Seat No

King Mongkut's University of Technology Thonburi

Midterm Examination
Semester 2 Academic Year 2014

CVE 341: Steel and Timber Design

Date: 27th February 2015 Time 9:00 – 12:00

Instructions :

1. The exam has **4** questions in **10** pages. Total points are **30** points with each question not of equal points.
2. Read the questions carefully and strictly follow instruction.
3. Textbooks and written materials **are allowed** in the examination room.
4. A calculator is allowed.
5. Write your name on every page.
6. Perform your work in the examination paper.

Examiner: Assistant Professor Aphinat Ashakul
Tel. 02-470-9148

This examination paper has been approved by the Department of Civil Engineering

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Associate Professor Dr. Sutat Leelataviwat
Head of the Civil Engineering Department

Student Name & I.D._____

1. From the given floor plan, carry out the following task (**12 Points**):

a) Check the adequacy of the H400x200x66.0 kg/m SM400 used as a secondary beam as shown.

b) Design the lightest H section for beam B1 without considering serviceability.

Use the following criteria:

All beams are to be SM400 steel

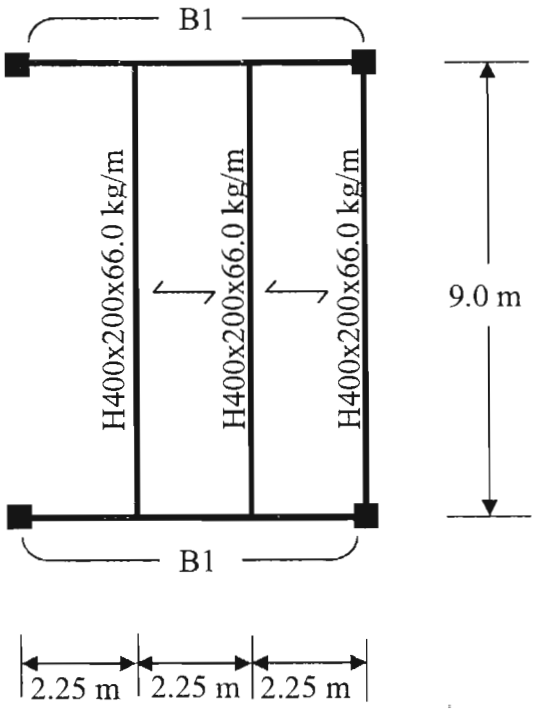
DL + LL of the floor is 800 kg/m^2

Consider beam's self-weight in all the calculation

No local failure mode is to be considered.

Use ASD method

H400x200x66.0 kg/m: $b_f = 200$ mm, $t_f = 13$ mm, $d = 400$ mm, $t_w = 8.0$ mm, $k = 29.0$ mm, $Z_x = 1{,}330$ cm^3, $S_x = 1{,}190$ cm^3



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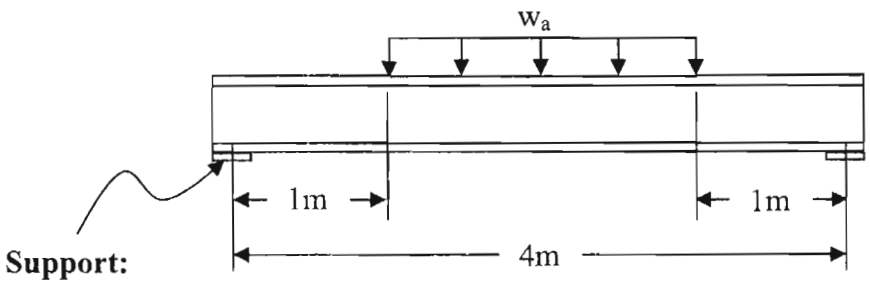
2. How much uniform load w_a can the H250x125x25.7 kg/m SM400 carry? Use the clear span in the calculation. The base plate size is 250x250 mm. The self-weight of the beam is negligible. **(10 Points)**

H250x125x25.7 kg/m: $b_f = 124$ mm, $t_f = 8.0$ mm, $d = 248$ mm, $t_w = 5.0$ mm, $k = 20.0$ mm, $Z_x = 319$ cm^3, $S_x = 285$ cm^3



Support:
150x150 mm
base plate

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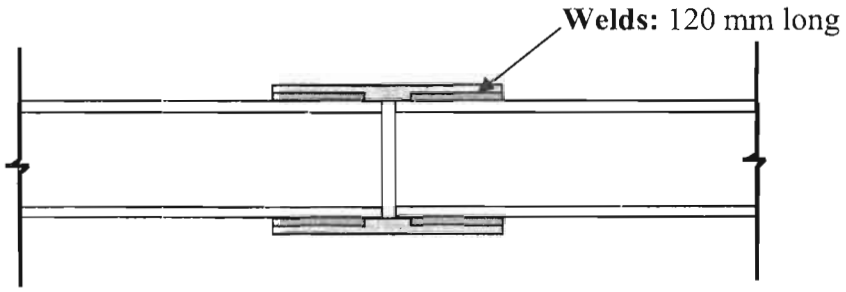
3. The spliced H150x150x31.5 kg/m SM520 (F_y = 3,700 kg/cm^2, F_u = 5,300 kg/cm^2) is to be used to transfer the service tensile force equal to 60 tons. The length of the welds used on each spliced plate is 120 mm long. Check whether or not this section can carry this load. Assume that the connection itself is sufficient. **(4 Points)**

H150x150x31.5 kg/m: b_f = 150 mm, t_f = 10 mm, d = 150 mm, t_w = 7.0 mm, A_g = 40.1 cm^2



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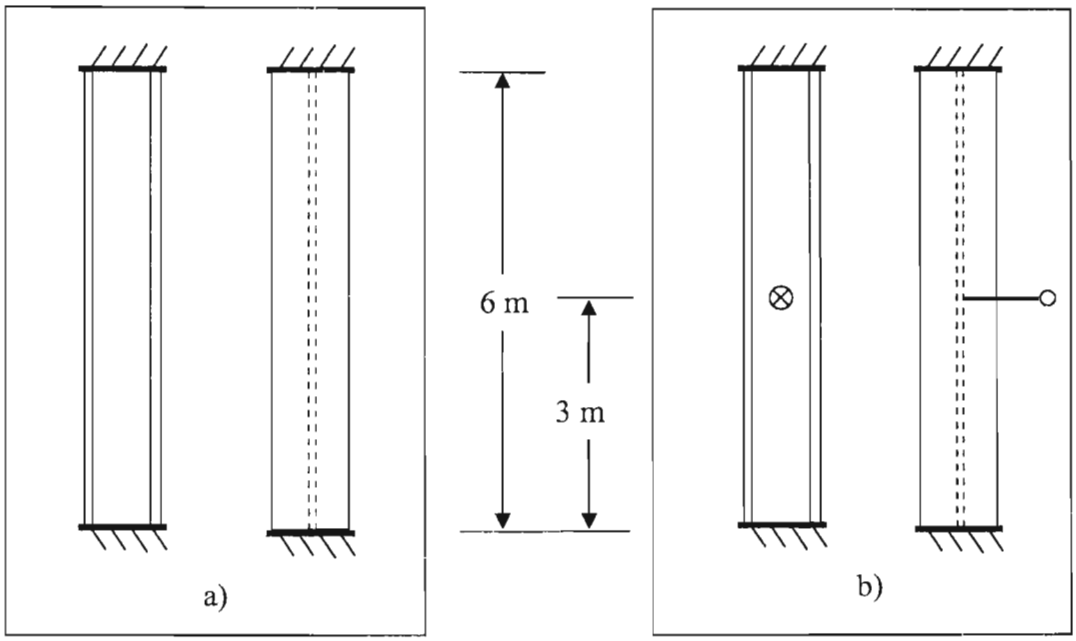
4. For the 6-m fixed-fixed H200x200x56.2 kg/m SM400 column shown, answer the following questions (**4 Points**):

a) How much compressive force can this column carry?

b) If a bracing is added in the middle to reduce the unbraced length in the weak axis direction, what K would you use for the calculation of F_{cr} in weak axis? Why? Answer briefly.

H200x200x56.2 kg/m: $b_f = 204$ mm, $t_f = 12$ mm, $d = 200$ mm, $t_w = 12$ mm

$r_x = 8.35$ cm, $r_y = 4.88$ cm, $A_g = 71.5$ cm^2



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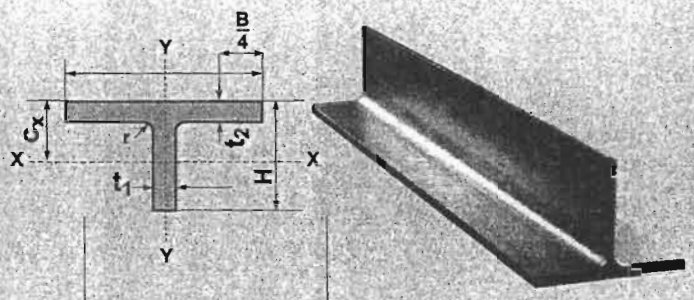
CUT BEAMS



(Cutting service is available upon request) | CUT BEAM | DIMENSION

Nominal Size	Weight	Sectional Dimension					Sectional Area	Moment of Inertia		Radius of Gyration		Modulus of Section		Center of Gravity
		H	B	t_1	t_2	r		I_x	I_y	i_x	i_y	Z_x	Z_y	C_x
mm	kg/m	mm	mm	mm	mm	mm	cm^2	cm^4	cm^4	cm	cm	cm^3	cm^3	cm
50x50	4.70	50.0	50	5.0	7	8	5.93	11.8	7.4	1.41	1.12	3.17	3.0	1.28
50x100	8.60	50.0	100	6.0	8	10	10.95	16.1	66.9	1.21	2.47	4.03	13.4	1.00
62.5x125	11.90	62.5	125	6.5	9	10	15.16	35.0	147.0	1.52	3.11	6.91	23.5	1.19
75x75	7.00	75.0	75	5.0	7	8	8.925	42.6	24.7	2.18	1.66	7.46	6.6	1.79
75x100	10.55	74.0	100	6.0	9	11	13.42	51.7	75.3	1.96	2.37	8.84	15.1	1.55
75x150	15.75	75.0	150	7.0	10	11	20.07	66.4	282.0	1.82	3.75	10.80	37.6	1.37
87.5x175	20.10	87.5	175	7.5	11	12	25.61	115.0	492.0	2.12	4.38	15.90	56.2	1.55
100x100	Ⓥ 9.10	99.0	99	4.5	7	11	11.59	93.8	56.8	2.84	2.21	12.10	11.5	2.14
	10.65	100.0	100	5.5	8	11	13.58	114.0	67.0	2.90	2.22	14.80	13.4	2.29
100x150	15.30	97.0	150	6.0	9	13	19.51	125.0	254.0	2.53	3.61	15.80	33.8	1.79
	24.95	100.0	200	8.0	12	13	31.77	184.0	801.0	2.41	5.02	22.30	80.1	1.73
100x200	* 28.10	100.0	204	12.0	12	13	35.77	256.0	851.0	2.67	4.88	32.40	83.4	2.09
	* 32.85	104.0	202	10.0	16	13	41.85	251.0	1,100.0	2.45	5.13	29.50	109.0	1.91
125x125	Ⓥ12.85	124.0	124	5.0	8	12	16.34	208.0	127.0	3.57	2.79	21.30	20.5	2.68
	14.80	125.0	125	6.0	9	12	18.83	248.0	147.0	3.63	2.79	25.60	23.5	2.78
125x175	22.05	122.0	175	7.0	11	16	28.12	289.0	492.0	3.20	4.18	29.10	56.3	2.27
125x250	Ⓥ32.20	122.0	252	11.0	11	16	41.03	445.0	1,470.0	3.29	5.98	45.30	117.0	2.39
	* 33.25	124.0	249	8.0	13	16	42.35	364.0	1,670.0	2.93	6.29	34.90	134.0	1.98
	36.20	125.0	250	9.0	14	16	46.09	412.0	1,820.0	2.99	6.29	39.50	146.0	2.08
	* 41.10	125.0	255	14.0	14	16	52.34	589.0	1,940.0	3.36	6.09	59.40	152.0	2.58
150x150	Ⓥ16.00	149.0	149	5.5	8	13	20.40	393.0	221.0	4.39	3.29	33.80	29.7	3.26
	18.35	150.0	150	6.5	9	13	23.39	464.0	254.0	4.45	3.29	40.00	33.8	3.41
150x200	28.40	147.0	200	8.0	12	18	36.19	572.0	802.0	3.97	4.71	48.20	80.2	2.83
	* 32.70	149.0	201	9.0	14	18	41.68	662.0	949.0	3.99	4.77	55.20	94.4	2.91
150x300	Ⓥ42.25	147.0	302	12.0	12	18	53.83	858.0	2,760.0	3.99	7.16	72.30	183.0	3.84
	* 43.50	149.0	299	9.0	14	18	55.40	715.0	3,120.0	3.59	7.51	57.00	209.0	2.36
	47.00	150.0	300	10.0	15	18	59.89	798.0	3,380.0	3.65	7.51	63.70	225.0	2.47
	* 53.00	150.0	305	15.0	15	18	67.39	1,110.0	3,550.0	4.05	7.26	92.50	233.0	2.03
	* 53.00	152.0	301	11.0	17	18	67.41	903.0	3,870.0	3.66	7.57	71.40	257.0	2.55
175x175	Ⓥ20.70	173.0	174	6.0	9	14	26.34	679.0	396.0	5.08	3.88	50.00	45.5	3.71
	24.80	175.0	175	7.0	11	14	31.57	815.0	492.0	5.08	3.95	59.30	56.2	3.75
	* 28.90	177.0	176	8.0	13	14	36.84	955.0	590.0	5.09	4.01	68.80	67.0	3.82
175x250	* 34.60	168.0	249	8.0	12	20	44.08	881.0	1,540.0	4.47	5.92	64.00	124.0	3.02
	39.85	170.0	250	9.0	14	20	50.76	1,020.0	1,830.0	4.48	6.00	73.10	146.0	3.09
175x350	* 53.00	169.0	351	13.0	13	20	67.63	1,420	4,690.0	4.59	8.33	104.00	267.0	3.21
	Ⓥ57.50	172.0	348	10.0	16	20	73.00	1,230	5,620.0	4.11	8.78	84.70	323.0	2.67
	* 65.50	172.0	354	16.0	16	20	83.32	1,800	5,920.0	4.65	8.43	131.00	335.0	3.40
	68.50	175.0	350	12.0	19	20	86.94	1,520	6,790.0	4.18	8.84	104.00	388.0	2.86
	* 78.00	175.0	357	19.0	19	20	99.19	2,200	7,220.0	4.71	8.53	158.00	404.0	3.59
200x200	Ⓥ28.30	198.0	199	7.0	11	16	36.08	1,190	723.0	5.76	4.48	76.40	72.7	4.17
	33.00	200.0	200	8.0	13	16	42.06	1,400	868.0	5.76	4.54	88.60	86.8	4.23
	* 37.75	202.0	201	9.0	15	16	48.08	1,605.0	1,015.0	5.78	4.59	101.00	101.0	4.31
200x300	* 47.15	193.0	299	9.0	14	22	60.05	1,530.0	3,120.0	5.04	7.21	95.50	209.0	3.33
	53.50	195.0	300	10.0	16	22	67.98	1,730.0	3,600.0	5.05	7.28	108.00	240.0	3.41

Note *Please contact us in advance for these Items.
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