Technical Note

Blast Design of Cold Formed Steel Connections

# STRENGTH TABLES FOR SPECIAL SEISMIC AND BLAST DESIGN OF COLD FORMED STEEL CONNECTIONS

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# STRENGTH TABLES FOR SPECIAL SEISMIC AND BLAST DESIGN OF COLD FORMED STEEL CONNECTIONS

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## Introduction

Various specifications and design standards allow the use of nominal strength of material when calculating resistance values of components for special blast or seismic design. Beyond the use of nominal strength, some design codes allow the use of an increased nominal strength or an increased expected strength. A Static Increase Factor (SIF) and a Dynamic Increase Factor (DIF) can be applied to nominal and expected strength, respectively, to attain greater material strength of components for special design purposes and when using dynamic analysis. The Steel Network has developed LRFD design strength, nominal strength and ultimate strength tables for each connector manufactured which can be used in special seismic and blast design and are compatible with the Static and Dynamic Strength Increase factors. This technical note provides background on the development of TSN connectors' strength and how to use it for seismic and blast design per various codes and standards in the US.

## Seismic Design

Special seismic design requirements are mandated in AISI S213 section C1.1 "Seismic Requirements", which are applicable to the design of cold formed steel shear walls or systems using diagonal strap bracing that resists wind, seismic, or other in-plane lateral loads. Section C1.1 directs the designer to the "Special Seismic Requirements" section, Section C5, if the design is in the United States or Mexico and the Response Modification coefficient, R, is greater than 3.

Section C5 "Special Seismic Requirements" is referenced and contains the provisions allowing nominal strength of materials to be used in the design of members and/or connections. Section C5.1 "Shear Walls" and Section C5.2 "Diagonal Strap Bracing" presents the provisions for design of connections, chord studs, anchorage, and foundations when using a shear wall or diagonal strap bracing lateral force resistance systems. Section C5.2.2.2 presents provisions that allow the nominal strength to be used for design of connections in the load path of diagonal strap bracing. This section states:

*"All members in the load path and uplift and shear anchorage thereto from the diagonal strap bracing member to the foundation shall have the* ***nominal strength*** *to resist the expected yield strength $A_gR_yF_y$, of the diagonal strap bracing member(s), except the* ***nominal strength*** *need not exceed the following, as applicable:*

*(a) In the United States and Mexico: Amplified seismic load.*
*(b) In Canada: Maximum anticipated seismic loads calculated with $R_dR_o$= 1.0."*

The load to design for is the expected strength of the diagonal strap bracing, but not to exceed the amplified seismic load.

**Blast Design**

UFC 4-010-01 Section B-3 outlines the design of window and skylight systems under extreme pressure loading such as a blast. Provisions are given for a static or dynamic method of design for window and skylight opening framing and connections. Section B-3.1 "Standard 10. Windows and Skylights" provides guidance on not reducing the nominal strength with a strength reduction factor for flexural mode. The code states:

*"Use strength design with load factors of 1.0 and **strength reduction factors** of 1.0 for all methods of analysis referenced herein \1\ for flexure and use typical strength reduction factors for other modes of failure."*

The UFC design code provides an alternative design method utilizing the dynamic material properties of the window glazing, framing members, connections, and supporting structural elements. Section B-3.1.1 "Dynamic Analysis" states:

*"Any of the glazing, framing members, connections, and supporting structural elements may be designed using **dynamic** analysis to prove the window or skylight system will provide performance equivalent to or better than the hazard rating associated with the applicable level of protection as indicated in Table 2-1... The design loading for a **dynamic** analysis will be the appropriate pressure and impulse from the applicable explosive weight at the actual standoff distance at which the window is sited. The design loading will be applied over the area tributary to the element being analyzed."*

The dynamic method of analysis and design of framing members incorporates strength increase factors that enhance the nominal and expected strength of materials. A Static Increase Factor (SIF) or Average Strength Factor (ASF) can be applied to the nominal strength of a material, while a Dynamic Increase Factor (DIF) can be applied to the expected strength of a material.

Documents such as the UFC 3-340-02, the ASCE Publication "Design of Blast-Resistant Buildings in Petrochemical Facilities", and the ASCE 59-11 Standard describe Static and Dynamic Increase Factors and the uses of each. Since the nominal strength is typically taken as the lower bound minimum yield strength of the material, the Static Increase Factor (SIF) or Average Strength Factor (ASF) are applied to the nominal strength to account for higher yield strength of installed components than minimum specified yield strength values. The resultant value is the "expected strength". Beyond the use of this expected strength level, ASCE and the UFC code states that the Dynamic Increase Factor (DIF) is to be applied to the expected strength to account for strain rate effects from a rapid blast loading to achieve greater dynamic strengths. Table 1 shows suggested increase factors to be used for cold-formed steel design as recommended by two different ASCE publications and the DoD UFC 3-340-02.

Table 1 - Static and Dynamic Increase Factors for Cold-Formed Steel

| | Static Increase Factor (SIF) or Average Strength Factor (ASF) | Dynamic Increase Factor (DIF) | |
|---|---|---|---|
| | | Bending/ Shear | Tension/ Compression |
| ASCE/SEI 59-11 (2011) | 1.1 | 1.1 | 1.1 |
| ASCE Design of Blast-Resistant Buildings in Petrochemical Facilities (2010) | 1.21 | 1.1 | 1.1 |
| UFC 3-340-02 (2014) | 1.21 | 1.1 | 1.1 |

In reference to the AISI S100-12 Specifications and the development of the nominal strength tables, it should be noted that LRFD design strength is typically determined as the nominal strength multiplied by the appropriate resistance factor (φ). Chapter F of the AISI Specification permits the calculation of LRFD design strength based on the ultimate strength of a specimen tested according to the provisions given within. This ultimate strength value is then multiplied by a smaller resistance factor than what is given in the main specification. Figure **1** is a diagram depicting the various levels of strength and the relationship between LRFD design strength, nominal strength, expected strength, ultimate strength, and dynamic strength.

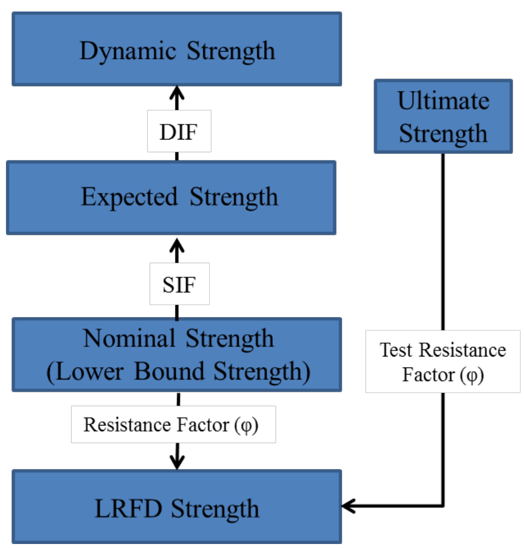


Figure 1 - Strength Relationship Diagram

## Strength Tables

The Steel Network has developed the following tables to present the LRFD design strength, nominal strength, and ultimate strength for all clip connectors manufactured. The ultimate and LRFD values for each clip are calculated according to the test method specified in AISI S100-12, Chapter F. The nominal strength is calculated as the LRFD strength divided by an average resistance factor of 0.9. Clip connectors or load directions marked with an (*) have their LRFD, nominal, and ultimate strength values all calculated using AISI S100-12 provisions.

### MasterClip® Series

| Connector (Application) | Load Direction | LRFD Design Strength (lbs) | Nominal Strength (lbs) | Ultimate Strength (lbs) |
|---|---|---|---|---|
| **VLB600 (Vertical Deflection)** | F1 | 362 | 402 | 612 |
| | F2 | 2,509 | 2,788 | 4,245 |
| **VLB600 (Rigid Connection)** | F1 | 1,481 | 1,646 | 2,506 |
| | F2 | 3,586 | 3,984 | 6,067 |
| | F3 | 2,869 | 3,188 | 4,855 |
| **VLB800 (Vertical Deflection)** | F1 | 440 | 489 | 745 |
| | F2 | 2,509 | 2,788 | 4,245 |
| **VLB800 (Rigid Connection)** | F1 | 1,576 | 1,751 | 2,667 |
| | F2 | 3,586 | 3,984 | 6,067 |
| | F3 | 2,032 | 2,258 | 3.438 |

**Notes:**
Strength values provided are those of the clip only (One clip). Attachment to stud framing and to structure must be evaluated independently.
Nominal Strength is calculated as LRFD Strength divided by an average resistance factor of 0.9.
Ultimate Strength is the average maximum load obtained from tests.
When dynamic analysis is used for blast design, the Nominal Strength may be allowed to be increased by a Static Increase Factor (SIF) and a Dynamic Increase Factor (DIF).

### VertiClip® Series

| Connector | Load Direction | LRFD Design Strength (lbs) | Nominal Strength (lbs) | Ultimate Strength (lbs) |
|---|---|---|---|---|
| **SL362** | F1 | 397 | 441 | 721 |
| | F2 | 1,696 | 1,885 | 2,680 |
| **SL400** | F1 | 318 | 353 | 600 |
| | F2 | 1,817 | 2,019 | 3,074 |
| **SL600** | F1 | 588 | 653 | 1,068 |
| | F2 | 2,691 | 2,990 | 4,251 |
| **SL800** | F1 | 579 | 643 | 1,052 |
| | F2 | 2,994 | 3,327 | 4,730 |
| **SL1000** | F1 | 664 | 738 | 1,206 |
| | F2 | 2,521 | 2,801 | 4,266 |
| **SL1200** | F1 | 611 | 679 | 1,110 |
| | F2 | 2,863 | 3,182 | 4,845 |
| **SLD150** | F2 | 82 | 91 | 139 |
| **SLD250** | F2 | 254 | 282 | 430 |
| **SLD362/400** | F2 | 575 | 639 | 973 |
| **SLD600** | F2 | 648 | 720 | 1,302 |
| **SLD800** | F2 | 1,091 | 1,212 | 1,844 |

| Connector | Load Direction | LRFD Design Strength (lbs) | Nominal Strength (lbs) | Ultimate Strength (lbs) |
|---|---|---|---|---|
| **SLB250** | F1 | 362 | 402 | 612 |
| | F2 | 2,509 | 2,788 | 4,245 |
| **SLB362** | F1 | 362 | 402 | 612 |
| | F2 | 2,509 | 2,788 | 4,245 |
| **SLB600** | F1 | 362 | 402 | 612 |
| | F2 | 2,509 | 2,788 | 4,245 |
| **SLB600-HD, (2) ¼” Screws** | F1 | 374 | 416 | 679 |
| | F2 | 1,901 | 2,112 | 3,216 |
| **SLB600-HD, (1) ½” Anchor** | F1 | 375 | 417 | 673 |
| | F2 | 1,606 | 1,785 | 2,718 |
| **SLB800** | F1 | 440 | 489 | 745 |
| | F2 | 2,509 | 2,788 | 4,245 |
| **SLB1000** | F2 | 2,430 | 2,700 | 4,112 |
| **SLB1200** | F2 | 2,430 | 2,700 | 4,112 |
| **SLBxxx-10, -12** | F2 | 2,430 | 2,700 | 4,112 |
| **SLS362/400-9, -12** | F2 | 1,991 | 2,212 | 3,821 |
| **SLS600-12** | F2 | 3,315 | 3,683 | 5,237 |
| **SLS600-15, -18, -20** | F2 | 3,398 | 3,776 | 5,750 |
| **SLS600-24** | F2 | 3,036 | 3,373 | 5,137 |
| **SLS800-12, -15, -18, -20** | F2 | 2,909 | 3,232 | 4,922 |
| **SLT9.5** | F1 | 546 | 607 | 991 |
| | F2 | 822 | 913 | 1,492 |
| **SLT(L)-12** | F1 | 784 | 871 | 1,422 |
| | F2 | 1,446 | 1,606 | 2,446 |
| **SLT(L)-15** | F1 | 784 | 871 | 1,422 |
| | F2 | 1,191 | 1,324 | 2,016 |
| **SLT(L)-18** | F1 | 784 | 871 | 1,422 |
| | F2 | 1,116 | 1,240 | 2,026 |
| **SLT(S)** | F1 (Front Fasteners) | 451 | 501 | 814 |
| | F2 (Front Fasteners) | 1,469 | 1,632 | 2,485 |
| | F1 (Back Fasteners) | 631 | 701 | 1,068 |
| | F2 (Back Fasteners) | 1,425 | 1,584 | 2,412 |
| **Splice600** | F2 | 2,126 | 2,363 | 3,598 |
| | F3 | 3,888 | 4,320 | 6,578 |
| **Splice800** | F2 | 2,126 | 2,363 | 3,598 |
| | F3 | 3,639 | 4,044 | 6,158 |

**Notes:**

Strength values provided are those of the clip only (One clip). Attachment to stud framing and to structure must be evaluated independently.
Nominal Strength is calculated as LRFD Strength divided by an average resistance factor of 0.9.
Ultimate Strength is the average maximum load obtained from tests.
When dynamic analysis is used for blast design, the Nominal Strength may be allowed to be increased by a Static Increase Factor (SIF) and a Dynamic Increase Factor (DIF).

## DriftClip® Series

| Connector | Load Direction | Fastener Pattern | LRFD Design Strength (lbs) | Nominal Strength (lbs) | Ultimate Strength (lbs) |
|---|---|---|---|---|---|
| DSLB362, 600, 800 | F2 | 1 | 1,467 | 1,630 | 2,317 |
| | | 2 | 916 | 1,018 | 1,663 |
| DSLS362/400-9 | F2 | 1 | 1,536 | 1,707 | 2,787 |
| | | 2 | 1,507 | 1,674 | 2,735 |
| DSLS362/400-12 | F2 | 1 | 1,977 | 2,197 | 3,588 |
| | | 2 | 1,722 | 1,913 | 3,126 |
| DSLS600-10 | F2 | 1 | 1,924 | 2,138 | 3,864 |
| | | 2 | 1,627 | 1,808 | 2,952 |
| DSLS600-12 | F2 | 1 | 2,980 | 3,311 | 4,707 |
| | | 2 | 2,788 | 3,098 | 4,405 |
| DSLS600-15[1] | F2 | 1 | 3,045 | 3,383 | 4,811 |
| | | 2 | 3,045 | 3,383 | 4,811 |
| DSLS600-20 | F2 | 1 | 3,582 | 3,980 | 6,061 |
| | | 2 | 2,664 | 2,960 | 4,507 |
| DSLS800-12 | F2 | 1 | 1,859 | 2,066 | 3,374 |
| | | 2 | 1,850 | 2,056 | 3,358 |
| DSLS800-15 | F2 | 1 | 3,026 | 3,362 | 5,492 |
| | | 2 | 1,915 | 2,128 | 3,475 |
| DSLS800-20 | F2 | 1 | 2,917 | 3,241 | 4,936 |
| | | 2 | 1,991 | 2,212 | 4,123 |
| DSLD362 | F2 | 1 | 186 | 207 | 317 |
| | | 2 | 85 | 94 | 141 |
| DSLD600 | F2 | 1 | 286 | 317 | 481 |
| | | 2 | 399 | 443 | 869 |
| DSLD800 | F2 | 1 | 318 | 354 | 578 |
| | | 2 | 293 | 326 | 858 |
| DSL362 | F2 | 1 | 796 | 884 | 1,320 |
| | | 2 | 397 | 441 | 720 |
| DSL600 | F2 | 1 | 1,242 | 1,380 | 2,254 |
| | | 2 | 1,840 | 2,044 | 3,051 |
| DSL800[1] | F2 | 1 | 1,666 | 1,851 | 3,023 |
| | | 2 | 1,666 | 1,851 | 3,023 |

**Notes:**

[1]Strength values limited by fastener pattern 1.

Strength values provided are those of the clip only (One clip). Attachment to stud framing and to structure must be evaluated independently.

Nominal Strength is calculated as the LRFD Strength divided by an average resistance factor of 0.9.

Ultimate Strength is maximum load obtained from tests.

When dynamic analysis is used for blast design, the Nominal Strength may be allowed to be increased by a Static Increase Factor (SIF) and a Dynamic Increase Factor (DIF).

## DriftTrak® Series

| Connector | Load Direction | Fastener Pattern | LRFD Strength (lbs) | Nominal Strength (lbs) | Ultimate Strength (lbs) |
|---|---|---|---|---|---|
| DT w/ DTSL | F2 | 8" Fastener Spacing - Pattern 1 | 1,001 | 1,112 | 1,807 |
| | | 8" Fastener Spacing - Pattern 2 | 770 | 856 | 1,303 |
| | | 16" Fastener Spacing - Pattern 1[1] | 1,001 | 1,112 | 1,807 |
| | | 16" Fastener Spacing - Pattern 2 | 774 | 860 | 1,309 |
| DT w/ DTSLB362/400, DTSLB600, DTSLB800 | F2 | 8" Fastener Spacing - Pattern 1 and 2 | 1,292 | 1,435 | 2,186 |
| | | 16" Fastener Spacing - Pattern 1 and 2 | 1,206 | 1,340 | 2,040 |
| DT w/ DTSLB362/400-HD, DTSLB600-HD, DTSLB800-HD, | F2 | 8" Fastener Spacing - Pattern 1 and 2 | 2,591 | 2,879 | 4,384 |
| | | 16" Fastener Spacing - Pattern 1 and 2 | 1,640 | 1,822 | 2,775 |
| DT w/ DTLB362/400 | F2 | 8” Fastener Spacing | 1,613 | 1,792 | 2,729 |
| | F3 | | 1,859 | 2,065 | 3,145 |
| DT w/ DTLB600 | F2 | 8" Fastener Spacing | 1,914 | 2,126 | 2,935 |
| | F3 | | 2,803 | 3,115 | 4,743 |
| DT w/ DTLB800 | F2 | 8" Fastener Spacing | 1,914 | 2,126 | 2,935 |
| | F3 | | 2,037 | 2,264 | 3,447 |
| DT w/ DTLB362/400-HD | F2 | 8” Fastener Spacing | 2,104 | 2,338 | 3,560 |
| | F3 | | 1,859 | 2,065 | 3,145 |
| DT w/ DTLB600-HD | F2 | 8" Fastener Spacing | 2,796 | 3,106 | 4,288 |
| | F3 | | 2,803 | 3,115 | 4,743 |
| DT w/ DTLB800-HD | F2 | 8" Fastener Spacing | 2,796 | 3,106 | 4,288 |
| | F3 | | 2,037 | 2,264 | 3,447 |
| DTH w/ DTSLB362/400-HD, DTSLB600-HD, DTSLB800-HD, | F2 | Headed Stud | 2,649 | 2,943 | 4,063 |
| DTH w/ DTLB362/400-HD | F2 | Headed Stud | 2,649 | 2,943 | 4,063 |
| | F3 | | 1,859 | 2,065 | 3,145 |
| DTH w/ DTLB600-HD | F2 | Headed Stud | 2,649 | 2,943 | 4,063 |
| | F3 | | 3,047 | 3,386 | 4,674 |
| DTH w/ DTLB800-HD | F2 | Headed Stud | 2,649 | 2,943 | 4,063 |
| | F3 | | 2,037 | 2,264 | 3,447 |
| PTS w/ DTSLB600-PTS, DTSLB800-PTS, | F2 | Headed Stud – PTS | 1,726 | 1,918 | 2,701 |
| PTS w/ DTLB600-PTS | F2 | Headed Stud – PTS | 1,815 | 2,017 | 2,784 |
| | F3 | | 1,856 | 2,062 | 2,846 |
| PTS w/ DTLB800-PTS | F2 | Headed Stud – PTS | 1,775 | 1,973 | 2,723 |
| | F3 | | 1,599 | 1,777 | 2,453 |

**Notes:**

[1]Strength values limited by corresponding 8” fastener spacing.

Strength values provided are those of the clip only (One clip). Attachment to stud framing and to structure must be evaluated independently.

Nominal Strength is calculated as the LRFD Strength divided by an average resistance factor of 0.9.

Ultimate Strength is maximum load obtained from tests.

When dynamic analysis is used for blast design, the Nominal Strength may be allowed to be increased by a Static Increase Factor (SIF) and a Dynamic Increase Factor (DIF).

StiffClip® Series

| Connector | Load Direction | LRFD Design Strength (lbs or in-lbs) | Nominal Strength (lbs or in-lbs) | Ultimate Strength (lbs or in-lbs) |
|---|---|---|---|---|
| **AL362** | F1 | 1,562 | 1,736 | 2,643 |
| | F2 | 2,354 | 2,616 | 3,983 |
| | F3 | 3,937 | 4,374 | 6,661 |
| **AL600** | F1 | 1,388 | 1,542 | 2,348 |
| | F2 | 3,493 | 3,882 | 5,911 |
| | F3 | 4,830 | 5,366 | 8,172 |
| **AL800** | F1 | 2,827 | 3,141 | 4,784 |
| | F2 | 4,022 | 4,469 | 6,806 |
| | F3 | 9,798 | 10,887 | 16,579 |
| **LB362** | F1 | 1,641 | 1,823 | 2,776 |
| | F2 | 3,297 | 3,664 | 5,579 |
| | F3 | 4,256 | 4,729 | 7,202 |
| **LB600** | F1 | 1,481 | 1,646 | 2,506 |
| | F2 | 3,297 | 3,664 | 5,579 |
| | F3 | 2,869 | 3,188 | 4,855 |
| **LB600-HD, (2) ¼” Screws** | F1 | 1,764 | 1,959 | 2,984 |
| | F2 | 1,810 | 2,011 | 3,062 |
| | F3 | 3,149 | 3,499 | 5,328 |
| **LB800** | F1 | 1,576 | 1,751 | 2,667 |
| | F2 | 3,297 | 3,664 | 5,579 |
| | F3 (4 #12 Screws Max.) | 2,032 | 2,258 | 3,438 |
| | F3 (10 #12 Screws Max.) | 6,188 | 6,875 | 10,470 |
| **LB800-4" Offset** | F1 | 1,993 | 2,214 | 3,617 |
| | F2 | 3,297 | 3,664 | 5,579 |
| | F3 | 2,496 | 2,773 | 4,223 |
| **LB1000** | F1 | 1,465 | 1,627 | 2,658 |
| | F2 | 2,270 | 2,522 | 4,120 |
| | F3 | 2,872 | 3,191 | 4,859 |
| **LB1000-4" Offset** | F1 | 1,465 | 1,627 | 2,658 |
| | F2 | 2,270 | 2,522 | 4,120 |
| | F3 | 2,506 | 2,784 | 4,240 |
| **LB1200** | F1 | 1,465 | 1,627 | 2,658 |
| | F2 | 2,270 | 2,522 | 4,120 |
| | F3 | 3,041 | 3,379 | 5,146 |
| **HE(L)** | F2 | 1,003 | 1,114 | 1,696 |
| | F3 | 4,901 | 5,446 | 8,293 |
| **HE(H)** | F2 | 1,739 | 1,932 | 2,943 |
| | F3 | 8,880 | 9,867 | 15,026 |
| **HE(S)** | F2 | 1,739 | 1,932 | 2,943 |
| | F3 | 4,753 | 5,281 | 8,043 |
| **HS362*** | F2* | 4,420 | 8,840 | 11,492 |
| | F3 | 1,773 | 1,970 | 3,000 |
| **HS600*** | F2* | 6,630 | 13,260 | 17,238 |
| | F3 | 2,943 | 3,270 | 4,980 |
| **HS800*** | F2* | 6,630 | 13,260 | 17,238 |
| | F3 | 3,885 | 4,317 | 6,574 |

| Connector | Load Direction | LRFD Design Strength (lbs or in-lbs) | Nominal Strength (lbs or in-lbs) | Ultimate Strength (lbs or in-lbs) |
|---|---|---|---|---|
| CL362/400-68 | F1 | 2,267 | 2,519 | 4,122 |
| | F2 | 3,071 | 3,412 | 4,851 |
| | F3 | 1,842 | 2,047 | 3,349 |
| | M1 (in-lbs) | 2,888 | 3,209 | 5,251 |
| CL362/400-118 | F1 | 3,880 | 4,311 | 6,129 |
| | F2 | 7,090 | 7,878 | 11,201 |
| | F3 | 3,611 | 4,012 | 6,565 |
| | M1 (in-lbs) | 6,299 | 6,999 | 11,453 |
| CL362/400-118H | F1 | 4,160 | 4,622 | 6,572 |
| | F2 | 7,973 | 8,858 | 12,595 |
| | F3 | 9,150 | 10,167 | 14,455 |
| | M1 (in-lbs) | 10,750 | 11,944 | 19,545 |
| CL600-68 | F1 | 2,275 | 2,528 | 3,594 |
| | F2 | 4,020 | 4,467 | 6,351 |
| | F3 | 1,932 | 2,147 | 3,513 |
| | M1 (in-lbs) | 4,978 | 5,531 | 9,050 |
| CL600-118 | F1 | 4,131 | 4,590 | 7,147 |
| | F2 | 6,578 | 7,308 | 10,391 |
| | F3 | 3,561 | 3,956 | 6,474 |
| | M1 (in-lbs) | 9,126 | 10,140 | 16,592 |
| CL600-118H | F1 | 6,659 | 7,399 | 10,520 |
| | F2 | 10,337 | 11,485 | 16,330 |
| | F3 | 9,620 | 10,689 | 15,197 |
| | M1 (in-lbs) | 9,958 | 11,065 | 18,106 |
| CL800-68 | F1 | 2,298 | 2,553 | 3,630 |
| | F2 | 4,263 | 4,736 | 6,734 |
| | F3 | 1,724 | 1,916 | 3,135 |
| | M1 (in-lbs) | 4,578 | 5,086 | 8,323 |
| CL800-118 | F1 | 5,375 | 5,972 | 8,491 |
| | F2 | 10,265 | 11,406 | 16,217 |
| | F3 | 4,270 | 4,744 | 8,291 |
| | M1 (in-lbs) | 13,170 | 14,634 | 23,946 |
| CL800-118H | F1 | 7,713 | 8,570 | 12,185 |
| | F2 | 13,251 | 14,723 | 20,933 |
| | F3 | 11,925 | 13,250 | 18,839 |
| | M1 (in-lbs) | 17,834 | 19,815 | 32,425 |
| TD | F3 | 15,722 | 17,469 | 19,127 |

**Notes:**
* Clip connectors and load directions have their LRFD, nominal, and ultimate strength values all calculated using AISI S100-12 provisions.
Strength values provided are those of the clip only (One clip). Attachment to stud framing and to structure must be evaluated independently.
Nominal Strength is calculated as LRFD Strength divided by an average resistance factor of 0.9.
Ultimate Strength is the average maximum load obtained from tests.
When dynamic analysis is used for blast design, the Nominal Strength may be allowed to be increased by a Static Increase Factor (SIF) and a Dynamic Increase Factor (DIF).

## MidWall® Series

| Connector | Load Direction | LRFD Design Strength | Nominal Strength | Ultimate Strength |
|---|---|---|---|---|
| **250MW** | M1 (in-lbs) | 9,855 | 10,950 | 12,288 |
| **362MW** | M1 (in-lbs) | 25,567 | 28,408 | 31,104 |
| **600MW** | M1 (in-lbs) | 31,328 | 34,809 | 38,112 |

**Notes:**

Strength values provided are those of the clip only (One clip). Attachment to stud framing and to structure must be evaluated independently.
Nominal Strength is calculated as LRFD Strength divided by an average resistance factor of 0.9.
Ultimate Strength is the average maximum load obtained from tests.
When dynamic analysis is used for blast design, the Nominal Strength may be allowed to be increased by a Static Increase Factor (SIF) and a Dynamic Increase Factor (DIF).

**References**

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