

File : Kieffer1033d.mcd

Site : Hampton Inn & Suites
5740 North State Road 7
Coconut Creek, Florida 33073

Sign Type : 3'-0" tall x 5" deep x 12'-4 1/2" overall length script 'Hampton' LED channel letters stacked over 2'-5" tall x 5" deep x 14'-3 3/8" overall length script 'Inn & Suites' LED channel letters, all mounted with double angle clips and remote power supplies. Two (2) letter sets will be installed. One set on the North building elevation and one set on the West building elevation.
Drawing No. 1404059 rev. A

Design loads are based on the 2010 Florida Building Code (ASCE 7-10) using Exposure C and 170 mph winds.

Design Wind Speed : (mph.) $V := 170.0$ Based on Risk Category II

Velocity Pressure Coefficient at a Height of Less Than 80', Exposure C : $K_z := 1.21$ Based on Table 30.3-1

Topographic Factor : $K_{zt} := 1.00$ Based on Table 26.8-1

Wind Directionality Factor : $K_d := 0.85$ Based on Table 26.6-1

Velocity Pressure : (PSF) $q_z := 0.00256 K_z K_{zt} K_d \cdot V^2$ $q_z = 76.093$ Based on 30.3-1

Combined External Pressure G_{Cp} (30.4-1) minus Internal Pressure G_{Cpi} (26.11-1) : $G_{C_{Comb}} := 1.65$

Load Combination Factor : $LCF := 0.60$ Based on 2.4.1, Case 7

Design Pressure : (PSF) $F := q_z \cdot G_{C_{Comb}} \cdot LCF$ $F = 75.332$ Use : $WL := 75.4$

Design Snow Load : (PSF) $SL := 0.0$ N/A

Reference : Manual of Steel Construction, AISC 13th Edition.

Mounting Angles : ASTM A-36 $F_y = 36.0$ ksi. ; $F_b = 23.76$ ksi. ; $F_v = 14.40$ ksi.

Mounting Bolts : 18-8 Stainless Steel $F_u = 60.0$ ksi. ; $F_t = 20.00$ ksi. ; $F_v = 10.00$ ksi.

Design Loads for the Individual Letters 'H', 'T' and 'S' and the Symbol '&':

Dead Load - Based on the Letter 'H' - Heaviest :

Based on 4.5 lbs./sq.ft. : $ShrDL := (3.0 \cdot 5.63) \cdot 4.5$ $ShrDL = 76.005$ lbs.

Wind Load - Based on the Letter 'H' :

5" Deep Letter plus Mounting Angles : $ShrWL := \left[2.5 \cdot 3.0 \cdot \left(\frac{5.0 + 2.375}{12} \right) \right] \cdot WL$ $ShrWL = 347.547$ lbs.

Snow Load - Based on the Letter 'S' :

5" Deep Letter plus Mounting Angles : $ShrSL := \left[2.33 \cdot 2.25 \cdot \left(\frac{5.0 + 2.375}{12} \right) \right] \cdot SL$ $ShrSL = 0$ lbs.

Combined Shear :

Summation : (lbs.) $ShrTot := \sqrt{(ShrDL + ShrWL)^2 + (ShrSL + ShrWL)^2}$ $ShrTot = 547.891$

Design of Mounting Bolts for the Individual Letters 'H', 'T' and 'S' and the Symbol '&':

Mounting Bolt Diameter : (in.) $MntBltDia := 0.375$

$$\text{Stress Area : (in.}^2\text{)} \quad \text{MntBltArea} := \frac{\pi \cdot \text{MntBltDia}^2}{4} \quad \text{MntBltArea} = 0.11$$

(Based on nominal diameter per AISC 4-3)

$$\text{Allowable Tension : (lbs.)} \quad \text{AllwTen} := 20000 \cdot \text{MntBltArea} \quad \text{AllwTen} = 2209$$

$$\text{Allowable Shear : (lbs.)} \quad \text{AllwShr} := 10000 \cdot \text{MntBltArea} \quad \text{AllwShr} = 1104$$

$$\text{Minimum Number of Mounting Bolts in Shear per Letter :} \quad \text{NoShr} := 4$$

(The letter 'H' has seven mounting bolts, the letter 'I' has six, the letter 'S' has five and the '&' symbol has four.)

$$\text{Shear Load per Mounting Bolt : (lbs.)} \quad \text{ShrMntBlt} := \frac{\text{ShrTot}}{\text{NoShr}} \quad \text{ShrMntBlt} = 136.973$$

$$\text{Number of Mounting Bolts in Tension per Letter :} \quad \text{NoTen} := 2$$

$$\text{Minimum Distance Between Mounting Bolts : (in.)} \quad \text{LvrArm} := 16.5$$

$$\text{Tension Load per Mounting Bolt : (lbs.)} \quad \text{TenMntBlt} := \frac{(\text{ShrTot}) \cdot (5.0 + 2.375)}{\text{NoTen} \cdot \text{LvrArm}} \quad \text{TenMntBlt} = 122.45$$

$$\text{Unity Check :} \quad \text{UCMntBlt} := \frac{\text{ShrMntBlt}}{\text{AllwShr}} + \frac{\text{TenMntBlt}}{\text{AllwTen}} \quad \text{UCMntBlt} = 0.179 < 1.00 \quad \text{OK}$$

Mounting Bolts

Note : Use 3/8" diameter 18-8 Stainless Steel bolt, with spacers thru EIFS, as listed :

Expansion bolts in concrete or brick walls.

Toggle bolts in concrete block or panel walls.

TEK screws in metal studs.

Lag bolts in wood studs.

All thread bolts with blocking between studs.

Design of Mounting Angles for the Individual Letters 'H', 'T' and 'S' and the Symbol '&':

$$\text{Angle Thickness : (in.)} \quad \text{AngleThk} := 0.1875 \quad \text{Angle Length : (in.)} \quad \text{AngleLngth} := 2.0$$

$$\text{Angle Specimen : (in.)} \quad \text{PLS} := (1.5 - 0.75) \quad \text{PLS} = 0.75$$

$$\text{Minimum Angle Thickness Required : (in.)} \quad \text{ReqdThk} := \sqrt{\frac{\text{ShrMntBlt} \cdot \text{PLS} \cdot 6}{(\text{AngleLngth} \cdot 23760)}} \quad \text{ReqdThk} = 0.114$$

$$\text{Unity Check - Angle Thickness :} \quad \text{UCAngThk} := \frac{\text{ReqdThk}}{\text{AngleThk}} \quad \text{UCAngThk} = 0.607 < 1.00 \quad \text{OK}$$

Design Loads for the 'amp' Letter Set :

Dead Load :

$$\text{Based on 4.5 lbs./sq.ft. :} \quad \text{ShrDL} := (1.42 \cdot 4.43) \cdot 4.5 \quad \text{ShrDL} = 28.308 \quad \text{lbs.}$$

Wind Load :

$$\text{5" Deep Letters plus Mounting Angles :} \quad \text{ShrWL} := \left[(3 \cdot 2.33) \cdot 1.42 \cdot \left(\frac{5.0 + 2.375}{12} \right) \right] \cdot \text{WL} \quad \text{ShrWL} = 459.957 \quad \text{lbs.}$$

Snow Load :

$$5" \text{ Deep Letters plus Mounting Angles : } \text{ShrSL} := \left[1.33 \cdot 4.43 \cdot \left(\frac{5.0 + 2.375}{12} \right) \right] \cdot \text{SL} \quad \text{ShrSL} = 0 \quad \text{lbs.}$$

Combined Shear :

$$\text{Summation : (lbs.) } \quad \text{ShrTot} := \sqrt{(\text{ShrDL} + \text{ShrWL})^2 + (\text{ShrSL} + \text{ShrWL})^2} \quad \text{ShrTot} = 670.793$$

Design of Mounting Bolts for the 'amp' Letter Set :

$$\text{Mounting Bolt Diameter : (in.) } \quad \text{MntBltDia} := 0.375$$

$$\text{Stress Area : (in.}^2\text{) } \quad \text{MntBltArea} := \frac{\pi \cdot \text{MntBltDia}^2}{4} \quad \text{MntBltArea} = 0.11$$

(Based on nominal diameter per AISC 4-3)

$$\text{Allowable Tension : (lbs.) } \quad \text{AllwTen} := 20000 \cdot \text{MntBltArea} \quad \text{AllwTen} = 2209$$

$$\text{Allowable Shear : (lbs.) } \quad \text{AllwShr} := 10000 \cdot \text{MntBltArea} \quad \text{AllwShr} = 1104$$

$$\text{Number of Mounting Bolts in Shear : } \quad \text{NoShr} := 12$$

$$\text{Shear Load per Mounting Bolt : (lbs.) } \quad \text{ShrMntBlt} := \frac{\text{ShrTot}}{\text{NoShr}} \quad \text{ShrMntBlt} = 55.899$$

$$\text{Minimum Number of Mounting Bolts in Tension : } \quad \text{NoTen} := 5$$

$$\text{Minimum Distance Between Mounting Bolts : (in.) } \quad \text{LvrArm} := 9.25$$

$$\text{Tension Load per Mounting Bolt : (lbs.) } \quad \text{TenMntBlt} := \frac{(\text{ShrTot}) \cdot (5.0 + 2.375)}{\text{NoTen} \cdot \text{LvrArm}} \quad \text{TenMntBlt} = 106.96$$

$$\text{Unity Check : } \quad \text{UCMntBlt} := \frac{\text{ShrMntBlt}}{\text{AllwShr}} + \frac{\text{TenMntBlt}}{\text{AllwTen}} \quad \text{UCMntBlt} = 0.099 < 1.00 \quad \text{OK}$$

Mounting Bolts

Note : Use 3/8" diameter 18-8 Stainless Steel bolt, with spacers thru EIFS, as listed :

Expansion bolts in concrete or brick walls.

Toggle bolts in concrete block or panel walls.

TEK screws in metal studs.

Lag bolts in wood studs.

All thread bolts with blocking between studs.

Design of Mounting Angles for the 'amp' Letter Set :

$$\text{Angle Thickness : (in.) } \quad \text{AngleThk} := 0.1875 \quad \text{Angle Length : (in.) } \quad \text{AngleLngth} := 2.0$$

$$\text{Angle Specimen : (in.) } \quad \text{PLS} := (1.5 - 0.75) \quad \text{PLS} = 0.75$$

$$\text{Minimum Angle Thickness Required : (in.) } \quad \text{ReqdThk} := \sqrt{\frac{\text{ShrMntBlt} \cdot \text{PLS} \cdot 6}{(\text{AngleLngth} \cdot 23760)}} \quad \text{ReqdThk} = 0.073$$

$$\text{Unity Check - Angle Thickness : } \quad \text{UCAngThk} := \frac{\text{ReqdThk}}{\text{AngleThk}} \quad \text{UCAngThk} = 0.388 < 1.00 \quad \text{OK}$$

Design Loads for the 'ton' Letter Set :Dead Load :

Based on 4.5 lbs./sq.ft. : $\text{ShrDL} := (1.43 \cdot 4.34) \cdot 4.5$ $\text{ShrDL} = 27.928$ lbs.

Wind Load :

5" Deep Letters plus Mounting Angles : $\text{ShrWL} := \left[(3 \cdot 2.33) \cdot 1.42 \cdot \left(\frac{5.0 + 2.375}{12} \right) \right] \cdot \text{WL}$ $\text{ShrWL} = 459.957$ lbs.

Snow Load :

5" Deep Letters plus Mounting Angles : $\text{ShrSL} := \left[1.33 \cdot 4.34 \cdot \left(\frac{5.0 + 2.375}{12} \right) \right] \cdot \text{SL}$ $\text{ShrSL} = 0$ lbs.

Combined Shear :

Summation : (lbs.) $\text{ShrTot} := \sqrt{[(\text{ShrDL} + \text{ShrWL})^2 + (\text{ShrSL} + \text{ShrWL})^2]}$ $\text{ShrTot} = 670.517$

Design of Mounting Bolts for the 'ton' Letter Set :

Mounting Bolt Diameter : (in.) $\text{MntBlDia} := 0.375$

Stress Area : (in.²) $\text{MntBlArea} := \frac{\pi \cdot \text{MntBlDia}^2}{4}$ $\text{MntBlArea} = 0.11$
(Based on nominal diameter per AISC 4-3)

Allowable Tension : (lbs.) $\text{AllwTen} := 20000 \cdot \text{MntBlArea}$ $\text{AllwTen} = 2209$

Allowable Shear : (lbs.) $\text{AllwShr} := 10000 \cdot \text{MntBlArea}$ $\text{AllwShr} = 1104$

Number of Mounting Bolts in Shear : $\text{NoShr} := 11$

Shear Load per Mounting Bolt : (lbs.) $\text{ShrMntBl} := \frac{\text{ShrTot}}{\text{NoShr}}$ $\text{ShrMntBl} = 60.956$

Minimum Number of Mounting Bolts in Tension : $\text{NoTen} := 5$

Minimum Distance Between Mounting Bolts : (in.) $\text{LvrArm} := 9.25$

Tension Load per Mounting Bolt : (lbs.) $\text{TenMntBl} := \frac{(\text{ShrTot}) \cdot (5.0 + 2.375)}{\text{NoTen} \cdot \text{LvrArm}}$ $\text{TenMntBl} = 106.92$

Unity Check : $\text{UCMntBl} := \frac{\text{ShrMntBl}}{\text{AllwShr}} + \frac{\text{TenMntBl}}{\text{AllwTen}}$ $\text{UCMntBl} = 0.104 < 1.00$ OK
Mounting Bolts

Note : Use 3/8" diameter 18-8 Stainless Steel bolt, with spacers thru EIFS, as listed :

Expansion bolts in concrete or brick walls.

Toggle bolts in concrete block or panel walls.

TEK screws in metal studs.

Lag bolts in wood studs.

All thread bolts with blocking between studs.

Design of Mounting Angles for the 'ton' Letter Set :

$$\text{Angle Thickness : (in.) } \quad \text{AngleThk} := 0.1875 \quad \text{Angle Length : (in.) } \quad \text{AngleLngth} := 2.0$$

$$\text{Angle Specimen : (in.) } \quad \text{PLS} := (1.5 - 0.75) \quad \text{PLS} = 0.75$$

$$\text{Minimum Angle Thickness Required : (in.) } \quad \text{ReqdThk} := \sqrt{\frac{\text{ShrMntBlt} \cdot \text{PLS} \cdot 6}{(\text{AngleLngth} \cdot 23760)}} \quad \text{ReqdThk} = 0.076$$

$$\text{Unity Check - Angle Thickness : } \quad \text{UCAngThk} := \frac{\text{ReqdThk}}{\text{AngleThk}} \quad \text{UCAngThk} = 0.405 < 1.00 \quad \text{OK}$$

Design Loads for the 'nn' Letter Set :Dead Load :

$$\text{Based on 4.5 lbs./sq.ft. : } \quad \text{ShrDL} := (1.42 \cdot 3.63) \cdot 4.5 \quad \text{ShrDL} = 23.196 \quad \text{lbs.}$$

Wind Load :

$$5" \text{ Deep Letters plus Mounting Angles : } \quad \text{ShrWL} := \left[(2 \cdot 2.67) \cdot 1.42 \cdot \left(\frac{5.0 + 2.375}{12} \right) \right] \cdot \text{WL} \quad \text{ShrWL} = 351.384 \quad \text{lbs.}$$

Snow Load :

$$5" \text{ Deep Letters plus Mounting Angles : } \quad \text{ShrSL} := \left[3.63 \cdot \left[\frac{(5.0 + 2.375)}{12} \right] \right] \cdot \text{SL} \quad \text{ShrSL} = 0 \quad \text{lbs.}$$

Combined Shear :

$$\text{Summation : (lbs.) } \quad \text{ShrTot} := \sqrt{(\text{ShrDL} + \text{ShrWL})^2 + (\text{ShrSL} + \text{ShrWL})^2} \quad \text{ShrTot} = 513.596$$

Design of Mounting Bolts for the 'nn' Letter Set :

$$\text{Mounting Bolt Diameter : (in.) } \quad \text{MntBltdia} := 0.375$$

$$\text{Stress Area : (in.}^2\text{) } \quad \text{MntBltdia} := \frac{\pi \cdot \text{MntBltdia}^2}{4} \quad \text{MntBltdia} = 0.11$$

(Based on nominal diameter per AISC 4-3)

$$\text{Allowable Tension : (lbs.) } \quad \text{AllwTen} := 20000 \cdot \text{MntBltdia} \quad \text{AllwTen} = 2209$$

$$\text{Allowable Shear : (lbs.) } \quad \text{AllwShr} := 10000 \cdot \text{MntBltdia} \quad \text{AllwShr} = 1104$$

$$\text{Number of Mounting Bolts in Shear : } \quad \text{NoShr} := 9$$

$$\text{Shear Load per Mounting Bolt : (lbs.) } \quad \text{ShrMntBltdia} := \frac{\text{ShrTot}}{\text{NoShr}} \quad \text{ShrMntBltdia} = 57.066$$

$$\text{Minimum Number of Mounting Bolts in Tension : } \quad \text{NoTen} := 4$$

$$\text{Minimum Distance Between Mounting Bolts : (in.) } \quad \text{LvrArm} := 9.25$$

$$\text{Tension Load per Mounting Bolt : (lbs.) } \quad \text{TenMntBltdia} := \frac{(\text{ShrTot}) \cdot (5.0 + 2.375)}{\text{NoTen} \cdot \text{LvrArm}} \quad \text{TenMntBltdia} = 102.37$$

$$\text{Unity Check : } \quad \text{UCMntBltdia} := \frac{\text{ShrMntBltdia}}{\text{AllwShr}} + \frac{\text{TenMntBltdia}}{\text{AllwTen}} \quad \text{UCMntBltdia} = 0.098 < 1.00 \quad \text{OK}$$

Mounting Bolts

Note : Use 3/8" diameter 18-8 Stainless Steel bolt, with spacers thru EIFS, as listed :

Expansion bolts in concrete or brick walls.

Toggle bolts in concrete block or panel walls.

TEK screws in metal studs.

Lag bolts in wood studs.

All thread bolts with blocking between studs.

Design of Mounting Angles for the 'nn' Letter Set :

Angle Thickness : (in.) AngleThk := 0.1875 Angle Length : (in.) AngleLngth := 2.0

Angle Specimen : (in.) PLS := (1.5 - 0.75) PLS = 0.75

Minimum Angle Thickness Required : (in.) ReqdTkh := $\sqrt{\left[\frac{\text{ShrMntBlT} \cdot \text{PLS} \cdot 6}{(\text{AngleLngth} \cdot 23760)} \right]}$ ReqdTkh = 0.074

Unity Check - Angle Thickness : UCAnghThk := $\frac{\text{ReqdTkh}}{\text{AngleThk}}$ UCAnghThk = 0.392 < 1.00 OK

Design Loads for the 'uities' Letter Set :

Dead Load :

Based on 4.5 lbs./sq.ft. : ShrDL := (1.42·4.58)·4.5 ShrDL = 29.266 lbs.

Wind Load :

5" Deep Letters plus Mounting Angles : ShrWL := $\left[(5 \cdot 1.33) \cdot 1.42 \cdot \left(\frac{5.0 + 2.375}{12} \right) \right] \cdot \text{WL}$ ShrWL = 437.585 lbs.

Snow Load :

5" Deep Letters plus Mounting Angles : ShrSL := $\left[1.33 \cdot 4.58 \cdot \left(\frac{5.0 + 2.375}{12} \right) \right] \cdot \text{SL}$ ShrSL = 0 lbs.

Combined Shear :

Summation : (lbs.) ShrTot := $\sqrt{\left[(\text{ShrDL} + \text{ShrWL})^2 + (\text{ShrSL} + \text{ShrWL})^2 \right]}$ ShrTot = 639.867

Design of Mounting Bolts for the 'uities' Letter Set :

Mounting Bolt Diameter : (in.) MntBlTdia := 0.375

Stress Area : (in.²) MntBlTarea := $\frac{\pi \cdot \text{MntBlTdia}^2}{4}$ MntBlTarea = 0.11
(Based on nominal diameter per AISC 4-3)

Allowable Tension : (lbs.) AllwTen := 20000·MntBlTarea AllwTen = 2209

Allowable Shear : (lbs.) AllwShr := 10000·MntBlTarea AllwShr = 1104

Number of Mounting Bolts in Shear : NoShr := 12

Shear Load per Mounting Bolt : (lbs.) ShrMntBlT := $\frac{\text{ShrTot}}{\text{NoShr}}$ ShrMntBlT = 53.322

Minimum Number of Mounting Bolts in Tension : $NoTen := 7$

Minimum Distance Between Mounting Bolts : (in.) $LvrArm := 9.25$

Tension Load per Mounting Bolt : (lbs.) $TenMntBlT := \frac{(ShrTot) \cdot (5.0 + 2.375)}{NoTen \cdot LvrArm}$ $TenMntBlT = 72.88$

Unity Check : $UCMntBlT := \frac{ShrMntBlT}{AllwShr} + \frac{TenMntBlT}{AllwTen}$ $UCMntBlT = 0.081 < 1.00$ OK
Mounting Bolts

Note : Use 3/8" diameter 18-8 Stainless Steel bolt, with spacers thru EIFS, as listed :

Expansion bolts in concrete or brick walls.

Toggle bolts in concrete block or panel walls.

TEK screws in metal studs.

Lag bolts in wood studs.

All thread bolts with blocking between studs.

Design of Mounting Angles for the 'uites' Letter Set :

Angle Thickness : (in.) $AngleThk := 0.1875$ Angle Length : (in.) $AngleLngth := 2.0$

Angle Specimen : (in.) $PLS := (1.5 - 0.75)$ $PLS = 0.75$

Minimum Angle Thickness Required : (in.) $ReqdThk := \sqrt{\frac{ShrMntBlT \cdot PLS \cdot 6}{(AngleLngth \cdot 23760)}}$ $ReqdThk = 0.071$

Unity Check - Angle Thickness : $UCAngThk := \frac{ReqdThk}{AngleThk}$ $UCAngThk = 0.379 < 1.00$ OK