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October 07, 2025

## **REPORT:**

26 Heron Street,  
West Roxbury, MA  
Beam to Beam Shear Connections  
Job: 250164; Drawings: Structural Drawings-S-001 thru S610  
(GSE Job No.25729)

## **Prepared for:**

D. Cronin's Welding Service, Inc.,  
70 State Street,  
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## **Scope of Project**

Design of Beam to Beam Shear Connections at 26 Heron Street, West Roxbury, MA

**26 HERON ST,  
WEST ROXBURY, MA  
STRUCTURAL PLANS**



Job 25729

October 17, 2025

## **Design Criteria**

Refer to Structural Notes on structural drawings dated 12/12/2024  
For Connection design, ASCE 7-10, AISC 360-10 edition, IBC 2018 as amended by the Massachusetts State Building Code 9<sup>th</sup> edition, and the AISC 15th Edition Manual have been used.

*All Steel Connections have been designed for the LRFD Loads given on Sheet S004*

## **Materials**

Structural steel shall be designed per the 'Specification for structural steel buildings' & American Welding Society (AWS D1.1) "Structural Welding Code - Steel" (E70XX Grade). AISC 15<sup>th</sup> edition. All Bars, Steel plates, Channels, MC Sections, and angles of grade ASTM A36 Grade 36 shall be used. All W sections ASTM A572 or 992-50 ksi shall be used. All HSS sections of grade ASTM A 500 – Grade B shall be used. The high-strength bolts of A325N or A490N shall be used for Shear & Moment Connections.

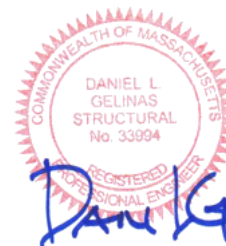
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- 2) **Shear Connection** – W18x35 Thru W18x86 Beam connecting to W18x\_ Steel beam using 3/8" Thick Extended Shear Plate with (5) - 3/4"  $\phi$  A325N Bolts & 1/4" thick weld - For 43 kip Shear
- 3) **Shear Connection** – W18x65 Thru W18x158 Beam connecting to W18x143 & W24x192 Steel beam using 3/8" Thick Extended Shear Plate with (5) - 3/4"  $\phi$  A325N Bolts & 1/4" thick weld - For 90 kip Shear - **NO GOOD**
- 3.1) **Shear Connection** – W18x\_ Beam connecting to W18x143 & W24x192 Steel beam using 1/2" Thick Extended Shear Plate with (5) - 1"  $\phi$  A490N Bolts & 5/16" thick weld - For 90 kip Shear - **REVISED**
- 4A) **Shear Connection** – W24x192 Beam connecting to W18x76 Steel beam using 3/8" Thick Extended Shear Plate with (7) - 3/4"  $\phi$  A325N Bolts & 1/4" thick weld - For 235 kip Shear - **NO GOOD**
- 4A.1) **Shear Connection** – W24x192 Beam connecting to W18x76 Steel beam using 3/4" Thick Extended Shear Plate with 2 rows of (7) - 1"  $\phi$  A490N Bolts & 1/2" thick weld - For 235 kip Shear - **REVISED**
- 4B) **Shear Connection** – W24x192 Beam connecting to W24x176 Steel beam using 3/8" Thick Extended Shear Plate with (7) - 3/4"  $\phi$  A325N Bolts & 1/4" thick weld - For 250 kip Shear - **NO GOOD**
- 4B.1) **Shear Connection** – W24x192 Beam connecting to W24x176 Steel beam using 3/4" Thick Extended Shear Plate with 2 rows of (7) - 1"  $\phi$  A490N Bolts & 1/2" thick weld - For 250 kip Shear - **REVISED**



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## B) BEAM TO BEAM - SHEAR CONNECTIONS SUMMARY

### NOTES:

- 1) DL IN THE RAM CONNECT OUTPUT DENOTES "DESIGN LOADS".
- 2) ALL STRUCTURAL STEEL GRADE A572 OR A992 (GR50 KSI) FOR ALL WIDE FLANGE SHAPES EXCEPT SECTIONS SMALLER THAN W8, A36 (36 KSI) FOR WIDE FLANGE SECTIONS SMALLER THAN W8, ASTM A53 GR B FOR PIPE SECTIONS, A500 GRADE-C (Fy=50 KSI) FOR RECTANGULAR HSS AND A500 GRADE-B (Fy=46 KSI) FOR ROUND HSS SECTIONS.
- 3) CONNECTION MATERIAL GRADE : ANGLES AND PLATE (A36-36 KSI). U.N.O.
- 4) ALL BOLTS ARE ¾" Ø A325N & 1" Ø A490N BOLTS (U.N.O)
- 5) WELDING ELECTRODES SHALL CONFORM TO ASTM SPECIFICATION E-70XX.
- 6) **DESIGN METHOD - LRFD PER AISC 15TH EDITION (AISC 360 - 10).**
- 7) **ALL THE CONNECTIONS HAVE BEEN DESIGNED FOR THE LOADS GIVEN ON SHEETS S004.**

### BEAM TO BEAM SHEAR CONNECTIONS SUMMARY

| CONN. ID | BEAM SIZE               | BEAM OR COLUMN SIZE | TYPE OF CONNECTION   | BOLT DESCRIPTION           | SHEAR PLATE & WELD THICKNESS                          | REACTIONS PER SHEET - S004 | REMARKS                                                                                                                                                                                                                                                |
|----------|-------------------------|---------------------|----------------------|----------------------------|-------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | W12x16, W12x22, W12x 30 | W18x35              | B2B SHEAR CONNECTION | (3) - ¾" Ø A325N           | 3/8" THICK EXTENDED SHEAR PLATE WITH 1/4" THICK WELD  | 10 KIPS SHEAR              |                                                                                                                                                                                                                                                        |
| 2        | W18x35 THRU W18x86      | W18x35, 40, 143     | B2B SHEAR CONNECTION | (5) - ¾" Ø A325N           | 3/8" THICK EXTENDED SHEAR PLATE WITH 1/4" THICK WELD  | 43 KIPS SHEAR              |                                                                                                                                                                                                                                                        |
| 3        | W18x65 THRU W18x158     | W18x143 & W24x192   | B2B SHEAR CONNECTION | (5) - ¾" Ø A325N           | 3/8" THICK EXTENDED SHEAR PLATE WITH 1/4" THICK WELD  | 90 KIPS SHEAR              | • ¾" DIA. BOLTS ARE FAILS IN SHEAR, BEARING, & TEAROUT                                                                                                                                                                                                 |
| 3.1      | W18x158, 130, 106       | W18x143 & W24x192   | B2B SHEAR CONNECTION | (5) - 1" Ø A490N           | 1/2" THICK EXTENDED SHEAR PLATE WITH 5/16" THICK WELD | 90 KIPS SHEAR              | CONNECTION REVISED WITH 1/2" THICK PLATE WITH 1" DIA. A490N BOLTS & 5/16" THICK WELD.                                                                                                                                                                  |
| 4A       | W24x192                 | W18x76              | B2B SHEAR CONNECTION | (7) - ¾" Ø A325N           | 3/8" THICK EXTENDED SHEAR PLATE WITH 1/4" THICK WELD  | 235 KIPS SHEAR             | <ul style="list-style-type: none"> <li>• ¾" DIA. BOLTS FAIL IN SHEAR, BEARING, &amp; TEAROUT.</li> <li>• 3/8" THICK PLATE FAILS IN YEILDING, RUPTURE, BLOCK SHEAR, &amp; FLEXURAL RUPTURE.</li> <li>• 1/4" THICK WELD FAILS IN INTERACTION.</li> </ul> |
| 4A.1     | W24x192                 | W18x76              | B2B SHEAR CONNECTION | 2 ROWS OF (7) - 1" Ø A490N | 3/4" THICK EXTENDED SHEAR PLATE WITH 1/2" THICK WELD  | 235 KIPS SHEAR             | CONNECTION REVISED WITH 3/4" THICK PLATE WITH TWO ROWS OF 1" DIA. A490N BOLTS & 1/2" THICK WELD.                                                                                                                                                       |
| 4B       | W24x192                 | W24X176             | B2B SHEAR CONNECTION | (7) - ¾" Ø A325N           | 3/8" THICK EXTENDED SHEAR PLATE WITH 1/4" THICK WELD  | 250 KIPS SHEAR             | <ul style="list-style-type: none"> <li>• ¾" DIA. BOLTS FAIL IN SHEAR, BEARING, &amp; TEAROUT.</li> <li>• 3/8" THICK PLATE FAILS IN YEILDING, RUPTURE, BLOCK SHEAR, &amp; FLEXURAL RUPTURE.</li> <li>• 1/4" THICK WELD FAILS IN INTERACTION.</li> </ul> |
| 4B.1     | W24x192                 | W24X176             | B2B SHEAR CONNECTION | 2 ROWS OF (7) - 1" Ø A490N | 3/4" THICK EXTENDED SHEAR PLATE WITH 1/2" THICK WELD  | 250 KIPS SHEAR             | CONNECTION REVISED WITH 3/4" THICK PLATE WITH TWO ROWS OF 1" DIA. A490N BOLTS & 1/2" THICK WELD.                                                                                                                                                       |

**NOTE: - ALL THE CONNECTIONS HAVE BEEN DESIGNED FOR THE LOADS GIVEN ON SHEETS S004**

### NOTE: -

RED TEXT CONNECTIONS ARE NO GOOD.

BLUE TEXT CONNECTIONS ARE REVISION FOR RESPECTIVE CONNECTIONS.

- 1) **Shear Connection** – W12x\_ Beam connecting to W18x35 Steel beam using 3/8" Thick Extended Shear Plate with  
(3) - 3/4"  $\phi$  A325N Bolts & 1/4" thick weld - For 10 kip Shear



RAM Connection

Units system: English

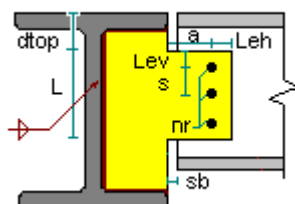
## Steel Connections Data

### Connection: 1V - SP\_BG\_1/4PL\_2B3/4

Family: Beam - Girder (BG)  
Type: Single plate  
Description: **CONN. ID - 1 - W12x\_ BEAM TO W18x35 BEAM**

### General information

#### Connector



### Members

#### Beam

##### General

|                                  |   |           |
|----------------------------------|---|-----------|
| Beam section                     | : | W 12X22   |
| Beam material                    | : | A992 Gr50 |
| sb: Beam setback                 | : | 0.5 in    |
| Beam edge inside support flanges | : | No        |
| Beam to girder alignment         | : | Top       |
| Horizontal angle (deg)           | : | 0         |
| Vertical angle (deg)             | : | 0         |
| Braced                           | : | No        |

##### Coped

|                        |   |      |
|------------------------|---|------|
| dct: Top cope depth    | : | 0 in |
| ct: Top cope length    | : | 0 in |
| dcb: Bottom cope depth | : | 0 in |
| cb: Bottom cope length | : | 0 in |

#### Girder

##### General

|                 |   |           |
|-----------------|---|-----------|
| Girder section  | : | W 18X35   |
| Girder material | : | A992 Gr50 |

### Single plate

# Connector

|                                                  |   |                     |
|--------------------------------------------------|---|---------------------|
| Section                                          | : | PL 3/8x6.85x8 1/2   |
| b: Width                                         | : | 4 in                |
| L: Length                                        | : | 8.5 in              |
| Plate type                                       | : | Extended            |
| tp: Plate thickness                              | : | 0.375 in            |
| Material                                         | : | A36                 |
| Plate position on beam                           | : | Top                 |
| dtop: Distance to beam top                       | : | 1.75 in             |
| Bolts                                            | : | 3/4" A325 N         |
| nr: Bolt rows                                    | : | 3                   |
| nc: Bolt columns                                 | : | 1                   |
| nc: Bolt columns                                 | : | 1                   |
| s: Pitch - longitudinal center-to-center spacing | : | 3 in                |
| Lev: Vertical edge distance                      | : | 1.25 in             |
| Leh: Horizontal edge distance                    | : | 1.5 in              |
| a: Distance between weld and bolts               | : | 2.5 in              |
| Hole type on plate                               | : | Short Slotted (SSL) |
| Slot direction on plate                          | : | Horizontal          |
| Hole type on beam                                | : | Standard (STD)      |
| Weld                                             | : | E70XX               |
| D: Weld size (1/16 in)                           | : | 4                   |
| Wo: Obtuse side weld size (AWS) (1/16 in)        | : | 4                   |
| Wa: Acute side weld size (AWS) (1/16 in)         | : | 4                   |
| Wo: Obtuse side weld size (AISC) (1/16 in)       | : | 4                   |
| Wa: Acute side weld size (AISC) (1/16 in)        | : | 4                   |



Units system: English

# Steel Connections Results

## Connection: 1V - SP\_BG\_1/4PL\_2B3/4

Family: Beam - Girder (BG)  
Type: Single plate  
Description: CONN. ID - 1 - W12x\_ BEAM TO W18x35 BEAM

Design code: AISC 360-16 LRFD

### Demands

| Description | Beam        |             | Left beam   |             | Load type |
|-------------|-------------|-------------|-------------|-------------|-----------|
|             | Ru<br>[kip] | Pu<br>[kip] | Ru<br>[kip] | Pu<br>[kip] |           |
| DL          | 10.00       | 0.00        | 0.00        | 0.00        | Design    |

### Geometric Considerations

| Dimensions                                  | Unit     | Value | Min. | Max. | Sta. | References        |
|---------------------------------------------|----------|-------|------|------|------|-------------------|
| <b>Plate (beam side)</b>                    |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 1.25  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 1.50  | 1.13 | --   | ✓    | Tables J3.4, J3.5 |
| Vertical center-to-center spacing (pitch)   | [in]     | 3.00  | 2.00 | 6.24 | ✓    | Sec. J3.5         |
| Clear distance between holes (longitudinal) | [in]     | 2.19  | 0.75 | --   | ✓    | Sec. J3.3         |
| <b>Beam</b>                                 |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 3.00  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 2.00  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| <b>Support</b>                              |          |       |      |      |      |                   |
| Weld size                                   | [1/16in] | 4     | 4    | --   | ✓    | p. 10-87          |

### Design Check

| Verification                  | Unit  | Capacity | Demand | Ctrl EQ | Ratio | References       |
|-------------------------------|-------|----------|--------|---------|-------|------------------|
| <b>Plate (beam side)</b>      |       |          |        |         |       |                  |
| Bolts shear                   | [Kip] | 19.30    | 10.00  | DL      | 0.52  | Tables (7-1..14) |
| Bolt bearing under shear load | [Kip] | 31.65    | 10.00  | DL      | 0.32  | Tables (7-1..14) |
| Bolt tearout under shear load | [Kip] | 37.50    | 10.00  | DL      | 0.27  | Sec. J3.6        |
| Shear yielding                | [Kip] | 68.85    | 10.00  | DL      | 0.15  | Eq. J4-3         |
| Shear rupture                 | [Kip] | 57.50    | 10.00  | DL      | 0.17  | Eq. J4-4         |
| Block shear                   | [Kip] | 59.85    | 10.00  | DL      | 0.17  | Eq. J4-5         |
| Flexural rupture              | [Kip] | 45.15    | 10.00  | DL      | 0.22  | p. 9-6           |

|                                            |          |        |       |    |             |                    |
|--------------------------------------------|----------|--------|-------|----|-------------|--------------------|
| Flexural yielding                          | [Kip*ft] | 18.29  | 2.08  | DL | <b>0.11</b> | p. 10-90           |
| Lateral torsional buckling                 | [Kip*ft] | 17.91  | 2.08  | DL | <b>0.12</b> | Sec. F1            |
| Compression                                | [Kip]    | 99.18  | 0.00  | DL | <b>0.00</b> | Sec. J4.4          |
| <b>Plate (support side)</b>                |          |        |       |    |             |                    |
| Weld capacity                              | [Kip]    | 187.66 | 10.00 | DL | <b>0.05</b> | Tables 8-4 .. 8-11 |
| Interaction of flexure and shear yielding  |          | 1.00   | 0.03  | DL | <b>0.03</b> | Eq. 10-5           |
| <b>Beam</b>                                |          |        |       |    |             |                    |
| Bolt bearing under shear load              | [Kip]    | 24.59  | 10.00 | DL | <b>0.41</b> | Tables (7-1..14)   |
| Shear yielding                             | [Kip]    | 95.94  | 10.00 | DL | <b>0.10</b> | Eq. J4-3           |
| <b>Support</b>                             |          |        |       |    |             |                    |
| Shear rupture of base metal at fillet weld | [in]     | 0.30   | 0.19  | DL | <b>0.63</b> | Eq. 9-2            |
| Shear strength at welds                    | [Kip]    | 149.17 | 10.00 | DL | <b>0.07</b> | Eq. J4-4           |
| <b>Bolt group</b>                          |          |        |       |    |             |                    |
| Bolt effective strength                    | [Kip]    | 19.30  | 10.00 | DL | <b>0.52</b> | Sec. J3.6          |

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|                                       |             |
|---------------------------------------|-------------|
| <b>Global critical strength ratio</b> | <b>0.63</b> |
|---------------------------------------|-------------|

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## Notes

The plate is designed with the extended configuration criteria.

## References

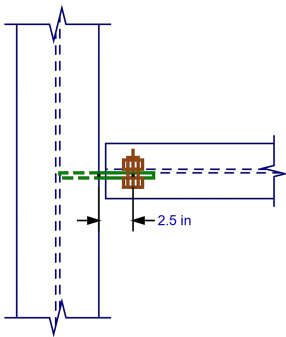
[14] Dowswell, B. et al, 2016, "Design of wrap-around gusset plates", Structural Design Solutions, LLC.

RAM Connection Standalone

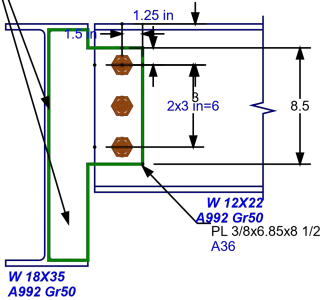
Units system: s

Current Date: s

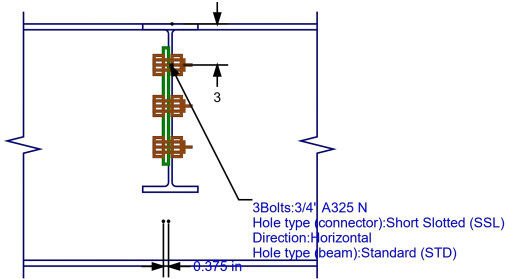
Top view



4/16 Lateral view  
4/16



Front view



2) **Shear Connection** – W18x35 Thru W18x86 Beam connecting to W18x\_ Steel beam using 3/8" Thick Extended Shear Plate with (5) - 3/4"  $\phi$  A325N Bolts & 1/4" thick weld - For 43 kip Shear



RAM Connection

Units system: English

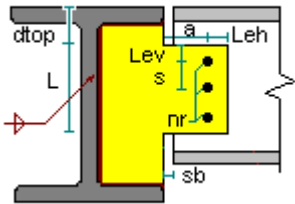
Steel Connections  
Data

Connection: 3V - SP\_BG\_1/4PL\_4B3/4

|              |                                         |
|--------------|-----------------------------------------|
| Family:      | Beam - Girder (BG)                      |
| Type:        | Single plate                            |
| Description: | CONN. ID - 2 - W18x_ BEAM TO W18x_ BEAM |

General information

Connector



Members

Beam

|                                  |             |
|----------------------------------|-------------|
| General                          |             |
| Beam section                     | : W 18X40   |
| Beam material                    | : A992 Gr50 |
| sb: Beam setback                 | : 0.5 in    |
| Beam edge inside support flanges | : No        |
| Beam to girder alignment         | : Top       |
| Horizontal angle (deg)           | : 0         |
| Vertical angle (deg)             | : 0         |
| Braced                           | : No        |

|                        |        |
|------------------------|--------|
| Coped                  |        |
| dct: Top cope depth    | : 0 in |
| ct: Top cope length    | : 0 in |
| dcb: Bottom cope depth | : 0 in |
| cb: Bottom cope length | : 0 in |

Girder

|                 |             |
|-----------------|-------------|
| General         |             |
| Girder section  | : W 18X40   |
| Girder material | : A992 Gr50 |

Single plate

# Connector

|                                                  |   |                     |
|--------------------------------------------------|---|---------------------|
| Section                                          | : | PL 3/8x6.85x14 1/2  |
| b: Width                                         | : | 4 in                |
| L: Length                                        | : | 14.5 in             |
| Plate type                                       | : | Extended            |
| tp: Plate thickness                              | : | 0.375 in            |
| Material                                         | : | A36                 |
| Plate position on beam                           | : | Top                 |
| dtop: Distance to beam top                       | : | 1.75 in             |
| Bolts                                            | : | 3/4" A325 N         |
| nr: Bolt rows                                    | : | 5                   |
| nc: Bolt columns                                 | : | 1                   |
| nc: Bolt columns                                 | : | 1                   |
| s: Pitch - longitudinal center-to-center spacing | : | 3 in                |
| Lev: Vertical edge distance                      | : | 1.25 in             |
| Leh: Horizontal edge distance                    | : | 1.5 in              |
| a: Distance between weld and bolts               | : | 2.5 in              |
| Hole type on plate                               | : | Short Slotted (SSL) |
| Slot direction on plate                          | : | Horizontal          |
| Hole type on beam                                | : | Standard (STD)      |
| Weld                                             | : | E70XX               |
| D: Weld size (1/16 in)                           | : | 4                   |
| Wo: Obtuse side weld size (AWS) (1/16 in)        | : | 4                   |
| Wa: Acute side weld size (AWS) (1/16 in)         | : | 4                   |
| Wo: Obtuse side weld size (AISC) (1/16 in)       | : | 4                   |
| Wa: Acute side weld size (AISC) (1/16 in)        | : | 4                   |



Units system: English

# Steel Connections Results

## Connection: 3V - SP\_BG\_1/4PL\_4B3/4

Family: Beam - Girder (BG)  
Type: Single plate  
Description: CONN. ID - 2 - W18x\_ BEAM TO W18x\_ BEAM

Design code: AISC 360-16 LRFD

### Demands

| Description | Beam        |             | Left beam   |             | Load type |
|-------------|-------------|-------------|-------------|-------------|-----------|
|             | Ru<br>[kip] | Pu<br>[kip] | Ru<br>[kip] | Pu<br>[kip] |           |
| DL          | 43.00       | 0.00        | 0.00        | 0.00        | Design    |

### Geometric Considerations

| Dimensions                                  | Unit     | Value | Min. | Max. | Sta. | References        |
|---------------------------------------------|----------|-------|------|------|------|-------------------|
| <b>Plate (beam side)</b>                    |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 1.25  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 1.50  | 1.13 | --   | ✓    | Tables J3.4, J3.5 |
| Vertical center-to-center spacing (pitch)   | [in]     | 3.00  | 2.00 | 7.56 | ✓    | Sec. J3.5         |
| Clear distance between holes (longitudinal) | [in]     | 2.19  | 0.75 | --   | ✓    | Sec. J3.3         |
| <b>Beam</b>                                 |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 3.00  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 2.00  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| <b>Support</b>                              |          |       |      |      |      |                   |
| Weld size                                   | [1/16in] | 4     | 4    | --   | ✓    | p. 10-87          |

### Design Check

| Verification                  | Unit  | Capacity | Demand | Ctrl EQ | Ratio | References       |
|-------------------------------|-------|----------|--------|---------|-------|------------------|
| <b>Plate (beam side)</b>      |       |          |        |         |       |                  |
| Bolts shear                   | [Kip] | 50.41    | 43.00  | DL      | 0.85  | Tables (7-1..14) |
| Bolt bearing under shear load | [Kip] | 82.69    | 43.00  | DL      | 0.52  | Tables (7-1..14) |
| Bolt tearout under shear load | [Kip] | 109.60   | 43.00  | DL      | 0.39  | Sec. J3.6        |
| Shear yielding                | [Kip] | 117.45   | 43.00  | DL      | 0.37  | Eq. J4-3         |
| Shear rupture                 | [Kip] | 99.10    | 43.00  | DL      | 0.43  | Eq. J4-4         |
| Block shear                   | [Kip] | 96.30    | 43.00  | DL      | 0.45  | Eq. J4-5         |
| Flexural rupture              | [Kip] | 122.85   | 43.00  | DL      | 0.35  | p. 9-6           |

|                                            |          |        |       |    |             |                    |
|--------------------------------------------|----------|--------|-------|----|-------------|--------------------|
| Flexural yielding                          | [Kip*ft] | 53.22  | 8.96  | DL | <b>0.17</b> | p. 10-90           |
| Lateral torsional buckling                 | [Kip*ft] | 50.82  | 8.96  | DL | <b>0.18</b> | Sec. F1            |
| Compression                                | [Kip]    | 169.19 | 0.00  | DL | <b>0.00</b> | Sec. J4.4          |
| <b>Plate (support side)</b>                |          |        |       |    |             |                    |
| Weld capacity                              | [Kip]    | 187.66 | 43.00 | DL | <b>0.23</b> | Tables 8-4 .. 8-11 |
| Interaction of flexure and shear yielding  |          | 1.00   | 0.16  | DL | <b>0.16</b> | Eq. 10-5           |
| <b>Beam</b>                                |          |        |       |    |             |                    |
| Bolt bearing under shear load              | [Kip]    | 77.84  | 43.00 | DL | <b>0.55</b> | Tables (7-1..14)   |
| Shear yielding                             | [Kip]    | 169.15 | 43.00 | DL | <b>0.25</b> | Eq. J4-3           |
| <b>Support</b>                             |          |        |       |    |             |                    |
| Shear rupture of base metal at fillet weld | [in]     | 0.32   | 0.19  | DL | <b>0.60</b> | Eq. 9-2            |
| Shear strength at welds                    | [Kip]    | 267.20 | 43.00 | DL | <b>0.16</b> | Eq. J4-4           |
| <b>Bolt group</b>                          |          |        |       |    |             |                    |
| Bolt effective strength                    | [Kip]    | 50.41  | 43.00 | DL | <b>0.85</b> | Sec. J3.6          |

---

|                                       |             |
|---------------------------------------|-------------|
| <b>Global critical strength ratio</b> | <b>0.85</b> |
|---------------------------------------|-------------|

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## Notes

The plate is designed with the extended configuration criteria.

## References

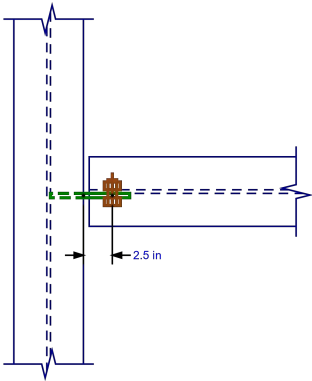
[14] Dowswell, B. et al, 2016, "Design of wrap-around gusset plates", Structural Design Solutions, LLC.

RAM Connection Standalone

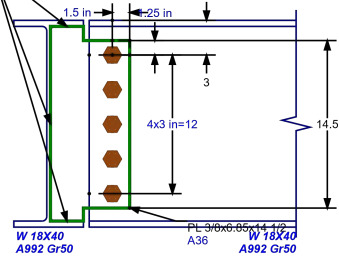
Units system: s

Current Date: s

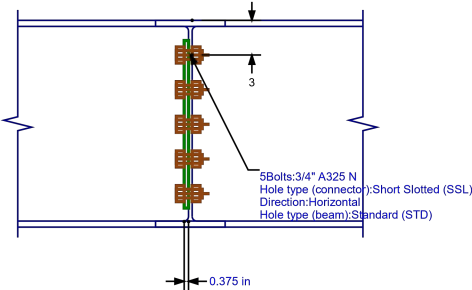
Top view



Lateral view  
4/16  
4/16



Front view



3) **Shear Connection** – W18x65 Thru W18x158 Beam connecting to W18x143 &W24x192 Steel beam using 3/8" Thick Extended Shear Plate with (5) - 3/4"  $\phi$  A325N Bolts & 1/4" thick weld - For 90 kip Shear - **NO GOOD**



RAM Connection

Units system: English

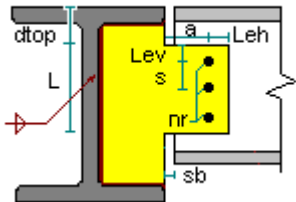
# Steel Connections Data

## Connection: 4V - SP\_BG\_3/8PL\_5B3/4

|              |                                                        |
|--------------|--------------------------------------------------------|
| Family:      | Beam - Girder (BG)                                     |
| Type:        | Single plate                                           |
| Description: | CONN. ID -3 - W18x_ BEAM TO W18X_ & W24x_ BEAM-NO GOOD |

### General information

Connector



### Members

Beam

|                                  |             |
|----------------------------------|-------------|
| General                          |             |
| Beam section                     | : W 18X60   |
| Beam material                    | : A992 Gr50 |
| sb: Beam setback                 | : 0.5 in    |
| Beam edge inside support flanges | : No        |
| Beam to girder alignment         | : Top       |
| Horizontal angle (deg)           | : 0         |
| Vertical angle (deg)             | : 0         |
| Braced                           | : No        |

|                        |        |
|------------------------|--------|
| Coped                  |        |
| dct: Top cope depth    | : 0 in |
| ct: Top cope length    | : 0 in |
| dcb: Bottom cope depth | : 0 in |
| cb: Bottom cope length | : 0 in |

Girder

|                 |             |
|-----------------|-------------|
| General         |             |
| Girder section  | : W 18X143  |
| Girder material | : A992 Gr50 |

### Single plate

# Connector

|                                                  |   |                     |
|--------------------------------------------------|---|---------------------|
| Section                                          | : | PL 3/8x9.24x14 1/2  |
| b: Width                                         | : | 4 in                |
| L: Length                                        | : | 14.5 in             |
| Plate type                                       | : | Extended            |
| tp: Plate thickness                              | : | 0.375 in            |
| Material                                         | : | A36                 |
| Plate position on beam                           | : | Top                 |
| dtop: Distance to beam top                       | : | 1.75 in             |
| Bolts                                            | : | 3/4" A325 N         |
| nr: Bolt rows                                    | : | 5                   |
| nc: Bolt columns                                 | : | 1                   |
| nc: Bolt columns                                 | : | 1                   |
| s: Pitch - longitudinal center-to-center spacing | : | 3 in                |
| Lev: Vertical edge distance                      | : | 1.25 in             |
| Leh: Horizontal edge distance                    | : | 1.5 in              |
| a: Distance between weld and bolts               | : | 2.5 in              |
| Hole type on plate                               | : | Short Slotted (SSL) |
| Slot direction on plate                          | : | Horizontal          |
| Hole type on beam                                | : | Standard (STD)      |
| Weld                                             | : | E70XX               |
| D: Weld size (1/16 in)                           | : | 4                   |
| Wo: Obtuse side weld size (AWS) (1/16 in)        | : | 4                   |
| Wa: Acute side weld size (AWS) (1/16 in)         | : | 4                   |
| Wo: Obtuse side weld size (AISC) (1/16 in)       | : | 4                   |
| Wa: Acute side weld size (AISC) (1/16 in)        | : | 4                   |



Units system: English

# Steel Connections Results

## Connection: 4V - SP\_BG\_3/8PL\_5B3/4

Family: Beam - Girder (BG)  
Type: Single plate  
Description: CONN. ID -3 - W18x\_ BEAM TO W18X\_ & W24x\_ BEAM-NO GOOD

Design code: AISC 360-16 LRFD

### Demands

| Description | Beam        |             | Left beam   |             | Load type |
|-------------|-------------|-------------|-------------|-------------|-----------|
|             | Ru<br>[kip] | Pu<br>[kip] | Ru<br>[kip] | Pu<br>[kip] |           |
| DL          | 90.00       | 0.00        | 0.00        | 0.00        | Design    |

### Geometric Considerations

| Dimensions                                  | Unit     | Value | Min. | Max. | Sta. | References        |
|---------------------------------------------|----------|-------|------|------|------|-------------------|
| <b>Plate (beam side)</b>                    |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 1.25  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 1.50  | 1.13 | --   | ✓    | Tables J3.4, J3.5 |
| Vertical center-to-center spacing (pitch)   | [in]     | 3.00  | 2.00 | 9.00 | ✓    | Sec. J3.5         |
| Clear distance between holes (longitudinal) | [in]     | 2.19  | 0.75 | --   | ✓    | Sec. J3.3         |
| <b>Beam</b>                                 |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 3.00  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 2.00  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| <b>Support</b>                              |          |       |      |      |      |                   |
| Weld size                                   | [1/16in] | 4     | 4    | --   | ✓    | p. 10-87          |

### Design Check

| Verification                  | Unit  | Capacity | Demand | Ctrl EQ | Ratio | References       |
|-------------------------------|-------|----------|--------|---------|-------|------------------|
| <b>Plate (beam side)</b>      |       |          |        |         |       |                  |
| Bolts shear                   | [Kip] | 37.53    | 90.00  | DL      | 2.40  | Tables (7-1..14) |
| Bolt bearing under shear load | [Kip] | 61.56    | 90.00  | DL      | 1.46  | Tables (7-1..14) |
| Bolt tearout under shear load | [Kip] | 73.80    | 90.00  | DL      | 1.22  | Sec. J3.6        |
| Shear yielding                | [Kip] | 117.45   | 90.00  | DL      | 0.77  | Eq. J4-3         |
| Shear rupture                 | [Kip] | 99.10    | 90.00  | DL      | 0.91  | Eq. J4-4         |
| Block shear                   | [Kip] | 96.30    | 90.00  | DL      | 0.93  | Eq. J4-5         |
| Flexural rupture              | [Kip] | 85.01    | 90.00  | DL      | 1.06  | p. 9-6           |

|                                            |          |        |       |    |      |                    |
|--------------------------------------------|----------|--------|-------|----|------|--------------------|
| Flexural yielding                          | [Kip*ft] | 53.22  | 18.75 | DL | 0.35 | p. 10-90           |
| Lateral torsional buckling                 | [Kip*ft] | 50.82  | 18.75 | DL | 0.37 | Sec. F1            |
| Compression                                | [Kip]    | 169.19 | 0.00  | DL | 0.00 | Sec. J4.4          |
| <b>Plate (support side)</b>                |          |        |       |    |      |                    |
| Weld capacity                              | [Kip]    | 187.77 | 90.00 | DL | 0.48 | Tables 8-4 .. 8-11 |
| Interaction of flexure and shear yielding  |          | 1.00   | 0.71  | DL | 0.71 | Eq. 10-5           |
| <b>Beam</b>                                |          |        |       |    |      |                    |
| Bolt bearing under shear load              | [Kip]    | 76.35  | 90.00 | DL | 1.18 | Tables (7-1..14)   |
| Shear yielding                             | [Kip]    | 226.59 | 90.00 | DL | 0.40 | Eq. J4-3           |
| <b>Support</b>                             |          |        |       |    |      |                    |
| Shear rupture of base metal at fillet weld | [in]     | 0.73   | 0.19  | DL | 0.26 | Eq. 9-2            |
| Shear strength at welds                    | [Kip]    | 619.22 | 90.00 | DL | 0.15 | Eq. J4-4           |
| <b>Bolt group</b>                          |          |        |       |    |      |                    |
| Bolt effective strength                    | [Kip]    | 37.53  | 90.00 | DL | 2.40 | Sec. J3.6          |

Global critical strength ratio

2.40

Notes

The plate is designed with the extended configuration criteria.

REFER TO REVISED CONNECTION 3.1 BELOW

References

[14] Dowswell, B. et al, 2016, "Design of wrap-around gusset plates", Structural Design Solutions, LLC.

Units system: s  
Current Date: s

Current Date: s

A schematic diagram of a bolted lap joint. Two vertical plates are shown, with a horizontal gap between them. A bolt is shown passing through the plates, with a nut and washer on the right side. A dimension line indicates a gap of 2.5 in between the plates.

Technical drawing of a window assembly. The drawing shows a cross-section of a window frame and sash. Key dimensions and components are labeled:

- Top Left:** 4/16 (likely referring to the glass thickness).
- Top Center:** 1.5 in (width of the top sash).
- Top Right:** 25 in (width of the top frame).
- Right Side:** 14.5 in (height of the window assembly).
- Center:** 4x3 in=12 (vertical spacing between the six panes).
- Bottom Left:** W 18X143 A992 Gr50 (label for the left vertical frame member).
- Bottom Center:** PL 3/8x0.24x14-12 A36 (label for the bottom plate).
- Bottom Right:** W 18X60 A992 Gr50 (label for the right vertical frame member).

3.1) **Shear Connection** – W18x\_ Beam connecting to W18x143 & W24x192 Steel beam using 1/2" Thick Extended Shear Plate with (5) -1"  $\phi$  A490N Bolts & 5/16" thick weld - For 90 kip Shear -**REVISED**



RAM Connection

Units system: English

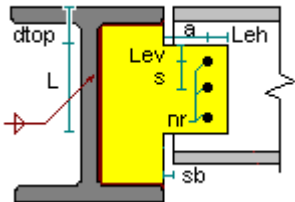
Steel Connections  
Data

Connection: 11V - SP\_BG\_3/8PL\_5B3/4

|              |                                                          |
|--------------|----------------------------------------------------------|
| Family:      | Beam - Girder (BG)                                       |
| Type:        | Single plate                                             |
| Description: | CONN. ID -3.1 - W18x_ BEAM TO W18x_ & W24x_ BEAM REVISED |

General information

Connector



Members

Beam

|                                  |             |
|----------------------------------|-------------|
| General                          |             |
| Beam section                     | : W 18X60   |
| Beam material                    | : A992 Gr50 |
| sb: Beam setback                 | : 0.5 in    |
| Beam edge inside support flanges | : No        |
| Beam to girder alignment         | : Top       |
| Horizontal angle (deg)           | : 0         |
| Vertical angle (deg)             | : 0         |
| Braced                           | : No        |

|                        |        |
|------------------------|--------|
| Coped                  |        |
| dct: Top cope depth    | : 0 in |
| ct: Top cope length    | : 0 in |
| dcb: Bottom cope depth | : 0 in |
| cb: Bottom cope length | : 0 in |

Girder

|                 |             |
|-----------------|-------------|
| General         |             |
| Girder section  | : W 18X143  |
| Girder material | : A992 Gr50 |

Single plate

# Connector

|                                                  |   |                     |
|--------------------------------------------------|---|---------------------|
| Section                                          | : | PL 1/2x9.74x14 1/2  |
| b: Width                                         | : | 4.5 in              |
| L: Length                                        | : | 14.5 in             |
| Plate type                                       | : | Extended            |
| tp: Plate thickness                              | : | 0.5 in              |
| Material                                         | : | A36                 |
| Plate position on beam                           | : | Top                 |
| dtop: Distance to beam top                       | : | 1.75 in             |
| Bolts                                            | : | 1" A490 N           |
| nr: Bolt rows                                    | : | 5                   |
| nc: Bolt columns                                 | : | 1                   |
| nc: Bolt columns                                 | : | 1                   |
| s: Pitch - longitudinal center-to-center spacing | : | 3 in                |
| Lev: Vertical edge distance                      | : | 1.25 in             |
| Leh: Horizontal edge distance                    | : | 2 in                |
| a: Distance between weld and bolts               | : | 2.5 in              |
| Hole type on plate                               | : | Short Slotted (SSL) |
| Slot direction on plate                          | : | Horizontal          |
| Hole type on beam                                | : | Standard (STD)      |
| Weld                                             | : | E70XX               |
| D: Weld size (1/16 in)                           | : | 5                   |
| Wo: Obtuse side weld size (AWS) (1/16 in)        | : | 5                   |
| Wa: Acute side weld size (AWS) (1/16 in)         | : | 5                   |
| Wo: Obtuse side weld size (AISC) (1/16 in)       | : | 5                   |
| Wa: Acute side weld size (AISC) (1/16 in)        | : | 5                   |



Units system: English

# Steel Connections Results

## Connection: 11V - SP\_BG\_3/8PL\_5B3/4

Family: Beam - Girder (BG)  
Type: Single plate  
Description: CONN. ID -3.1 - W18x\_ BEAM TO W18x\_ & W24x\_ BEAM REVISED

Design code: AISC 360-16 LRFD

### Demands

| Description | Beam        |             | Left beam   |             | Load type |
|-------------|-------------|-------------|-------------|-------------|-----------|
|             | Ru<br>[kip] | Pu<br>[kip] | Ru<br>[kip] | Pu<br>[kip] |           |
| DL          | 90.00       | 0.00        | 0.00        | 0.00        | Design    |

### Geometric Considerations

| Dimensions                                  | Unit     | Value | Min. | Max. | Sta. | References        |
|---------------------------------------------|----------|-------|------|------|------|-------------------|
| <b>Plate (beam side)</b>                    |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 1.25  | 1.25 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 2.00  | 1.38 | --   | ✓    | Tables J3.4, J3.5 |
| Vertical center-to-center spacing (pitch)   | [in]     | 3.00  | 2.67 | 9.96 | ✓    | Sec. J3.5         |
| Clear distance between holes (longitudinal) | [in]     | 1.88  | 1.00 | --   | ✓    | Sec. J3.3         |
| <b>Beam</b>                                 |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 3.00  | 1.25 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 2.00  | 1.25 | --   | ✓    | Tables J3.4, J3.5 |
| <b>Support</b>                              |          |       |      |      |      |                   |
| Weld size                                   | [1/16in] | 5     | 5    | --   | ✓    | p. 10-87          |

### Design Check

| Verification                  | Unit  | Capacity | Demand | Ctrl EQ | Ratio | References       |
|-------------------------------|-------|----------|--------|---------|-------|------------------|
| <b>Plate (beam side)</b>      |       |          |        |         |       |                  |
| Bolts shear                   | [Kip] | 83.32    | 90.00  | DL      | 1.08  | Tables (7-1..14) |
| Bolt bearing under shear load | [Kip] | 109.44   | 90.00  | DL      | 0.82  | Tables (7-1..14) |
| Bolt tearout under shear load | [Kip] | 100.47   | 90.00  | DL      | 0.90  | Sec. J3.6        |
| Shear yielding                | [Kip] | 156.60   | 90.00  | DL      | 0.57  | Eq. J4-3         |
| Shear rupture                 | [Kip] | 111.74   | 90.00  | DL      | 0.81  | Eq. J4-4         |
| Block shear                   | [Kip] | 131.72   | 90.00  | DL      | 0.68  | Eq. J4-5         |
| Flexural rupture              | [Kip] | 97.07    | 90.00  | DL      | 0.93  | p. 9-6           |

|                                            |          |        |       |    |      |                    |
|--------------------------------------------|----------|--------|-------|----|------|--------------------|
| Flexural yielding                          | [Kip*ft] | 70.96  | 18.75 | DL | 0.26 | p. 10-90           |
| Lateral torsional buckling                 | [Kip*ft] | 69.57  | 18.75 | DL | 0.27 | Sec. F1            |
| Compression                                | [Kip]    | 234.90 | 0.00  | DL | 0.00 | Sec. J4.4          |
| <b>Plate (support side)</b>                |          |        |       |    |      |                    |
| Weld capacity                              | [Kip]    | 234.71 | 90.00 | DL | 0.38 | Tables 8-4 .. 8-11 |
| Interaction of flexure and shear yielding  |          | 1.00   | 0.40  | DL | 0.40 | Eq. 10-5           |
| <b>Beam</b>                                |          |        |       |    |      |                    |
| Bolt bearing under shear load              | [Kip]    | 101.80 | 90.00 | DL | 0.88 | Tables (7-1..14)   |
| Shear yielding                             | [Kip]    | 226.59 | 90.00 | DL | 0.40 | Eq. J4-3           |
| <b>Support</b>                             |          |        |       |    |      |                    |
| Shear rupture of base metal at fillet weld | [in]     | 0.73   | 0.24  | DL | 0.33 | Eq. 9-2            |
| Shear strength at welds                    | [Kip]    | 619.22 | 90.00 | DL | 0.15 | Eq. J4-4           |
| <b>Bolt group</b>                          |          |        |       |    |      |                    |
| Bolt effective strength                    | [Kip]    | 82.38  | 90.00 | DL | 1.09 | Sec. J3.6          |

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|                                       |             |
|---------------------------------------|-------------|
| <b>Global critical strength ratio</b> | <b>1.09</b> |
|---------------------------------------|-------------|

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## Notes

The plate is designed with the extended configuration criteria.

CONSIDERED 10% OVERAGE  
ALLOWANCE FOR CONNECTION DESIGN.

## References

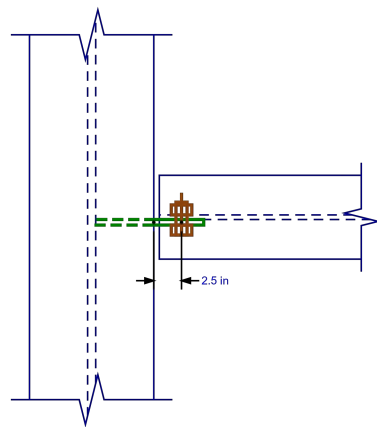
[14] Dowswell, B. et al, 2016, "Design of wrap-around gusset plates", Structural Design Solutions, LLC.

## RAM Connection Standalone

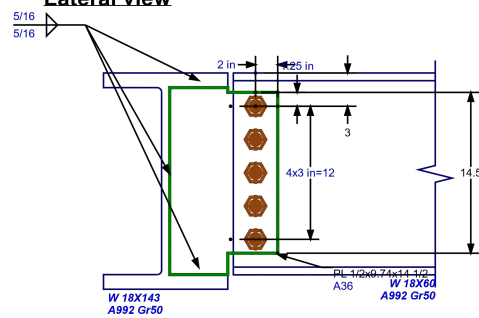
Units system: s

Current Date: s

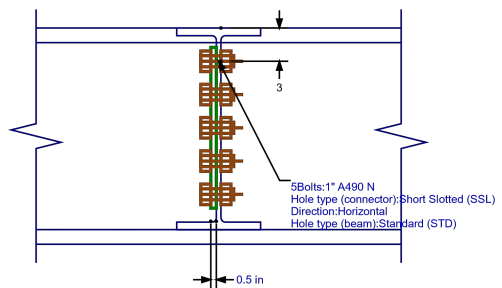
**Top view**



**Lateral view**



**Front view**



**4A) Shear Connection** – W24x192 Beam connecting to W18x76 Steel beam using 3/8" Thick Extended Shear Plate with (7) -3/4"  $\phi$  A325N Bolts & 1/4" thick weld - For 235 kip Shear - **NO GOOD**



RAM Connection

Units system: English

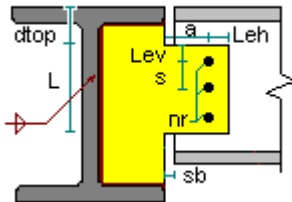
## Steel Connections Data

### Connection: 9V - SP\_BG\_1/2PL\_5B1

Family: Beam - Girder (BG)  
Type: Single plate  
Description: **CONN. ID -4A - W24x192 BEAM TO W18x76 BEAM-NO GOOD**

### General information

#### Connector



### Members

#### Beam

##### General

|                                  |   |           |
|----------------------------------|---|-----------|
| Beam section                     | : | W 24X192  |
| Beam material                    | : | A992 Gr50 |
| sb: Beam setback                 | : | 0.5 in    |
| Beam edge inside support flanges | : | No        |
| Beam to girder alignment         | : | Top       |
| Horizontal angle (deg)           | : | 0         |
| Vertical angle (deg)             | : | 0         |
| Braced                           | : | No        |

##### Coped

|                        |   |      |
|------------------------|---|------|
| dct: Top cope depth    | : | 0 in |
| ct: Top cope length    | : | 0 in |
| dcb: Bottom cope depth | : | 0 in |
| cb: Bottom cope length | : | 0 in |

#### Girder

##### General

|                 |   |           |
|-----------------|---|-----------|
| Girder section  | : | W 18X76   |
| Girder material | : | A992 Gr50 |

### Single plate

# Connector

|                                                  |   |                     |
|--------------------------------------------------|---|---------------------|
| Section                                          | : | PL 3/8x9.29x20 1/2  |
| b: Width                                         | : | 4 in                |
| L: Length                                        | : | 20.5 in             |
| Plate type                                       | : | Extended            |
| tp: Plate thickness                              | : | 0.375 in            |
| Material                                         | : | A36                 |
| Plate position on beam                           | : | Top                 |
| dtop: Distance to beam top                       | : | 2 in                |
| Bolts                                            | : | 3/4" A325 N         |
| nr: Bolt rows                                    | : | 7                   |
| nc: Bolt columns                                 | : | 1                   |
| nc: Bolt columns                                 | : | 1                   |
| s: Pitch - longitudinal center-to-center spacing | : | 3 in                |
| Lev: Vertical edge distance                      | : | 1.25 in             |
| Leh: Horizontal edge distance                    | : | 1.5 in              |
| a: Distance between weld and bolts               | : | 2.5 in              |
| Hole type on plate                               | : | Short Slotted (SSL) |
| Slot direction on plate                          | : | Horizontal          |
| Hole type on beam                                | : | Standard (STD)      |
| Weld                                             | : | E70XX               |
| D: Weld size (1/16 in)                           | : | 4                   |
| Wo: Obtuse side weld size (AWS) (1/16 in)        | : | 4                   |
| Wa: Acute side weld size (AWS) (1/16 in)         | : | 4                   |
| Wo: Obtuse side weld size (AISC) (1/16 in)       | : | 4                   |
| Wa: Acute side weld size (AISC) (1/16 in)        | : | 4                   |



Units system: English

# Steel Connections Results

## Connection: 9V - SP\_BG\_1/2PL\_5B1

Family: Beam - Girder (BG)  
Type: Single plate  
Description: CONN. ID -4A - W24x192 BEAM TO W18x76 BEAM-NO GOOD

Design code: AISC 360-16 LRFD

### Demands

| Description | Beam        |             | Left beam   |             | Load type |
|-------------|-------------|-------------|-------------|-------------|-----------|
|             | Ru<br>[kip] | Pu<br>[kip] | Ru<br>[kip] | Pu<br>[kip] |           |
| DL          | 235.00      | 0.00        | 0.00        | 0.00        | Design    |

### Geometric Considerations

| Dimensions                                  | Unit     | Value | Min. | Max. | Sta. | References        |
|---------------------------------------------|----------|-------|------|------|------|-------------------|
| <b>Plate (beam side)</b>                    |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 1.25  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 1.50  | 1.13 | --   | ✓    | Tables J3.4, J3.5 |
| Vertical center-to-center spacing (pitch)   | [in]     | 3.00  | 2.00 | 9.00 | ✓    | Sec. J3.5         |
| Clear distance between holes (longitudinal) | [in]     | 2.19  | 0.75 | --   | ✓    | Sec. J3.3         |
| <b>Beam</b>                                 |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 3.25  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 2.00  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| <b>Support</b>                              |          |       |      |      |      |                   |
| Weld size                                   | [1/16in] | 4     | 4    | --   | ✓    | p. 10-87          |

### Design Check

| Verification                  | Unit  | Capacity | Demand | Ctrl EQ | Ratio | References       |
|-------------------------------|-------|----------|--------|---------|-------|------------------|
| <b>Plate (beam side)</b>      |       |          |        |         |       |                  |
| Bolts shear                   | [Kip] | 68.56    | 235.00 | DL      | 3.43  | Tables (7-1..14) |
| Bolt bearing under shear load | [Kip] | 112.45   | 235.00 | DL      | 2.09  | Tables (7-1..14) |
| Bolt tearout under shear load | [Kip] | 155.32   | 235.00 | DL      | 1.51  | Sec. J3.6        |
| Shear yielding                | [Kip] | 166.05   | 235.00 | DL      | 1.42  | Eq. J4-3         |
| Shear rupture                 | [Kip] | 140.70   | 235.00 | DL      | 1.67  | Eq. J4-4         |
| Block shear                   | [Kip] | 132.75   | 235.00 | DL      | 1.77  | Eq. J4-5         |
| Flexural rupture              | [Kip] | 164.56   | 235.00 | DL      | 1.43  | p. 9-6           |

|                                            |          |        |        |    |      |                    |
|--------------------------------------------|----------|--------|--------|----|------|--------------------|
| Flexural yielding                          | [Kip*ft] | 106.38 | 48.96  | DL | 0.46 | p. 10-90           |
| Lateral torsional buckling                 | [Kip*ft] | 99.00  | 48.96  | DL | 0.49 | Sec. F1            |
| Compression                                | [Kip]    | 239.21 | 0.00   | DL | 0.00 | Sec. J4.4          |
| <b>Plate (support side)</b>                |          |        |        |    |      |                    |
| Weld capacity                              | [Kip]    | 187.55 | 235.00 | DL | 1.25 | Tables 8-4 .. 8-11 |
| Interaction of flexure and shear yielding  |          | 1.00   | 2.21   | DL | 2.21 | Eq. 10-5           |
| <b>Beam</b>                                |          |        |        |    |      |                    |
| Bolt bearing under shear load              | [Kip]    | 272.21 | 235.00 | DL | 0.86 | Tables (7-1..14)   |
| Shear yielding                             | [Kip]    | 619.65 | 235.00 | DL | 0.38 | Eq. J4-3           |
| <b>Support</b>                             |          |        |        |    |      |                    |
| Shear rupture of base metal at fillet weld | [in]     | 0.43   | 0.19   | DL | 0.45 | Eq. 9-2            |
| Shear strength at welds                    | [Kip]    | 509.68 | 235.00 | DL | 0.46 | Eq. J4-4           |
| <b>Bolt group</b>                          |          |        |        |    |      |                    |
| Bolt effective strength                    | [Kip]    | 68.56  | 235.00 | DL | 3.43 | Sec. J3.6          |

Global critical strength ratio

3.43

Notes

The plate is designed with the extended configuration criteria.

REFER TO REVISED CONNECTION 4A.1 BELOW

References

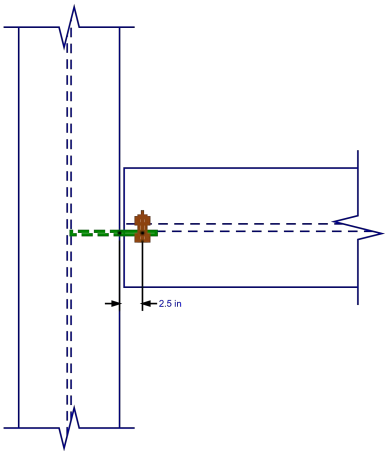
[14] Dowswell, B. et al, 2016, "Design of wrap-around gusset plates", Structural Design Solutions, LLC.

RAM Connection Standalone

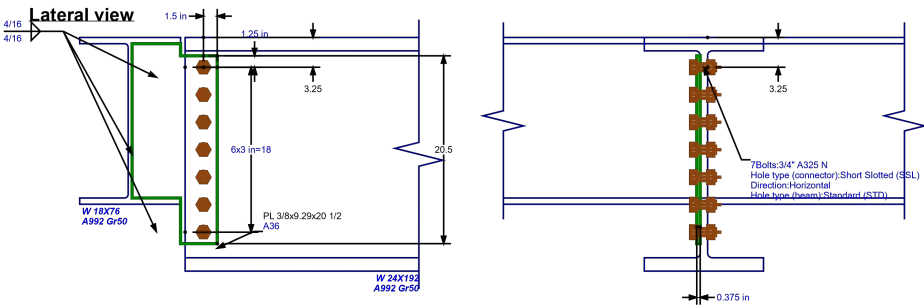
Units system: s

Current Date: s

Top view



Front view



**4A.1) Shear Connection** – W24x192 Beam connecting to W18x76 Steel beam using 3/4" Thick Extended Shear Plate with 2 rows of (7) -1"  $\phi$  A490N Bolts & 1/2" thick weld - For 235 kip Shear - **REVISED**



RAM Connection

Units system: English

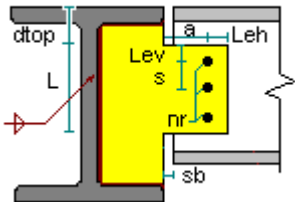
Steel Connections  
Data

Connection: 13V - SP\_BG\_1/2PL\_5B1

|              |                                                      |
|--------------|------------------------------------------------------|
| Family:      | Beam - Girder (BG)                                   |
| Type:        | Single plate                                         |
| Description: | CONN. ID -4A.1 - W24x192 BEAM TO W18x76 BEAM-REVISED |

General information

Connector



Members

Beam

General

|                                  |   |           |
|----------------------------------|---|-----------|
| Beam section                     | : | W 24X192  |
| Beam material                    | : | A992 Gr50 |
| sb: Beam setback                 | : | 0.5 in    |
| Beam edge inside support flanges | : | No        |
| Beam to girder alignment         | : | Top       |
| Horizontal angle (deg)           | : | 0         |
| Vertical angle (deg)             | : | 0         |
| Braced                           | : | No        |

Coped

|                        |   |      |
|------------------------|---|------|
| dct: Top cope depth    | : | 0 in |
| ct: Top cope length    | : | 0 in |
| dcb: Bottom cope depth | : | 0 in |
| cb: Bottom cope length | : | 0 in |

Girder

General

|                 |   |           |
|-----------------|---|-----------|
| Girder section  | : | W 18X76   |
| Girder material | : | A992 Gr50 |

Single plate

# Connector

|                                                  |   |                     |
|--------------------------------------------------|---|---------------------|
| Section                                          | : | PL 3/4x12.79x20 1/2 |
| b: Width                                         | : | 7.5 in              |
| L: Length                                        | : | 20.5 in             |
| Plate type                                       | : | Extended            |
| tp: Plate thickness                              | : | 0.75 in             |
| Material                                         | : | A36                 |
| Plate position on beam                           | : | Top                 |
| dtop: Distance to beam top                       | : | 2 in                |
| Bolts                                            | : | 1" A490 N           |
| nr: Bolt rows                                    | : | 7                   |
| nc: Bolt columns                                 | : | 2                   |
| nc: Bolt columns                                 | : | 2                   |
| g: Gage - transverse center-to-center spacing    | : | 3.5 in              |
| s: Pitch - longitudinal center-to-center spacing | : | 3 in                |
| Lev: Vertical edge distance                      | : | 1.25 in             |
| Leh: Horizontal edge distance                    | : | 1.5 in              |
| a: Distance between weld and bolts               | : | 2.5 in              |
| Hole type on plate                               | : | Short Slotted (SSL) |
| Slot direction on plate                          | : | Horizontal          |
| Hole type on beam                                | : | Standard (STD)      |
| Weld                                             | : | E70XX               |
| D: Weld size (1/16 in)                           | : | 8                   |
| Wo: Obtuse side weld size (AWS) (1/16 in)        | : | 8                   |
| Wa: Acute side weld size (AWS) (1/16 in)         | : | 8                   |
| Wo: Obtuse side weld size (AISC) (1/16 in)       | : | 8                   |
| Wa: Acute side weld size (AISC) (1/16 in)        | : | 8                   |



Units system: English

# Steel Connections Results

## Connection: 13V - SP\_BG\_1/2PL\_5B1

Family: Beam - Girder (BG)  
Type: Single plate  
Description: CONN. ID -4A.1 - W24x192 BEAM TO W18x76 BEAM-REVISED

Design code: AISC 360-16 LRFD

### Demands

| Description | Beam        |             | Left beam   |             | Load type |
|-------------|-------------|-------------|-------------|-------------|-----------|
|             | Ru<br>[kip] | Pu<br>[kip] | Ru<br>[kip] | Pu<br>[kip] |           |
| DL          | 235.00      | 0.00        | 0.00        | 0.00        | Design    |

### Geometric Considerations

| Dimensions                                  | Unit     | Value | Min. | Max.  | Sta. | References        |
|---------------------------------------------|----------|-------|------|-------|------|-------------------|
| <b>Plate (beam side)</b>                    |          |       |      |       |      |                   |
| Vertical edge distance                      | [in]     | 1.25  | 1.25 | --    | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 1.50  | 1.38 | --    | ✓    | Tables J3.4, J3.5 |
| Vertical center-to-center spacing (pitch)   | [in]     | 3.00  | 2.67 | 12.00 | ✓    | Sec. J3.5         |
| Clear distance between holes (longitudinal) | [in]     | 1.88  | 1.00 | --    | ✓    | Sec. J3.3         |
| Horizontal center-to-center spacing (gage)  | [in]     | 3.50  | 2.67 | 12.00 | ✓    | Sec. J3.5         |
| Clear distance between holes (transversal)  | [in]     | 2.19  | 1.00 | --    | ✓    | Sec. J3.3         |
| <b>Beam</b>                                 |          |       |      |       |      |                   |
| Vertical edge distance                      | [in]     | 3.25  | 1.25 | --    | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 2.00  | 1.25 | --    | ✓    | Tables J3.4, J3.5 |
| <b>Support</b>                              |          |       |      |       |      |                   |
| Weld size                                   | [1/16in] | 8     | 8    | --    | ✓    | p. 10-87          |

### Design Check

| Verification                  | Unit  | Capacity | Demand | Ctrl EQ | Ratio | References       |
|-------------------------------|-------|----------|--------|---------|-------|------------------|
| <b>Plate (beam side)</b>      |       |          |        |         |       |                  |
| Bolts shear                   | [Kip] | 266.60   | 235.00 | DL      | 0.88  | Tables (7-1..14) |
| Bolt bearing under shear load | [Kip] | 525.28   | 235.00 | DL      | 0.45  | Tables (7-1..14) |
| Bolt tearout under shear load | [Kip] | 745.46   | 235.00 | DL      | 0.32  | Sec. J3.6        |
| Shear yielding                | [Kip] | 332.10   | 235.00 | DL      | 0.71  | Eq. J4-3         |
| Shear rupture                 | [Kip] | 238.57   | 235.00 | DL      | 0.99  | Eq. J4-4         |

|                                            |          |        |        |    |             |                    |
|--------------------------------------------|----------|--------|--------|----|-------------|--------------------|
| Block shear                                | [Kip]    | 273.64 | 235.00 | DL | <b>0.86</b> | Eq. J4-5           |
| Flexural rupture                           | [Kip]    | 281.31 | 235.00 | DL | <b>0.84</b> | p. 9-6             |
| Flexural yielding                          | [Kip*ft] | 212.75 | 48.96  | DL | <b>0.23</b> | p. 10-90           |
| Lateral torsional buckling                 | [Kip*ft] | 211.19 | 48.96  | DL | <b>0.23</b> | Sec. F1            |
| Compression                                | [Kip]    | 498.15 | 0.00   | DL | <b>0.00</b> | Sec. J4.4          |
| <b>Plate (support side)</b>                |          |        |        |    |             |                    |
| Weld capacity                              | [Kip]    | 375.09 | 235.00 | DL | <b>0.63</b> | Tables 8-4 .. 8-11 |
| Interaction of flexure and shear yielding  |          | 1.00   | 0.55   | DL | <b>0.55</b> | Eq. 10-5           |
| <b>Beam</b>                                |          |        |        |    |             |                    |
| Bolt bearing under shear load              | [Kip]    | 635.77 | 235.00 | DL | <b>0.37</b> | Tables (7-1..14)   |
| Shear yielding                             | [Kip]    | 619.65 | 235.00 | DL | <b>0.38</b> | Eq. J4-3           |
| <b>Support</b>                             |          |        |        |    |             |                    |
| Shear rupture of base metal at fillet weld | [in]     | 0.43   | 0.38   | DL | <b>0.90</b> | Eq. 9-2            |
| Shear strength at welds                    | [Kip]    | 509.68 | 235.00 | DL | <b>0.46</b> | Eq. J4-4           |
| <b>Bolt group</b>                          |          |        |        |    |             |                    |
| Bolt effective strength                    | [Kip]    | 266.60 | 235.00 | DL | <b>0.88</b> | Sec. J3.6          |

---

|                                       |             |
|---------------------------------------|-------------|
| <b>Global critical strength ratio</b> | <b>0.99</b> |
|---------------------------------------|-------------|

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Notes

The plate is designed with the extended configuration criteria.

References

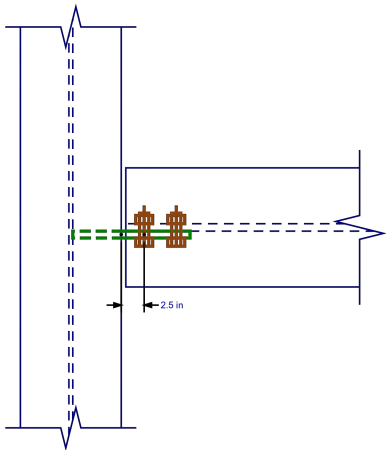
[14] Dowswell, B. et al, 2016, "Design of wrap-around gusset plates", Structural Design Solutions, LLC.

RAM Connection Standalone

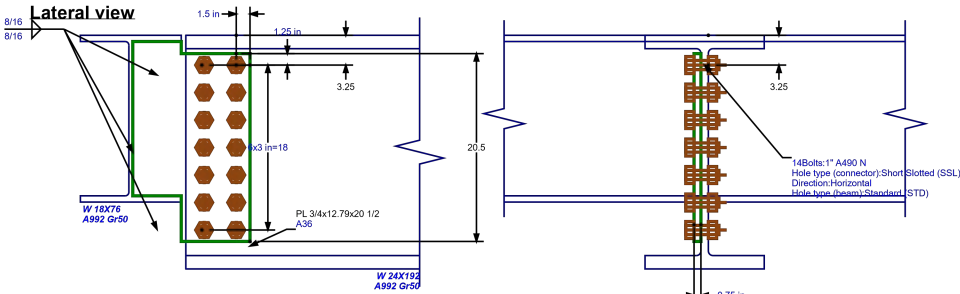
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Current Date: s

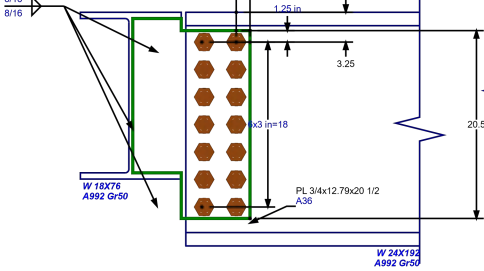
Top view



Front view



Lateral view



**4B) Shear Connection** – W24x192 Beam connecting to W24x176 Steel beam using 3/8" Thick Extended Shear Plate with (7) -3/4"  $\phi$  A325N Bolts & 1/4" thick weld - For 250 kip Shear - **NO GOOD**



RAM Connection

Units system: English

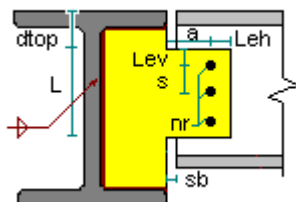
## Steel Connections Data

### Connection: 10V - SP\_BG\_1/2PL\_5B1

Family: Beam - Girder (BG)  
Type: Single plate  
Description: **CONN. ID -4B - W24x192 BEAM TO W24x176 BEAM NO GOOD**

### General information

#### Connector



### Members

#### Beam

##### General

|                                  |   |           |
|----------------------------------|---|-----------|
| Beam section                     | : | W 24X192  |
| Beam material                    | : | A992 Gr50 |
| sb: Beam setback                 | : | 0.5 in    |
| Beam edge inside support flanges | : | No        |
| Beam to girder alignment         | : | Top       |
| Horizontal angle (deg)           | : | 0         |
| Vertical angle (deg)             | : | 0         |
| Braced                           | : | No        |

##### Coped

|                        |   |      |
|------------------------|---|------|
| dct: Top cope depth    | : | 0 in |
| ct: Top cope length    | : | 0 in |
| dcb: Bottom cope depth | : | 0 in |
| cb: Bottom cope length | : | 0 in |

#### Girder

##### General

|                 |   |           |
|-----------------|---|-----------|
| Girder section  | : | W 24X176  |
| Girder material | : | A992 Gr50 |

### Single plate

# Connector

|                                                  |   |                     |
|--------------------------------------------------|---|---------------------|
| Section                                          | : | PL 3/8x10.08x20 1/2 |
| b: Width                                         | : | 4 in                |
| L: Length                                        | : | 20.5 in             |
| Plate type                                       | : | Extended            |
| tp: Plate thickness                              | : | 0.375 in            |
| Material                                         | : | A36                 |
| Plate position on beam                           | : | Top                 |
| dtop: Distance to beam top                       | : | 1.5 in              |
| Bolts                                            | : | 3/4" A325 N         |
| nr: Bolt rows                                    | : | 7                   |
| nc: Bolt columns                                 | : | 1                   |
| nc: Bolt columns                                 | : | 1                   |
| s: Pitch - longitudinal center-to-center spacing | : | 3 in                |
| Lev: Vertical edge distance                      | : | 1.25 in             |
| Leh: Horizontal edge distance                    | : | 1.5 in              |
| a: Distance between weld and bolts               | : | 2.5 in              |
| Hole type on plate                               | : | Short Slotted (SSL) |
| Slot direction on plate                          | : | Horizontal          |
| Hole type on beam                                | : | Standard (STD)      |
| Weld                                             | : | E70XX               |
| D: Weld size (1/16 in)                           | : | 4                   |
| Wo: Obtuse side weld size (AWS) (1/16 in)        | : | 4                   |
| Wa: Acute side weld size (AWS) (1/16 in)         | : | 4                   |
| Wo: Obtuse side weld size (AISC) (1/16 in)       | : | 4                   |
| Wa: Acute side weld size (AISC) (1/16 in)        | : | 4                   |



Units system: English

# Steel Connections Results

## Connection: 10V - SP\_BG\_1/2PL\_5B1

Family: Beam - Girder (BG)  
Type: Single plate  
Description: CONN. ID -4B - W24x192 BEAM TO W24x176 BEAM NO GOOD

Design code: AISC 360-16 LRFD

### Demands

| Description | Beam        |             | Left beam   |             | Load type |
|-------------|-------------|-------------|-------------|-------------|-----------|
|             | Ru<br>[kip] | Pu<br>[kip] | Ru<br>[kip] | Pu<br>[kip] |           |
| DL          | 250.00      | 0.00        | 0.00        | 0.00        | Design    |

### Geometric Considerations

| Dimensions                                  | Unit     | Value | Min. | Max. | Sta. | References        |
|---------------------------------------------|----------|-------|------|------|------|-------------------|
| <b>Plate (beam side)</b>                    |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 1.25  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 1.50  | 1.13 | --   | ✓    | Tables J3.4, J3.5 |
| Vertical center-to-center spacing (pitch)   | [in]     | 3.00  | 2.00 | 9.00 | ✓    | Sec. J3.5         |
| Clear distance between holes (longitudinal) | [in]     | 2.19  | 0.75 | --   | ✓    | Sec. J3.3         |
| <b>Beam</b>                                 |          |       |      |      |      |                   |
| Vertical edge distance                      | [in]     | 3.21  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 2.00  | 1.00 | --   | ✓    | Tables J3.4, J3.5 |
| <b>Support</b>                              |          |       |      |      |      |                   |
| Weld size                                   | [1/16in] | 4     | 4    | --   | ✓    | p. 10-87          |

### Design Check

| Verification                  | Unit  | Capacity | Demand | Ctrl EQ | Ratio | References       |
|-------------------------------|-------|----------|--------|---------|-------|------------------|
| <b>Plate (beam side)</b>      |       |          |        |         |       |                  |
| Bolts shear                   | [Kip] | 63.70    | 250.00 | DL      | 3.92  | Tables (7-1..14) |
| Bolt bearing under shear load | [Kip] | 104.49   | 250.00 | DL      | 2.39  | Tables (7-1..14) |
| Bolt tearout under shear load | [Kip] | 138.40   | 250.00 | DL      | 1.81  | Sec. J3.6        |
| Shear yielding                | [Kip] | 166.05   | 250.00 | DL      | 1.51  | Eq. J4-3         |
| Shear rupture                 | [Kip] | 140.70   | 250.00 | DL      | 1.78  | Eq. J4-4         |
| Block shear                   | [Kip] | 132.75   | 250.00 | DL      | 1.88  | Eq. J4-5         |
| Flexural rupture              | [Kip] | 149.44   | 250.00 | DL      | 1.67  | p. 9-6           |

|                                            |          |        |        |    |      |                    |
|--------------------------------------------|----------|--------|--------|----|------|--------------------|
| Flexural yielding                          | [Kip*ft] | 106.38 | 52.08  | DL | 0.49 | p. 10-90           |
| Lateral torsional buckling                 | [Kip*ft] | 99.00  | 52.08  | DL | 0.53 | Sec. F1            |
| Compression                                | [Kip]    | 239.21 | 0.00   | DL | 0.00 | Sec. J4.4          |
| <b>Plate (support side)</b>                |          |        |        |    |      |                    |
| Weld capacity                              | [Kip]    | 250.80 | 250.00 | DL | 1.00 | Tables 8-4 .. 8-11 |
| Interaction of flexure and shear yielding  |          | 1.00   | 2.51   | DL | 2.51 | Eq. 10-5           |
| <b>Beam</b>                                |          |        |        |    |      |                    |
| Bolt bearing under shear load              | [Kip]    | 252.93 | 250.00 | DL | 0.99 | Tables (7-1..14)   |
| Shear yielding                             | [Kip]    | 619.65 | 250.00 | DL | 0.40 | Eq. J4-3           |
| <b>Support</b>                             |          |        |        |    |      |                    |
| Shear rupture of base metal at fillet weld | [in]     | 0.75   | 0.19   | DL | 0.25 | Eq. 9-2            |
| Shear strength at welds                    | [Kip]    | 899.44 | 250.00 | DL | 0.28 | Eq. J4-4           |
| <b>Bolt group</b>                          |          |        |        |    |      |                    |
| Bolt effective strength                    | [Kip]    | 63.70  | 250.00 | DL | 3.92 | Sec. J3.6          |

---

|                                       |             |
|---------------------------------------|-------------|
| <b>Global critical strength ratio</b> | <b>3.92</b> |
|---------------------------------------|-------------|

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Notes

The plate is designed with the extended configuration criteria.

REFER TO REVISED  
CONNECTION 4B.1 BELOW

References

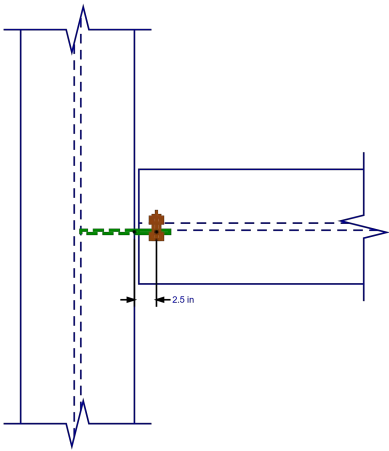
[14] Dowswell, B. et al, 2016, "Design of wrap-around gusset plates", Structural Design Solutions, LLC.

RAM Connection Standalone

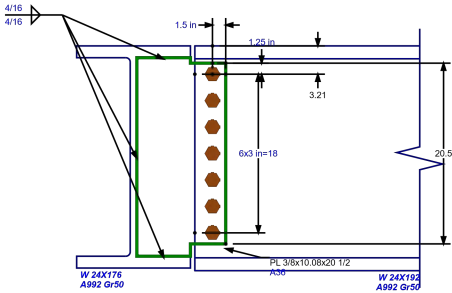
Units system: s

Current Date: s

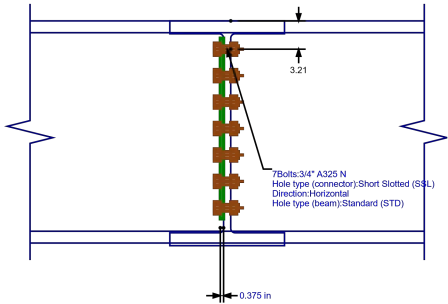
Top view



Lateral view



Front view



**4B.1) Shear Connection** – W24x192 Beam connecting to W24x176 Steel beam using 3/4" Thick Extended Shear Plate with 2 rows of (7) -1"  $\phi$  A490N Bolts & 1/2" thick weld - For 250 kip Shear - **REVISED**



RAM Connection

Units system: English

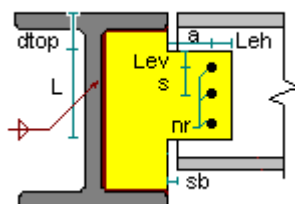
## Steel Connections Data

### Connection: 14V - SP\_BG\_1/2PL\_5B1

Family: Beam - Girder (BG)  
Type: Single plate  
Description: **CONN. ID -4B.1 - W24x192 BEAM TO W24x176 BEAM REVISED**

### General information

#### Connector



### Members

#### Beam

##### General

|                                  |   |           |
|----------------------------------|---|-----------|
| Beam section                     | : | W 24X192  |
| Beam material                    | : | A992 Gr50 |
| sb: Beam setback                 | : | 0.5 in    |
| Beam edge inside support flanges | : | No        |
| Beam to girder alignment         | : | Top       |
| Horizontal angle (deg)           | : | 0         |
| Vertical angle (deg)             | : | 0         |
| Braced                           | : | No        |

##### Coped

|                        |   |      |
|------------------------|---|------|
| dct: Top cope depth    | : | 0 in |
| ct: Top cope length    | : | 0 in |
| dcb: Bottom cope depth | : | 0 in |
| cb: Bottom cope length | : | 0 in |

#### Girder

##### General

|                 |   |           |
|-----------------|---|-----------|
| Girder section  | : | W 24X176  |
| Girder material | : | A992 Gr50 |

### Single plate

# Connector

|                                                  |   |                     |
|--------------------------------------------------|---|---------------------|
| Section                                          | : | PL 3/4x13.58x20 1/2 |
| b: Width                                         | : | 7.5 in              |
| L: Length                                        | : | 20.5 in             |
| Plate type                                       | : | Extended            |
| tp: Plate thickness                              | : | 0.75 in             |
| Material                                         | : | A36                 |
| Plate position on beam                           | : | Top                 |
| dtop: Distance to beam top                       | : | 2 in                |
| Bolts                                            | : | 1" A490 N           |
| nr: Bolt rows                                    | : | 7                   |
| nc: Bolt columns                                 | : | 2                   |
| nc: Bolt columns                                 | : | 2                   |
| g: Gage - transverse center-to-center spacing    | : | 3.5 in              |
| s: Pitch - longitudinal center-to-center spacing | : | 3 in                |
| Lev: Vertical edge distance                      | : | 1.25 in             |
| Leh: Horizontal edge distance                    | : | 1.5 in              |
| a: Distance between weld and bolts               | : | 2.5 in              |
| Hole type on plate                               | : | Short Slotted (SSL) |
| Slot direction on plate                          | : | Horizontal          |
| Hole type on beam                                | : | Standard (STD)      |
| Weld                                             | : | E70XX               |
| D: Weld size (1/16 in)                           | : | 8                   |
| Wo: Obtuse side weld size (AWS) (1/16 in)        | : | 8                   |
| Wa: Acute side weld size (AWS) (1/16 in)         | : | 8                   |
| Wo: Obtuse side weld size (AISC) (1/16 in)       | : | 8                   |
| Wa: Acute side weld size (AISC) (1/16 in)        | : | 8                   |



Units system: English

# Steel Connections Results

## Connection: 14V - SP\_BG\_1/2PL\_5B1

Family: Beam - Girder (BG)  
Type: Single plate  
Description: CONN. ID -4B.1 - W24x192 BEAM TO W24x176 BEAM REVISED

Design code: AISC 360-16 LRFD

### Demands

| Description | Beam        |             | Left beam   |             | Load type |
|-------------|-------------|-------------|-------------|-------------|-----------|
|             | Ru<br>[kip] | Pu<br>[kip] | Ru<br>[kip] | Pu<br>[kip] |           |
| DL          | 250.00      | 0.00        | 0.00        | 0.00        | Design    |

### Geometric Considerations

| Dimensions                                  | Unit     | Value | Min. | Max.  | Sta. | References        |
|---------------------------------------------|----------|-------|------|-------|------|-------------------|
| <b>Plate (beam side)</b>                    |          |       |      |       |      |                   |
| Vertical edge distance                      | [in]     | 1.25  | 1.25 | --    | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 1.50  | 1.38 | --    | ✓    | Tables J3.4, J3.5 |
| Vertical center-to-center spacing (pitch)   | [in]     | 3.00  | 2.67 | 12.00 | ✓    | Sec. J3.5         |
| Clear distance between holes (longitudinal) | [in]     | 1.88  | 1.00 | --    | ✓    | Sec. J3.3         |
| Horizontal center-to-center spacing (gage)  | [in]     | 3.50  | 2.67 | 12.00 | ✓    | Sec. J3.5         |
| Clear distance between holes (transversal)  | [in]     | 2.19  | 1.00 | --    | ✓    | Sec. J3.3         |
| <b>Beam</b>                                 |          |       |      |       |      |                   |
| Vertical edge distance                      | [in]     | 3.25  | 1.25 | --    | ✓    | Tables J3.4, J3.5 |
| Horizontal edge distance                    | [in]     | 2.00  | 1.25 | --    | ✓    | Tables J3.4, J3.5 |
| <b>Support</b>                              |          |       |      |       |      |                   |
| Weld size                                   | [1/16in] | 8     | 8    | --    | ✓    | p. 10-87          |

### Design Check

| Verification                  | Unit  | Capacity | Demand | Ctrl EQ | Ratio | References       |
|-------------------------------|-------|----------|--------|---------|-------|------------------|
| <b>Plate (beam side)</b>      |       |          |        |         |       |                  |
| Bolts shear                   | [Kip] | 250.42   | 250.00 | DL      | 1.00  | Tables (7-1..14) |
| Bolt bearing under shear load | [Kip] | 493.39   | 250.00 | DL      | 0.51  | Tables (7-1..14) |
| Bolt tearout under shear load | [Kip] | 659.17   | 250.00 | DL      | 0.38  | Sec. J3.6        |
| Shear yielding                | [Kip] | 332.10   | 250.00 | DL      | 0.75  | Eq. J4-3         |
| Shear rupture                 | [Kip] | 238.57   | 250.00 | DL      | 1.05  | Eq. J4-4         |

|                                            |          |        |        |    |      |                    |
|--------------------------------------------|----------|--------|--------|----|------|--------------------|
| Block shear                                | [Kip]    | 273.64 | 250.00 | DL | 0.91 | Eq. J4-5           |
| Flexural rupture                           | [Kip]    | 255.47 | 250.00 | DL | 0.98 | p. 9-6             |
| Flexural yielding                          | [Kip*ft] | 212.75 | 52.08  | DL | 0.24 | p. 10-90           |
| Lateral torsional buckling                 | [Kip*ft] | 211.19 | 52.08  | DL | 0.25 | Sec. F1            |
| Compression                                | [Kip]    | 498.15 | 0.00   | DL | 0.00 | Sec. J4.4          |
| <b>Plate (support side)</b>                |          |        |        |    |      |                    |
| Weld capacity                              | [Kip]    | 501.61 | 250.00 | DL | 0.50 | Tables 8-4 .. 8-11 |
| Interaction of flexure and shear yielding  |          | 1.00   | 0.63   | DL | 0.63 | Eq. 10-5           |
| <b>Beam</b>                                |          |        |        |    |      |                    |
| Bolt bearing under shear load              | [Kip]    | 597.17 | 250.00 | DL | 0.42 | Tables (7-1..14)   |
| Shear yielding                             | [Kip]    | 619.65 | 250.00 | DL | 0.40 | Eq. J4-3           |
| <b>Support</b>                             |          |        |        |    |      |                    |
| Shear rupture of base metal at fillet weld | [in]     | 0.75   | 0.38   | DL | 0.51 | Eq. 9-2            |
| Shear strength at welds                    | [Kip]    | 899.44 | 250.00 | DL | 0.28 | Eq. J4-4           |
| <b>Bolt group</b>                          |          |        |        |    |      |                    |
| Bolt effective strength                    | [Kip]    | 250.42 | 250.00 | DL | 1.00 | Sec. J3.6          |

|                                |      |
|--------------------------------|------|
| Global critical strength ratio | 1.05 |
|--------------------------------|------|

Notes

The plate is designed with the extended configuration criteria.

CONSIDERED 10% OVERAGE ALLOWANCE FOR CONNECTION DESIGN.

References

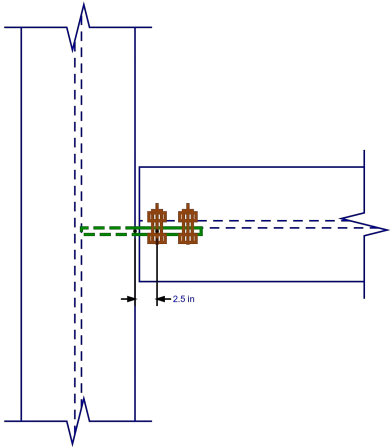
[14] Dowswell, B. et al, 2016, "Design of wrap-around gusset plates", Structural Design Solutions, LLC.

RAM Connection Standalone

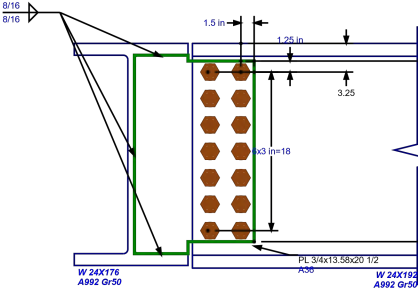
Units system: s

Current Date: s

Top view



Lateral view



Front view

