د افغانستان اسلامی جمهوریت

د لوړو زده کړو وزارت

لغمان پوهنتون

انجنیری پوهنځی

# Steel Design



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د پلار نوم : مستو خان

صنف : دریم

سکشن: B

حاضري شمیره : 37

استاد : پوهیالي خیبر (خپلواک)

کال ۱۳۹۹ ه ش

# بسم الله الرحمن الرحيم

## سریزه

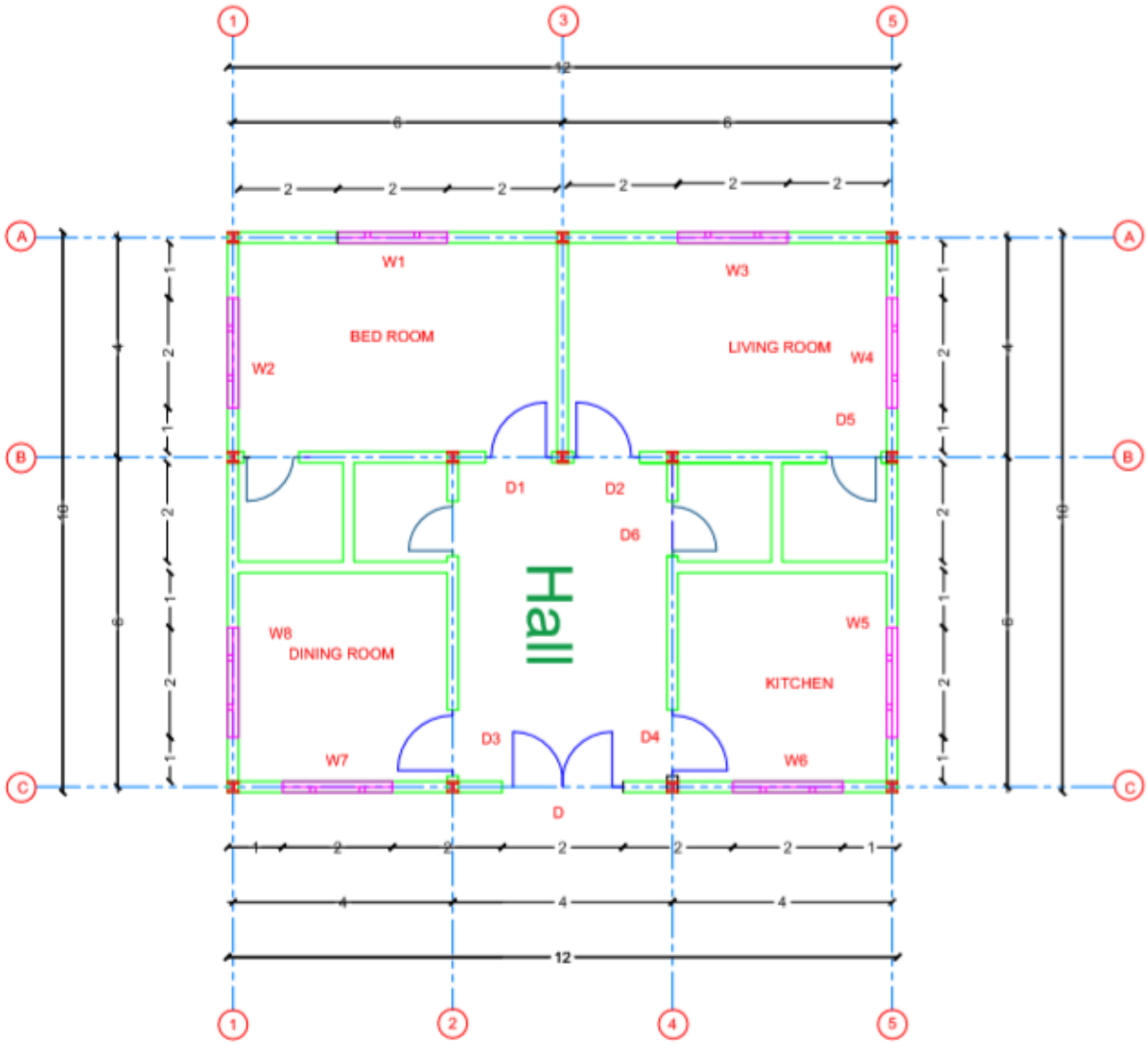
له کله نه چی انسان د ځمکی په مخ قدم ایښی نو له همغه پیل نه یی د اوسیدو لپاره ځان ته دیوه سرپناه د پیداکولو هڅه کړی . دا ځکه چی هر انسان له هوا او اوبو وروسته ترټولو لمړی اړین عنصر چی د هوسا ژوند تیرولو لپاره ورته اړتیا لری هغه هم سرپنا ده نه یواځی انسانان بلکی الوتونکی هم چی کله په یوه سیمه کی وغواړی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

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

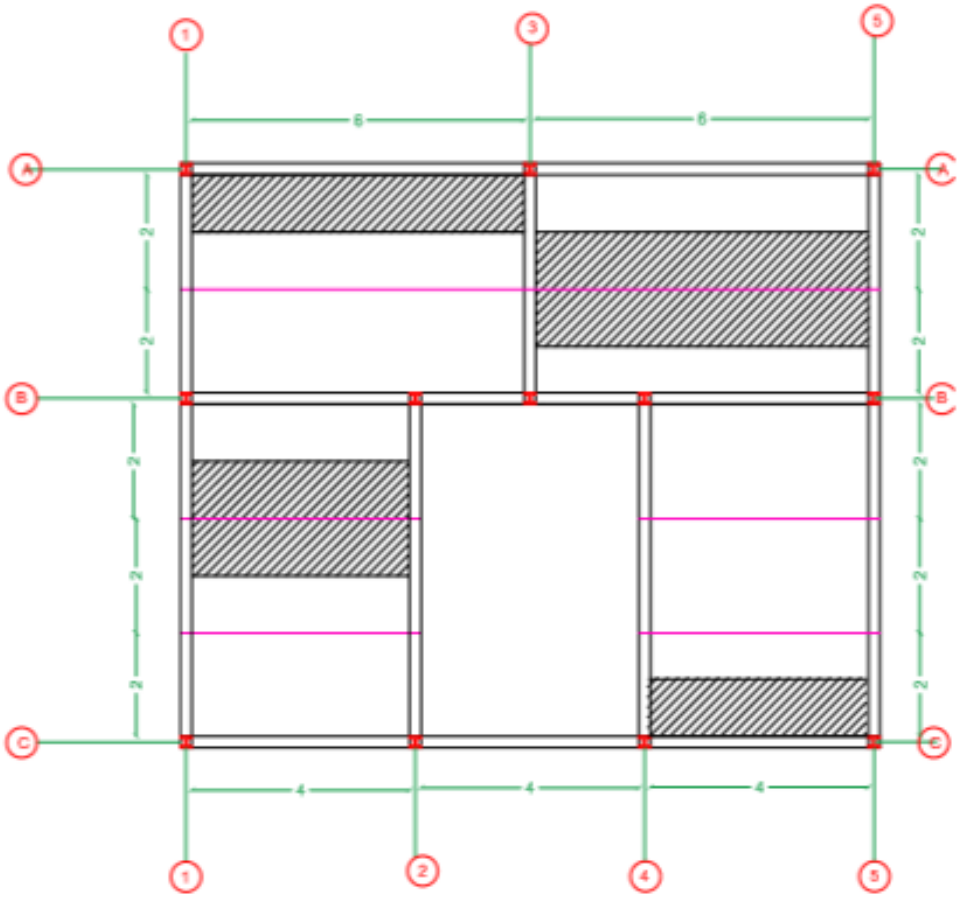
نو له دی څخه څرګندیږی چی انسانانو له همغه پیله ځان ته سرپناه جوړه وی چی د انسان په متمدن کیدو سره د سرپناه په جوړولوکی مختلف بدلونونه راغلل چی اوس وخت عموما چی کوم ساختمانونه جوړیږی هغه د اوسپنیزکانکریت ، لرګیو،او فولادی ساختمانونو څخه عبارت دی چی نظر دې ټولو ته فولادی ساختمانونه ډیر کارول کیږی . او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

مورِ چي کوم فولادي ساختمان ډيزاين کوو د هغه پلان په لاندي ډول دی

# پلان



# د بیمونو اوکادرو چوکاټ



## لومړی برخه

د ټولو نه وړومبي ددغي ساختمان Roof deck ډیزاین کوو

د Roof د ډیزاین دپاره یوازي live load په نظر کي نیسو.

د مسکوني ودانیو دپاره live load = 192 kg/m$^2$

Wu = 1.4 *192 kg/m$^2$ =268.8 kg/m$^2$

د نهایی بار واحد د SI څخه PSF ته اړوو

**Wu = 268.8*2.204/3,28$^2$ = 55.06 PS**

**Roof deck ځخه جدولونو د دهغه او مراجعه کوو ته VULCRAFT MENUAL اوس انتخابوو . مونږ چې کوم Roof deck انتخاب کړي دي د هغه وايه 2m ده اوس موږ بدلوو Ft په واحد دغه**

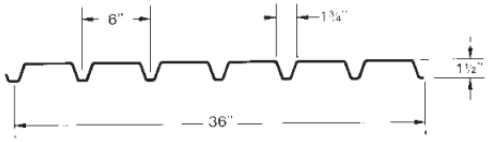
**2m = 2*3,28 Ft = 6.56 Ft**

**DECK F20 1.5F صفحه کي ځلورمه برخه په لومړي VULCRAFT MENUAL د انتخابوو**

**کوم چې 6 Ft – 6in وايه لري او همدارنګه 58 PSF بار د زغملو وړتيا لري او طول يې 6 Ft -6 in دي**

## 1.5 F

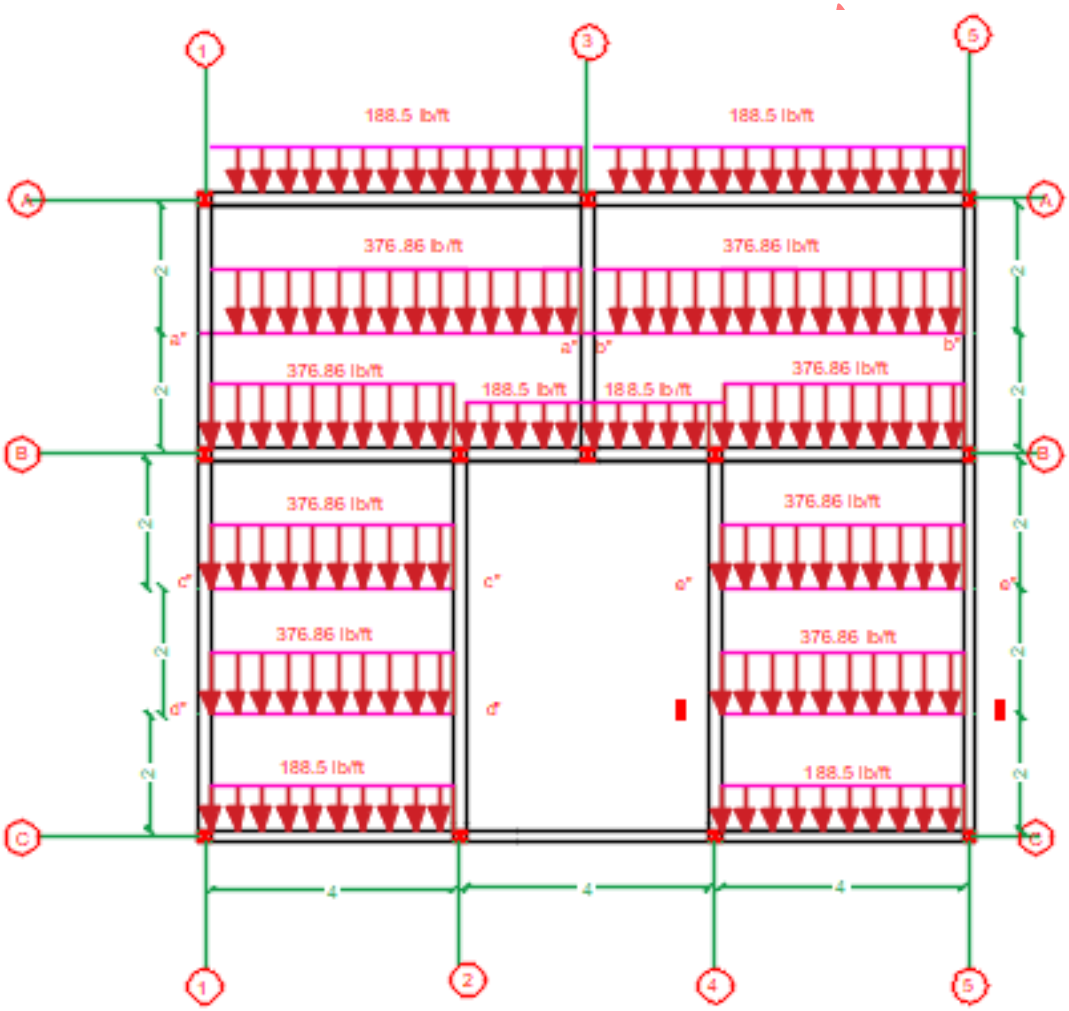
Maximum Sheet Length 42'-0
Extra Charge for Lengths Under 6'-0
ICBO Approved (No.3415)
Factory Mutual Approved
Deck type & gauge — Max. deck span
1.5F22..... 4'-11"
1.5F20..... 5'-5"
1.5F18..... 6'-3"
FM Approvals No. 0C8A7.AM




### 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 4'-0 | 4'-6 | 5'-0 | 5'-6 | 6'-0 | 6'-6 | 7'-0 | 7'-6 | 8'-0 | 8'-6 | 9'-0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 هربیم ته لوډ په خطي ډول بښودل شوې




په پورته چوکاټ کِی ځینې بیمونه د اوږدوالي او پر هغوې د وارده بار له مخې یو ډول دي

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

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

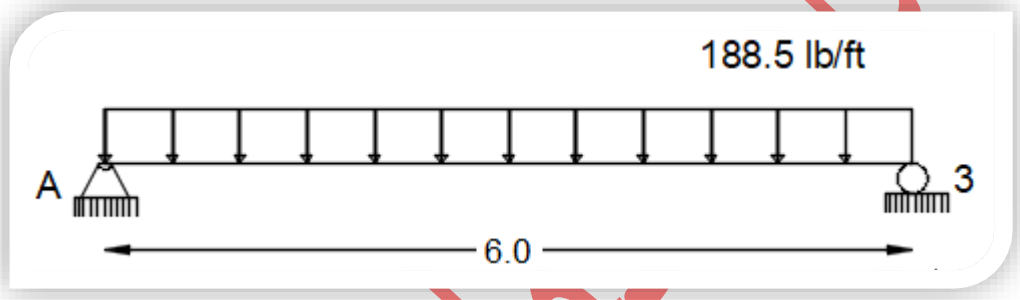
$B_{2-3} = B_{3-4}$

a”-a” = b”-b” , c”-c”= d”-d”=e”-e”=f”-f”

# اوس نو لومړي $A_{1-3}$ بيم ډيزاين کوو

په هر بيم د ROOF DECK 1.99 PSF وزن په نظر کي نيول کيږي

نوټ : د بيمونو او ګاډرو اندازه ګذاري په متر ده چي په محاسبه کي په فوټ اړول کيږي




Wu=188.5 lb/ft

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

$$M\ max = \frac{188.5\ lb/ft*(19.7\ ft)2}{8} = 9144.4\ lb*ft$$

$$S\ required = \frac{M}{\delta\ Alowable}$$

$$\delta\ Alowable\ for\ steel = 29\ ksi$$

ft=12 in

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

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

## Table 1–2 (continued)
## M Shapes
### Properties

M SHAPES

| Nom-inal Wt. | Compact Section Criteria | | Axis X-X | | | | Axis Y-Y | | | | $r_{ts}$ | $h_o$ | $\frac{J}{S_x h_o}$ | Torsional Properties | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\frac{b_f}{2t_f}$ | $\frac{h}{t_w}$ | $I$ | $S$ | $r$ | $Z$ | $I$ | $S$ | $r$ | $Z$ | | | | $J$ | $C_w$ |
| lb/ft | | | 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 | 3[illegible] | | .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.b | 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 |

مونږ د AISC MENUAL په 28 صفحه کی M8*6.2 ډوله مقطع انتخابوو

اوس یاده مقطع د عرضي تشنج دپاره چیک کوو V= 1854.15 V=w*L / 2

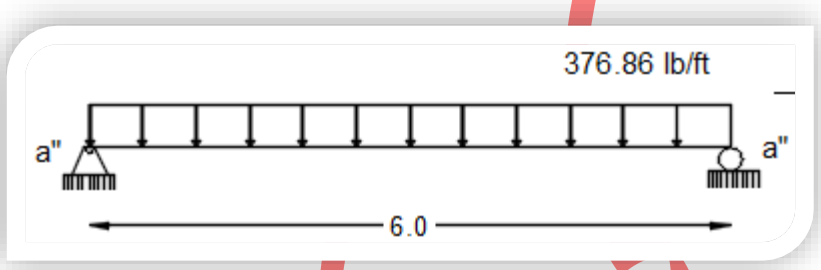
A=tw*d , A=0.129*8 , A= 1.032 in $^2$ ,

ƮV/A

Ʈ=1854.15 /1.032=1.79665 Ksi

Ʈ allowable =12ksi Ʈ allowable > Ʈ ……. ok

# اوس a"-a" بیم ډیزاین کوو




**Wu=376.86 lb/ft**

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

**$Mmax = (376.86 *19.68^2)/8 = 18244.8$ lb*ft**

**S required=$\frac{M}{\delta\ Alowable}$**

**ft=12 in**

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

**اوس (28, 29)صفحو ته ځو او د $s=7.79in^3$ $M_{10*9}$ بیم مقطع انتخابوو**

## Table 1–2 (continued)
## M Shapes
### Properties

M SHAPES

| Nom-inal Wt. | Compact Section Criteria | | Axis X-X | | | | Axis Y-Y | | | | $r_{ts}$ | $h_o$ | $\frac{J}{S_x h_o}$ | Torsional Properties | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\frac{b_f}{2t_f}$ | $\frac{h}{t_w}$ | $I$ | $S$ | $r$ | $Z$ | $I$ | $S$ | $r$ | $Z$ | | | | $J$ | $C_w$ |
| lb/ft | | | 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 عرضي تشنج دپاره محاسبه کوو**

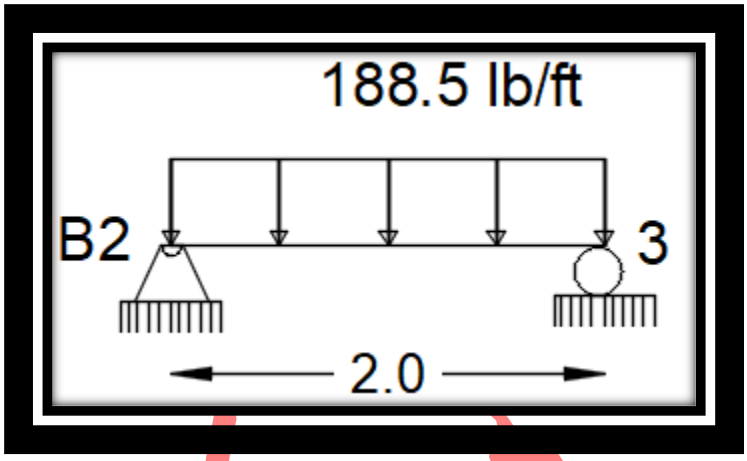
**τ=V/A , v=3708.3 lb**

**A=tw*d , A=0.157*10 , A= 1.57 in $^2$**

**τ=3708.3/1.57 =2.362 ksi**

**τ allowable=12ksi τ allowable > τ ..... ok**

# اوس $B_{2-3}$ ډيزاين کوو




**Wu=188.5 lb/ft**

**M max=(188.5*6.56$^2$)/8 =1014 lb*ft**

**S required=$\frac{M}{\delta\ Alowable}$**

**ft=12 in**

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

**اوس په (28,29)صفحو کې $s=1\ in^3$ $M_{3*2.9}$ بيم مقطع انتخابوو**

## Table 1–2 (continued)
## M Shapes
### Properties

M SHAPES

| Nominal Wt. | Compact Section Criteria | | Axis X-X | | | | Axis Y-Y | | | | $r_{ts}$ | $h_o$ | $\frac{J}{S_x h_o}$ | Torsional Properties | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\frac{b_f}{2t_f}$ | $\frac{h}{t_w}$ | $I$ | $S$ | $r$ | $Z$ | $I$ | $S$ | $r$ | $Z$ | | | | $J$ | $C_w$ |
| lb/ft | | | 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.[illegible] | | | 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 | [illegible] | 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 | 1[illegible] | [illegible]3.[illegible] | | 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 يې عرضي تشنج ته محاسبه کوو**

**τ=V/A**

**V=618.05**

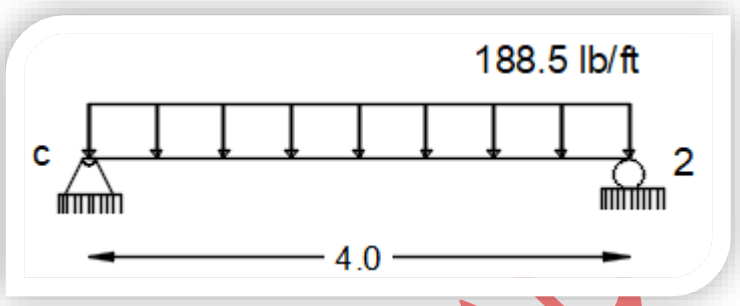
**A=tw*d , A=0.09*3 , A= 0.27 in $^2$**

**τ= (618.05)/(0.27)=2289.07psi , τ allowable=12ksi**

**τ= 2.28907Ksi**

**τ allowable > τ ..... ok**

# اوس $C_{1-2}$ بیم ډیزاین کوو




**Wu = 188.5 lb/ft**

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

**$M\ max=(188.5*13.12^2)/8 = 4056\ lb*ft$**

**ft=12 in**

**S required=$\frac{M}{\delta\ Alowable}$**

**$S_{req}=(4056*12)/29000\ psi = 1.67\ in^3$**

**اوس په 31,32 صفحو کې د $S_{3*5.7}$ , $S=1.67in^3$ مقطع انتخابوو**

Table 1–3 (continued)
**S Shapes**
**Properties**

S SHAPES

| Nom-inal Wt. | Compact Section Criteria | | Axis X-X | | | | Axis Y-Y | | | | $r_{ts}$ | $h_o$ | Torsional Properties | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\frac{b_f}{2t_f}$ | $\frac{h}{t_w}$ | $I$ | $S$ | $r$ | $Z$ | $I$ | $S$ | $r$ | $Z$ | | | $J$ | $C_w$ |
| lb/ft | | | in.$^4$ | in.$^3$ | in. | in.$^3$ | in.$^4$ | in.$^3$ | in. | in.$^3$ | in. | in. | in.$^4$ | in.$^6$ |
| 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 |
| 5.7 | 4.48 | 11.0 | 2.50 | 1.67 | 1.23 | 1.94 | 0.447 | 0.383 | 0.518 | 0.656 | 0.605 | 2.74 | 0.0433 | 0.838 |

## اوس یی عرضي تشنج ته محاسبه کوو

**τ=V/A**

**V = 1236.1 lb**

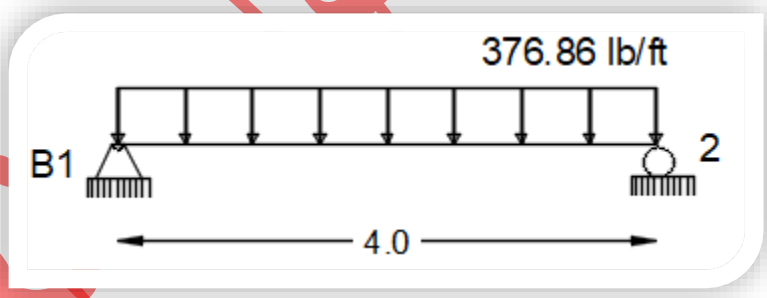
**A=tw*d , A=0.17*3 = 0.51 $in^2$**

**τ=1236.1 lb /0.51 $in^2$=2423.7 psi , τ allowable=12ksi**

**τ= 2.4237 Ksi**

**τ allowable > τ ..... ok**

## اوس د $B_{1-2}$ بیم ډیزاین کوو




**Wu=376.86 lb/ft**

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

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

**Ft =12 in**

**S required=$\frac{M}{\delta\ Alowable}$**

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

اوس د مینول په (31,30 )صفحه کِي $S_{4*9.5,}$ , $S=38in^3$ بیم مقطع انتخابوو

S SHAPES

| Nom-inal Wt. | Compact Section Criteria | | Axis X-X | | | | Axis Y-Y | | | | $r_{ts}$ | $h_o$ | Torsional Properties | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\frac{b_f}{2t_f}$ | $\frac{h}{t_w}$ | $I$ | $S$ | $r$ | $Z$ | $I$ | $S$ | $r$ | $Z$ | | | $J$ | $C_w$ |
| lb/ft | | | in.$^4$ | in.$^3$ | in. | in.$^3$ | in.$^4$ | in.$^3$ | in. | in.$^3$ | in. | in. | in.$^4$ | in.$^6$ |
| 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 یی عرضي تشنج ته محاسبه کوو

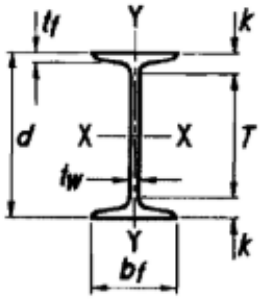



Table 1–3
S Shapes
Dimensions

| Shape | Area, $A$ | Depth, $d$ | | Web Thickness, $t_w$ | | $\frac{t_w}{2}$ | Flange Width, $b_f$ | | Flange Thickness, $t_f$ | | Distance $k$ | Distance $T$ | Distance Workable Gage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | in.$^2$ | in. | | in. | | in. | in. | | in. | | in. | in. | in. |
| S24×121 | 35.5 | 24.5 | 24 1/2 | 0.800 | 13/16 | 7/16 | 8.05 | 8 | 1.09 | 1 1/16 | 2 | 20 1/2 | 4 |
| S4×9.5 | 2.79 | 4.00 | 4 | 0.326 | 5/16 | 3/16 | 2.80 | 2 3/4 | 0.293 | 5/16 | 3/4 | 2 1/2 | — |

**Ƭ=V/A**

**V= 2472.2 lb**

**A=tw*d , A=0.326*4 = 1.304 $in^2$**

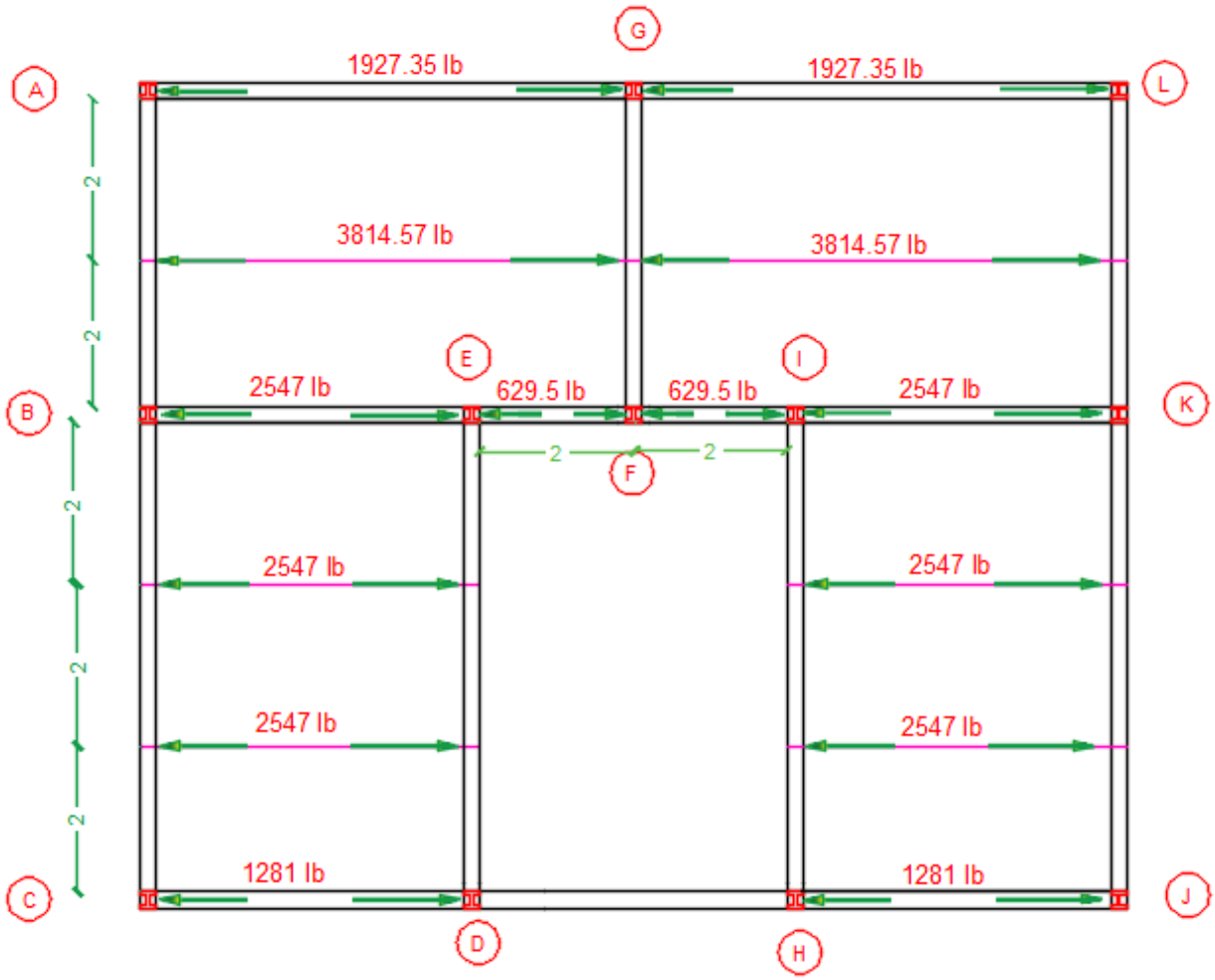
**Ƭ=2472.2 lb /1.304 $in^2$= 1895.86 psi , Ƭ allowable=12ksi**

**Ƭ= 1.89586 Ksi**

**Ƭ allowable > Ƭ ..... ok**

# د ګاډرو ډیزاین محاسبه

**په لاندي چوکاټ کي مجموعي لوډ د بیمونو څخه ګاډروته د انتقال په حالت کي ښودل شوي.کوم چې د بیمونو او Roof د ډیډلوډ اولایف لوډڅخه ترلاسه شوي.**



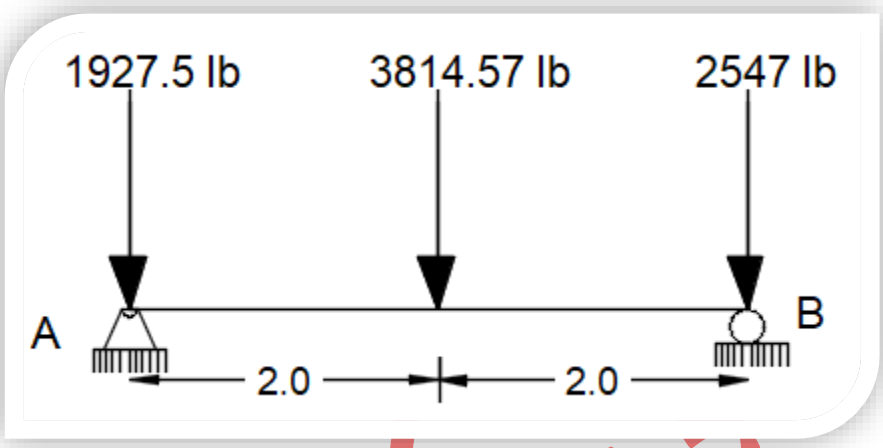

**په پورته چوکاټ کِی ځینې ګاډرونه د اوږدوالي او پر هغوي د وارده بار له مخې یو ډول دي. لکه :**

**A-B = L-K**

**B-C = K-J , E-D = I-H**

**G-F**

# د A-B گادر ډیزاین




**W=3814.57 lb , L=4m**

**Mmax=w*l/4**

**Mmax = 12511.79 lb*ft**

**S required=$\frac{M}{\delta\ Alowable}$**

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

**اوس په 27 صفحه کې $w_{6*9}$ مقطع دګادرلپاره انتخابوو $S=5.56\ in^3$ .**

| Nominal Wt. | Compact Section Criteria | | Axis X-X | | | | Axis Y-Y | | | | $r_{ts}$ | $h_o$ | Torsional Properties | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\frac{b_f}{2t_f}$ | $\frac{h}{t_w}$ | $I$ | $S$ | $r$ | $Z$ | $I$ | $S$ | $r$ | $Z$ | | | $J$ | $C_w$ |
| lb/ft | | | 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 یی عرضي تشنج ته محاسبه کوو

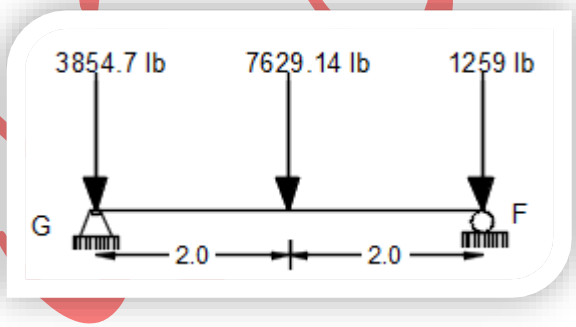
**τ=V/A , v=1907.28 lb ,**

**A=tw*d A=0.17*5.9 , A=1.003 $in^2$**

**τ=1907.28 lb / 1.003 $in^2$ = 1796.6psi , τ allowable=12ksi**

**1.7966ksi < τalowable …… ok**

# اوس دG-Fد ګادر ډیزاین کوو




**,W =7629.14lb , L=4m Mmax=w*l/4 = 25023.58 lb*ft**

**S required=$\frac{M}{\delta Alowable}$ , 1m=3.28ft , 1ft=12in**

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

**اوس په25 صفحه کي $W_{10*12}$ د بیم مقطع انتخابوو چي 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 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\frac{b_f}{2t_f}$ | $\frac{h}{t_w}$ | $I$ | $S$ | $r$ | $Z$ | $I$ | $S$ | $r$ | $Z$ | | | $J$ | $C_w$ |
| lb/ft | | | in.$^4$ | in.$^3$ | in. | in.$^3$ | in.$^4$ | in.$^3$ | in. | in.$^3$ | in. | in. | in.$^4$ | in.$^6$ |
| 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 |
| 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 یی عرضي تشنج ته محاسبه کوو

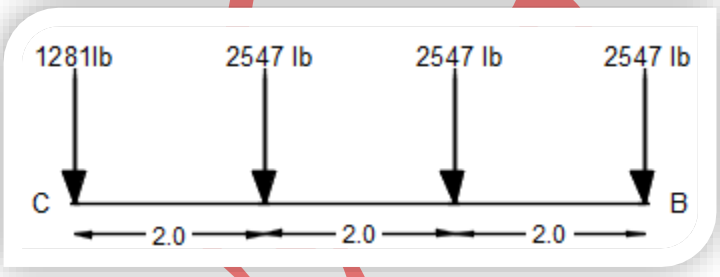
$\tau = V/A$ , $v = 3814.57lb$ , $A = 1.87in^2$

$\tau = 3814.57lb / 1.87in^2 = 2039$ psi , $\tau$ alowable $= 12ksi$

$\tau = 2.039$ ksi

$\tau < \tau$ allowable …… .. ok

# اوس C-B کادر ډیزاین کوو




Ay=3828 lb , By=5094 lb

Mmax =16708.32 lb* ft

S required=$\frac{M}{\delta\ Alowable}$

$S_{req}$ = 16708.32*12 in /29000 psi =6.91 $in^3$

اوس په27 صفحه کي $W_{6*12}$ د بیم مقطع انتخابوو چي عبارت ده له:

S=7.31 $in^3$

| Nom-inal Wt. | Compact Section Criteria | | Axis X-X | | | | Axis Y-Y | | | | $r_{ts}$ | $h_o$ | Torsional Properties | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\frac{b_f}{2t_f}$ | $\frac{h}{t_w}$ | $I$ | $S$ | $r$ | $Z$ | $I$ | $S$ | $r$ | $Z$ | | | $J$ | $C_w$ |
| lb/ft | | | 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 |

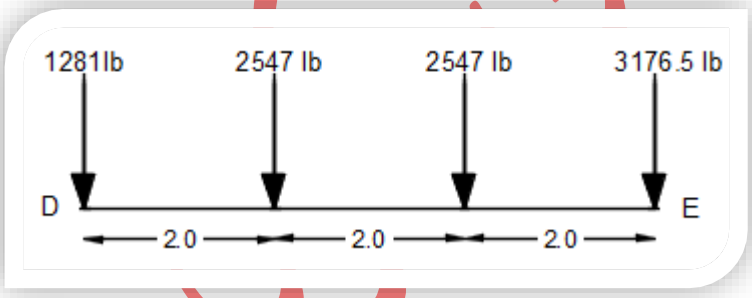
**اوس یی عرضي تشنج ته محاسبه کوو**

**Ƭ=V/A , V=2547 lb , A=1.4 $in^2$**

**Ƭ=2547/1.4=1819.3 psi , Ƭalowable =12 ksi**

**1.8193 ksi < 12 ksi ……. ……. ok**

## E-D کادر ډیزاین




**Dy =3828 lb , Ey = 5723.5 lb , 1 ft = 12in**

**S required=$\frac{M}{\delta\ Alowable}$**

**$M_{max}$= 16708.32 lb*ft**

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

**د مینول په۲۷ صفحه کي w $_{6*12}$ د بیم مقطع انتخابووکمه چي د C-Bګادر لپاره انتخاب شوي چي عبارت له: S=7.31 $in^3$**

**اوس یی عرضي تشنج ته محاسبه کوو**

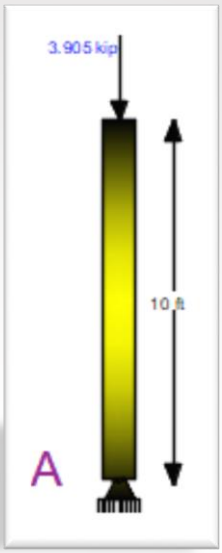
**Ƭ=V/A , V=2547 lb , A=Tw*d =0.23*6.03 = 1.4 $in^2$ ، A = 1.4 $in^2$**

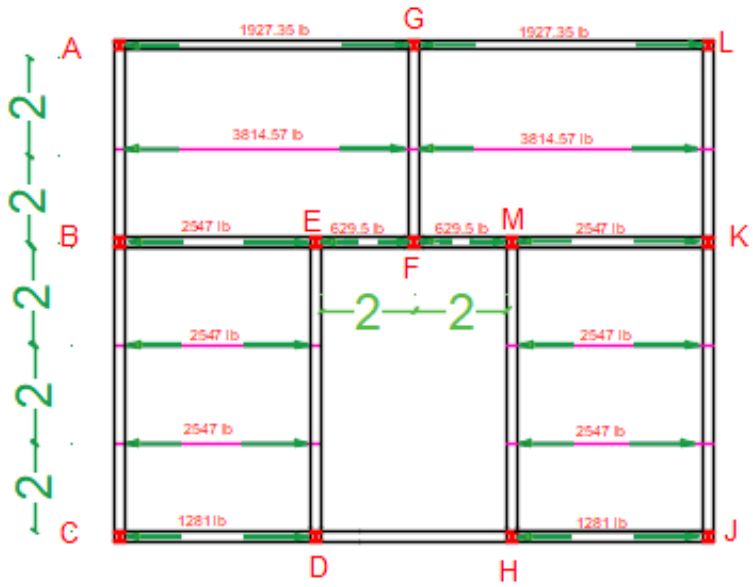
**Ƭ=2547/1.4=1819.3 psi , Ƭalowable =12 ksi , 1.8193 ksi < 12 ksi….. ok**

## A =L پایی ډیزاین

# د پایو ډیزاین

Wu =3.905
kip




د هري پایی اوږدوالي 10 ft دي

د ټولو پایو اتکاوي په دواړو خواوو کې PIN دي

په دي پلان کې ځینی پاي پر هغوي د واردیدو قوو له مخې یو ډول دي

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

اوس د menual په 468 صفحه کې د HSS2*2*1/8مقطع انتخابوو

R= 0.761 in

SR= AL/R≤ 200

Aکالم ارتفاع=10 ft

SR=( 10*12) in/0.76in
SR=157.7

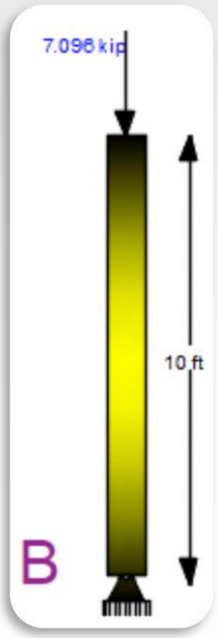
157.7< 200 …. ok

| Shape | | HSS2½×2½× | | | | 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 | | $P_n/\Omega_c$ ASD | $\phi_c P_n$ LRFD | $P_n/\Omega_c$ ASD | $\phi_c P_n$ LRFD | $P_n/\Omega_c$ ASD | $\phi_c P_n$ LRFD | $P_n/\Omega_c$ ASD | $\phi_c P_n$ LRFD | $P_n/\Omega_c$ ASD | $\phi_c P_n$ 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 | 6.69 | 10.1 | 5.07 | 7.63 |

نوموړي ډیزاین د C=D=H=J لپاره هم کفایت کوی ځکه چې 4.08 kip/ft ظرفیت لرونکي دي او په C,D,H,J کالمونو باندي لدي کمه قوه موجوده ده.

## B=K پایی دیزاین

Wu =7.096
kip




اوس د menual په 468
صفحه کې د
HSS2*2*1/8مقطع
انتخابوو

R=0.761 in

SR= AL/R≤ 200

B=10 ftکالم ارتفاع

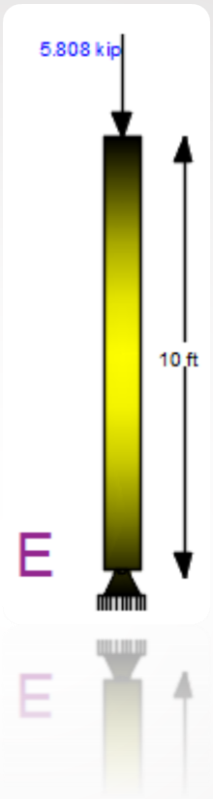
SR=( 10*12) in/0.761in
SR=157.69

157.69< 200 …. ok

| 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 | | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ |
| | | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD |
| t, 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 | 6.69 | 10.1 | 5.07 | 7.63 |

## E=M پایی دیزاین

Wu =5.808 kip




| Shape | | HSS2¼×2¼× | | | | 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 | | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ |
| | | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD |
| t, 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 |



اوس د menual په 468 صفحه کي د HSS2*2*1/8مقطع انتخابوو

R=0.761 in

SR= AL/R≤ 200

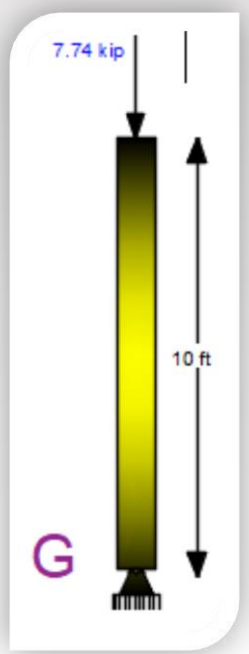
B=10 ftکالم ارتفاع

SR=( 10*12) in/0.761in

SR=157.69

## G پایی دیزاین

**Wu = 7.7 4 kip**




| 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 | | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ |
| | | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD |
| respect to least 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 | 6.69 | 10.1 | 5.07 | 7.63 |
| | 11 | 8.22 | 12.4 | 6.14 | 9.23 | 6.44 | 9.68 | 5.53 | 8.31 | 4.19 | 6.30 |
| | 12 | 6.91 | 10.4 | 5.16 | 7.75 | | | 4.64 | 6.98 | 3.52 | 5.30 |
| | 13 | 5.89 | 8.85 | 4.40 | 6.61 | | | | | | |
| | 14 | | | 3.79 | 5.70 | | | | | | |

**اوس د menual په 468 صفحه کې د HSS2*2*3/16مقطع انتخابوو**

**R=0.733in**

**SR= AL/R≤ 200**

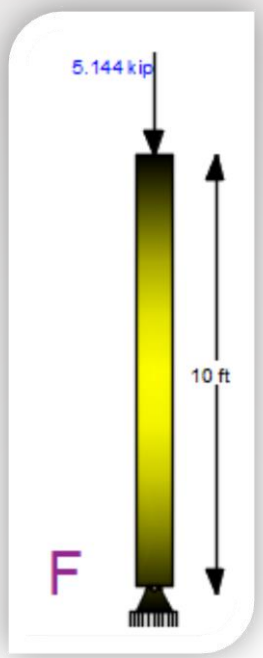
**Bکالم ارتفاع=10 ft**

**SR=( 10*12) in/0.733in**
**SR=163.7**

**163.7< 200 …. ok**

## F پایی ډیزاین

**Wu =5.1445 kip**




**اوس د menual په 468 صفحه کي د $W_{8*58}$ مقطع انتخابوو**

**R=0.761 in**

**SR= AL/R≤ 200**

**Bکالم ارتفاع=10 ft**

**SR=( 10*12) in/0.761in**

**SR=157.69**

**157.69< 200 …. ok**

Table 4–4 (continued)
Available Strength in Axial Compression, kips
Square HSS

$F_y$ = 46 ksi

HSS2¼–HSS2

| Shape | | HSS2¼×2¼× | | | | 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 | | $P_n/\Omega_c$ ASD | $\phi_c P_n$ LRFD | $P_n/\Omega_c$ ASD | $\phi_c P_n$ LRFD | $P_n/\Omega_c$ ASD | $\phi_c P_n$ LRFD | $P_n/\Omega_c$ ASD | $\phi_c P_n$ LRFD | $P_n/\Omega_c$ ASD | $\phi_c P_n$ LRFD |
| Effective slenderness ratio $Kl/r$ | 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 | | 6.26 | 9.42 |
| | 10 | 9.95 | 15.0 | 7.43 | 11.2 | 7.80 | 11.7 | | | 5.07 | 7.63 |
| | 11 | 8.22 | 12.4 | 6.14 | 9.23 | 6.44 | 9.68 | 5.53 | 8.31 | 4.19 | 6.30 |
| | 12 | 6.91 | 10.4 | 5.16 | 7.75 | | | 4.64 | 6.98 | 3.52 | 5.30 |
| | 13 | 5.89 | 8.85 | 4.40 | 6.61 | | | | | | |
| | 14 | | | 3.79 | 5.70 | | | | | | |

**ومن الله توفيق**

**اختتام**