

2705/302
2709/302
2710/302
STRUCTURES III
June/July 2018
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN BUILDING TECHNOLOGY
DIPLOMA IN ARCHITECTURE**

MODULE III

STRUCTURES III

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

answer booklet;

calculator;

drawing instruments.

Answer any FIVE of the following EIGHT questions.

All questions carry equal marks.

Maximum marks for each part of a question are indicated.

Candidates should answer the questions in English.

This paper consists of 12 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. Using moment distribution method, analyse the beam loaded as shown in figure 1 and hence sketch the shear force and bending moment diagrams indicating the values at all critical points. (20 marks)

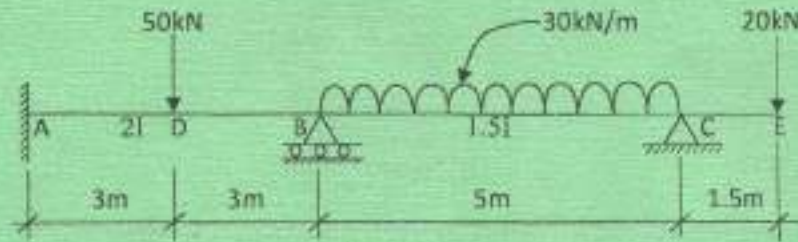


Figure 1

2. Using the three moments theorem, analyse the beam, shown in figure 2 and hence sketch the shear force diagram indicating all critical values. (20 marks)

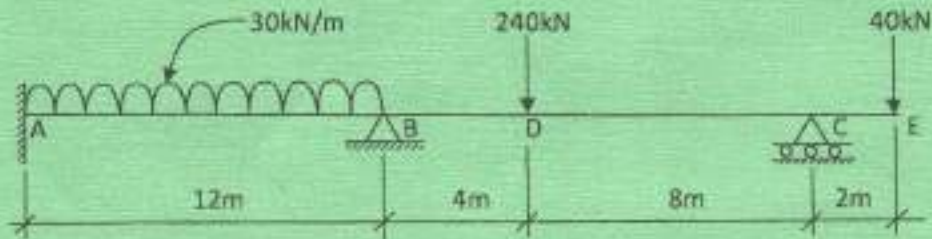


Figure 2

3. (a) Sketch the influence line diagrams for the following when the unit load crosses the beam as shown in figure 3:

- (i) reaction at A;
- (ii) reaction at B;
- (iii) bending moment at D.

(11 1/2 marks)

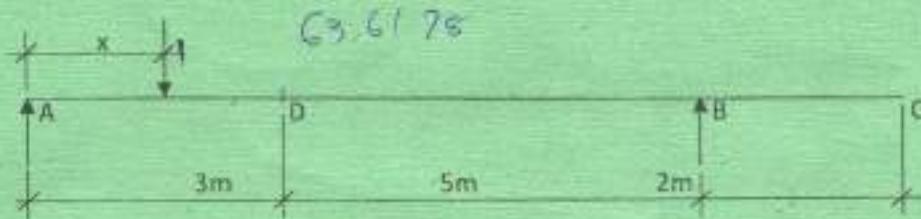


Figure 3

- (b) Determine the maximum bending moment at D when a uniformly distributed load of 50kN/m and 6m long crosses the beam shown in **figure 3** from A to C.

(8 $\frac{1}{2}$ marks)

4. Using moment distribution method, analyse the frame shown in **figure 4** and hence Sketch the bending moment diagram indicating the values at all the critical points.

(20 marks)

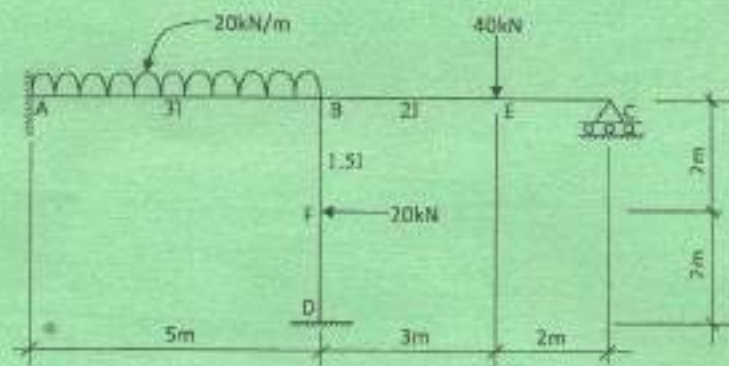


Figure 4

5. (a) Define the following terms with respect to structural timber:

- (i) dry stress;
- (ii) grade stress;
- (iii) glued laminated member;
- (iv) strength class.

(4 marks)

- (b) Describe mechanical stress grading of timber.

(4 marks)

- (c) A timber column of strength class 3 (SC3) consists of a 100 mm square section which is restrained at both ends in position but not in direction. Assuming the actual length is 3.9 m , determine the maximum long term load the column can carry. Using the information in tables 1 to 3.

(12 marks)

6. **Figure 5** shows the layout plan of a suspended reinforced concrete slab supported on universal beams (UB). Assuming the beams are fully laterally restrained select a suitable UB section in grade 43 steel for beam marked 'X' to satisfy bending, shear and deflection. Use the following information:

- density of reinforced concrete = 2400 kg/m^3
- live load = 3 kN/m^2
- partitions = 1.5 kN/m^2
- finishes = 0.8 kN/m^2
- $E = 205 \text{ kN/m}^2$
- permissible deflection = $\frac{1}{360}$ span, (20 marks)

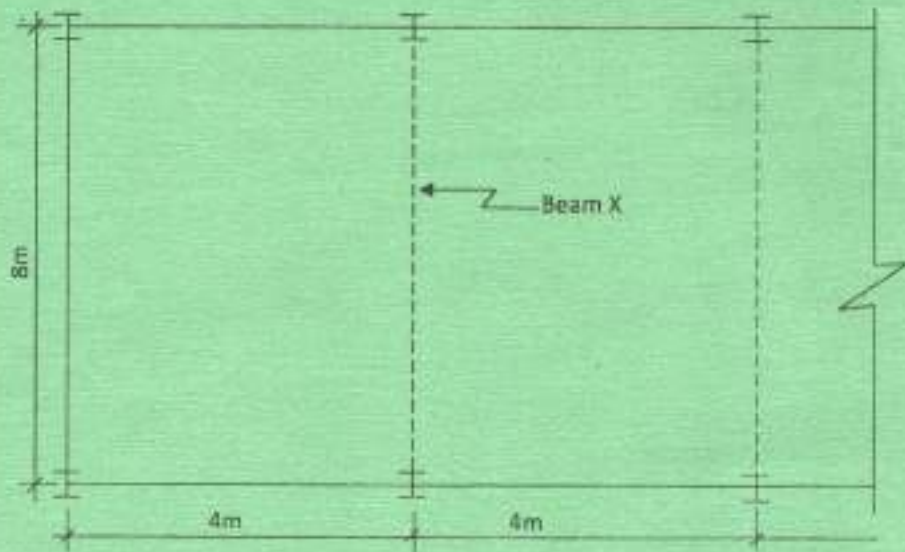


Figure 5

7. Timber floor joists of effective length 4 m are spaced at 450 mm centres and have bearing of 100 mm at the supports. Using the following information, design the joists for bending and hence check for shear, deflection and bearing;

- Timber strength class SC3
- Medium term loading duration.
- Loading:
 - T & G boarding and ceiling = 0.24 kN/m^2
 - Joists = 0.14 kN/m^2
 - Imposed load = 1.5 kN/m^2
 - Available timber sizes
 - 225 x 50 mm
 - 200 x 50 mm
 - 175 x 50 mm
 - Use information provided in tables. (20 marks)

8. (a) State two examples for each of the following limit states:

(i) ultimate;

(ii) serviceability.

(2 marks)

(b) With the aid of sketches, describe the following methods of design of steel structures:

(i) simple design;

(ii) rigid design.

(6 marks)

(c) Determine the compressive resistance for a 305 x 305 x 118 Kg/m UC section if it is encased in concrete of compressive strength 20 N/mm^2 as per BS 5950.

(12 marks)

Table 1

Duration of loading	Value of K_1
Long term (e.g. dead + permanent imposed)	1.00
Medium term (e.g. dead + snow, dead + temporary imposed)	1.25
Short term (e.g. dead + imposed + wind, dead + imposed + snow + wind)	1.50
Very short term (e.g. dead + imposed + wind)	1.75

Table 2: Depth factor, K_7

1. $K_7 = 1.17$ for solid beams having a depth $< 72\text{mm}$
2. $K_7 = (300/h)^{0.11}$ for solid beams
with $72\text{mm} < h < 300\text{mm}$
3. $K_7 = 0.81(h^2 + 92300)/(h^2 + 56800)$ for solid beams
with $h < 300\text{mm}$

Table 3: Grade stresses, modulus of elasticity and density for strength classes SC1-9 for the dry exposure condition

Strength Class (Nmm^{-2})	Bending parallel to grain (Nmm^{-2})	Tension parallel to grain (Nmm^{-2})	Compression parallel to grain (Nmm^{-2})	Compression perpendicular to grain*		Shear parallel to grain (Nmm^{-2})	Modulus of elasticity		Approximate Density
				(Nmm^{-2})	(Nmm^{-2})		(Nmm^{-2})	(kgm^{-3})	
SC1	2.8	2.2	3.5	2.1	1.2	0.46	6800	4500	540
SC2	4.1	2.5	5.3	2.1	1.6	0.66	8000	5000	540
SC3	5.3	3.2	6.8	2.2	1.7	0.67	8800	5800	540
SC4	7.5	4.5	7.9	2.4	1.9	0.71	9900	6600	590
SC5	10.0	6.0	8.7	2.8	2.4	1.00	10700	7100	590/760
SC6	12.5	7.5	12.5	3.8	2.8	1.50	14100	11800	840
SC7	15.0	9.0	14.5	4.4	3.3	1.75	16200	13600	960
SC8	17.5	10.5	16.5	5.2	3.9	2.00	18700	15600	1080
SC9	20.5	12.3	19.5	6.1	4.6	2.25	21600	18000	1200

Table 4
Reinforcement-bar areas (mm²) per metre width for various bar spacings

Bar Diameter (mm)	Bar spacing (mm)									
	75	100	125	150	175	200	225	250	275	300
6	377	283	226	189	162	142	126	113	103	94
8	671	503	402	335	287	252	223	201	183	168
10	1047	785	628	523	449	393	349	314	286	262
12	1508	1131	905	754	646	566	503	452	411	377
16	2681	2011	1608	1340	1149	1005	894	804	731	670
20	4189	3142	2513	2094	1795	1571	1396	1257	1142	1047
25	6545	4909	3927	3272	2805	2454	2182	1963	1785	1636
32	-	8042	6434	5362	4596	4021	3574	3217	2925	2681
40	-	-	10050	8378	7181	6283	5585	5027	4570	4189

Areas of group of reinforcement bars (mm²)

Bar Diameter (mm)	Number of bars									
	1	2	3	4	5	6	7	8	9	10
6	28	57	85	113	141	170	198	226	254	283
8	50	101	151	201	251	302	352	402	452	503
10	79	157	236	314	393	471	550	628	707	785
12	113	226	339	452	565	679	792	905	1017	1131
16	201	402	603	804	1005	1206	1407	1608	1809	2011
20	314	628	942	1257	1571	1885	2199	2513	2827	3142
25	491	982	1473	1963	2454	2945	3436	3927	4418	4909
32	804	1608	2412	3216	4021	4825	5629	6433	7237	8042
40	1256	2513	3769	5026	6283	7539	8796	10050	11310	12570

Table 5

Design grade	Thickness (mm), less than or equal to	Sections, plates and hollow sections, p_y ($N\ mm^{-2}$)
43	16	275
	40	265
	63	255
	80	245
	100	235
50	16	355
	40	345
	63	335
	80	325
	100	315
55	16	450
	25	430
	40	
	63	400

Design in structural steelwork to BS 5950

Table 6: Limiting width to thickness ratios (elements which exceed these limits are to be taken as class 4, slender cross-sections)

Type of element (all rolled sections)	Class of section		
	(1) Plastic	(2) Compact	(3) Semi-compact
Outstand element of compression flange	$\frac{b}{T} \leq 8.5 \epsilon$	$\frac{b}{T} \leq 9.5 \epsilon$	$\frac{b}{T} \leq 15 \epsilon$
Web with neutral axis at mid-depth	$\frac{d}{t} \leq 79 \epsilon$	$\frac{d}{t} \leq 98 \epsilon$	$\frac{d}{t} \leq 120 \epsilon$
Web subject to comp- ression throughout	$\frac{d}{t} \leq 39 \epsilon$	$\frac{d}{t} \leq 39 \epsilon$	$\frac{d}{t} \leq 39 \epsilon$

Note: $\epsilon = (275/p_y)^{1/2}$ (4.4)

Table 7 : Compressive strength, p_c ($N\ mm^{-2}$) for struts

λ	p_c					λ	p_c				
	225	245	255	265	275		225	245	255	265	275
15	225	245	255	265	275	96	133	140	143	146	148
20	224	243	253	263	272	98	130	137	139	142	145
25	220	239	248	258	267	100	127	133	136	138	141
30	216	234	243	253	262	102	124	130	132	135	137
35	211	229	238	247	256	104	122	127	129	131	133
40	207	224	233	241	250	106	119	124	126	128	130
42	205	222	231	239	248	108	116	121	123	125	126
44	203	220	228	237	245	110	113	118	120	121	123
46	201	218	226	234	242	112	111	115	117	118	120
48	199	215	223	231	239	114	108	112	114	115	117
50	197	213	221	229	237	116	105	109	111	112	114
52	195	210	218	226	234	118	103	106	108	109	111
54	192	208	215	223	230	120	100	104	105	107	108
56	190	205	213	220	227	122	98	101	103	104	105
58	188	202	210	217	224	124	96	99	100	101	102
60	185	200	207	214	221	126	94	96	97	99	100
62	183	197	204	210	217	128	91	94	95	96	97
64	180	194	200	207	213	130	89	92	93	94	95
66	178	191	197	203	210	135	84	86	87	88	89
68	175	188	194	200	206	140	79	81	82	83	84
70	172	185	190	196	202	145	75	77	78	78	79
72	169	181	187	193	198	150	71	72	73	74	74
74	167	179	183	189	194	155	67	69	69	70	70
76	164	175	180	185	190	160	64	65	66	66	66
78	161	171	176	181	186	165	60	61	62	63	63
80	158	168	172	177	181	170	57	58	59	59	60
82	155	164	169	173	177	175	55	56	56	56	57
84	152	161	165	169	173	180	52	53	53	54	54
86	149	157	161	165	169	185	49	50	51	51	51
88	146	154	158	161	165	190	47	48	48	48	49
90	143	150	154	157	161	195	45	46	46	46	47
92	139	147	150	153	156	200	43	44	44	44	44
94	136	143	147	150	152						

Table 8: Compressive strength, p_c (N mm⁻²) for struts (Table 27(c), BS 5950)

λ	P_c					λ	P_c				
	225	245	255	265	275		225	245	255	265	275
15	225	245	255	265	275	96	133	140	143	146	148
20	224	243	253	263	272	98	130	137	139	142	145
25	220	239	248	258	267	100	127	133	136	138	141
30	216	234	243	253	262	102	124	130	132	135	137
35	211	229	238	247	256	104	122	127	129	131	133
40	207	224	233	241	250	106	119	124	126	128	130
42	205	222	231	239	248	108	116	121	123	125	126
44	203	220	228	237	245	110	113	118	120	121	123
46	201	218	226	234	242	112	111	115	117	118	120
48	199	215	223	231	239	114	108	112	114	115	117
50	197	213	221	229	237	116	105	109	111	112	114
52	195	210	218	226	234	118	103	106	108	109	111
54	192	208	215	223	230	120	100	104	105	107	108
56	190	205	213	220	227	122	98	101	103	104	105
58	188	202	210	217	224	124	96	99	100	101	102
60	185	200	207	214	221	126	94	96	97	99	100
62	183	197	204	210	217	128	91	94	95	96	97
64	180	194	200	207	213	130	89	92	93	94	95
66	178	191	197	203	210	135	84	86	87	88	89
68	175	188	194	200	206	140	79	81	82	83	84
70	172	185	190	196	202	145	75	77	78	78	79
72	169	181	187	193	198	150	71	72	73	74	74
74	167	178	183	189	194	155	67	69	69	70	70
76	164	175	180	185	190	160	64	65	66	66	66
78	161	171	176	181	186	165	60	61	62	63	63
80	158	168	172	177	181	170	57	58	59	59	60
82	155	164	169	173	177	175	55	56	56	56	57
84	152	161	165	169	173	180	52	53	53	54	54
86	149	157	161	165	169	185	49	50	51	51	51
88	146	154	158	161	165	190	47	48	48	48	49
90	143	150	154	157	161	195	45	46	46	46	47
92	139	147	150	153	156	200	43	44	44	44	44
94	136	143	147	150	152						



UNIVERSAL BEAMS

DIMENSIONS AND PROPERTIES

Serial size	Mass per metre	Depth of section D	Width of section B	Thickness		Ripst. radius r	Depth between flanges d	Area of section
				Web t	Flange T			
487 x 181	38	487.4	182.8	11.6	18.8	10.2	407.8	125.3
	38	483.8	182.0	10.8	17.3	10.2	407.8	113.8
	32	480.2	181.3	9.9	16.0	10.2	407.8	104.8
	24	482.8	180.5	9.2	14.8	10.2	407.8	95.0
487 x 182	42	485.8	182.8	8.5	12.7	10.2	407.8	88.4
	34	485.1	182.8	10.7	18.8	10.2	406.8	104.8
	27	481.3	182.0	8.8	17.0	10.2	406.8	95.0
	20	487.2	181.3	8.1	16.0	10.2	406.8	85.4
408 x 178	60	484.7	182.8	8.0	13.3	10.2	407.2	75.2
	52	449.8	182.4	7.8	10.9	10.2	407.2	68.8
	46	413.8	178.2	8.7	18.0	10.2	385.8	85.0
	38	408.4	178.8	8.8	14.3	10.2	385.8	85.8
408 x 180	54	482.8	177.8	7.8	12.8	10.2	385.8	78.0
	46	482.3	177.8	7.8	10.9	10.2	385.8	68.4
	38	387.3	142.8	8.9	11.2	10.2	385.8	53.0
	32	348.8	147.8	8.3	8.0	10.2	385.8	48.4
388 x 171	67	384.0	173.2	8.1	13.7	10.2	312.2	85.4
	51	358.8	173.1	8.0	13.0	10.2	312.2	72.2
	46	352.8	171.5	7.3	11.5	10.2	312.2	64.6
	40	352.0	171.0	8.8	11.7	10.2	312.2	57.8
388 x 127	38	382.8	128.0	8.8	10.7	10.2	311.1	48.4
	32	348.8	128.0	8.8	8.5	10.2	311.1	41.8
	28	310.8	128.0	7.7	13.7	8.9	288.8	38.4
	24	307.1	128.1	6.7	11.8	8.9	288.8	38.8
308 x 188	40	303.8	185.1	8.1	10.2	8.9	285.8	31.8
	38	306.8	124.3	8.9	12.8	8.9	284.8	40.8
	48	310.4	124.3	8.0	12.1	8.9	284.8	40.8
	37	303.8	123.8	7.2	10.7	8.9	284.8	41.8
308 x 182	22	312.7	182.4	8.9	10.8	7.8	278.8	41.8
	28	308.8	181.8	8.1	8.1	7.8	278.8	38.2
	25	304.8	181.8	5.8	6.8	7.4	278.8	31.4
	22	259.8	147.2	7.2	12.7	7.8	258.8	38.1
284 x 148	31	281.8	148.1	8.1	8.6	5.8	218.8	40.0
	28	280.8	148.1	8.4	10.8	5.8	218.8	38.2
	25	287.0	148.1	8.1	8.6	5.8	218.8	31.2
	22	284.0	148.1	8.8	8.8	5.8	218.8	28.4
288 x 133	50	288.8	133.8	8.3	9.8	7.8	172.2	26.0
	28	288.8	133.8	8.3	7.8	7.8	172.2	21.2

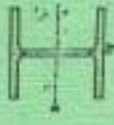
In calculating the net moment of inertia, each flange at 300 mm or greater width is reduced by two holes, and each flange less than 300 mm wide by one hole. See Explanatory Notes.



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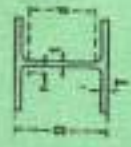
DIMENSIONS AND PROPERTIES

Serial size	Moment of inertia		Radius of gyration		Elastic modulus		Ratio D/T
	Gross	Net	Axis X-X	Axis Y-Y	Axis X-X	Axis Y-Y	
487 x 181	48717	40818	2343	1910	4.22	1958	24.0
	41021	34458	2008	1698	4.28	1778	21.4
	33100	28888	1671	1438	4.22	1612	20.8
	28401	24799	1482	1258	4.18	1481	21.8
487 x 182	38214	32074	1943	1602	2.21	189.0	24.8
	32428	28744	1612	1408	2.28	171.0	22.8
	28877	25857	1408	1260	2.21	158.8	21.8
	25484	22811	1200	1120	2.23	142.8	20.8
408 x 178	21345	19028	845	17.82	3.11	94.8	21.2
	17329	14062	1848	18.86	4.03	132.4	22.8
	14329	11688	21438	18.87	4.00	118.8	22.8
	11606	9854	1199	18.82	3.87	108.8	21.8
408 x 180	18828	16457	1077	18.80	2.85	114.8	27.0
	15847	13785	538	18.28	2.82	77.8	26.2
	13452	11017	111	16.88	2.88	62.8	26.0
	11017	8948	697	16.12	3.89	57.2	23.7
388 x 171	18522	17048	1382	14.82	2.82	108.8	21.8
	16077	14853	1188	14.82	2.82	96.8	21.8
	12384	10888	888	14.80	2.81	86.8	20.8
	10808	9812	812	14.57	3.78	80.8	20.2
388 x 127	10087	9218	267	14.28	2.88	97.8	22.1
	8280	7811	280	14.20	2.88	88.8	21.2
	1710	10134	1081	13.08	3.84	83.2	21.2
	8948	8603	897	13.09	3.80	78.2	20.8
308 x 182	8923	7384	783	12.88	3.86	80.2	20.8
	8643	8643	860	12.80	2.78	81.4	21.2
	8143	7408	288	12.87	2.70	82.2	21.4
	8818	8818	337	12.28	2.87	81.8	21.4
308 x 182	8487	8487	183	12.86	3.16	81.8	21.8
	8421	8421	183	12.82	3.08	81.8	21.8
	8362	8362	183	11.82	1.98	287.8	23.8
	8362	8362	183	11.82	1.98	287.8	23.8
284 x 148	8558	8558	877	10.81	3.81	82.0	20.8
	8374	8374	871	10.82	3.81	82.0	20.8
	8374	8374	871	10.82	3.81	82.0	20.8
	8374	8374	871	10.82	3.81	82.0	20.8
284 x 182	4008	3889	178	10.82	3.22	82.0	20.8
	3408	3248	148	10.78	3.14	82.0	20.8
	2887	2887	130	10.06	2.88	82.0	20.8
	2887	2887	130	10.06	2.88	82.0	20.8
288 x 133	3887	3478	284	8.72	3.18	82.0	21.8
	3288	3037	210	8.84	3.10	82.0	21.8



UNIVERSAL COLUMNS
Parallel Flanges
DIMENSIONS AND PROPERTIES

UNIVERSAL COLUMNS
Parallel Flanges
DIMENSIONS AND PROPERTIES



Serial Size	Masses of Elements			Radii of Gyration			Elastic Modulus			K _{ch} D T	
	Area x-z cm ²	Area y-y cm ²	Area x-y cm ²	Axis x-x cm	Axis y-y cm	Axis z-z cm	Axis x-x cm ⁴	Axis y-y cm ⁴	Axis z-z cm ⁴		
388 x 406	275140	343076	982171	18.3	11.0	11.0	11502	4832	4832	8.3	
	227023	300212	82685	18.0	10.8	10.8	9984	2951	2951	8.3	
	183118	181331	67805	17.3	10.7	10.7	8386	3253	3253	7.5	
	149785	129159	55410	17.1	10.5	10.5	7004	3233	3233	8.5	
	122474	107897	44816	16.8	10.4	10.4	6027	3314	3314	8.5	
	98894	87843	39714	16.8	10.3	10.3	6080	1840	1840	10.8	
	79110	69424	31008	16.3	10.3	10.3	4159	1870	1870	12.6	
	Columns Core										
	308 x 308	172281	152326	68097	16.8	10.8	10.8	8075	3207	3207	8.0
		68707	57808	23832	10.2	8.87	8.87	2542	1202	1202	13.8
57153		49798	20470	10.9	9.52	9.52	3104	1100	1100	16.5	
48825		42550	17470	10.8	9.40	9.40	2681	843.8	843.8	17.5	
40248		35040	14855	10.8	9.28	9.28	2264	790.4	790.4	20.2	
78777		72827	24843	14.8	8.23	8.23	4314	1826	1826	8.2	
64177		59236	20238	14.5	8.14	8.14	3841	1273	1273	8.4	
50832		46833	16230	14.2	8.02	8.02	3381	1034	1034	10.8	
38740		35768	12324	13.8	7.89	7.89	3088	808.3	808.3	13.1	
30828		30214	10072	13.7	7.82	7.82	2049	881.4	881.4	14.8	
284 x 284	27901	26472	8008	13.8	7.79	7.79	1788	867.0	867.0	16.8	
	22700	20488	7268	13.4	7.68	7.68	1442	478.0	478.0	20.8	
	22914	21171	6796	11.8	6.78	6.78	2070	740.8	740.8	8.1	
	22416	20590	7444	11.6	6.66	6.66	1822	670.4	670.4	11.0	
	17510	16860	5901	11.3	6.57	6.57	1373	486.9	486.9	13.0	
	14207	13978	4849	11.2	6.53	6.53	1009	378.9	378.9	15.1	
	11380	10287	3873	11.1	6.48	6.48	884.8	305.0	305.0	17.8	
	8482	8274	3178	10.7	6.32	6.32	681.8	288.7	288.7	10.8	
	7541	7348	2536	10.6	6.28	6.28	702.4	246.0	246.0	12.5	
	6088	5893	2041	10.6	6.19	6.19	681.1	186.0	186.0	14.8	
203 x 203	8283	4653	1770	8.90	5.18	5.18	610.4	173.8	173.8	18.8	
	4564	4035	1529	8.81	5.11	5.11	448.2	151.5	151.5	18.5	
	2218	1932	709	8.84	5.87	5.87	274.2	81.78	81.78	14.1	
	1742	1515	558	8.75	5.82	5.82	221.2	73.08	73.08	16.8	
	1283	1104	403	8.81	5.88	5.88	186.7	62.95	62.95	22.4	

Note: Core hole is conducted from each flange under 300 mm wide (serial size) and two holes from each flange 300 mm and over (serial size), to calculating the Net Moment of Inertia about x-x.

Serial Size	Depth of Section D mm	Width of Section B mm	Thickness		Flange T mm	Root Radius r mm	Depth between Flanges d mm	Area of Section cm ²	
			Web t mm	Flange T mm					
388 x 408	474.7	424.1	47.8	77.0	15.2	290.1	908.1		
	463.7	418.9	43.0	67.6	15.2	280.1	701.8		
	438.8	412.4	36.9	58.0	15.2	260.1	585.9		
	418.1	407.0	30.6	48.2	15.2	250.1	500.9		
	406.4	403.0	28.5	42.9	15.2	240.1	432.7		
	393.7	399.0	22.8	36.5	15.2	230.1	388.0		
	381.0	388.0	18.3	30.2	15.2	220.1	338.8		
	Columns Core								
	284 x 284	427.0	424.4	48.0	83.2	15.2	280.1	607.1	
		374.7	374.4	16.8	27.0	15.2	230.1	251.9	
368.3		372.1	14.5	23.8	15.2	220.1	225.7		
362.0		370.2	12.8	20.7	15.2	210.1	195.3		
355.8		368.3	10.7	17.5	15.2	200.1	164.9		
349.3		321.8	28.9	48.1	15.2	248.0	380.4		
342.8		317.8	23.0	37.7	15.2	248.0	305.6		
299.8		314.1	19.2	31.4	15.2	248.0	283.2		
272.2		310.8	18.7	26.0	15.2	248.0	201.3		
210.8		308.7	13.3	21.7	15.2	248.0	174.6		
284 x 284	207.8	304.8	11.9	18.7	15.2	248.0	148.8		
	202.8	304.8	9.9	15.4	15.2	248.0	123.3		
	289.1	284.8	19.2	31.7	12.7	200.2	311.4		
	278.4	281.0	18.6	28.1	12.7	200.2	267.7		
	268.7	288.2	13.0	20.6	12.7	200.2	198.8		
	260.4	285.8	10.8	17.3	12.7	200.2	144.0		
	254.0	284.0	8.8	14.2	12.7	200.2	83.9		
	221.2	208.8	13.0	20.6	10.2	160.8	110.1		
	215.8	204.2	10.3	17.3	10.2	160.8	81.1		
	208.6	205.2	9.3	14.2	10.2	160.8	71.8		
182 x 182	208.2	202.8	8.0	13.5	10.2	160.8	66.4		
	203.2	203.2	7.2	11.0	10.2	160.8	58.8		
	181.8	184.4	8.1	11.5	7.6	122.4	47.4		
	187.5	182.8	6.6	9.4	7.8	122.4	38.2		
	182.4	182.4	6.1	6.8	7.8	122.4	29.8		

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