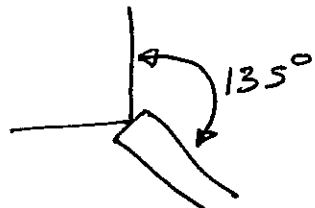
Truss to Corner Connection

Need to investigate

1) Wall to hanger Connection
2) hanger
3) hanger to truss Connection



$R = 839\#$

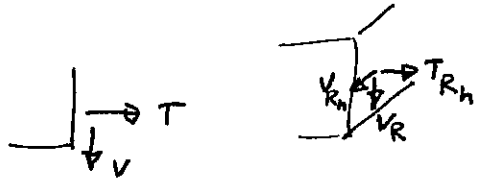
$R_h = 1197\#$

Assume

1) f'c = 2500 psi with no reinforcement near the anchors
2) Truss chord material = 20ga min
3) Start using #10 SDS screws
4) use Hilti HY150 MAX post installed adhesive
5) use 3/8" threaded rod

~~# #~~

1) Wall to hanger Connection



Find min loads:

$T = (0.707)(1197) = 846\#$

$V = \sqrt{839^2 + 846^2} = 1192\#$

allowable loads per Hilti Catalog

3/8" ϕ @ $h_e = 3\,3/8$ $T_{all} = 880\#/Bolt = 1760\#/pair$

$V_{all} = 1135 = 2270$

$$\frac{T}{T_{all}} = \frac{846}{1760} = 0.480$$

$$\frac{V}{V_{all}} = \frac{1192}{2270} = 0.525$$

$1.005 > 1.0$ No GOOD

Increase Rod diameter to ½" ϕ

$T_{all} = 1055\#/Bolt \Rightarrow 2110\#/pair$

$V_{all} = 1745 \Rightarrow 3490$

$$\frac{T}{T_{all}} = \frac{846}{2110} = 0.401$$

$$\frac{V}{V_{all}} = \frac{1192}{3490} = 0.342$$

$0.743 < 1.0$ GOOD!

REGISTERED PROFESSIONAL ENGINEER
RUSSELL T. TANGREN
No. C 72160
EXP: 6/30/2014
CIVIL
STATE OF CALIFORNIA

10/01/2013

Truss to Corner Connection

2) hanger

$T = 1197$
$V = 839$

use 16ga Grade 33 clip

$T_{all} = 1986\ ^{\#}/plate$
$V_{all} = 3184\ ^{\#}/plate$

$\frac{T}{T_{all}} = \frac{1197}{(2)1986} = 0.301$
$\frac{V}{V_{all}} = \frac{839}{(2)3184} = 0.200$
} $0.501 < 1.0$ GOOD!

Pullout vs Pull over @ hanger to wall connection

$\frac{1}{2}$" ϕ threaded rod $\Rightarrow$ $1\frac{1}{4}$" outside diameter washer

Pull over Tension = 846 # applied over the first half of the washer edge

$P_{a\,ou} = \frac{1592}{2} = 796\ ^{\#}/clip = 1592\ ^{\#}/connection > 846^{\#}$ ∴ good!

3) hanger to truss connection

use #10 SDS screws

$P_{as} = 266\ ^{\#}/screw$

$R = \sqrt{839^2 + 1197^2} = 1462$

$\frac{1462}{255} \Rightarrow (6)$ #10 SDS $\Rightarrow (3)$ per side

$(6)(255) = 1530\ ^{\#}/connection$

REGISTERED PROFESSIONAL ENGINEER
RUSSELL T. TANGREN
No. C 72160
EXP: 6/30/2014
CIVIL
STATE OF CALIFORNIA

10/01/2013

Truss to Corner Connection

Find Max Capacity

1) $T_{max} = 2110$ #
   $V_{max} = 3490$

2) $T_{max} = 1986$
   $V_{max} = 3184$

3) $T_{max} = 1530$
   $V_{max} = 1530$

Min capacities

$V_{max} = 1530$

$T_{max} = 1530$

REGISTERED PROFESSIONAL ENGINEER
RUSSELL T. TANGREN
No. C 72160
EXP: 6/30/2014
CIVIL
STATE OF CALIFORNIA

10/01/2013

truss to concrete wall connection at a corner

Threaded Rod capacity calculation

Applied tension	846	lbs
Applied Shear	1192	lbs
min embedment	3.375	in
edge distance:	4	in
Rod diameter:	0.50	in
F'c :	2500	psi

Anchor Capacitys:		
Tension	3479	lbs
Shear	1386	lbs
CSI =	1.103	This will work.

Tension

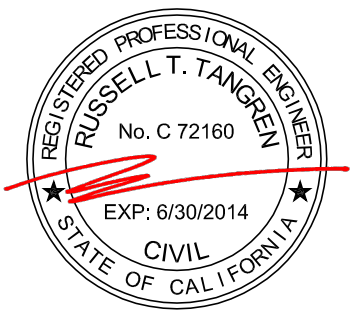
Nua =	1353.6
Vua =	1907.2
Nsa =	14190
ϕ =	0.65
n =	1
ϕNsa =	9224
ϕNcb =	3478.998
Anc =	91.75781
Anco =	102.5156
Ψed,n =	0.803704
Ψc,n =	1
Ψcp,n =	1
Nb =	7440.325
Kc =	24
ϕ =	0.65
Ca,min =	1.75
Na =	7570.126
Nao =	10523.35
τk,cr =	1985
Scr,na =	10.125
τk,uncr =	1985
Ccr,na =	5.0625
Anao =	102.5156
Ana =	91.75781
Ψed,na =	0.803704
Ψp,na =	1
ϕ =	0.65
ϕNa =	4920.582

Steel Capacity	9224
Concrete Capacity	3479
Adhesive Capacity	4921

Shear

Vsa	5815
ϕ =	0.6
ϕVsa =	3489
Vcb =	1979.899
Vb =	1979.899
ϕ =	0.7
Avc =	72
Avco =	72
Ψed,v =	1
Ψc,v =	1
le =	4
ϕVcb =	1386
Kcp =	2
Na =	7570.126
Ncb =	5352.305
Vcp =	15140.25
ϕ =	0.7
ϕVcp =	10598

Steel Capacity	3489
Concrete Break out	1386
Concrete pryout	10598



10/16/2013

Truss to corner connection

Shear

2007 AISI

h	3	in	Allowable Shear:	2101	lbs./plate
plate gauge	16ga				
t	0.0566	in	Applied Shear:	839	lbs/connection
h/t =	53.00353		V/Va =	0.3993	
Fv =	19800				
Aw	0.1698				
Vn =	3362.04	lbs			0.1875
Ω =	1.6		E =	29500000 psi	155.8933
Va =	2101	lbs	Kv =	5.34	
			Fy =	33000 psi	
			sqrt(Ekv/Fy)	69.09151	

10/01/2013

Truss to corner connection

Allowable Tension per 2007 NaSpec

Plate Gauge	16ga
thickness	0.0566
width	3
Fy	33000
Fu	45000
Hole Diameter	0.19
Number of holes	5
Hole Spacing	0.5625

Allowable Tension: 1986 lbs

Applied Tension: 1197 lbs./connec

T/Ta = 0.301

Ag =	0.1698	in^2
Tn =	5603.4	lbs
Ta =	3355.329	lbs

An =	0.11603	in^2
Tn =	5221.35	psi
Ta =	2610.675	

An =	0.11603
Ft =	50100
Tn	5813.103
Ω =	2.22
Ta	2618.515

Ft =	38000
Ta =	4409.14
Ω =	2.22
Ta =	1986.099

10/01/2013

Truss to Corner Connection

Screw Capacity, Based on 2007 North American Cold-formed steel Specification.

Gauge of plate next to screw head	16ga	
Gauge of plate not next to screw head	20ga	
Thickness of plate next to screw head	0.0566	(t1)
Thickness of plate not next to screw head	0.0346	(t2)
Ultimate tensile Strength for t1 (Fu)	45000	psi
Ultimate tensile Strength for t2 (Fu)	65000	psi

Fastener	#10		
Diameter of fastener	0.19	Ω =	3
washer Diameter	0.3125		
		Pas =	255
t2/t1 =	0.611307	Paot =	121
		Paov =	398
Pns =	765.8674		
Pns =	1306.611	need	
Pns =	1153.737	T =	0
min =	765.8674	V =	1462
Pns =	1306.611	Min. No. of screws =	6
Pns =	1153.737		
min =	1153.737	T/Paov =	0
		V/Pas =	0.95447
pull out		csi =	0.95447
Pnot =	363		
Ω =	3		
Paot =	121		
Pull Over			
Pnov =	1194		
Ω =	3		
Paov =	398		

10/01/2013

Truss to corner connection

Screw Capacity, Based on 2007 North American Cold-formed steel Specification.

Gauge of plate next to screw head	16ga	
Gauge of plate not next to screw head	custom	
Thickness of plate next to screw head	0.0566	(t1)
Thickness of plate not next to screw head	8	(t2)
Ultimate tensile Strength for t1 (Fu)	45000	psi
Ultimate tensile Strength for t2 (Fu)	80000	psi

Fastener	Custom
Diameter of fastener	0.5
washer Diameter	1.25
t2/t1 =	141.3428
Pns =	5376000
Pns =	3438.45
Pns =	864000
min =	3438.45
Pns =	3438.45
Pns =	864000
min =	3438.45

pull out N/A

Pnot =	~~272000~~
Ω =	3
Paot =	~~90667~~

Pull Over

Pnov =	4776
Ω =	3
Paov =	1592

Ω =	3
Pas =	1146
Paot =	~~90667~~ N/A
Paov =	1592
need	
T =	423
V =	596
T/Paov =	0.13286
V/Pas =	0.26
csi =	0.39286

10/01/2013