

د افغانستان اسلامي جمهوریت

د لویو زده کړو وزارت

لنډ پوهنتون

انجنیرۍ پوهنځی



Steel Design

Ketabton.com

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سکشن: B

حاضري شمیره : 37

استاد : پوهنځي ځییر (خپلواک)

کال ۱۳۹۹ هـ ش

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

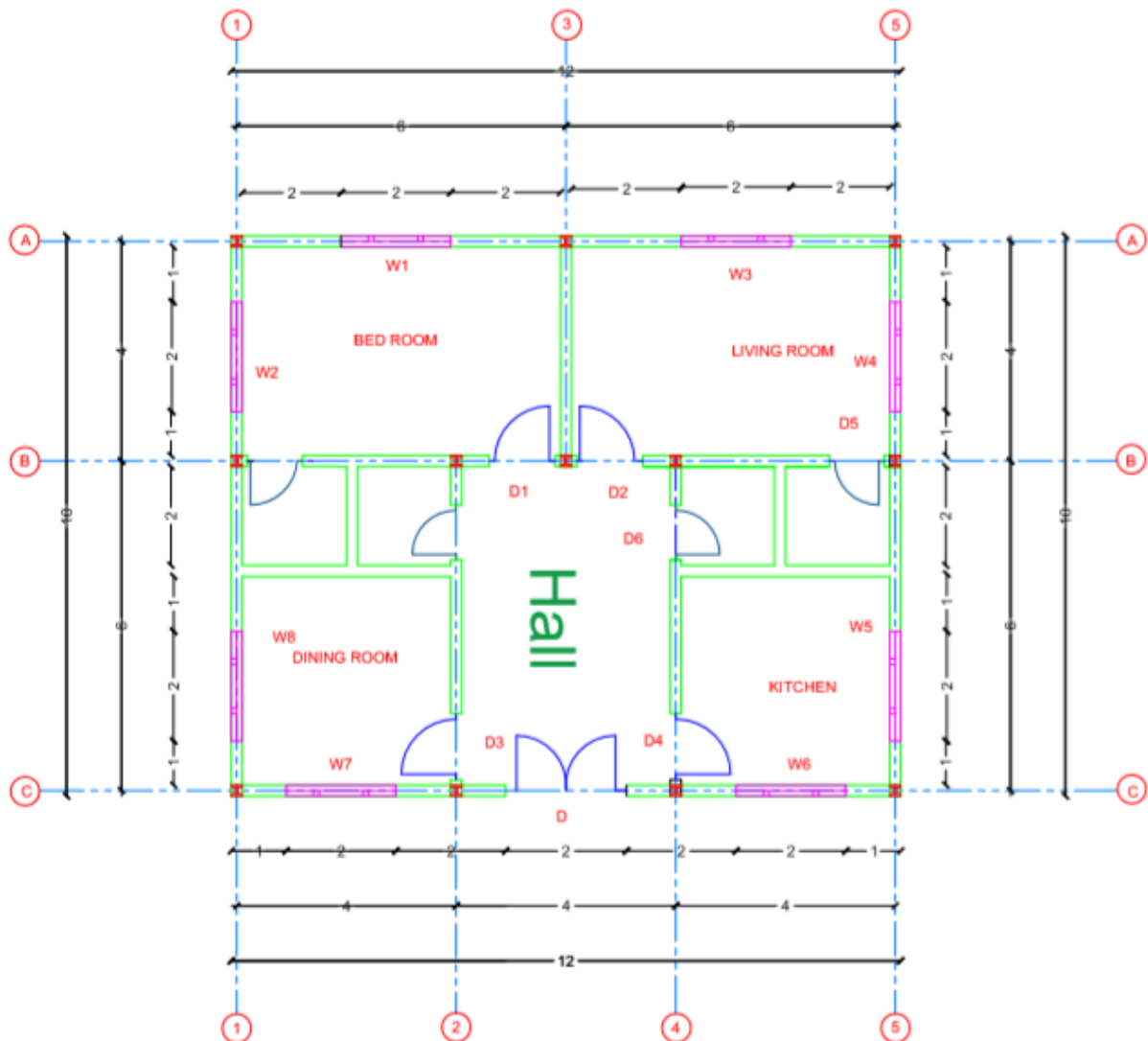
سریزه

له کله نه چی انسان د ځمکې په مخ قدم ایښی نو له هغه پیل نه یی د اوسیدو لپاره ځان ته دیوه سرپناه د پیداکولو هڅه کړی . دا ځکه چی هر انسان له هوا او اوبو وروسته ترټولو لمړی اړین عنصر چی د هوسا ژوند تیرولو لپاره ورته اړتیا لری هغه هم سرپنا ده نه یواځی انسانان بلکی الوتونکی هم چی کله په یوه سیمه کی وغواړی دپیر وخت لپاره ووسیږی نو لومړی ځان ته له ونو ، بوټو او خابښاکو څخه د اوسیدو لپاره ځای برابروی .

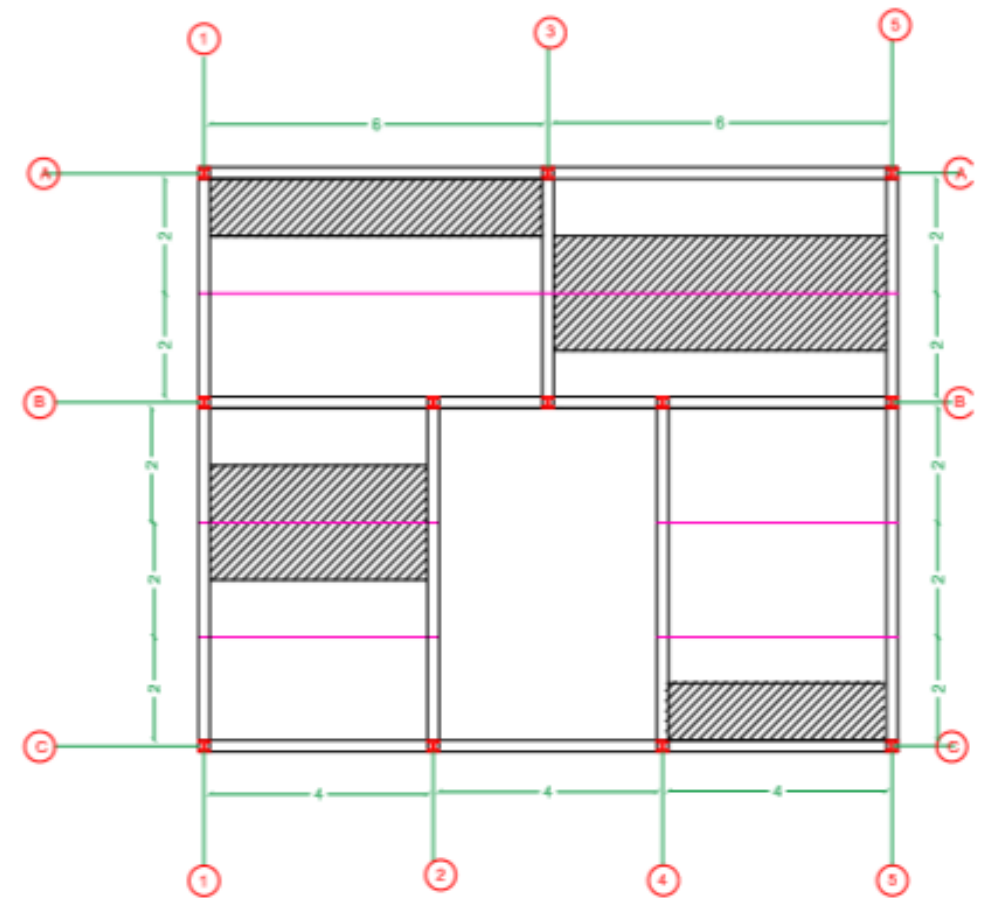
په پخوانی وختونوکی کله چی د انسانانو ژوند په مشترک ډول نه و نو په هغه وخت کی خلکو په غارونو او د لویو ډبرو په اړه خونو او کنجونو کی ژوند تیراوه نو دوی دې ته اړ و چی خپل خانونه د طبیعت د نا مؤزنه شرایطو او همدارنگه د ځنگلونو ، غرونو او دشتو وحشی حیواناتو څخه ځان په امن وساتی .

نو له دی څخه څرگندیږی چی انسانانو له هغه پیله ځان ته سرپناه جوړه وی چی د انسان په متمدن کیدو سره د سرپناه په جوړولوکی مختلف بدلونونه راغلل چی اوس وخت عموما چی کوم ساختمانونه جوړیږی هغه د اوسپنیزکانکریت ، لرگیو، او فولادی ساختمانونو څخه عبارت دی چی نظر دې ټولو ته فولادی ساختمانونه ډیر کارول کیږی . او فولاد یو ډیره مهمه ساختمانی ماده ده چی نن سبا په ساختمانی چاروکی په پراخه اندازه ورڅخه استفاده کیږی . لکه په مسکونی ودانیو ، سرکونو ، پلونو، هایدرولیکی ساختمانونو اوداسی نور....

موږ چی کوم فولادی ساختمان ډیزاین کوو د هغه پلان په لاندی ډول دی



د بيمونو او ګاډرو چوکاټ



لومړۍ برخه

د ټولو نه وړومبې ددغي ساختمان Roof deck ډيزاين کوو

د Roof ډ ډيزاين دپاره يوازي live load په نظر کي نيسو.

د مسکوني ودانيو دپاره $\text{live load} = 192 \text{ kg/m}^2$

$$W_u = 1.4 * 192 \text{ kg/m}^2 = 268.8 \text{ kg/m}^2$$

د نهايي بار واحد د SI څخه PSF ته اړوو

$$W_u = 268.8 * 2.204 / 3,28^2 = 55.06 \text{ PS}$$

اوس VULCRAFT MANUAL ته مراجعه کوو او دهغه د جدولونو څخه Roof deck انتخابوو. مونږ چي کوم Roof deck انتخاب کړي دي د هغه وایه 2m ده اوس مونږ دغه واحد په Ft بدلوو

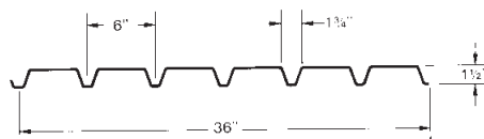
$$2\text{m} = 2 * 3,28 \text{ Ft} = 6.56 \text{ Ft}$$

د VULCRAFT MANUAL په لومړي برخه څلورمه صفحه کي DECK F20 1.5F انتخابوو

کوم چي 6 Ft – 6in وایه لري او همدارنگه 58 PSF بار د زغملو وړتیا لري او طول يي 6 Ft -6 in دي

1.5 F

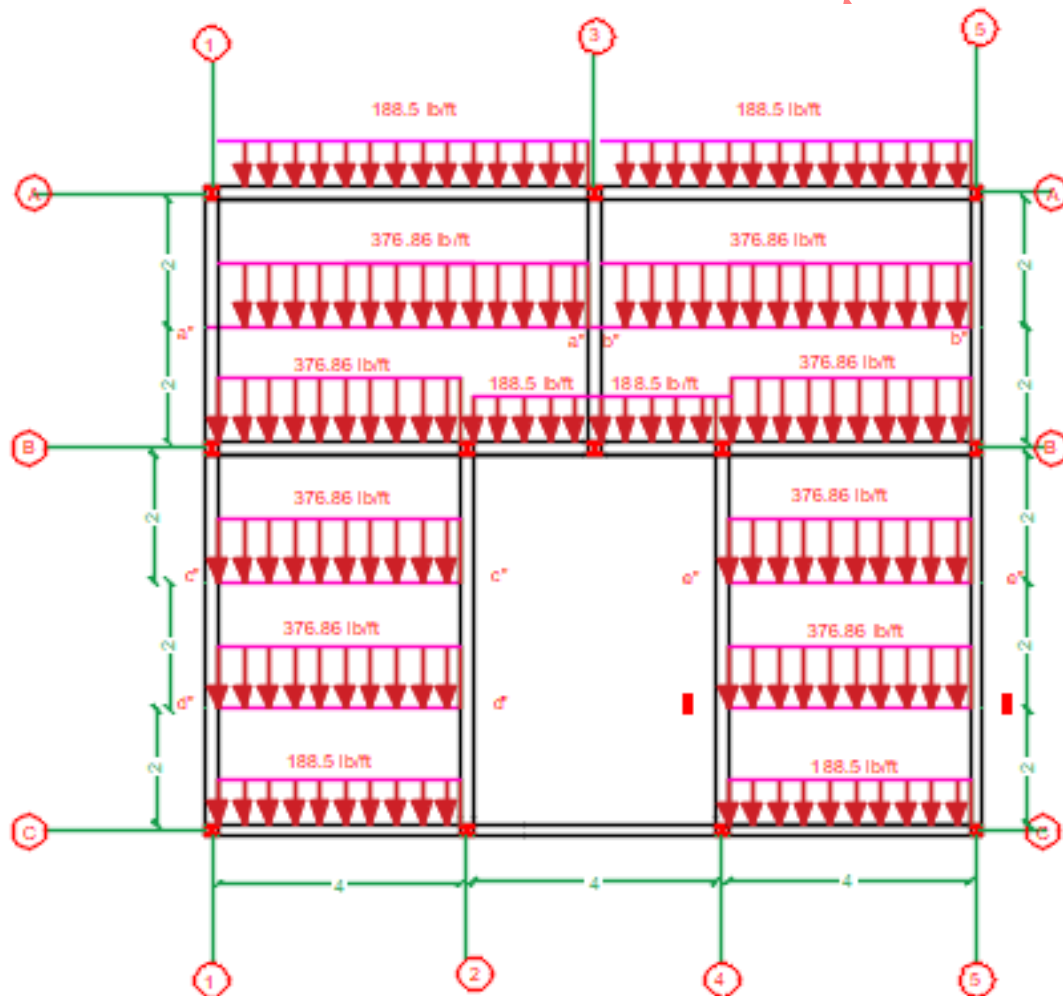
Maximum Sheet Length 42'-0"
Extra Charge for Lengths Under 6'-0"
ICBO Approved (No.3415)
Factory Mutual Approved
Deck type & gauge — Max. deck span
1.5F22..... 4'-11"
1.5F20..... 5'-5"
1.5F18..... 6'-3"
FM Approvals No. 0C8A7.AM



VERTICAL LOADS FOR TYPE 1.5F

No. of Spans	Deck Type	Max. SDI Const. Span	Allowable Total (Dead + Live) Uniform Load (PSF)											
			Span (ft.-in.) C. to C. of Support											
1	F22	4'-9"	93	74	60	49	41	35	30	27	23	21		
	F21	5'-1"	106	84	68	56	47	40	35	30	26	23	21	
	F20	5'-5"	116	92	74	61	51	44	38	33	29	25	23	
	F19	6'-0"	138	109	89	73	61	52	44	38	33	29	26	
	F18	6'-5"	158	125	101	84	70	59	49	42	36	32	29	
2	F22	5'-10"	101	80	65	53	45	38	33	29	25	22	20	
	F21	6'-2"	113	89	72	60	50	43	37	32	28	25	22	
	F20	6'-6"	123	97	79	65	55	47	40	35	31	27	24	
	F19	7'-1"	143	113	92	76	64	54	47	41	36	32	28	
	F18	7'-8"	163	128	104	86	72	62	53	46	41	36	32	
3	F22	5'-10"	126	100	81	67	56	48	41	36	32	28	25	
	F21	6'-2"	141	111	90	74	63	53	46	40	35	31	28	
	F20	6'-6"	154	122	99	82	69	58	50	44	39	34	30	
	F19	7'-1"	179	142	115	95	80	68	59	51	45	40	35	
	F18	7'-8"	203	160	130	107	90	77	66	58	51	45	40	

په لاندې چوکاټ کې هرېم ته لور په خطي ډول بنودل شوي



په پورته چوکاټ کې ځینې بېمونه د اوږدوالي او پر هغوي د وارده بار له مخې یو ډول دي

$$A_{1-3} = A_{3-5} \quad C_{1-2} = C_{4-5}$$

$$B_{1-2} = B_{4-5}$$

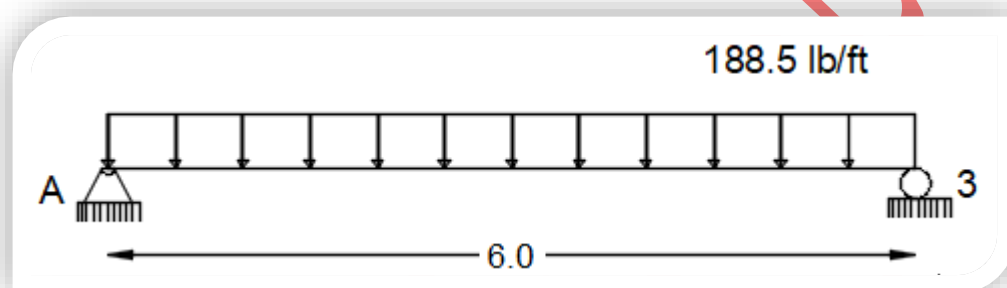
$$B_{2-3} = B_{3-4}$$

$$a'' - a'' = b'' - b'' \quad , \quad c'' - c'' = d'' - d'' = e'' - e'' = f'' - f''$$

اوس نو لومري A_{1-3} بيم ڊيزاين ڪوو

په هر بيم د **ROOF DECK** **1.99 PSF** وزن په نظر ڪي نيول ڪيري

نوٽ: د بيمونو او ګاډرو اندازه گذاري په متر ده چي په محاسبه ڪي په فوټ اړول ڪيري



$$W_u = 188.5 \text{ lb/ft}$$

$$M_{\max} = W \cdot L^2 / 8$$

$$M_{\max} = \frac{188.5 \text{ lb/ft} \cdot (19.7 \text{ ft})^2}{8} = 9144.4 \text{ lb} \cdot \text{ft}$$

$$S_{\text{required}} = \frac{M}{\delta_{\text{Allowable}}}$$

$$\delta_{\text{Allowable for steel}} = 29 \text{ ksi}$$

$$ft = 12 \text{ in}$$

$$S_{\text{req}} = \frac{9144.4 \cdot 12 \text{ lb} \cdot \text{in}}{29000 \text{ psi}} = 3.78 \text{ in}^3$$

اوس (28, 29) صفحو ته ځو او د 4.9 in^3 ، $M_{8 \times 6.2}$ بيم مقطع انتخابوو

Table 1-2 (continued)
M Shapes
Properties



Nom- inal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	$\frac{J}{S_x h_o}$	Torsional Properties	
			I	S	r	Z	I	S	r	Z				J	C_w
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	in. ⁴	in. ³	in.	in. ³	in. ⁴	in. ³	in.	in. ³	in.	in.		in. ⁴	in. ⁶
12.4	8.22	74.8	89.3	14.2	4.96	16.5	2.01	1.07	0.744	1.68	0.100	12.3	0.000283	0.0493	76.0
11.6	8.29	74.8	80.3	12.8	4.86	15.0	1.51	0.864	0.667	1.37	0.099	12.3	0.000263	0.0414	57.1
11.8	6.81	62.5	72.2	12.0	4.56	14.3	1.09	0.709	0.559	1.15	0.108	11.8	0.000355	0.0500	37.7
10.8	7.30	69.2	66.7	11.1	4.58	13.2	1.01	0.661	0.564	1.07	0.104	11.8	0.000300	0.0393	35.0
10	9.03	74.7	61.7	10.3	4.57	12.2	1.03	0.636	0.592	1.02	0.098	11.8	0.000240	0.0292	35.9
9	6.53	58.4	39.0	8.83	3.83	9.22	0.672	0.500	0.503	0.809	0.117	9.81	0.000411	0.0314	16.1
8	7.39	65.0	34.0	6.95	3.82	8.20	0.593	0.441	0.500	0.711	0.111	9.81	0.000328	0.0224	14.2
7.5	7.77	71.0	33.0	6.60	3.85	7.77	0.562	0.418	0.503	0.670	0.107	9.81	0.000289	0.0187	13.5
6.5	6.03	53.8	18.5	4.63	3.11	5.43	0.376	0.329	0.443	0.529	0.131	7.81	0.000509	0.0184	5.73
6.2	6.44	56.5	17.6	4.39	3.10	5.15	0.352	0.308	0.439	0.495	0.127	7.81	0.000455	0.0156	5.38
4.4	5.39	47.0	7.23	2.41	2.36	2.80	0.180	0.195	0.372	0.311	0.152	5.81	0.000707	0.00990	1.53
3.7	7.75	54.7	5.96	2.01	2.34	2.33	0.173	0.173	0.398	0.273	0.137	5.75	0.000459	0.00530	1.45

مونڊر د AISC MANUAL په 28 صفحہ کی M8*6.2 ډوله مقطع انتخابوو

اوس ياده مقطع د عرضي تشنج دپاره چيک کوو $V = w * L / 2$ $V = 1854.15$

$A = t_w * d$, $A = 0.129 * 8$, $A = 1.032 \text{ in}^2$,

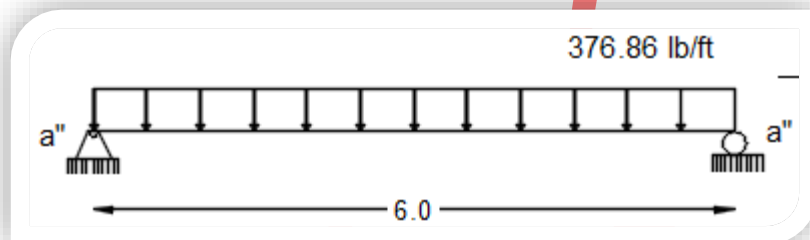
$\tau = V / A$

$\tau = 1854.15 / 1.032 = 1.79665 \text{ Ksi}$

$\tau_{\text{allowable}} = 12 \text{ ksi}$

$\tau_{\text{allowable}} > \tau$ ok

اوس a"-a" بيم ڊيزاين ڪوو



$$W_u = 376.86 \text{ lb/ft}$$

$$M_{\max} = W \cdot L^2 / 8$$

$$M_{\max} = (376.86 \cdot 19.68^2) / 8 = 18244.8 \text{ lb} \cdot \text{ft}$$

$$S_{\text{required}} = \frac{M}{\sigma_{\text{allowable}}}$$

$$f_t = 12 \text{ in}$$

$$S_{\text{req}} = (18244.8 \cdot 12) \text{ lb} \cdot \text{in} / 29000 \text{ psi} = 7.55 \text{ in}^3$$

اوس (28, 29) صفحو ته ڇو او د $M_{10 \times 9} s = 7.79 \text{ in}^3$ بيم مقطع انتخابوو

DIMENSIONS AND PROPERTIES

1-29

Table 1-2 (continued)
M Shapes
Properties



Nom- inal Wt. lb/ft	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	$\frac{J}{S_x h_o}$	Torsional Properties	
			I	S	r	Z	I	S	r	Z				J	C_w
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	in. ⁴	in. ³	in.	in. ³	in. ⁴	in. ³	in.	in. ³	in.	in.		in. ⁴	in. ⁶
12.4	8.22	74.8	89.3	14.2	4.96	16.5	2.01	1.07	0.744	1.68	0.100	12.3	0.000283	0.0493	76.0
11.6	8.29	74.8	80.3	12.8	4.86	15.0	1.51	0.864	0.667	1.37	0.099	12.3	0.000263	0.0414	57.1
11.8	6.81	62.5	72.2	12.0	4.56	14.3	1.09	0.709	0.559	1.15	0.108	11.8	0.000355	0.0500	37.7
10.8	7.30	69.2	66.7	11.1	4.58	13.2	1.01	0.661	0.564	1.07	0.104	11.8	0.000300	0.0393	35.0
10	9.03	74.7	61.7	10.3	4.57	12.2	1.03	0.636	0.592	1.02	0.098	11.8	0.000240	0.0292	35.9
9	6.53	58.4	39.0	7.79	3.83	9.22	0.672	0.500	0.503	0.809	0.117	9.81	0.000411	0.0314	16.1
8	7.39	65.0	34.6	6.95	3.82	8.20	0.593	0.441	0.500	0.711	0.111	9.81	0.000328	0.0224	14.2

اوس یی د عرضی تشنج دپاره محاسبه کوو

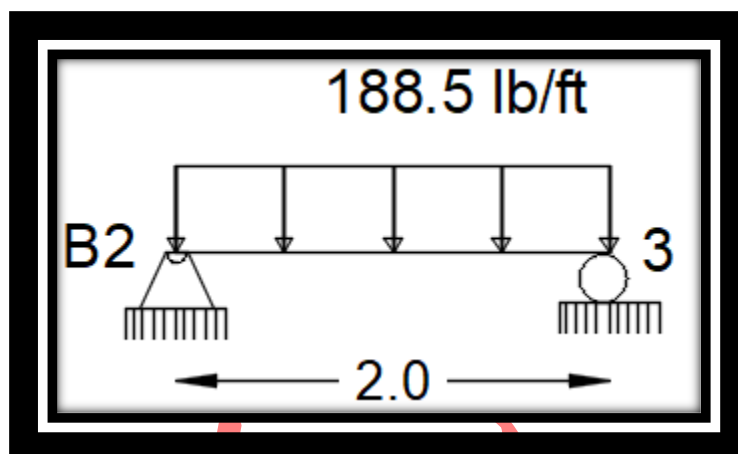
$$\tau = V/A, \quad v = 3708.3 \text{ lb}$$

$$A = t_w \cdot d, \quad A = 0.157 \cdot 10, \quad A = 1.57 \text{ in}^2$$

$$\tau = 3708.3 / 1.57 = 2.362 \text{ ksi}$$

$$\tau_{\text{allowable}} = 12 \text{ ksi} \quad \tau_{\text{allowable}} > \tau \quad \text{..... ok}$$

اوس B₂₋₃ ڊيزاين ڪو



$$W_u = 188.5 \text{ lb/ft}$$

$$M_{\max} = (188.5 \times 6.56^2) / 8 = 1014 \text{ lb*ft}$$

$$S_{\text{required}} = \frac{M}{\delta_{\text{Allowable}}}$$

$$ft = 12 \text{ in}$$

$$S_{\text{req}} = (1014 \text{ lb*ft} \times 12) / 29000 \text{ psi} = 0.42 \text{ in}^3$$

اوس په (28,29) صفحو ڪي $s = 1 \text{ in}^3$ $M_{3 \times 2.9}$ بيم مقطع انتخابو

Table 1-2 (continued) M Shapes Properties														 M SHAPES	
Nom- inal WL	Compact Section Criteria		Axis X-X				Axis Y-Y				r_x	r_y	$\frac{J}{S_x h_y}$	Torsional Properties	
			I	S	r	Z	I	S	r	Z				J	C_w
lb/ft	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	in. ⁴	in. ³	in.	in. ³	in. ⁴	in. ³	in.	in. ³	in.	in.		in. ⁴	in. ⁶
12.4	8.22	74.8	89.3	14.2	4.96	16.5	2.01	1.07	0.744	1.68	0.100	12.3	0.000283	0.0493	76.0
11.6	8.29	74.8	80.3	12.8	4.86	15.0	1.51	0.864	0.667	1.37	0.099	12.3	0.000263	0.0414	57.1
11.8	6.81	62.5	72.2	12.0	4.56	14.3	1.09	0.709	0.559	1.15	0.108	11.8	0.000355	0.0500	37.7
10.8	7.30	69.2	66.7	11.1	4.58	13.2	1.01	0.661	0.564	1.07	0.104	11.8	0.000300	0.0393	35.0
10	9.03	74.7	61.7	10.3	4.57	12.2	1.03	0.636	0.592	1.02	0.098	11.8	0.000240	0.0292	35.9
9	6.53	58.4	39.0	9.22	4.22	11.2	0.672	0.500	0.503	0.809	0.117	9.81	0.000411	0.0314	16.1
8	7.39	65.0	34.6	8.20	3.82	8.20	0.593	0.441	0.500	0.711	0.111	9.81	0.000328	0.0224	14.2
7.5	7.77	71.0	33.0	6.60	3.85	7.77	0.562	0.418	0.503	0.670	0.107	9.81	0.000289	0.0187	13.5
6.5	6.03	53.8	18.5	4.63	3.11	5.43	0.376	0.329	0.443	0.529	0.131	7.81	0.000509	0.0184	5.73
6.2	6.44	56.5	17.0	4.30	3.11	5.15	0.352	0.308	0.439	0.495	0.127	7.81	0.000455	0.0156	5.38
4.4	5.39	47.0	7.23	2.41	2.36	2.80	0.180	0.195	0.372	0.311	0.152	5.81	0.000707	0.00990	1.53
3.7	7.75	54.7	5.96	2.01	2.34	2.33	0.173	0.173	0.398	0.273	0.137	5.75	0.000459	0.00530	1.45
18.9	6.01	11.2	24.2	9.67	2.08	11.1	8.70	3.48	1.25	5.33	0.28	4.56	0.00709	0.313	45.7
6	11.9	22.0	4.72	2.48	1.64	2.74	1.47	0.771	0.915	1.18	0.22	3.56	0.00208	0.0184	4.85
4.08	6.62	26.4	3.53	1.77	1.67	2.00	0.325	0.289	0.506	0.453	0.220	3.81	0.00218	0.0147	1.19
3.45	8.65	33.9	2.86	1.43	1.68	1.60	0.248	0.221	0.496	0.346	0.200	3.88	0.00148	0.00820	0.930
3.2	8.65	33.9	2.86	1.43	1.68	1.60	0.248	0.221	0.496	0.346	0.200	3.88	0.00148	0.00820	0.930
2.9	8.65	23.6	1.50	1.00	1.28	1.12	0.248	0.221	0.521	0.344	0.250	2.88	0.00275	0.00790	0.511

اوس یی عرضی تشنج ته محاسبه کوو

$$\tau = V/A$$

$$V = 618.05$$

$$A = t_w \cdot d, \quad A = 0.09 \cdot 3, \quad A = 0.27 \text{ in}^2$$

$$\tau = (618.05)/(0.27) = 2289.07 \text{ psi}, \quad \tau_{\text{allowable}} = 12 \text{ ksi}$$

$$\tau = 2.28907 \text{ Ksi}$$

$$\tau_{\text{allowable}} > \tau \quad \text{..... ok}$$

اوس یی عرضی تشنج ته محاسبه کوو

$$\tau = V/A$$

$$V = 1236.1 \text{ lb}$$

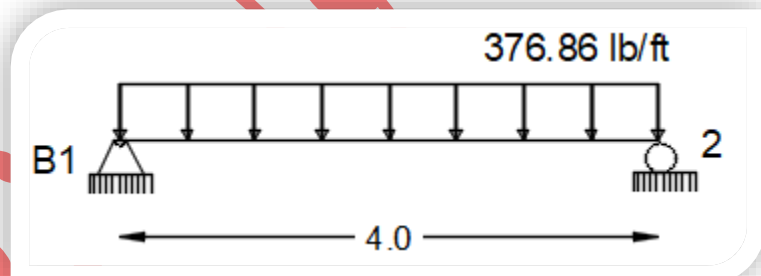
$$A = tw * d, \quad A = 0.17 * 3 = 0.51 \text{ in}^2$$

$$\tau = 1236.1 \text{ lb} / 0.51 \text{ in}^2 = 2423.7 \text{ psi}, \quad \tau_{\text{allowable}} = 12 \text{ ksi}$$

$$\tau = 2.4237 \text{ Ksi}$$

$$\tau_{\text{allowable}} > \tau \quad \text{..... ok}$$

اوس د B₁₋₂ بیم دیزاین کوو



$$W_u = 376.86 \text{ lb/ft}$$

$$M_{\text{max}} = W * L^2 / 8$$

$$M_{\text{max}} = (376.86 \text{ lb/ft} * 13.12^2 \text{ ft}^2) / 8 = 8108.8 \text{ lb*ft}$$

$$F_t = 12 \text{ in}$$

$$S_{\text{required}} = \frac{M}{\sigma_{\text{Allowable}}}$$

$$S_{\text{req}} = (8108.8 * 12) / 29000 \text{ psi} = 3.365 \text{ in}^3$$

اوس د مينول په (31,30) صفحه كي $S_{4 \times 9.5}$, $S = 38 \text{ in}^3$ بيم مقطع انتخابوو

S SHAPES														
Nom- inal WL	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
			I	S	r	Z	I	S	r	Z			J	C_w
	lb/ft	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	in. ⁴	in. ³	in.	in. ³	in. ⁴	in. ³	in.	in. ³	in.	in.	in. ⁴
121	3.69	25.9	3160	258	9.43	306	83.0	20.6	1.53	36.3	1.94	23.4	12.8	11400
9.5	4.77	8.33	6.76	3.38	1.56	4.04	0.887	0.635	0.564	1.13	0.698	3.71	0.120	3.05

اوس يی عرضي تشنج ته محاسبه کوو

The diagram illustrates the cross-section of an S-shape. Key dimensions labeled include: t_f (flange thickness), d (overall depth), t_w (web thickness), b_f (flange width), and k (fillet radius). The X-X and Y-Y axes are also indicated.

Table 1-3
S Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance		
				Thickness, t_w	$\frac{t_w}{2}$		Width, b_f	Thickness, t_f			k	T	Workable Gage
	in. ²	in.		in.	in.		in.	in.			in.	in.	in.
S24×121	35.5	24.5	24½	0.800	¹³ / ₁₆	7/16	8.05	8	1.09	1½/16	2	20½	4
4×9.5	2.79	4.00	4	0.326	⁵ / ₁₆	³ / ₁₆	2.80	2¾	0.293	⁵ / ₁₆	³ / ₄	2½	—

$$\tau = V/A$$

$$V = 2472.2 \text{ lb}$$

$$A = t_w \cdot d, \quad A = 0.326 \cdot 4 = 1.304 \text{ in}^2$$

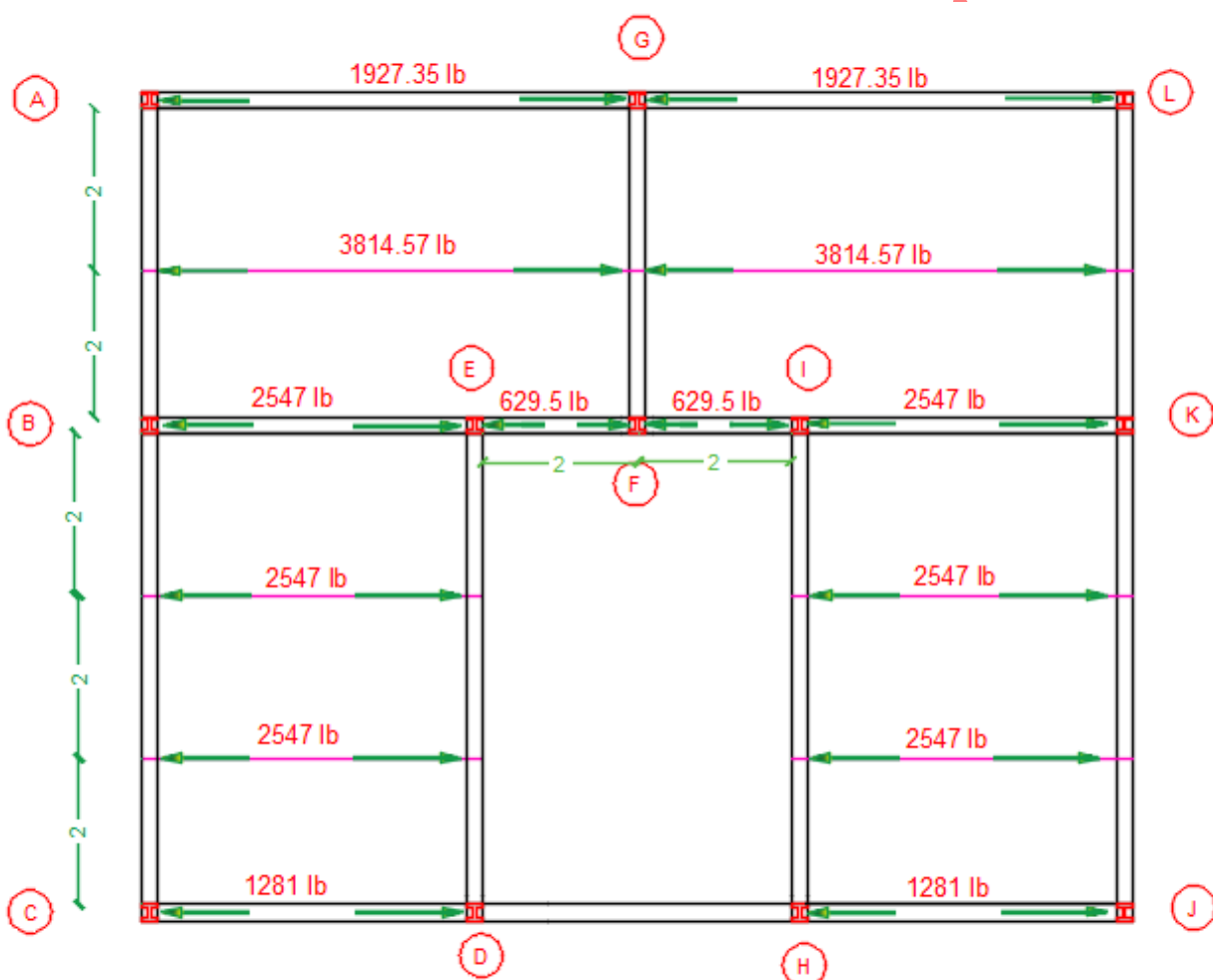
$$\tau = 2472.2 \text{ lb} / 1.304 \text{ in}^2 = 1895.86 \text{ psi}, \quad \tau_{\text{allowable}} = 12 \text{ ksi}$$

$$\tau = 1.89586 \text{ Ksi}$$

$$\tau_{\text{allowable}} > \tau \quad \text{..... ok}$$

د ګاډرو ډیزاین محاسبه

په لاندې چوکاټ کې مجموعي لوډ د بیمونو څخه ګاډروته د انتقال په حالت کې بنودل شوي. کوم چې د بیمونو او Roof د ډیډلوډ اولایف لوپڅخه ترلاسه شوي.



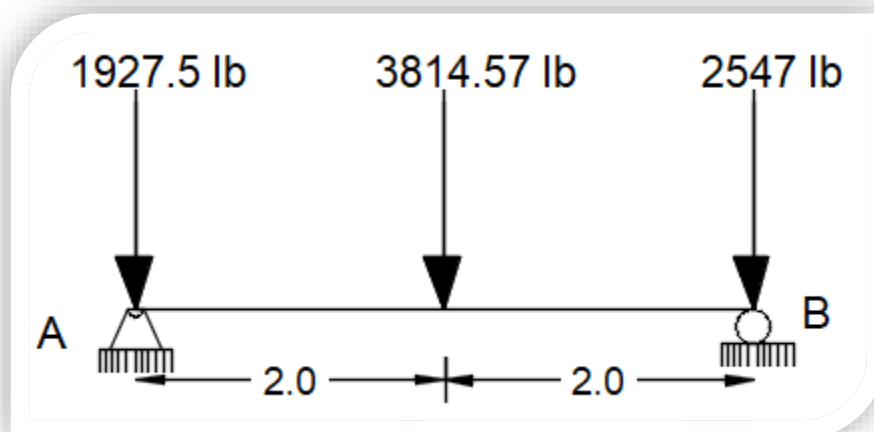
په پورته چوکاټ کې ځینې ګاډرونه د اوږدوالي او پر هغوي د وارده بار له مخې یو ډول دي. لکه :

$$A-B = L-K$$

$$B-C = K-J, \quad E-D = I-H$$

$$G-F$$

د A-B گادر ډیزاین



$$W=3814.57 \text{ lb} , L=4\text{m}$$

$$M_{\max}=w \cdot l/4$$

$$M_{\max} = 12511.79 \text{ lb} \cdot \text{ft}$$

$$S_{\text{required}} = \frac{M}{\delta_{\text{Allowable}}}$$

$$S_{\text{req}} = 12511.79 \text{ lb} \cdot 12 \text{ in} / 29000 \text{ psi} = 5.18 \text{ in}^3$$

اوس په 27 صفحه كي w_6 مقطع د گادر لپاره انتخابوو $S=5.56 \text{ in}^3$.

Nom- inal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
			I	S	r	Z	I	S	r	Z			J	C_w
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	in. ⁴	in. ³	in.	in. ³	in. ⁴	in. ³	in.	in. ³	in.	in.	in. ⁴	in. ⁶
67	4.43	11.1	272	60.4	3.72	70.1	88.6	21.4	2.12	32.7	2.43	8.07	5.05	1440
9	9.16	29.2	16.4	5.56	2.47	6.23	2.20	1.11	0.905	1.72	1.06	5.69	0.0405	17.7

اوس يی عرضي تشنج ته محاسبه کوو

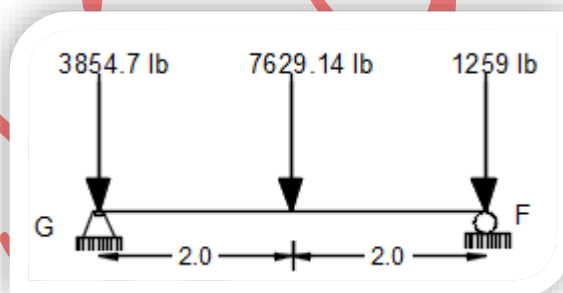
$$\tau = V/A, \quad v = 1907.28 \text{ lb},$$

$$A = tw * d \quad A = 0.17 * 5.9, \quad A = 1.003 \text{ in}^2$$

$$\tau = 1907.28 \text{ lb} / 1.003 \text{ in}^2 = 1796.6 \text{ psi}, \quad \tau_{\text{allowable}} = 12 \text{ ksi}$$

$$1.7966 \text{ ksi} < \tau_{\text{allowable}} \dots\dots\dots \text{ok}$$

اوس د G-F د گادر ډیزاین کوو



$$W = 7629.14 \text{ lb}, \quad L = 4 \text{ m}$$

$$M_{\text{max}} = w * l / 4 = 25023.58 \text{ lb} * \text{ft}$$

$$S_{\text{required}} = \frac{M}{\sigma_{\text{allowable}}},$$

$$1 \text{ m} = 3.28 \text{ ft}, \quad 1 \text{ ft} = 12 \text{ in}$$

$$S_{\text{req}} = 25023.58 * 12 / 29000 \text{ psi} = 10.35 \text{ in}^3$$

اوس په 25 صفحه کې W_{10*12} د بيم مقطع انتخابوو چې عبارت ده له: $S = 10.9$

W12 – W10														
Nom- inal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I in. ⁴	S in. ³	r in.	Z in. ³	I in. ⁴	S in. ³	r in.	Z in. ³			in.	in.
lb/ft	$2t_f$	t_w												
58	7.82	27.0	475	78.0	5.28	86.4	107	21.4	2.51	32.5	2.82	11.6	2.10	3570
10	7.41	30.5	66.9	13.6	3.90	10.0	2.69	1.40	0.610	2.30	1.01	9.72	0.104	66.3
12	9.43	46.6	53.8	10.9	3.90	12.6	2.18	1.10	0.785	1.74	0.983	9.66	0.0547	50.9

اوس يی عرضي تشنج ته محاسبه کوو

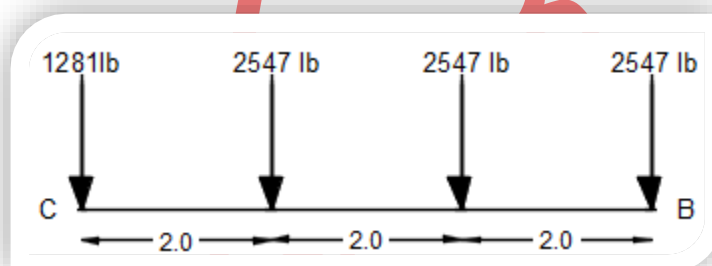
$$\tau = V/A, v = 3814.57 \text{ lb}, A = 1.87 \text{ in}^2$$

$$\tau = 3814.57 \text{ lb} / 1.87 \text{ in}^2 = 2039 \text{ psi}, \tau_{\text{allowable}} = 12 \text{ ksi}$$

$$\tau = 2.039 \text{ ksi}$$

$$\tau < \tau_{\text{allowable}} \dots \dots \text{ok}$$

اوس C-B گادر ډیزاین کوو



$$A_y = 3828 \text{ lb}, B_y = 5094 \text{ lb}$$

$$M_{\text{max}} = 16708.32 \text{ lb} \cdot \text{ft}$$

$$S_{\text{required}} = \frac{M}{\sigma_{\text{allowable}}}$$

$$S_{\text{req}} = 16708.32 \cdot 12 \text{ in} / 29000 \text{ psi} = 6.91 \text{ in}^3$$

اوس په 27 صفحه كي $W_{6 \times 12}$ د بيم مقطع انتخابوو چي عبارت ده له:

$$S = 7.31 \text{ in}^3$$

Nom- inal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
			I	S	r	Z	I	S	r	Z			J	C_w
lb/ft	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	in. ⁴	in. ³	in.	in. ³	in. ⁴	in. ³	in.	in. ³	in.	in.	in. ⁴	in. ⁶
67	4.43	11.1	272	60.4	3.72	70.1	88.6	21.4	2.12	32.7	2.43	8.07	5.05	1440

12	7.14	21.6	22.1	7.31	2.49	8.30	2.99	1.50	0.918	2.32	1.08	5.75	0.0903	24.7
----	------	------	------	------	------	------	------	------	-------	------	------	------	--------	------

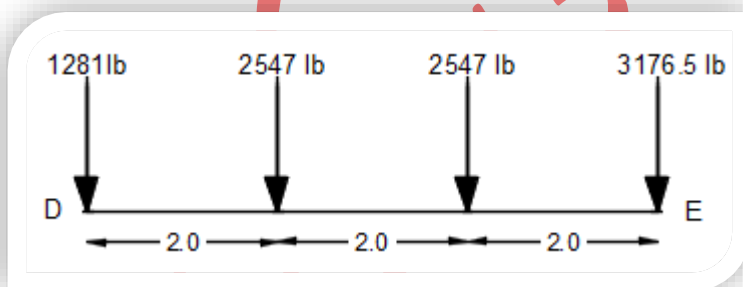
اوس يی عرضي تشنج ته محاسبه کوو

$$\tau = V/A \quad , \quad V = 2547 \text{ lb} \quad , \quad A = 1.4 \text{ in}^2$$

$$\tau = 2547/1.4 = 1819.3 \text{ psi} \quad , \quad \tau_{\text{allowable}} = 12 \text{ ksi}$$

$$1.8193 \text{ ksi} < 12 \text{ ksi} \quad \dots\dots\dots \text{ok}$$

E-D گادر ډيزاين



$$D_y = 3828 \text{ lb} \quad , \quad E_y = 5723.5 \text{ lb} \quad , \quad 1 \text{ ft} = 12 \text{ in}$$

$$S_{\text{required}} = \frac{M}{\delta_{\text{Allowable}}}$$

$$M_{\text{max}} = 16708.32 \text{ lb} \cdot \text{ft}$$

$$S_{\text{req}} = 16708.32 \text{ lb} \cdot 12 / 29000 \text{ psi} = 6.91 \text{ in}^3$$

د مینول په ۲۷ صفحه کې $w_{6 \times 12}$ د بیم مقطع انتخاب وکړه چې د C-B گادر لپاره
انتخاب شوي چې عبارت له: $S = 7.31 \text{ in}^3$

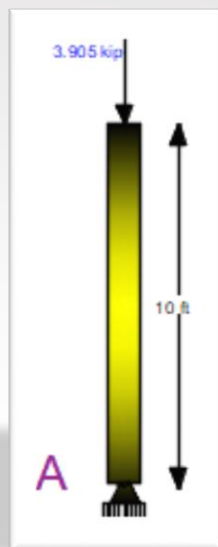
اوس يی عرضي تشنج ته محاسبه کوو

$$\tau = V/A \quad , \quad V = 2547 \text{ lb} \quad , \quad A = t_w \cdot d = 0.23 \cdot 6.03 = 1.4 \text{ in}^2 \quad , \quad A = 1.4 \text{ in}^2$$

$$\tau = 2547/1.4 = 1819.3 \text{ psi} \quad , \quad \tau_{\text{allowable}} = 12 \text{ ksi} \quad , \quad 1.8193 \text{ ksi} < 12 \text{ ksi} \dots\dots \text{ok}$$

A=L پای دیزاین

$W_u = 3.905$
kip



اوس د manual په 468
صفحه كي د
HSS2*2*1/8 مقطع
انتخابوو

$R = 0.761$ in

$SR = AL/R \leq 200$

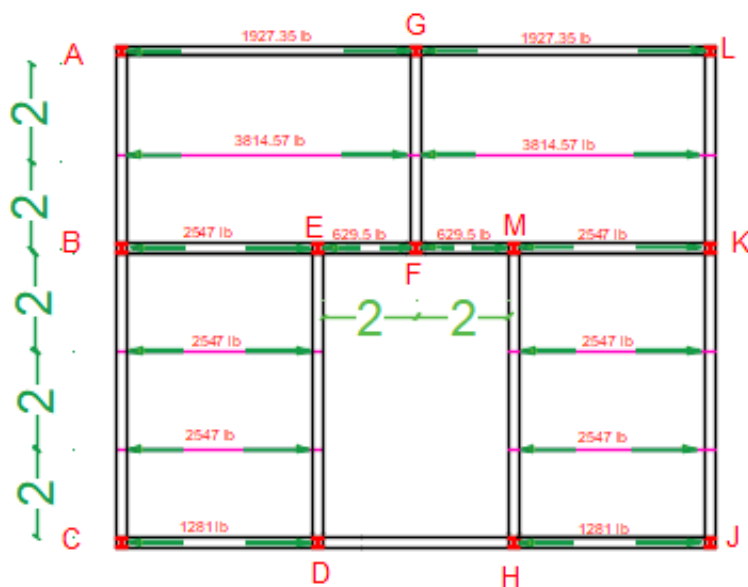
$A = 10$ ft کالم ارتفاع

$SR = (10 \times 12) \text{ in} / 0.761 \text{ in}$

$SR = 157.7$

$157.7 < 200 \dots \text{ok}$

د پایو دیزاین



د هري پایو اوږدوالي 10 ft دي

د ټولو پایو اتکايي په دواړو خواوو كي PIN دي
په دي پلان كي ځینی پای پر هغوي د واردیدو قوو له
مخي یو ډول دي

$A=L$, $B=K$, $E=M$, $C=D=H=J$, F , G

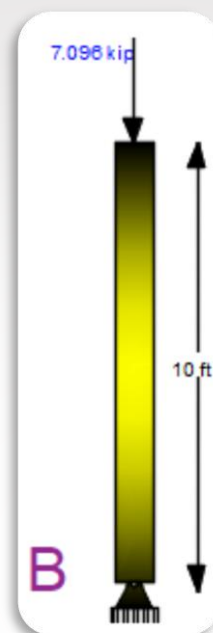
Shape	HSS2 1/4 x 2 1/4 x						HSS2 x 2 x					
	3/16		1/8		1/4		3/16		1/4		3/8	
	0.174		0.116		0.233		0.174		0.116		0.116	
Wu/R	4.94		3.47		5.38		4.30		3.04			
Design	P_u/Ω_c		P_u/P_n		P_u/Ω_c		P_u/P_n		P_u/Ω_c		P_u/P_n	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
0	37.7	56.6	26.3	39.6	41.5	62.4	32.9	49.4	23.1	34.8		
1	37.1	55.8	26.0	39.0	40.7	61.2	32.3	48.5	22.7	34.2		
2	35.6	53.5	25.0	37.6	38.4	57.7	30.6	45.9	21.6	32.5		
3	33.2	49.9	23.4	35.2	34.8	52.3	27.9	42.0	19.9	29.9		
4	30.1	45.3	21.4	32.1	30.4	45.6	24.6	37.0	17.7	26.6		
5	26.6	40.0	19.0	28.6	25.5	38.3	20.9	31.5	15.2	22.9		
6	22.8	34.3	16.5	24.8	20.5	30.9	17.2	25.8	12.7	19.0		
7	19.1	28.6	13.9	20.9	15.9	23.9	13.6	20.4	10.2	15.3		
8	15.5	23.3	11.5	17.2	12.2	18.3	10.4	15.7	7.93	11.9		
9	12.3	18.5	9.17	13.8	9.63	14.5	8.26	12.4	6.26	9.42		
10	9.95	15.0	7.43	11.2	7.80	11.7	6.68	10.1	5.07	7.63		

نوموړي دیزاین د $C=D=H=J$ لپاره هم کفایت کوی ځکه
چي 4.08 kip/ft ظرفیت لرونکي دي او په C,D,H,J
کالمونو باندې لږ کچه قوه موجوده ده.

B=K پای دیزاین

Shape		HSS2 1/4×2 1/4×				HSS2×2×					
		3/16		1/8		1/4		3/16		1/8	
t _{design} in.		0.174		0.116		0.233		0.174		0.116	
Wt/ft		4.94		3.47		5.38		4.30		3.04	
Design		P _r /Ω _c		φ _c P _r		P _r /Ω _c		φ _c P _r		P _r /Ω _c	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
radius of gyration r _y	0	37.7	56.6	26.3	39.6	41.5	62.4	32.9	49.4	23.1	34.8
	1	37.1	55.8	26.0	39.0	40.7	61.2	32.3	48.5	22.7	34.2
	2	35.6	53.5	25.0	37.6	38.4	57.7	30.6	45.9	21.6	32.5
	3	33.2	49.9	23.4	35.2	34.8	52.3	27.9	42.0	19.9	29.9
	4	30.1	45.3	21.4	32.1	30.4	45.6	24.6	37.0	17.7	26.6
	5	26.6	40.0	19.0	28.6	25.5	38.3	20.9	31.5	15.2	22.9
	6	22.8	34.3	16.5	24.8	20.5	30.9	17.2	25.8	12.7	19.0
	7	19.1	28.6	13.9	20.9	15.9	23.9	13.6	20.4	10.2	15.3
	8	15.5	23.3	11.5	17.2	12.2	18.3	10.4	15.7	7.93	11.9
	9	12.3	18.5	9.17	13.8	9.63	14.5	8.26	12.4	6.26	9.42
10	9.95	15.0	7.43	11.2	7.80	11.7	6.66	10.1	5.07	7.63	

$W_u = 7.096$
kip



اوس د manual په 468
صفحه كي د
HSS2*2*1/8 مقطع
انتخابوو

$R = 0.761$ in

$SR = AL/R \leq 200$

$B = 10$ ft کالم ارتفاع

$SR = (10 \times 12) \text{ in} / 0.761 \text{ in}$

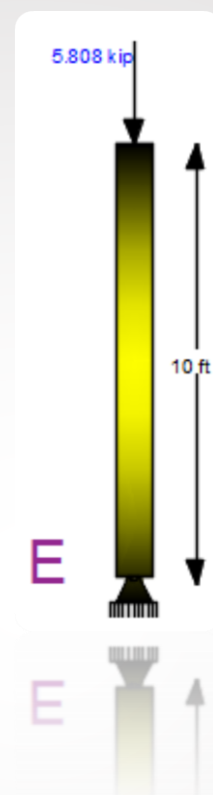
$SR = 157.69$

$157.69 < 200 \dots \text{ok}$

E=M پای دیزاین

Shape	HSS2 1/4 × 2 1/8 ×				HSS2 × 2 ×					
	3/16		1/8		1/4		3/16		1/2	
t_{design} in.	0.174		0.116		0.233		0.174		0.116	
Wt/ft	4.94		3.47		5.38		4.30		3.04	
Design	P_n/Ω_c		$\phi_c P_n$		P_n/Ω_c		$\phi_c P_n$		P_n/Ω_c	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
radius of gyration r_y	0	37.7	56.6	26.3	39.6	41.5	62.4	32.9	49.4	23.1
	1	37.1	55.8	26.0	39.0	40.7	61.2	32.3	48.5	22.7
	2	35.6	53.5	25.0	37.6	38.4	57.7	30.6	45.9	21.6
	3	33.2	49.9	23.4	35.2	34.8	52.3	27.9	42.0	19.9
	4	30.1	45.3	21.4	32.1	30.4	45.6	24.6	37.0	17.7
	5	26.6	40.0	19.0	28.6	25.5	38.3	20.9	31.5	15.2
	6	22.8	34.3	16.5	24.8	20.5	30.9	17.2	25.8	12.7
	7	19.1	28.6	13.9	20.9	15.9	23.9	13.6	20.4	10.2
	8	15.5	23.3	11.5	17.2	12.2	18.3	10.4	15.7	7.93
	9	12.3	18.5	9.17	13.8	9.63	14.5	8.26	12.4	6.26
	10	9.95	15.0	7.43	11.2	7.80	11.7	6.69	10.1	5.07

$W_u = 5.808$
kip



اوس د manual په 468
صفحه كي د
HSS2*2*1/8 مقطع
انتخابوو

$R = 0.761$ in

$SR = AL/R \leq 200$

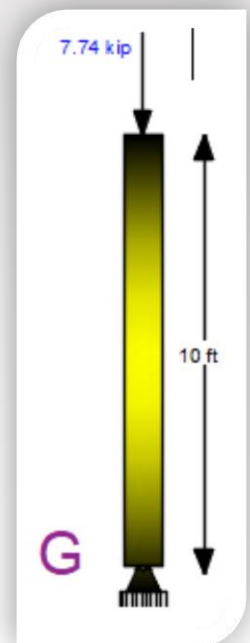
$B = 10$ ft کالم ارتفاع

$SR = (10 \times 12) \text{ in} / 0.761 \text{ in}$

$SR = 157.69$

G پای دیزاین

$$W_u = 7.74 \text{ kip}$$



Shape		HSS2 1/4 x 2 1/4 x				HSS2 x 2 x			
		3/16	1/8	1/4	3/16	1/8	1/4	3/16	1/8
t_{design} in.		0.174	0.116	0.233	0.174	0.116	0.233	0.174	0.116
Wt/lb		4.94	3.47	5.38	4.30	3.04	4.94	3.47	5.38
Design	r _y	P_n/Ω_c		$\phi_c P_n$		P_n/Ω_c		$\phi_c P_n$	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
0		37.7	56.6	26.3	39.6	41.5	62.4	32.9	49.4
1		37.1	55.8	26.0	39.0	40.7	61.2	32.3	48.5
2		35.6	53.5	25.0	37.6	38.4	57.7	30.6	45.9
3		33.2	49.9	23.4	35.2	34.8	52.3	27.9	42.0
4		30.1	45.3	21.4	32.1	30.4	45.6	24.6	37.0
5		26.6	40.0	19.0	28.6	25.5	38.3	20.9	31.5
6		22.8	34.3	16.5	24.8	20.5	30.9	17.2	25.8
7		19.1	28.6	13.9	20.9	15.9	23.9	13.6	20.4
8		15.5	23.3	11.5	17.2	12.2	18.3	10.4	15.7
9		12.3	18.5	9.17	13.8	9.63	14.5	8.26	12.4
10		9.95	15.0	7.43	11.2	7.80	11.7	6.69	10.1
11		8.22	12.4	6.14	9.23	6.44	9.68	5.53	8.31
12		6.91	10.4	5.16	7.75			4.64	6.98
13		5.89	8.85	4.40	6.61			3.52	5.30
14				3.79	5.70				

اوس د manual په 468
صفحه كي د
HSS2*2*3/16 مقطع
انتخابوو

$$R=0.733\text{in}$$

$$SR= AL/R \leq 200$$

$$B=10 \text{ ft كالم ارتفاع}$$

$$SR=(10*12) \text{ in}/0.733\text{in}$$

$$SR=163.7$$

$$163.7 < 200 \dots \text{ok}$$

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