

TYPE 130 T. BEAM

DESIGN OF PRESTRESS CONCRETE BASS BEAMS TYPE 1345

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.

1.3 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 1345 is a T-Beam with a 500mm wide flange 40 to 30 mm thick and a rib 90 mm deep and 80 to 90 mm wide.

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

	1345	TOPPING
Depth m	0.130	0.180
Area sq m	0.0254000	0.0434000
I m x 4	0.0000310	0.0000760
Yt m	0.0379400	0.0618400
Yb m	0.0920600	0.1181600
Zt m x 3	-0.0008171	-0.0012290
Zb m x 3	0.0003367	0.0006432
b mm	90	90
Table 14	1.30	1.24
Centroid of wires from bottom	0.035000	0.035000
e cf wires	0.57060	0.083160
d	0.095	0.145

WIRES	Dia	dx is depth from top
First (Bottom)	5 mm	dx = 107.5
Second (Middle)	5 mm	dx = 82.5
Third (Top) two	0 mm	dx = 60.0

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 $\% f_{ci}$ -17.5 N/sq mm

Allowable tensile stress f_{ti} 3.5 N/sq mm

2.2.3 EXAMPLES (SEE APPENDIX 1 TO 4)

APPENDIX 1 1m Beam 70 % Jack Force

APPENDIX 2 5m Beam 70 % Jack Force

APPENDIX 3 1m Beam 80 % Jack Force

APPENDIX 4 5m Beam 80 % Jack Force

It can be seen that the profile of the 1345 Beam is designed for a jack loss of approx 30 %.

In practice this can be seen when the beams leave the beds with too much camber.

For "one off" conditions, reinforcing can be cast into the top of the beam to reduce tension cracks and transfer can be delayed until f_{ci} exceeds 35 N/sq mm.

Note that the transfer conditions are not dependent on the lengths of the beams.

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 1

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 5)

APPENDIX 5 5.5 m Beam

The 1345 should not in general cases be longer than 5.5m as propping may be required.

It can be seen that the bottom of the beam is restricted to zero tension to avoid cracks forming. The 5.5 m is however a guideline due to all the assumptions such as live load of 1 kN/sq m etc.

2.4 DESIGN OF BASS BEAMS DURING SCREEDING

The beams are designed unpropped to carry the weight of the screeding.

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 6)

APPENDIX 6 5.5 m Beam

A live load of 1kN/sq m was used as well as the weight of the wet concrete and it can be seen that the stress is at the allowable of 6.9 tension.

Any spans beyond 5.5 m will need an individual design check.

2.5 DESIGN OF BASS BEAMS 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

2.5.2 LIMITS

Allowable comp stress -19.8 N/sq mm

Allowable tensile stress ft 6.9 N/sq mm Allow max 15

Not applicable

2.5.3 EXAMPLES (SEE APPENDIX 7 AND 8)

APPENDIX 7 3m Beam 10 kN/sq m LIVE LOAD

APPENDIX 8 5m Beam 2 kN/sq m LIVE LOAD

The limitation with Bass Beams is tension developing in the bottom fibres. At 10 kN/sq m the tension is well below the allowable for class 3 (6.9). In practice a more conservative limit of 2 N/sq mm is adopted to suit deflection and Shear requirements. The load span tables reflect this more conservative limit.

2.6 DEFLECTIONS (SEE APPENDIX 9)

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 1

JOB INPUT INFORMATION

VARIABLES

SPAN	1.0 m	BEAM DEPTH	130 mm
		SCREED	0 mm
		BOTTOM DIA	5 mm
JACK LOSS	70 % (70 TO 80%)	MIDDLE DIA	5 mm
CREEP ETC LOSS	10 % (10 TO 30 %)	TOP DIA	0 mm
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	0.61 kN/m		
			: TOPPING	0.00 kN/m
FINISHES	0.0 kN/sq m		: FINISHES	0.00 kN/m
			:	
LIVE	0.0 kN/sq m		: LIVE	0.00 kN/m
			: TOTAL	0.61 kN/m

DESIGN OF BASS BEAMS AT TRANSFER

BEAM LENGTH 1m

SUMMARY OF LOADS AND FORCES

TOTAL SW 0.6 kN

LEFT SUPPORT 0.3 kN

RIGHT SUPPORT 0.3 kN

SPAN	Pi/A	PIE/Zit	Pie/Zib	SF*X	M	SW	MOMENT
0.0	-3.4	6.0	-14.4	0.0	0.0	0.0	0.0
0.1	-3.4	6.0	-14.4	0.0	-0.0	0.0	0.0
0.1	-3.4	6.0	-14.4	0.0	-0.0	0.0	0.0
0.2	-3.4	6.0	-14.4	0.0	-0.0	0.0	0.0
0.2	-3.4	6.0	-14.4	0.1	-0.0	0.0	0.0
0.2	-3.4	6.0	-14.4	0.1	-0.0	0.0	0.0
0.3	-3.4	6.0	-14.4	0.1	-0.0	0.1	0.1
0.4	-3.4	6.0	-14.4	0.1	-0.0	0.1	0.1
0.4	-3.4	6.0	-14.4	0.1	-0.0	0.1	0.1
0.4	-3.4	6.0	-14.4	0.1	-0.1	0.1	0.1
0.5	-3.4	6.0	-14.4	0.2	-0.1	0.1	0.1
0.5	-3.4	6.0	-14.4	0.2	-0.1	0.1	0.1
0.6	-3.4	6.0	-14.4	0.2	-0.1	0.1	0.1
0.7	-3.4	6.0	-14.4	0.2	-0.1	0.1	0.1
0.7	-3.4	6.0	-14.4	0.2	-0.1	0.1	0.1
0.8	-3.4	6.0	-14.4	0.2	-0.2	0.1	0.1
0.8	-3.4	6.0	-14.4	0.2	-0.2	0.1	0.1
0.9	-3.4	6.0	-14.4	0.3	-0.2	0.0	0.0
0.9	-3.4	6.0	-14.4	0.3	-0.2	0.0	0.0
1.0	-3.4	6.0	-14.4	0.3	-0.3	0.0	0.0
1.0	-3.4	6.0	-14.4	0.3	-0.3	-0.0	-0.0

AFTER LOSSES

	M/zit	M/zib	Top	Bott	Top	Bott
	0.0	0.0	2.6	-17.8	2.3	-16.0
	-0.0	0.0	2.6	-17.8	2.3	-16.0
	-0.0	0.1	2.6	-17.7	2.3	-15.9
	-0.0	0.1	2.5	-17.7	2.3	-15.9
	-0.1	0.1	2.5	-17.6	2.3	-15.9
	-0.1	0.2	2.5	-17.6	2.3	-15.8
	-0.1	0.2	2.5	-17.6	2.3	-15.8
	-0.1	0.2	2.5	-17.6	2.3	-15.8
	-0.1	0.2	2.5	-17.6	2.2	-15.8
	-0.1	0.2	2.5	-17.6	2.2	-15.8
	-0.1	0.2	2.5	-17.6	2.2	-15.8
	-0.1	0.2	2.5	-17.6	2.2	-15.8
	-0.1	0.2	2.5	-17.6	2.2	-15.8
	-0.1	0.2	2.5	-17.6	2.3	-15.8
	-0.1	0.2	2.5	-17.6	2.3	-15.8
	-0.1	0.2	2.5	-17.6	2.3	-15.8
	-0.1	0.1	2.5	-17.6	2.3	-15.9
	-0.0	0.1	2.5	-17.7	2.3	-15.9
	-0.0	0.1	2.6	-17.7	2.3	-15.9
	-0.0	0.0	2.6	-17.8	2.3	-16.0
	0.0	-0.0	2.6	-17.8	2.3	-16.0

Allowable comp stress % fci -17.5 N/sq mm

Allowable tensile stress fti 3.5 N/sq mm

After losses

MAIN TOP	2.6 N/sq mm	2.3
SPAN BOTTOM	-17.8 N/sq mm	-16.0

APPENDIX 2

JOB INPUT INFORMATION

VARIABLES

SPAN	5.0 m	BEAM DEPTH	130 mm
		SCREED	0 mm
		BOTTOM DIA	5 mm
JACK LOSS	70 % (70 TO 80%)	MIDDLE DIA	5 mm
CREEP ETC LOSS	10 % (10 TO 30 %)	TOP DIA	0 mm
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	0.61 kN/m		
				:	TOPPING
					0.00 kN/m
FINISHES	0.0 kN/sq m			:	FINISHES
					0.00 kN/m
				:	
LIVE	0.0 kN/sq m			:	LIVE
					0.00 kN/m
				:	TOTAL
					0.61 kN/m

DESIGN OF BASS BEAMS AT TRANSFER

BEAM LENGTH 5m

SUMMARY OF LOADS AND FORCES

TOTAL SW	3.0 kN
LEFT SUPPORT	1.5 kN
RIGHT SUPPORT	1.5 kN

SPAN Pi/A PIE/Zit Pie/Zib SF*X M SW MOMENT

0.0	-3.4	6.0	-14.4	0.0	0.0	0.0
0.3	-3.4	6.0	-14.4	0.4	-0.0	0.4
0.5	-3.4	6.0	-14.4	0.8	-0.1	0.7
0.8	-3.4	6.0	-14.4	1.1	-0.2	1.0
1.0	-3.4	6.0	-14.4	1.5	-0.3	1.2
1.3	-3.4	6.0	-14.4	1.9	-0.5	1.4
1.5	-3.4	6.0	-14.4	2.3	-0.7	1.6
1.8	-3.4	6.0	-14.4	2.7	-0.9	1.7
2.0	-3.4	6.0	-14.4	3.0	-1.2	1.8
2.3	-3.4	6.0	-14.4	3.4	-1.5	1.9
2.5	-3.4	6.0	-14.4	3.8	-1.9	1.9
2.8	-3.4	6.0	-14.4	4.2	-2.3	1.9
3.0	-3.4	6.0	-14.4	4.6	-2.7	1.8
3.3	-3.4	6.0	-14.4	5.0	-3.2	1.7
3.5	-3.4	6.0	-14.4	5.3	-3.7	1.6
3.8	-3.4	6.0	-14.4	5.7	-4.3	1.4
4.0	-3.4	6.0	-14.4	6.1	-4.9	1.2
4.3	-3.4	6.0	-14.4	6.5	-5.5	1.0
4.5	-3.4	6.0	-14.4	6.9	-6.2	0.7
4.8	-3.4	6.0	-14.4	7.2	-6.9	0.4
5.0	-3.4	6.0	-14.4	7.6	-7.6	0.0

AFTER LOSSES

	M/zit	M/zib	Top	Bott	Top	Bott
	0.0	0.0	2.6	-17.8	2.3	-16.0
	-0.4	1.1	2.2	-16.7	1.9	-14.9
	-0.8	2.0	1.8	-15.8	1.5	-14.0
	-1.2	2.9	1.4	-14.9	1.1	-13.1
	-1.5	3.6	1.1	-14.2	0.8	-12.4
	-1.7	4.2	0.8	-13.6	0.6	-11.8
	-2.0	4.8	0.6	-13.0	0.4	-11.3
	-2.1	5.1	0.5	-12.6	0.2	-10.9
	-2.2	5.4	0.4	-12.4	0.1	-10.6
	-2.3	5.6	0.3	-12.2	0.0	-10.4
	-2.3	5.7	0.3	-12.1	0.0	-10.4
	-2.3	5.6	0.3	-12.2	0.0	-10.4
	-2.2	5.4	0.4	-12.4	0.1	-10.6
	-2.1	5.1	0.5	-12.6	0.2	-10.9
	-2.0	4.8	0.6	-13.0	0.4	-11.3
	-1.7	4.2	0.8	-13.6	0.6	-11.8
	-1.5	3.6	1.1	-14.2	0.8	-12.4
	-1.2	2.9	1.4	-14.9	1.1	-13.1
	-0.8	2.0	1.8	-15.8	1.5	-14.0
	-0.4	1.1	2.2	-16.7	1.9	-14.9
	0.0	0.0	2.6	-17.8	2.3	-16.0

Allowable comp stress % fci -17.5 N/sq mm

Allowable tensile stress fti 3.5 N/sq mm

After losses

MAIN top 2.6 N/sq mm 2.3

SPAN bottom -17.8 N/sq mm -16.0

APPENDIX 3

JOB INPUT INFORMATION

VARIABLES

SPAN	1.0 m	BEAM DEPTH	130 mm
		SCREED	0 mm
		BOTTOM DIA	5 mm
JACK LOSS	80 % (70 TO 80%)	MIDDLE DIA	5 mm
CREEP ETC LOSS	10 % (10 TO 30 %)	TOP DIA	0 mm
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 0.61 kN/m
	:	TOPPING 0.00 kN/m
FINISHES 0.0 kN/sq m	:	FINISHES 0.00 kN/m
	:	
LIVE 0.0 kN/sq m	:	LIVE 0.00 kN/m
	:	TOTAL 0.61 kN/m

DESIGN OF BASS BEAMS AT TRANSFER

BEAM LENGTH 1.0 m

SUMMARY OF LOADS AND FORCES

TOTAL SW	0.6 kN
LEFT SUPPORT	0.3 kN
RIGHT SUPPORT	0.3 kN

SPAN	Pi/A	PIE/Zit	Pie/Zib	SF*X	M SW	MOMENT
0.0	-3.8	6.8	-16.5	0.0	0.0	0.0
0.1	-3.8	6.8	-16.5	0.0	-0.0	0.0
0.1	-3.8	6.8	-16.5	0.0	-0.0	0.0
0.2	-3.8	6.8	-16.5	0.0	-0.0	0.0
0.2	-3.8	6.8	-16.5	0.1	-0.0	0.0
0.2	-3.8	6.8	-16.5	0.1	-0.0	0.1
0.3	-3.8	6.8	-16.5	0.1	-0.0	0.1
0.4	-3.8	6.8	-16.5	0.1	-0.0	0.1
0.4	-3.8	6.8	-16.5	0.1	-0.0	0.1
0.4	-3.8	6.8	-16.5	0.1	-0.1	0.1
0.5	-3.8	6.8	-16.5	0.2	-0.1	0.1
0.5	-3.8	6.8	-16.5	0.2	-0.1	0.1
0.6	-3.8	6.8	-16.5	0.2	-0.1	0.1
0.7	-3.8	6.8	-16.5	0.2	-0.1	0.1
0.7	-3.8	6.8	-16.5	0.2	-0.1	0.1

0.8	-3.8	6.8	-16.5	0.2	-0.2	0.1
0.8	-3.8	6.8	-16.5	0.2	-0.2	0.0
0.9	-3.8	6.8	-16.5	0.3	-0.2	0.0
0.9	-3.8	6.8	-16.5	0.3	-0.2	0.0
1.0	-3.8	6.8	-16.5	0.3	-0.3	0.0
1.0	-3.8	6.8	-16.5	0.3	-0.3	-0.0

AFTER LOSSES

M/zit	M/zib	Top	Bott	Top	Bott
0.0	0.0	3.0	-20.3	2.7	-18.3
-0.0	0.0	2.9	-20.3	2.7	-18.3
-0.0	0.1	2.9	-20.3	2.6	-18.2
-0.0	0.1	2.9	-20.2	2.6	-18.2
-0.1	0.1	2.9	-20.2	2.6	-18.2
-0.1	0.2	2.9	-20.2	2.6	-18.1
-0.1	0.2	2.9	-20.1	2.6	-18.1
-0.1	0.2	2.9	-20.1	2.6	-18.1
-0.1	0.2	2.9	-20.1	2.6	-18.1
-0.1	0.2	2.9	-20.1	2.6	-18.1
-0.1	0.2	2.9	-20.1	2.6	-18.1
-0.1	0.2	2.9	-20.1	2.6	-18.1
-0.1	0.2	2.9	-20.1	2.6	-18.1
-0.1	0.2	2.9	-20.1	2.6	-18.1
-0.1	0.2	2.9	-20.1	2.6	-18.1
-0.1	0.2	2.9	-20.2	2.6	-18.1
-0.1	0.1	2.9	-20.2	2.6	-18.2
-0.0	0.1	2.9	20.2	2.6	-18.2
-0.0	0.1	2.9	-20.3	2.6	-18.2
-0.0	0.0	2.9	-20.3	2.7	-18.3
0.0	-0.0	3.0	-20.3	2.7	-18.3

Allowable comp stress % fci -17.5 N/sq mm

Allowable tensile stress fti 3.5 N/sq mm

After losses

top 3.0 N/sq mm 2.7

bottom -20.3 N/sq mm -18.3

APPENDIX 4

JOB INPUT INFORMATION

VARIABLES

SPAN	5.0 m	BEAM DEPTH	130 mm
		SCREED	0 mm
		BOTTOM DIA	5 mm
JACK LOSS	80 % (70 TO 80%)	MIDDLE DIA	5 mm
CREEP ETC LOSS	10 % (10 TO 30 %)	TOP DIA	0 mm
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	0.61 kN/m		
			: TOPPING	0.00 kN/m
FINISHES	0.0 kN/sq m		: FINISHES	0.00 kN/m
			:	
LIVE	0.0 kN/sq m		: LIVE	0.00 kN/m
			: TOTAL	0.61 kN/m

DESIGN OF BASS BEAMS AT TRANSFER

BEAM LENGTH 5m

SUMMARY OF LOADS AND FORCES

TOTAL SW	3.0 kN
LEFT SUPPORT	1.5 kN
RIGHT SUPPORT	1.5 kN

SPAN Pi/A PIE/Zit Pie/Zib SF*X M SW MOMENT

0.0	-3.8	6.8	-16.5	0.0	0.0	0.0
0.3	-3.8	6.8	-16.5	0.4	-0.0	0.4
0.5	-3.8	6.8	-16.5	0.8	-0.1	0.7
0.8	-3.8	6.8	-16.5	1.1	-0.2	1.0
1.0	-3.8	6.8	-16.5	1.5	-0.3	1.2
1.3	-3.8	6.8	-16.5	1.9	-0.5	1.4
1.5	-3.8	6.8	-16.5	2.3	-0.7	1.6
1.8	-3.8	6.8	-16.5	2.7	-0.9	1.7
2.0	-3.8	6.8	-16.5	3.0	-1.2	1.8
2.3	-3.8	6.8	-16.5	3.4	-1.5	1.9
2.5	-3.8	6.8	-16.5	3.8	-1.9	1.9
2.8	-3.8	6.8	-16.5	4.2	-2.3	1.9
3.0	-3.8	6.8	-16.5	4.6	-2.7	1.8
3.3	-3.8	6.8	-16.5	5.0	-3.2	1.7
3.5	-3.8	6.8	-16.5	5.3	-3.7	1.6

3.8	-3.8	6.8	-16.5	5.7	-4.3	1.4
4.0	-3.8	6.8	-16.5	6.1	-4.9	1.2
4.3	-3.8	6.8	-16.5	6.5	-5.5	1.0
4.5	-3.8	6.8	-16.5	6.9	-6.2	0.7
4.8	-3.8	6.8	-16.5	7.2	-6.9	0.4
5.0	-3.8	6.8	-16.5	7.6	-7.6	-0.0

AFTER LOSSES

	M/zit	M/zib	Top	Bott	Top	Bott
	0.0	0.0	3.0	-20.3	2.7	-18.3
	-0.4	1.1	2.5	-19.3	2.2	-17.2
	-0.8	2.0	2.1	-18.3	1.8	-16.3
	-1.2	2.9	1.8	-17.5	1.5	-15.4
	-1.5	3.6	1.5	-16.7	1.2	-14.7
	-1.7	4.2	1.2	-16.1	0.9	-14.1
	-2.0	4.8	1.0	-15.6	0.7	-13.6
	-2.1	5.1	0.8	-15.2	0.5	-13.2
	-2.2	5.4	0.7	-14.9	0.4	-12.9
	-2.3	5.6	0.7	-14.7	0.4	-12.7
	-2.3	5.7	0.6	-14.7	0.3	-12.6
	-2.3	5.6	0.7	-14.7	0.4	-12.7
	-2.2	5.4	0.7	-14.9	0.4	-12.9
	-2.1	5.1	0.8	-15.2	0.5	-13.2
	-2.0	4.8	1.0	-15.6	0.7	-13.6
	-1.7	4.2	1.2	-16.1	0.9	-14.1
	-1.5	3.6	1.5	-16.7	1.2	-14.7
	-1.2	2.9	1.8	-17.5	1.5	-15.4
	-0.8	2.0	2.1	-18.3	1.8	-16.3
	-0.4	1.1	2.5	-19.3	2.2	-17.2
	0.0	0.0	3.0	-20.3	2.7	-18.3

Allowable comp stress % fci -17.5 N/sq mm

Allowable tensile stress fti 3.5 N/sq mm

After losses

MAIN top 3.0 N/sq mm 2.7

SPAN bottom -20.3 N/sq mm -18.3

2.7	-2.3	4.2	-10.1	8.4	-4.2	4.2
3.0	-2.3	4.2	-10.1	9.2	-5.1	4.2
3.3	-2.3	4.2	-10.1	10.1	-6.0	4.0
3.6	-2.3	4.2	-10.1	10.9	-7.1	3.8
3.8	-2.3	4.2	-10.1	11.7	-8.2	3.5
4.1	-2.3	4.2	-10.1	12.6	-9.4	3.1
4.4	-2.3	4.2	-10.1	13.4	-10.7	2.7
4.7	-2.3	4.2	-10.1	14.3	-12.1	2.1
5.0	-2.3	4.2	-10.1	15.1	-13.6	1.5
5.2	-2.3	4.2	-10.1	15.9	-15.1	0.8
5.5	-2.3	4.2	-10.1	16.8	-16.8	-0.0

AFTER LOSSES

M/zit M/zib Top Bott

0.0	0.0	1.8	-12.5
-1.0	2.4	0.8	-10.1
-1.8	4.5	-0.0	-8.0
-2.6	6.4	-0.8	-6.1
-3.3	8.0	-1.5	-4.5
-3.9	9.3	-2.0	-3.1
-4.3	10.5	-2.5	-2.0
-4.7	11.3	-2.9	-1.1
-4.9	12.0	-3.1	-0.5
-5.1	12.3	-3.3	-0.1
-5.1	12.5	-3.3	0.0
-5.1	12.3	-3.3	-0.1
-4.9	12.0	-3.1	-0.5
-4.7	11.3	-2.9	-1.1
-4.3	10.5	-2.5	-2.0
-3.9	9.3	-2.0	-3.1
-3.3	8.0	-1.5	-4.5
-2.6	6.4	-0.8	-6.1
-1.8	4.5	-0.0	-8.0
-1.0	2.4	0.8	-10.1
0.0	-0.0	1.8	-12.5

2.5	-2.3	4.2	-10.1	11.6	-5.2	6.4
2.7	-2.3	4.2	-10.1	12.9	-6.5	6.5
3.0	-2.3	4.2	-10.1	14.2	-7.8	6.4
3.3	-2.3	4.2	-10.1	15.5	-9.3	6.2
3.6	-2.3	4.2	-10.1	16.8	-10.9	5.9
3.8	-2.3	4.2	-10.1	18.1	-12.7	5.4
4.1	-2.3	4.2	-10.1	19.4	-14.5	4.8
4.4	-2.3	4.2	-10.1	20.7	-16.5	4.1
4.7	-2.3	4.2	-10.1	22.0	-18.7	3.3
5.0	-2.3	4.2	-10.1	23.3	-20.9	2.3
5.2	-2.3	4.2	-10.1	24.6	-23.3	1.2
5.5	-2.3	4.2	-10.1	25.9	-25.9	-0.0

AFTER LOSSES

M/zit M/zib Top Bott

0.0	0.0	1.8	-12.5
-1.5	3.6	0.3	-8.8
-2.8	6.9	-1.0	-5.5
-4.0	9.8	-2.2	-2.7
-5.1	12.3	-3.2	-0.2
-5.9	14.4	-4.1	1.9
-6.6	16.1	-4.8	3.7
-7.2	17.5	-5.4	5.0
-7.6	18.4	-5.8	6.0
-7.8	19.0	-6.0	6.5
-7.9	19.2	-6.1	6.7
-7.8	19.0	-6.0	6.5
-7.6	18.4	-5.8	6.0
-7.2	17.5	-5.4	5.0
-6.6	16.1	-4.8	3.7
-5.9	14.4	-4.1	1.9
-5.1	12.3	-3.2	-0.2
-4.0	9.8	-2.2	-2.7
-2.8	6.9	-1.0	-5.5
-1.5	3.6	0.3	-8.8
0.0	0.0	1.8	-12.5

APPENDIX 7

REV 1

JOB INPUT INFORMATION

VARIABLES

SPAN	3.0 m	BEAM DEPTH	130 mm
		SCREED	50 mm
		BOTTOM DIA	5 mm
JACK LOSS	70 % (70 TO 80%)	MIDDLE DIA	5 mm
CREEP ETC LOSS	30 % (10 TO 30 %)	TOP DIA	0 mm
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 0.61 kN/m
	:	TOPPING 0.60 kN/m
FINISHES 0.0 kN/sq m	:	FINISHES 0.00 kN/m
	:	
LIVE 10.0 kN/sq m	:	LIVE 5.00 kN/m
	:	TOTAL 6.21 kN/m

DESIGN OF BASS BEAMS WITH LIVE LOADS

SPAN 3.0 m	BEAM LENGTH	3.0 m
CENTROID OF BEAM FROM LE 1.50	RATIO L	0.50
CENTROID OF BEAM FROM RI 1.50	RATIO R	0.50
POINT LOAD 1	RATIO L	1.00
	RATIO R	0.00
TOTAL SW	1.8 kN	TOTAL DL 3.6 kN
TOTAL SCREED	1.8 kN	TOTAL LL 15.0 kN
TOTAL FINISHES	0.0 kN	TOTAL 18.6 kN
TOTAL LIVE LOAD	15.0 kN	
LEFT SUPPORT	1.8 kN	7.5 0.0 9.3 kN
RIGHT SUPPORT	1.8 kN	7.5 0.0 9.3 kN

SPAN	Pf/A	PfE/Zit	Pfe/Zib	SF*X	M	UDL POINT
0.0	-1.4	4.0	-7.7		0.0	0.0
0.2	-1.4	4.0	-7.7		1.4	-0.1
0.3	-1.4	4.0	-7.7		2.8	-0.3
0.5	-1.4	4.0	-7.7		4.2	-0.6
0.6	-1.4	4.0	-7.7		5.6	-1.1
0.8	-1.4	4.0	-7.7		7.0	-1.7
0.9	-1.4	4.0	-7.7		8.4	-2.5
1.1	-1.4	4.0	-7.7		9.8	-3.4
1.2	-1.4	4.0	-7.7		11.2	-4.5

1.3	-1.4	4.0	-7.7	12.6	-5.7	0.0
1.5	-1.4	4.0	-7.7	14.0	-7.0	0.0
1.6	-1.4	4.0	-7.7	15.4	-8.5	0.0
1.8	-1.4	4.0	-7.7	16.8	-10.1	0.0
1.9	-1.4	4.0	-7.7	18.2	-11.8	0.0
2.1	-1.4	4.0	-7.7	19.6	-13.7	0.0
2.2	-1.4	4.0	-7.7	21.0	-15.7	0.0
2.4	-1.4	4.0	-7.7	22.4	-17.9	0.0
2.5	-1.4	4.0	-7.7	23.8	-20.2	0.0
2.7	-1.4	4.0	-7.7	25.1	-22.6	0.0
2.8	-1.4	4.0	-7.7	26.5	-25.2	0.0
3.0	-1.4	4.0	-7.7	27.9	-27.9	0.0

AFTER LOSSES

	M/zit	M/zib	Top	Bott	Top	Bott
	0.0	0.0	0.0	0.0	2.7	-9.1
	0.0	1.3	-1.1	2.1	1.6	-7.0
	0.0	2.5	-2.0	3.9	0.6	-5.2
	0.0	3.6	-2.9	5.5	-0.2	-3.5
	0.0	4.5	-3.6	7.0	-1.0	-2.1
	0.0	5.2	-4.3	8.1	-1.6	-0.9
	0.0	5.9	-4.8	9.1	-2.1	0.0
	0.0	6.4	-5.2	9.9	-2.5	0.8
	0.0	6.7	-5.5	10.4	-2.8	1.3
	0.0	6.9	-5.6	10.8	-3.0	1.7
	0.0	7.0	-5.7	10.9	-3.0	1.8
	0.0	6.9	-5.6	10.8	-3.0	1.7
	0.0	6.7	-5.5	10.4	-2.8	1.3
	0.0	6.4	-5.2	9.9	-2.5	0.8
	0.0	5.9	-4.8	9.1	-2.1	0.0
	0.0	5.2	-4.3	8.1	-1.6	-0.9
	0.0	4.5	-3.6	7.0	-1.0	-2.1
	0.0	3.6	-2.9	5.5	-0.2	-3.5
	0.0	2.5	-2.0	3.9	0.6	-5.2
	0.0	1.3	-1.1	2.1	1.6	-7.0
	0.0	0.0	-0.0	0.0	2.7	-9.1

Allowable comp stress % fci -19.8 N/sq mm

Allowable tensile stress ft 6.9 N/sq mm Allow max 15

MAIN	TOP	2.7	N/sq mm -3.0
SPAN	BOTTOM	-9.1	N/sq mm 1.8

APPENDIX 8

JOB INPUT INFORMATION

VARIABLES

SPAN	5.0 m	BEAM DEPTH	130 mm
		SCREED	50 mm
		BOTTOM DIA	5 mm
JACK LOSS	70 % (70 TO 80%)	MIDDLE DIA	5 mm
CREEP ETC LOSS	30 % (10 TO 30 %)	TOP DIA	0 mm
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	0.61 kN/m		
			: TOPPING	0.60 kN/m
FINISHES	0.0 kN/sq m		: FINISHES	0.00 kN/m
			:	
LIVE	2.0 kN/sq m		: LIVE	1.00 kN/m
			: TOTAL	2.21 kN/m

DESIGN OF BASS BEAMS WITH LIVE LOADS

SPAN 5.0 m		BEAM LENGTH	5.0 m
CENTROID OF BEAM FROM LE	2.50	RATIO L	0.50
CENTROID OF BEAM FROM RI	2.50	RATIO R	0.50
POINT LOAD 1		RATIO L	1.00
		RATIO R	0.00
TOTAL SW	3.0 kN	TOTAL DL	6.0 kN
TOTAL SCREED	3.0 kN	TOTAL LL	5.0 kN
TOTAL FINISHES	0.0 kN	TOTAL	11.0 kN
TOTAL LIVE LOAD	5.0 kN		
LEFT SUPPORT	3.0 kN	2.5	0.0 5.5 kN
RIGHT SUPPORT	3.0 kN	2.5	0.0 5.5 kN

SPAN Pf/A Pfe/Zit Pfe/Zib SF*X M UDL POINT

0.0	-1.4	4.0	-7.7	0.0	0.0	0.0
0.3	-1.4	4.0	-7.7	1.4	-0.1	0.0
0.5	-1.4	4.0	-7.7	2.8	-0.3	0.0
0.8	-1.4	4.0	-7.7	4.1	-0.6	0.0
1.0	-1.4	4.0	-7.7	5.5	-1.1	0.0
1.3	-1.4	4.0	-7.7	6.9	-1.7	0.0
1.5	-1.4	4.0	-7.7	8.3	-2.5	0.0
1.8	-1.4	4.0	-7.7	9.7	-3.4	0.0
2.0	-1.4	4.0	-7.7	11.0	-4.4	0.0

2.3	-1.4	4.0	-7.7	12.4	-5.6	0.0
2.5	-1.4	4.0	-7.7	13.8	-6.9	0.0
2.8	-1.4	4.0	-7.7	15.2	-8.4	0.0
3.0	-1.4	4.0	-7.7	16.6	-9.9	0.0
3.3	-1.4	4.0	-7.7	18.0	-11.7	0.0
3.5	-1.4	4.0	-7.7	19.3	-13.5	0.0
3.8	-1.4	4.0	-7.7	20.7	-15.5	0.0
4.0	-1.4	4.0	-7.7	22.1	-17.7	0.0
4.3	-1.4	4.0	-7.7	23.5	-20.0	0.0
4.5	-1.4	4.0	-7.7	24.9	-22.4	0.0
4.8	-1.4	4.0	-7.7	26.2	-24.9	0.0
5.0	-1.4	4.0	-7.7	27.6	-27.6	0.0

AFTER LOSSES

	MPT	MOMENT	M/ZFT	M/ZFBt	Top	Bott
	0.0	0.0	0.0	0.0	2.7	-9.1
	0.0	1.3	-1.1	2.0	1.6	-7.0
	0.0	2.5	-2.0	3.9	0.6	-5.2
	0.0	3.5	-2.9	5.5	-0.2	-3.6
	0.0	4.4	-3.6	6.9	-0.9	-2.2
	0.0	5.2	-4.2	8.1	-1.6	-1.0
	0.0	5.8	-4.7	9.0	-2.1	-0.1
	0.0	6.3	-5.1	9.8	-2.5	0.7
	0.0	6.6	-5.4	10.3	-2.7	1.2
	0.0	6.8	-5.6	10.6	-2.9	1.5
	0.0	6.9	-5.6	10.7	-3.0	1.6
	0.0	6.8	-5.6	10.6	-2.9	1.5
	0.0	6.6	-5.4	10.3	-2.7	1.2
	0.0	6.3	-5.1	9.8	-2.5	0.7
	0.0	5.8	-4.7	9.0	-2.1	0.1
	0.0	5.2	-4.2	8.1	-1.6	-1.0
	0.0	4.4	-3.6	6.9	-0.9	-2.2
	0.0	3.5	-2.9	5.5	-0.2	-3.6
	0.0	2.5	-2.0	3.9	0.6	-5.2
	0.0	1.3	-1.1	2.0	1.6	-7.0
	0.0	0.0	-0.0	0.0	2.7	-9.1

Allowable comp stress % fci -19.8 N/sq mm

Allowable tensile stress ft 6.9 N/sq mm Allow max 15

MAIN	TOP	2.7	N/sq mm -3.0
SPAN	BOTTOM	-9.1	N/sq mm 1.6

