Steel-to-Steel Connections: An Introduction for Engineers and Architects

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VP of Sales
LNA Solutions, Inc.
About LNA Solutions

**LNA Solutions:** The industry leader in steel-to-steel connections technical design expertise and industry-tested products

- Specialize in steel connections
- Manufacturer with worldwide distribution
- In-house engineers provide technical and design support
- Regional sales force provide site visits/consulting
- International product approvals - Lloyd’s, DIBt and ICC ES ESR 3217
- Over 70 years of industry experience
Steelwork Clamping Options

Any Size

Any Orientation

Any Shape
Loading Criteria

- Shear
- Compression
- Combined
- Tensile
- Frictional
Typical Beam to Beam Connection

- Top BeamClamps
- Top Spacer or Packing
- Location Plate
- Bottom Spacer or Packing
- Bottom BeamClamps
# Typical Beam Connection Load Table

## Four Bolt BeamClamp Connections

<table>
<thead>
<tr>
<th>Bolt Diameter</th>
<th>Standard BeamClamps</th>
<th>High Capacity (BY)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/2&quot;</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>Tensile Load (4 bolts in lbs.)</td>
<td>5,172</td>
<td>8,876</td>
</tr>
<tr>
<td>Frictional Load (4 bolts in lbs.)</td>
<td>292</td>
<td>877</td>
</tr>
<tr>
<td>Shear Load (2 bolts in lbs.)</td>
<td>---</td>
<td>7,360</td>
</tr>
<tr>
<td>Torque (ft. lbs.)</td>
<td>51</td>
<td>109</td>
</tr>
</tbody>
</table>
Designing a Connection

What do I need to know?

- Steel sections being connected
- Orientation of the steel sections
- Loading requirements
LNA Design Assembly Detail

BeamClamp

SAFE WORKING
TENSION LOAD = 42,522 lbs
per connection

FACTOR OF SAFETY ON
BEAMCLAMP CLAMPS
= 5:1

SAFE WORKING
FRICTION LOAD = 8,222 lbs
per connection

FACTOR OF SAFETY ON
BEAMCLAMP CLAMPS
= 2:1

BOLT TORQUE = 346 ft-lbs

ITEM NO. | BeamClamp PART# | QTY.
---|---|---
1 | B7TC20 | 6
2 | BHC20 | 6
3 | 3/4" x 8-1/2" A325 Bolt Set | 6
4 | 3/4" End Plate w/ 7/8" Holes (by Others) | 1

SECTION A-A
SCALE 1:6

DETAIL B
SCALE 1:3

BeamClamp®

Customer Signature of Approval Date

[BeamClamp logo]

LNA SOLUTIONS
A SSE SECURITY COMPANY

CUSTOMER: [Name]
SINCE [Date]

DATE: 1/7/14
PROJ: [Project Name]

PART #: LGC14401001-3

SCALE N-T-S
RIG No. 014401001-3
LNA Design Assembly Detail
THE FOLLOWING DESIGN REVIEW IS FOR REFERENCE ONLY!

CONNECTION CHECKS FOR GIRDER CLAMP:

LNA SOLUTIONS DRAWING: D1609301

Customer Support No.: CALCIULATED VALUES

Reactions at Support

### Existing Beam Dimensions

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>9.00 kips</td>
</tr>
<tr>
<td>M1</td>
<td>0.00 k-ft</td>
</tr>
<tr>
<td>F2</td>
<td>0.00 kips</td>
</tr>
<tr>
<td>M2</td>
<td>0.00 k-ft</td>
</tr>
<tr>
<td>F3</td>
<td>0.00 kips</td>
</tr>
<tr>
<td>M3</td>
<td>0.00 k-ft</td>
</tr>
</tbody>
</table>

### Cap Plate Dimensions (in)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTS1</td>
<td>7.50</td>
</tr>
<tr>
<td>Plate Width</td>
<td>6.00</td>
</tr>
<tr>
<td>B</td>
<td>1.25</td>
</tr>
<tr>
<td>Thickness</td>
<td>0.61</td>
</tr>
<tr>
<td>Hole Dia.</td>
<td>0.69</td>
</tr>
</tbody>
</table>

### Beam Clamp Clamp Dimensions (in)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTS2</td>
<td>3.50</td>
</tr>
<tr>
<td>Plate Length</td>
<td>7.50</td>
</tr>
<tr>
<td>D1/D2</td>
<td>1.31</td>
</tr>
<tr>
<td>Thicknes</td>
<td>0.61</td>
</tr>
</tbody>
</table>

### Bolt & Nut Dimensions (in)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolt Length</td>
<td>3.585</td>
</tr>
<tr>
<td>Std. Nut Thickness</td>
<td>0.625</td>
</tr>
<tr>
<td>Bolt Dia.</td>
<td>0.63</td>
</tr>
<tr>
<td>Washer Thickness</td>
<td>0.125</td>
</tr>
<tr>
<td>Inst. Allowance</td>
<td>0.313</td>
</tr>
</tbody>
</table>

1.) Check Beam Clamp Clamp Capacity

Try 3/4" Type BY

Total Tension per Clamp (T) = 2.25 kips

Try 5/8" Type BK 2.71 kips Value from LNA Solutions Catalog

Result: 5/8 in Type BK OK
What Happens to the Flange?

Prying Action on Flange
Failure Mode Analysis

Failure Mode 1: Plastic Flange Failure

Failure Mode 2: Combined bolt/clamp failure and flange failure

Failure Mode 3: Bolt Failure
Beam Clamp Summary

- No drilling or welding
- No hot work permits
- No Abatement Precautions
- Onsite adjustability during installation
- No weakening of existing steelwork
- Reduced design time/installation costs
- Guaranteed load capabilities
- Free technical support & CAD drawings
- Easy to specify
Beam Clamp Applications
Monorail Connections
Wind Turbine Support Structure
Temporary Pulley Track for Construction Lift
Medical Equipment Supports
Pulaski Skyway Bridge Supports
Offshore Drilling Platform Monorails
Lighting Support with Rigging Clamps
Rigging Clamp Used as Life Line End Connection
Rigging Clamp Used to Support Lighting Structure
Box Bolt

- For connecting to hollow steel sections without: *Drilling/Tapping, Welding, Through-Bolting, or Access Holes*
- Only requires one-sided access
- Basic hand tools required for 15-second install
- Approved by ICC (ES ESR-3217)
- Guaranteed load and aesthetic design
- Suitable for rectangular, square, & circular tube
Box Bolt Applications
Standard Box Bolt Options

- Available in Three Finishes:
  - Zinc plated, hot-dip galvanized, stainless steel
- Available in Three Lengths: (Specials Available)
  - Size 1 – Clamping Range: 1/8” thru 1-5/8”
  - Size 2 – Clamping Range: 11/16” thru 2-13/16”
  - Size 3 – Clamping Range: 1-3/16” thru 4”
- Available in Six Diameters (Core Bolt)
- Various Fastener Styles:
  - Countersunk, button head, hex head, & socket head
Type C Box Bolt Options (ICC Approved)

- Available with One Finish:
  - Hot-dip galvanized

- Available in Three Lengths: (Specials Available)
  - Size 1 – Clamping Range: 3/8” thru 1-13/16”
  - Size 2 – Clamping Range: 11/16” thru 3”
  - Size 3 – Clamping Range: 1-1/2” thru 4”

- Available in Three Diameters (Core Bolt):
  - 1/2”, 5/8”, 3/4”

- Fastener Head Styles:
  - Hexagon head
One World Trade Center, NYC
Mercedes-Benz Stadium, Georgia
Box Bolt Summary

- ICC Approval
- No tapping, welding, strapping through-bolting, etc.
- No site power or special tools required
- Different finishes available
- Reduced installation cost/time
- No touch-up required
- Guaranteed load capabilities
- Free technical support
Why Utilize the LNA Solutions Method

- No site drilling or welding required
- No “Hot Work” required
- No damage to existing coatings
- No special tools or skilled labor
- No weakening of existing steel
- On site adjustability
- Reduced installation costs
- Solutions where drilling/welding won’t work!
Why Utilize the LNA Solutions Method

- Regional sales force
- Site surveys
- Guaranteed load capacity
- Factor of safety - 5:1
- Free technical design assistance
- Free drawings and calculations
- Free specifications assistance
Questions?

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