For CLEVELAND	Job no. 49633	Sheet no.
Made by SJL	Checked by DJG	Backchecked by SJL
Date 9-28-11	Date 10/3/11	Date 10-3-11

HNTB

INSPECTION WALKWAY

→ CONNECTION OF W8x18 TO GIRDER WEB TO ALLOW FOR DIFFERENTIAL MOVEMENT BETWEEN GIRDERS AND STRINGERS

→ From Stringer to Floorbeam slotted Hole calculation, max differential movement between Girders + Stringer is 2.00" (one direction) (spreadsheet located at N:\49633\Bridges\Design\Final Design\Unit 2\3D Analysis\Revised Model\Detail Faster\Slotted Hole Calculation - checked.xlsx)

→ Say movement is 2.0" (one-direction)

→ Contractor wants to erect W8x18 between Stringer + Girder before placing slab. Inspection Walkway Grip strut, posts + rails will be erected after deck is poured.

∴ During deck placement, connection between W8x18 + Girder Web only needs to support dead load of W8x18 + threaded rod + HSS Tube for G.S. support

→ Check if connection is adequate if an angle bracket with slotted hole is used to support W8x18 during deck placement.

→ Note: Connection of W8x18 to Stringer will be hard-bolted before deck placement

Dead Load:

$(18\ plf)(15') + (8')(2)(0.67_{plf}) + (22.39_{plf})(4.5')$

W8x18 | hanger rod | HSS

↓ faster ↓ add 10% for connections

$= (378\ lb)(1.25)(1.1) = 520\ lb.$

→ Say 600 lb.

Reaction to Girder = 300 lb. = 0.3 k

Capacity of 7/8" bolt in shear:
(AASHTO 6.13.2.7)

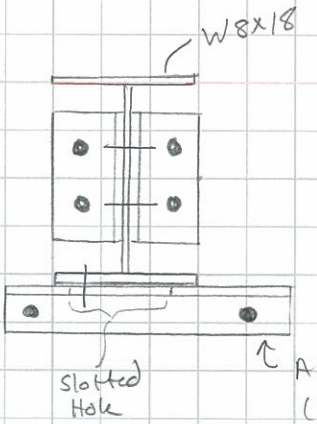
$\phi R_n = \phi\, 0.38\, A_b\, F_u N$ $\quad \phi = 0.80$

$\phi R_n = (0.80)(0.38)(0.60\ in^2)(120\ ksi)(1)$

$\phi R_n = 21.9\ k$

$\phi R_n = 21.9\ k >> 0.3\ k$ = Reaction

→ Use 2 bolts to support angle bracket with slotted hole.



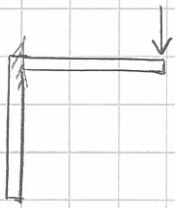
ME101-1204

For CLEVELAND	Job no. 49633	Sheet no.
Made by SJL	Checked by DJG	Backchecked by SJL
Date 9-29-11	Date 10/3/11	Date 10-3-11

HNTB

→ Check required thickness of Angle Bracket if Angle is a L3½ × 3½

→ Treat top leg as a cantilever



Assume supporting width is under W8×18 flange
$b_f = 5.25"$

$M_u = PL = (0.3k)(3\frac{1}{2}")$

$M_u = 1.05\ k\cdot in.$

$\sigma = 50ksi = \frac{M}{S} = \frac{(1.05\ k\cdot in)}{\frac{(5.25")(t)^2}{6}}$

$\Rightarrow t = 0.155"$

→ Use a L 3½ × 3½ × ⅜ × 1'-0" for Angle Bracket

For CLEVELAND	Job no. 49633	Sheet no.
Made by SJL	Checked by DJG	Backchecked by SJL
Date 9-30-11	Date 10/3/11	Date 10-3-11

HNTB

INSPECTION WALKWAY

→ Check capacity of connection from Inspection Walkway support beam, W8x18, to Girder web.

→ Previous support beam was a C8x13.7. New support beam is a W8x18. Difference in weight is 5 plf.

→ Additional weight on system:

$(5\ plf)(15')(1.25^{\text{footer}}) = 94\ lb.$

→ Say 100 lb.

→ Additional Reaction on connection:

$\frac{100\ lb}{2} = 50\ lb = 0.05k$

→ Additional force is negligible.

→ Original connection was conservatively designed as fixed, but could have been designed as pinned. (see 3-15-11 calcs)

Reaction to bolts: 1126.3 lb + 50 lb. ↓ from 8-2-11 calcs.

Say Rxn = 1200 lb. = 1.2 k

Capacity of 7/8" Ø bolt: $\phi R_n = 21.9\ k$

→ OK by inspection

For CLEVELAND	Job no. 49633	Sheet no.
Made by SJL	Checked by DJG	Backchecked by SJL
Date 9-30-11	Date 10/3/11	Date 10-3-11

HNTB

INSPECTION WALKWAY

→ Check connection between W8x18 support beam and Girder Web using L4x4x5/16

→ Conservatively say all load goes to connection

⇒ $R_A + R_B + 100\,lb = 6303\,lb$ (8-2-11 calcs)

→ Check Bearing Resistance at Bolt Holes: (AASHTO 6.13.2.9)

$\phi R_n = \phi 1.2\, L_c\, t\, F_u \quad \phi = 0.8$

$\phi R_n = (0.80)(1.2)(1\frac{1}{16}")(\frac{5}{16}")(120ksi)$

$\phi R_n = 24.75k > 6.3k \Rightarrow OK$

→ Check Block Shear: (AASHTO 6.13.4)

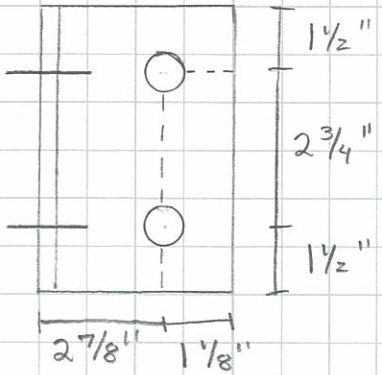
$\phi R_n = \phi R_p(0.58 F_u A_{vn} + U_{bs} F_u A_{tn}) \le \phi R_p(0.58 F_y A_{gv} + U_{bs} F_u A_{tn})$

Assume $R_p = 0.9$ (punched, consv.)

$F_u = 65ksi$

$F_y = 50ksi$

Assume pinned connection, $U_{bs} = 1.0$



$A_{vn} = 2.75" + 1.5" - (1.5)(15/16") = (2.84")(5/16")$

$A_{tn} = 1\frac{1}{8}" - (0.5)(15/16") = (0.66")(5/16")$

$A_{gv} = 1.5" + 2.75" = (4.25")(5/16")$

$\phi R_n = (0.8)(0.9)[(0.58)(65ksi)(2.84")(5/16") + (1)(65ksi)(0.66")(5/16")]$
$\le (0.8)(0.9)[(0.58)(50ksi)(4.25")(5/16") + (1.0)(65ksi)(0.66")(5/16")]$

$\phi R_n = 33.7k \le 37.4k$

$\phi R_n = 33.7k > 6.3k \Rightarrow OK$

→ Check Shear (AASHTO 6.13.5.3)

Shear Yielding:

$\phi R_n = \phi_v 0.58 F_y A_{vg}$

$\phi R_n = (1)(0.58)(50ksi)(5/16")(5.75")$

$\phi R_n = 52.1k > 6.3k \Rightarrow OK$

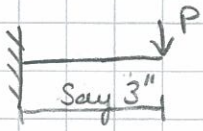
Shear Rupture

$\phi R_n = \phi_{vu} 0.58 R_p F_u A_{vn}$

$\phi R_n = (0.80)(0.58)(0.90)(65ksi)(5/16")(3.875")$

$\phi R_n = 32.9k$

→ Check leg of angle in bending



$m = PL = (6.3k)(3") \quad m = 18.9\,k\cdot in.$

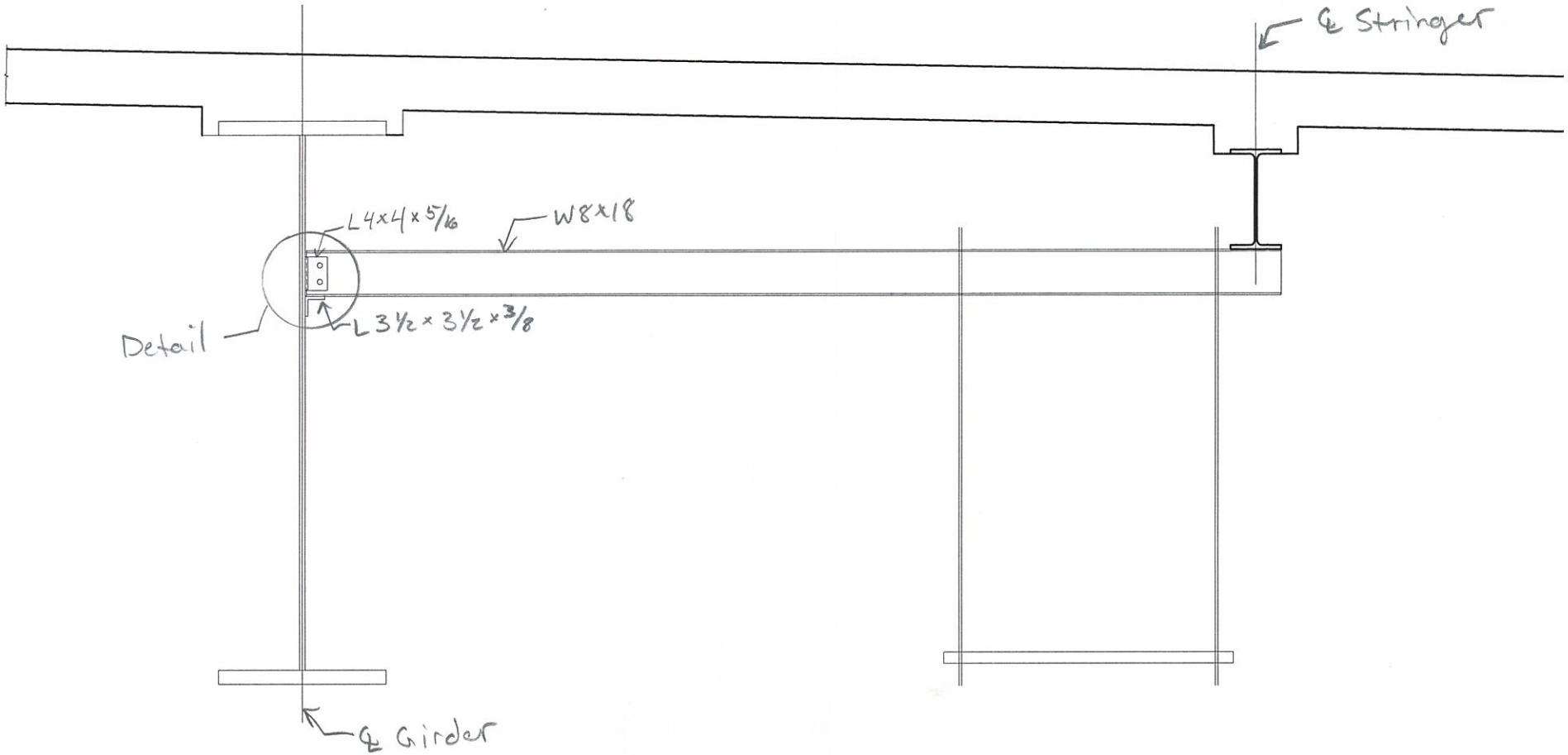
$\sigma = \frac{m}{S} \Rightarrow \quad \sigma = \frac{(18.9\,k\cdot in)}{(5/16")(5.75")^2/6}$

$\sigma = 11\,ksi \ll 50ksi \Rightarrow OK$

49633

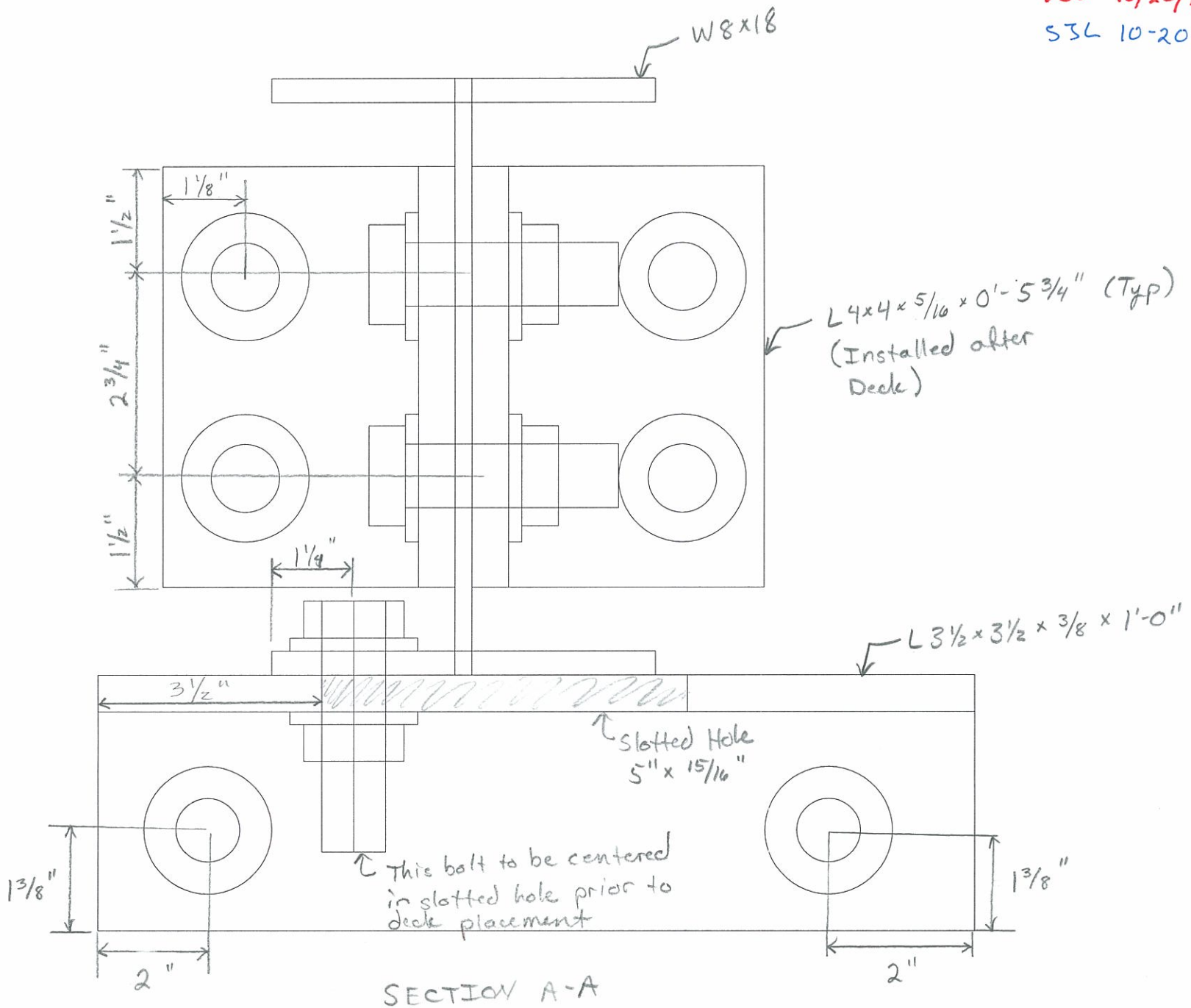
DJG 10/3/11
SJL 10-3-11

Inspection Walkway connection



776 55

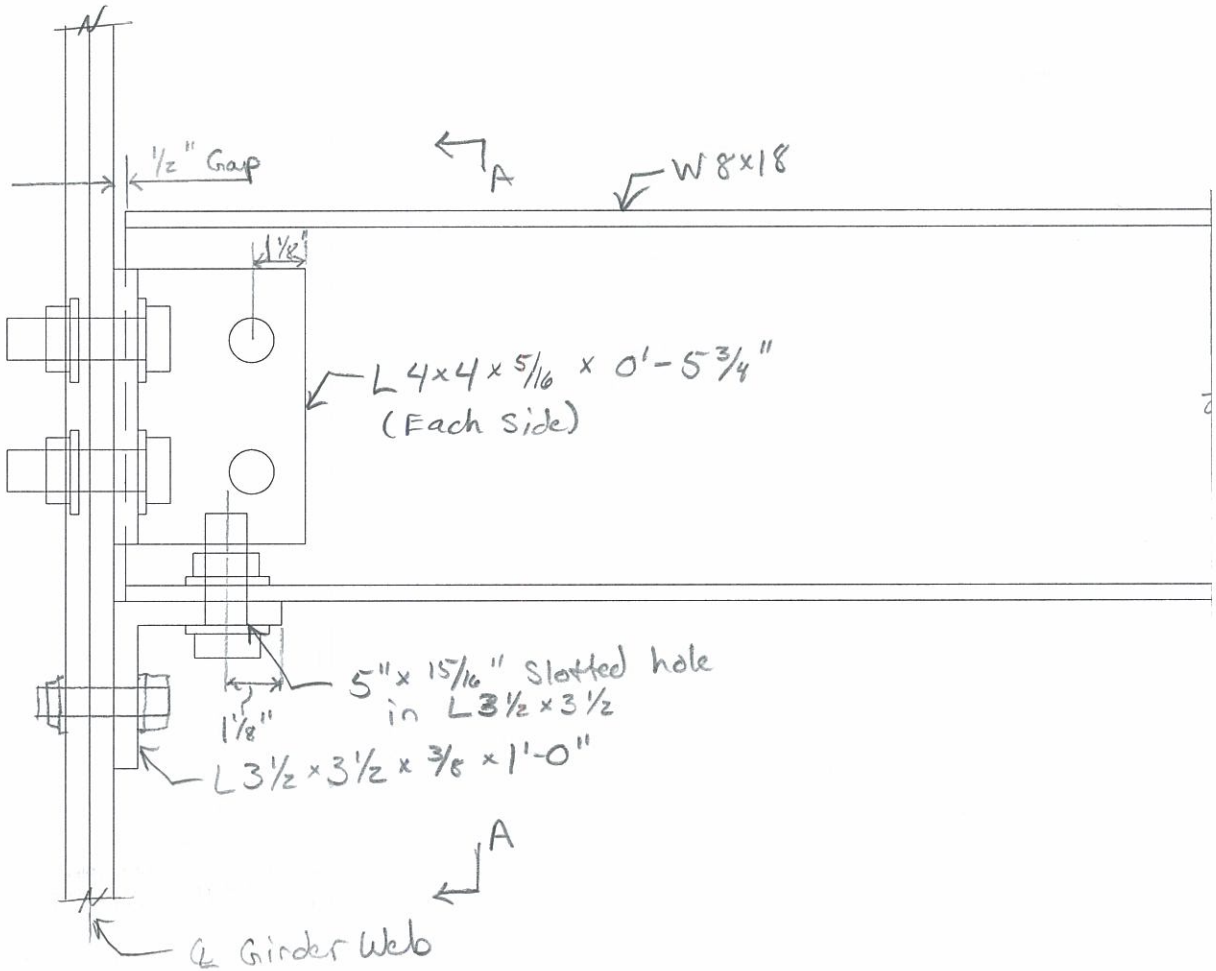
SJL 9-30-11
DJG 10/20/11
SJL 10-20-11



SECTION A-A

496 00

SJL 9-30-11
DJG 10/3/11
SJL 10-3-11



Detail

Notes:
- All bolts are 7/8"Ø, A325, high-strength bolts
- All holes are 15/16"Ø holes, UNO.