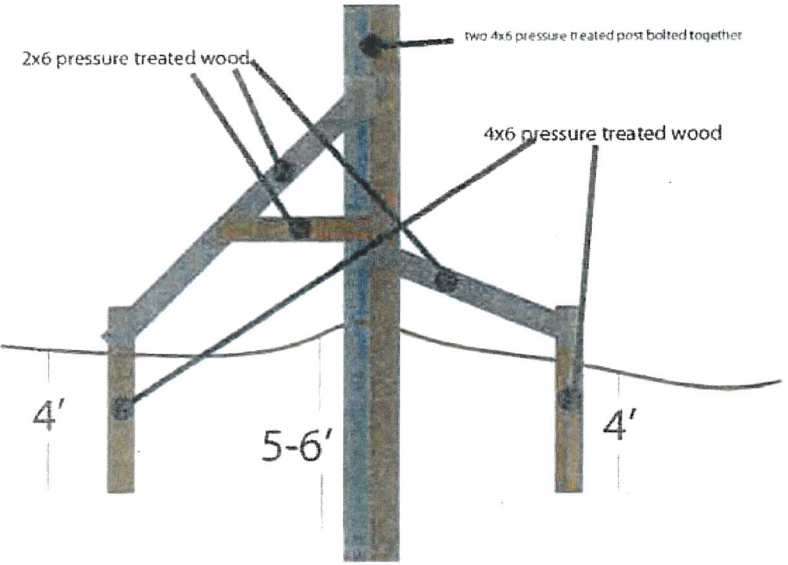
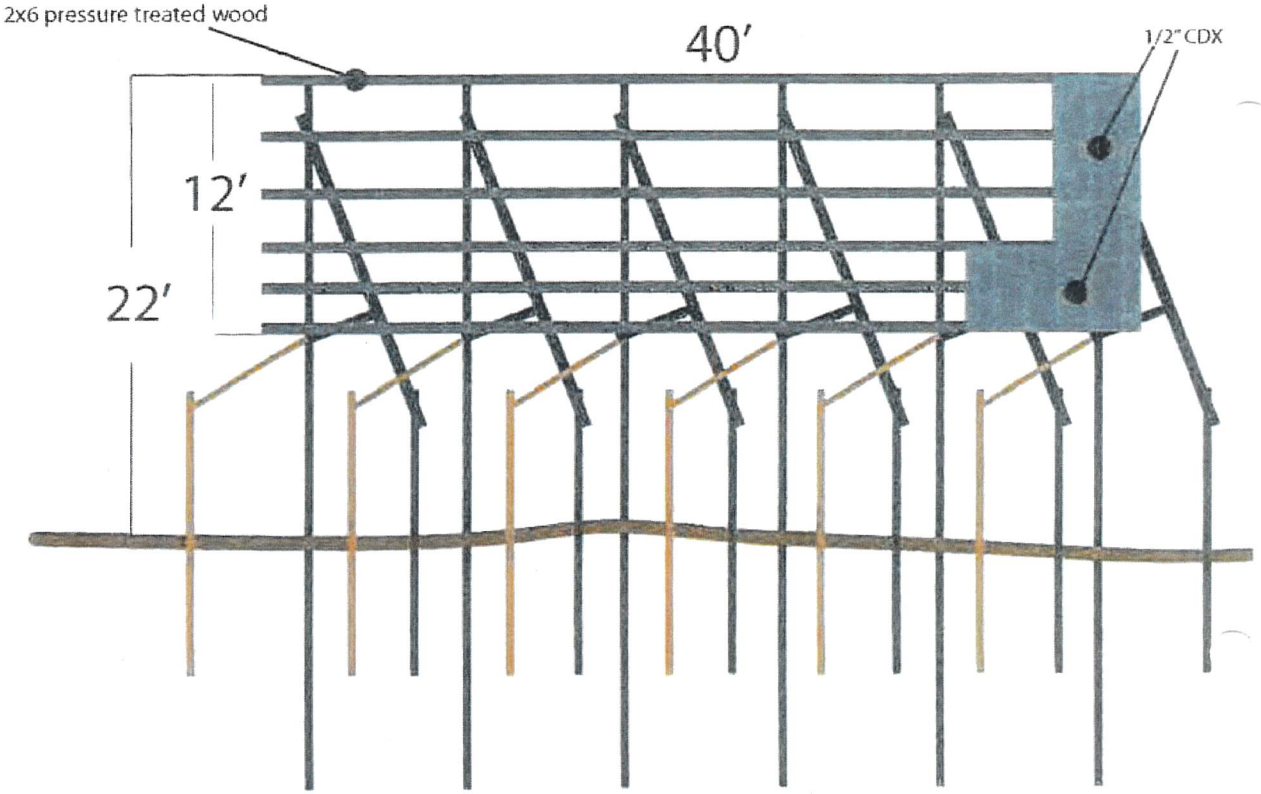
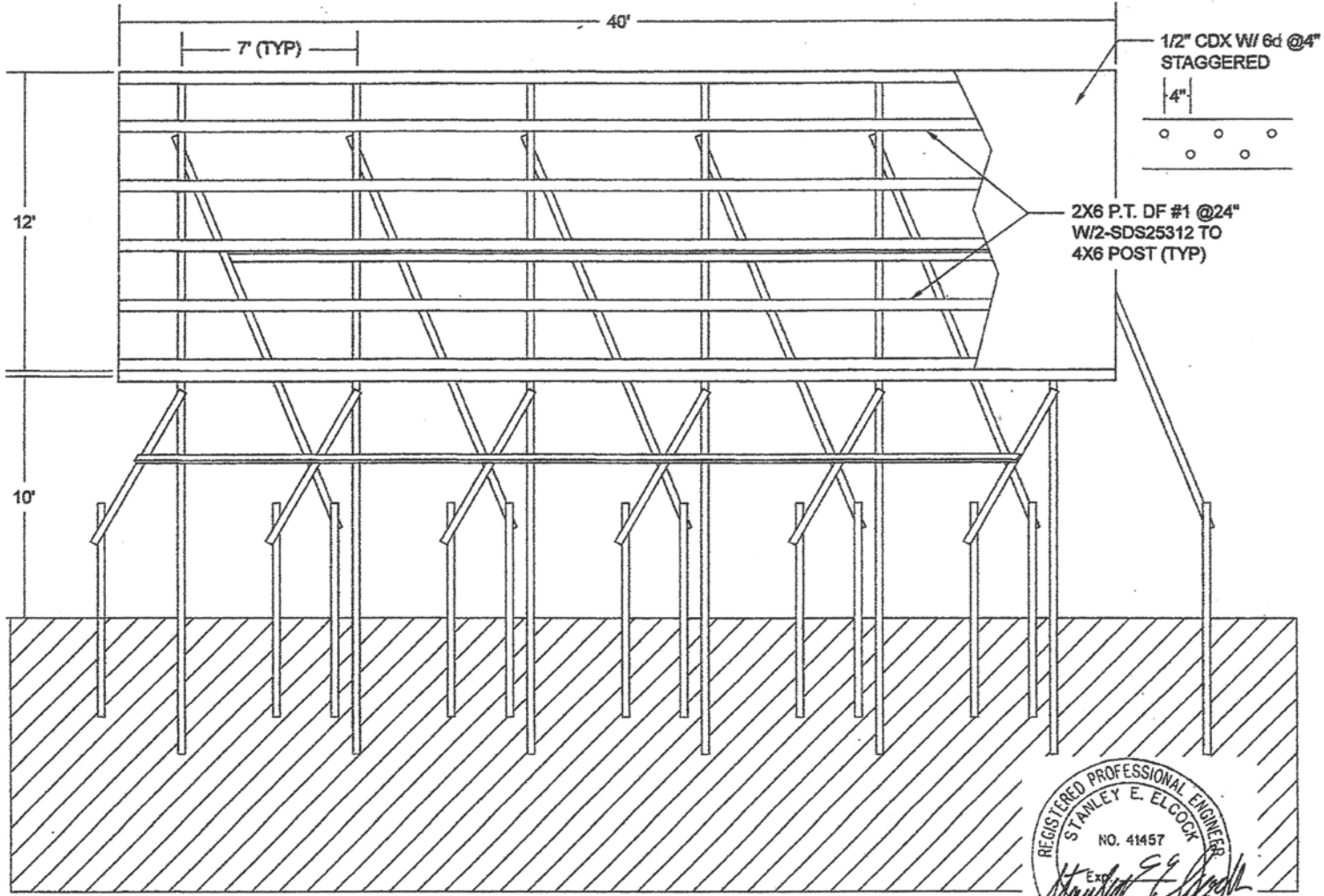
Side view



front view





NOTE: ALL FASTENERS ARE GALVINIZED OR STAINLESS STEEL
ALL TIMBER P.T. DF #1

FRONT VIEW

1/8" = 1'-0"

12/05/19

REGISTERED PROFESSIONAL ENGINEER
STANLEY E. ELCOCK
NO. 41457
Exp.
CIVIL
STATE OF CALIFORNIA

SEE ENGINEERING
C41457
791 8th -ST - Suite P
ARCATA, CA 95521
T: 707-498-6315

ALL POINTS
SIGN REPAIR
HIGHWAY 101
BETWEEN EUREKA & ARCATA

PLOT DATE:	12/5/19
DRAWN:	CEE
CHECKED BY:	SEE
CHECKED DATE:	
SCALE:	1/4" = 1'-0"
REVISION DATE:	
REVISION DATE:	

SHEET: 2 OF 2


Money for
Agriculture
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OUTFRONT


UNSAFE

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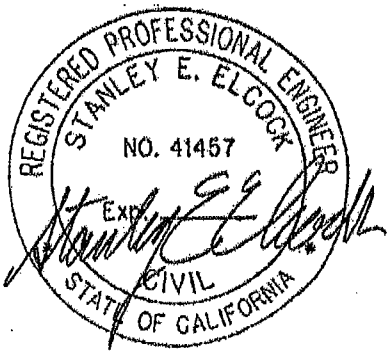
PLANS * CONSTRUCTION * SPECIAL PROJECTS * SHORING * TEMPORARY SYSTEMS
Stanley Elcock, P.E. C41457

Client: Allpoints Signs, Owner

Project: Sign Repair

Location:

Highway 101 Between Eureka and Arcata
Eureka, CA.



CALCULATIONS

Framing

References

2016 California Building Code

Western Woods Use Book

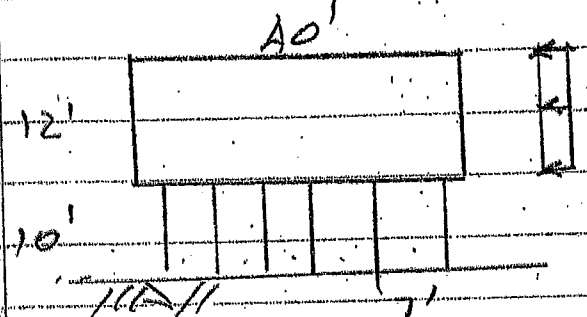
December 5, 2019

ALL POINTS
BILL BOARD
REPAIR
12-3-19 1/

WIND

$0.00256(85)^2(0.85)(1)(1.35) = 21.2$ PSF

USE 25 PSF



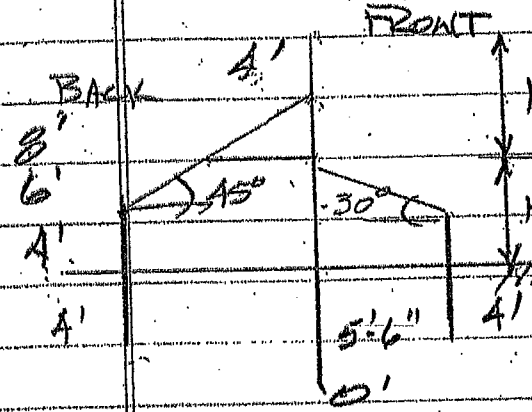
25 PSF x 12 x 40 = 12000# Total

25 PSF x 12 x 7' = 2100# / Post

ΣM: 12000 x (10+6) = 192000 Ft-lb ATM

192000 / 6 Posts = 32000 Ft-lb / Post ATM

AVG



ΣM_0: 2100 x 16' = 18 F_{B1} + 9 F_{F1}

$F_{B1} = F_{F1} = 1244$#

5/8" bolts = 870 x 1.33 x 2

= 2314 > 1244

FOR 2x6: 1244 / 8.25 = 151 psi

480,000 / (L^2 / 1.5²) = 151 L_{max} = 7'

FOR 2x8: 1244 / 10.88 = 114 psi

480000 / L^2 / 1.5² = 114 L_{max} = 8'

14 √2 = 20'

2 - 5/8" bolt to 4x6

⟹ USE 2x6 P.T. DF No.1 diagonal back BRACE w/ 2 - 2x6 @ 7' max w/ 2 - SDS x 3½" Flat 2x6 to 2x8 diagonal Brace

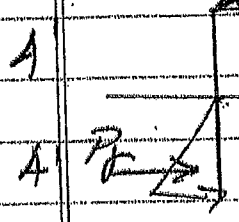
ALL POINTS
BILLBOARD
REPAIR
12-3-19 2/

HORIZONTAL STRUT TO BACKBRACE

$480000/(96^2/1.5^2) = 117$ psi

$117 \times 6.25^{in} \leq 965\#$ capacity 2x6

1244#



$MP = 90pcf \times \frac{1}{2}(4)^2 \frac{1}{3}(4) \tan^2 60$

$= 2880$ ft-lb

$OTM = \frac{1244}{\sqrt{2}} \times 8 = 7037$ ft-lb

$MP = 45D^3 = 7037$

$D = 5.4' \times 1.4$

$= 7.5'$ min depth

SIGN WEIGHT:

1/2" CDX $= 1.5 \times 7 \times 12 = 126\#$ / POST

dbl 4x6 $= 35pcf \times \frac{38.5^{in}}{144} \times 30' = 281\#$ / POST

BRACES

2x6: $35 \times (6.25/144)(20') = 40\#$ / POST

2x6 @ 24 HORIZ. $= (40\#/20)7' \times 6 = 84\#$ / POST

531#

Add LL $= 300\#$ POINT LOAD $300\#/1.33 = 225$

757# Total / Post

$19.25^{in} \times 2$ POSTS $= 38.5^{in} = 0.27^{ft}$

$757\#/0.27^{ft} = 2800$ PSF > BAY MUD

Side Friction $= 120PSF \times 7.5' \times (3.5 \times 2 + 11 \times 2)/12'$

$= 1812\# + 300 \times 0.27 = 1947\# > 757\#$

ALL POINTS
BILLBOARD
REPAIR 12-3-19 3/

FRONT BRACES

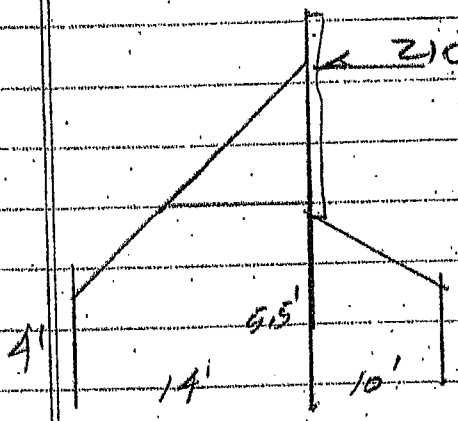
1244 x 1.1547 = 1437# ↘

1437 / 10.88 = 132 psi

480000 / L² / 2.25 = 132 L_{max} = 7'1"

⟹ Add 2x6 flat @ midspan

RE-CHECK POST EMBEDMENT



ΣM₀: M_R = 2880 ft-lb

4x6 dbl Post

$2 \cdot 90 \left(\frac{1}{3}\right)(D)^2 \frac{1}{3}(D) tan^2 20$

$= 45 D^3$

$7037 - 2880 = 45 D^3$

$D = 4.5' \times 1.4$

$D_{4x6} = 6.5'$

UPLIFT / OT:

2100 x 22.5 = 14 R_1 + 10 R_2 ↓

47250 = 14 R_1 + 10 (100 PSF x 4 x 24.2)

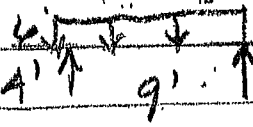
+ 10 (500 PSF x 38.5" / 144)

R_1 = 2538# ↑ (NG)

Add deadman:

M_R = 7037 / 2880 = 2.5' min dia

Check dbl 4x6 bolted:



W = 175 PLF 175 (9)² / 8 x 12 / 7.5 = 28 in³

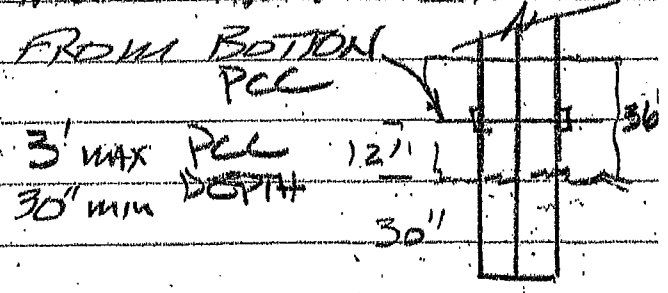
dbl 4x6 (OK)

ALL POINTS
BILLBOARDS
12-5-19 4/

3' dia x4 = 150 π(3)²/4 x4
= 4241# / π(9)/4 = 600 PSF

FOR 500 PSF:
3.5' dia 531# / π(3.5)²/4 = 55.2 PSF
500 - 55.2 = 444.8 PSF DL PCC
UNREINF PCC = 145 PCF
444.8 / 145 = 3.1' DEEP (OK)
145 x 3' x π(3.5)²/4 = 4185# DEAD WGT

⇒ USE 4pl 4x6 MAIN POST Bolted
w/ 5/8" MB GALVANIZED @ 4' c/L
Add 5/8" A/I Thread Coupler each x 24" LONG
in POST 12" FROM BOTTOM



2x6 Flat cantilever:
(25PSF x 2)(2.5)²/2 x 12/850 x 1.25 = 1.76 in³ (OK)
Δ = 50(2.5)⁴ 1728 / 8(1.6x10⁶)(1.55) = 0.17" = L/176 < L/120
⇒ 2x6 Flat @ 24 cantilever is Adequate

CDX Nailing:
Ld = 26#/in x 1.5" = 39# 50PSF x 2' x 7' = 700#
700/39 = 18 nails over 7' = Ld @ 4" oc

2x6 Flat @ 24 Fasteners:
50PSF x 2 x 7 = 700# / 385#/SDS = 2 min. SDS25312 (SS)

Reconstruction Plan

Construction and reconstruction of billboards is performed by a 3-5 man crew and is expected to take 2-4 days. No construction equipment is needed. We use shovels and post hole diggers for the post, battery powered hand tools, ladders, and clamps, bolts and screws. No temporary structures or materials are required to reconstruct, IE we do not need to build scaffolding or set temporary brace post of any kind.

Below is a general workflow for how this location will be repaired.

1. Crews will began demoing all non reusable elements of the structure. This consist of using sawzalls to cut wood into sizes we are able to carry. Once small enough to carry all non-usable elements are stacked in a pile on the shoulder of the highway behind the guardrail.
2. Once all non-usable parts are removed we will began repairing the structure. This billboard actually broke about 8' up the post so in this case it looks like 6-9 of the vertical uprights will be able to be reused. For the remaining 3-6 uprights we will remove old post & concrete and dig new holes in their location. If old post cannot be removed we will dig a new hole next to old post.
3. Once all post holes are dug we set new upright in holes and hand mix bags of concrete into the hole one bag at a time.
4. Once all post are set you connect main post to back brace post.
5. Run new horizontal stringers connecting all main post.
6. Mount front and rear catwalks.
7. Sheet face with plywood
8. Install new billboard wrap.

Best Management Plan

As already outlined above, the repair and maintenance of a billboard structure has a very minimal impact as it is just a few people working with hand tools.

Since no construction equipment is used we do not have any provisions for spills as there is nothing to spill.

All new materials are stacked on the shoulder of the highway behind the guardrail until they are needed.

Construction debris only consist of empty bags of concrete and off cuts of wood, once created all bags are put into a trash bag and all off cuts are stacked on the shoulder of the highway until they are loaded up.

Soil from post holes are minimal and left on site.