TOP	1.1 N/sq mm	-2.3
SPAN	BOTTOM	-2.9 N/sq mm	0.5

SPAN	Pf/A	PfE/Zit	Pfe/Zib	SF*X	M UDL
0.0	-0.9	2.0	-2.0	0.0	0.0
0.2	-0.9	2.0	-2.0	1.3	-0.1
0.3	-0.9	2.0	-2.0	2.6	-0.3
0.5	-0.9	2.0	-2.0	3.9	-0.6
0.6	-0.9	2.0	-2.0	5.2	-1.0
0.8	-0.9	2.0	-2.0	6.5	-1.6
0.9	-0.9	2.0	-2.0	7.8	-2.3
1.1	-0.9	2.0	-2.0	9.1	-3.2
1.2	-0.9	2.0	-2.0	10.4	-4.2
1.3	-0.9	2.0	-2.0	11.7	-5.3
1.5	-0.9	2.0	-2.0	13.0	-6.5
1.6	-0.9	2.0	-2.0	14.3	-7.9
1.8	-0.9	2.0	-2.0	15.6	-9.4
1.9	-0.9	2.0	-2.0	16.9	-11.0
2.1	-0.9	2.0	-2.0	18.2	-12.7
2.2	-0.9	2.0	-2.0	19.5	-14.6
2.4	-0.9	2.0	-2.0	20.8	-16.6
2.5	-0.9	2.0	-2.0	22.1	-18.8
2.7	-0.9	2.0	-2.0	23.4	-21.1
2.8	-0.9	2.0	-2.0	24.7	-23.5
3.0	-0.9	2.0	-2.0	26.0	-26.0

AFTER LOSSES

M PT	MOMENT	M/Zft	M/Zfb	Top	Bott
0.0	0.0	0.0	0.0	1.1	-2.9
0.0	1.2	-0.6	0.6	0.5	-2.2
0.0	2.3	-1.2	1.2	-0.1	-1.7
0.0	3.3	-1.7	1.7	-0.6	-1.2
0.0	4.2	-2.1	2.1	-1.1	-0.7
0.0	4.9	-2.5	2.5	-1.4	-0.4
0.0	5.5	-2.8	2.8	-1.7	-0.1
0.0	5.9	-3.0	3.0	-2.0	0.2
0.0	6.2	-3.2	3.2	-2.1	0.3
0.0	6.4	-3.3	3.3	-2.2	0.4
0.0	6.5	-3.4	3.4	-2.3	0.5
0.0	6.4	-3.3	3.3	-2.2	0.4
0.0	6.2	-3.2	3.2	-2.1	0.3
0.0	5.9	-3.0	3.0	-2.0	0.2
0.0	5.5	-2.8	2.8	-1.7	-0.1
0.0	4.9	-2.5	2.5	-1.4	-0.4

0.0	4.2	-2.1	2.1	-1.1	-0.7
0.0	3.3	-1.7	1.7	-0.6	-1.2
0.0	2.3	-1.2	1.2	-0.1	-1.7
0.0	1.2	-0.6	0.6	0.5	-2.2
0.0	0.0	0.0	0.0	1.1	-2.9

**APPENDIX 33**

4.3.7 DEFLECTIONS OF BEAMS

4.3.7.1 CLASS 1 AND CLASS 2 MEMBERS

Deflections may be calculated using elastic analysis

4.3.7.2 CLASS 3 MEMBERS

As per Class 1 and Class 2 if permanent load < 25 % of design imposed load

Where permanent load exceeds 25 % then Tables 7 and 8 only i.e. span/20 for effective depth

SPAN 4.2 UDL 1.5

INITIAL FINAL	
Elastic deflection due to Prestress P.e.l./8EI	-5 -3
Elastic deflection due to self wt 5w <sup>4</sup> /384EI	5 5
Elastic deflection due to topping 5w <sup>4</sup> /384EI	7
Elastic deflection due to UDL 5w <sup>4</sup> /384EI	1
Elastic deflection due to P	0
Elastic defect due to creep	-2
0.2 Hogging at transfer	
6.3 Prior to loading	
7.3 Final deflection	
SPAN 3.0 UDL 10	

INITIAL FINAL	
Elastic deflection due to Prestress P.e.l./8EI	-2 -2
Elastic deflection due to self wt 5w <sup>4</sup> /384EI	1 1
Elastic deflection due to topping 5w <sup>4</sup> /384EI	2
Elastic deflection due to UDL 5w <sup>4</sup> /384EI	1
Elastic deflection due to P	0
Elastic defect due to creep	-2
-1.2 Hogging at transfer	
-0.2 Prior to loading	
0.6 Final deflection	