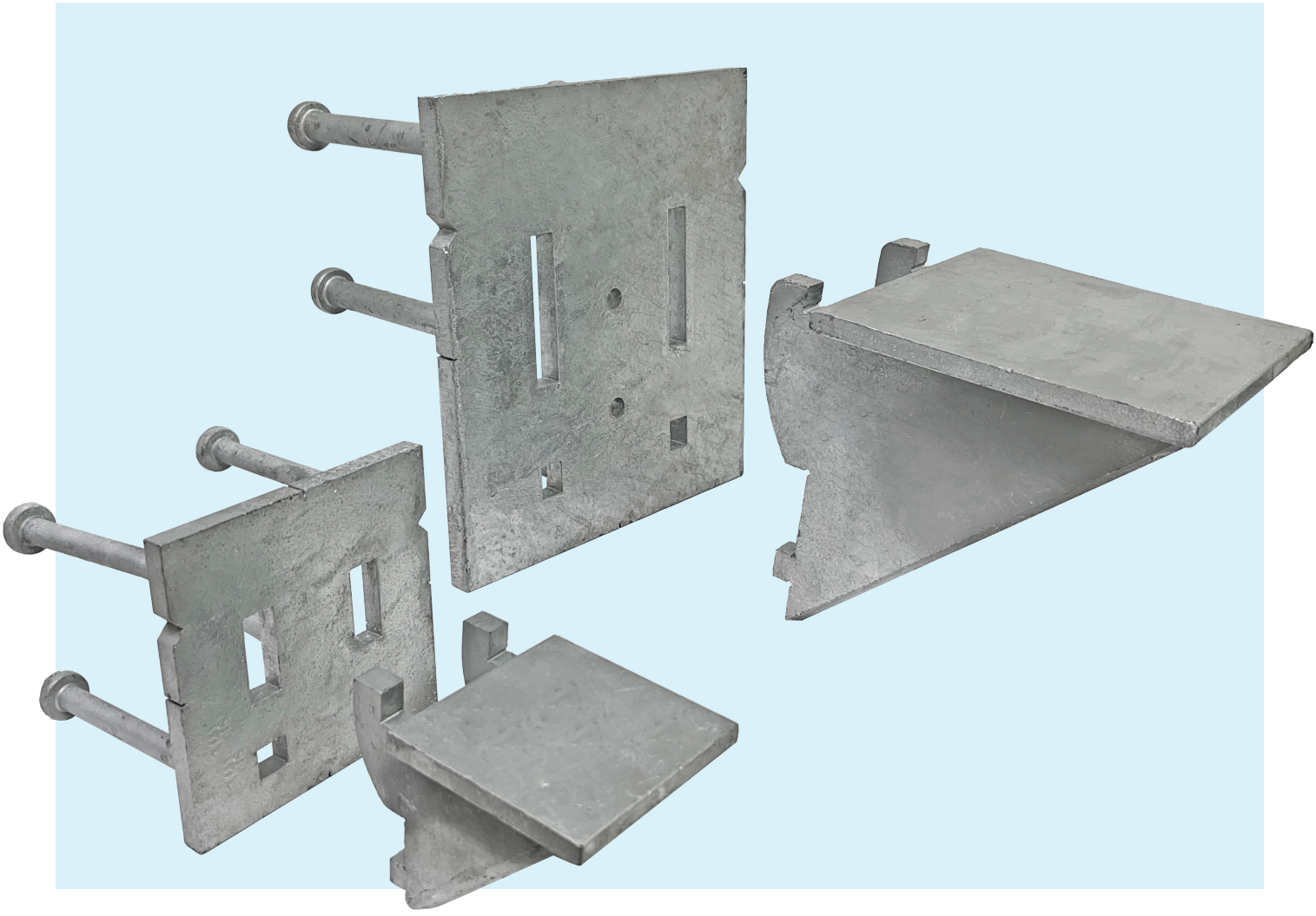
Structural Connections

Corbel Replacement

Leviat®
A CRH COMPANY

MB Rapid-Lok® Ultimate

The ultimate alternative to concrete corbels



Featured product brand

MeadowBurke

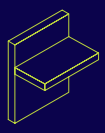
Imagine. Model. Make.

US PATENT NO. 10,883,265

Leviat®
A CRH COMPANY

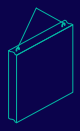
We imagine, model and make engineered products and innovative construction solutions that help turn architectural visions into reality and enable our construction partners to build better, safer, stronger and faster.

Our areas of expertise:



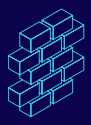
Structural Connections

Systems to form robust, efficient connections, and continuity of concrete reinforcement as necessary, between walls, slabs, columns, beams and balconies, providing structural integrity as well as enhanced thermal and acoustic performance.



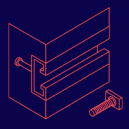
Lifting & Bracing

Systems for the safe and efficient transportation, lifting and temporary bracing of cast concrete elements and tilt-up panels before permanent structural connections are made.



Façade Support & Restraint

Systems for the safe and thermally-efficient fixing of the external building envelope, including brick and natural stone, insulated sandwich panels, curtain walling and suspended concrete façades, and also the repair and strengthening of existing masonry installations.

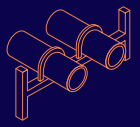


Anchoring & Fixing

Systems for fixing secondary fixtures to concrete, including anchor channels, bolts and inserts; also tension rod systems for roofs and canopies.

Formwork & Site Accessories

Non-structural accessories that complement our engineered solutions and help keep your construction environment operating safely and efficiently, including molds for casting standard and special concrete elements and construction essentials such as reinforcing bar spacers.



Industrial Technology

Mounting channels, pipe clamps and other versatile framing systems that provide safe fixing in a wide range of industrial applications.

Leviat product ranges:

Ancon | Aschwanden | Connolly | Halfen | Helifix | Isedio | Meadow Burke | Modersohn | Moment | Plaka | Scaldex | Thermomass

Traditional Corbel Hurdles

Concrete Corbel Challenges

The use of traditional concrete corbels presents challenges that complicate production, impede overall quality, and affect the long-term safety and durability of critical load-bearing applications such as those in parking garages.

Labor-intensive Operations

- Multiple concrete pours
- Complex rebar detailing
- Manual handling

Manufacturing concrete corbels is often labor-intensive and costly, requiring the handling of heavy concrete elements. Critical safety measures are essential and add complexity and expense to the process.

Costly Secondary Forming

- Special forming required
- Additional dunnage
- Irregular shapes

Casting traditional corbels requires specialized equipment, forms and procedures. Concrete mix, curing times, and environmental conditions must be controlled to meet quality metrics and structural standards.

Inefficient Storage & Handling

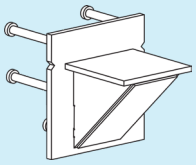
- Cracking concerns
- Obstacles to erection
- Costly repair

Storing and shipping walls and columns with incorporated corbels is also a challenge. These protruding elements often become obstacles and make the erection process more complex.

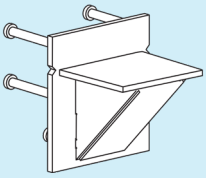
MB Rapid-Lok® Ultimate

provides solutions to these issues plus a host of other benefits!

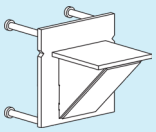
RLU-8



RLU-10



RLU-M



Available in three configurations

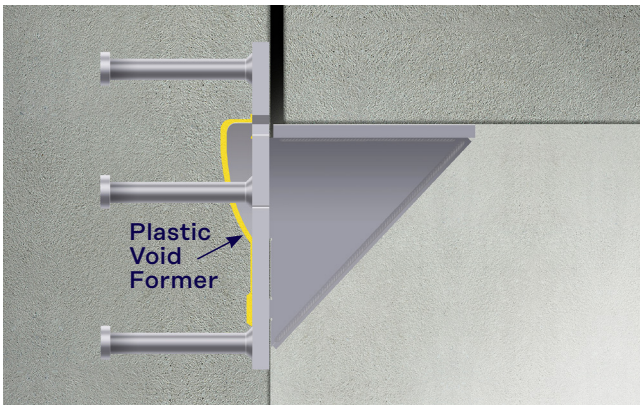
MB Rapid-Lok Ultimate

Overview

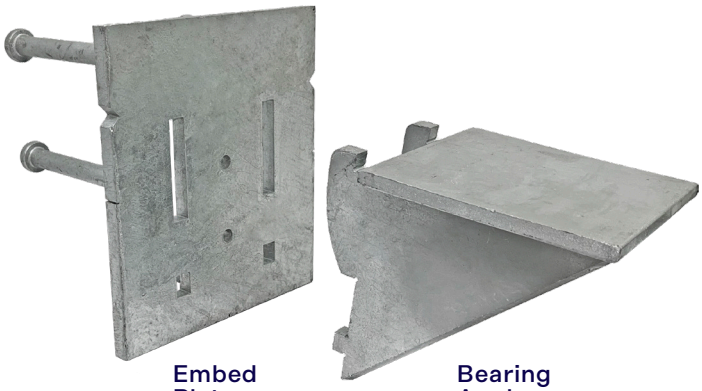
Leviat's MB Rapid-Lok Ultimate is an engineered steel corbel system that provides a permanent, durable, easy-to-install replacement for traditional concrete corbels and welded angles.

Rapid-Lok Ultimate is available in several sizes and capacities to support a variety of load-bearing elements, including double tees and precast stairs.

Installation is safe and simple. The Embed Plate is cast into the concrete column or panel at the precast plant with the face flush to the wall surface. Once the unit is on-site, the attached void formers are removed from the face of the embed plate to reveal recesses. The Bearing Angle ears are then engaged into the recesses of the Embed Plate, securely locking the entire assembly into place without requiring a weld.



US PATENT NO. 10,883,265

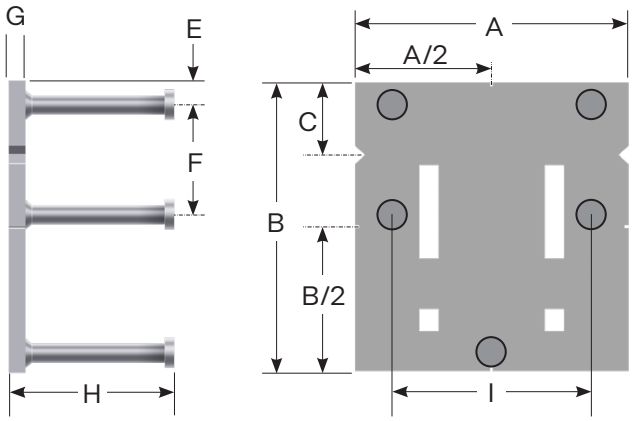


Benefits

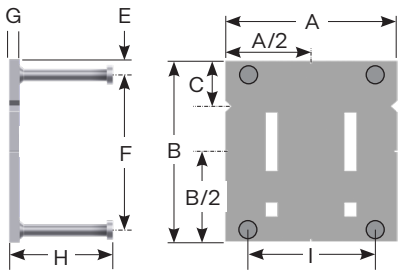
- **Structural Engineers**
  - Capacity rating using LFRD methodology
  - Consolidation of models and capacity ranges for simpler design selection
  - Load tested to ACI-318's 5% fractile to meet current code requirements
  - Fire rating per ASTM-E119 and CAN/ULC-S101
- **Double Tee Producers**
  - Labor efficiencies from simplified panel forming
  - Safety improvements by minimizing the risk of injuries
  - Cost reductions in transportation and dunnage
- **Erectors**
  - More efficient installation by avoiding obstructions from preinstalled concrete corbels
  - Lightweight Bearing Angle securely engages without requiring weld
- **Architects and Consultants**
  - Fluid feature in the finished structure emulating a concrete cast corbel
  - Discreet projection with a HDG finish
  - Eliminates potential cracking problems with traditional concrete corbels

Embed Plate & Bearing Angle

The Rapid-Lok Ultimate Embed Plate and Bearing Angle are manufactured from ASTM A572 and A36 steel. They have a hot-dip galvanized finish per ASTM A153.



RLU-8 & RLU-10



RLU-M

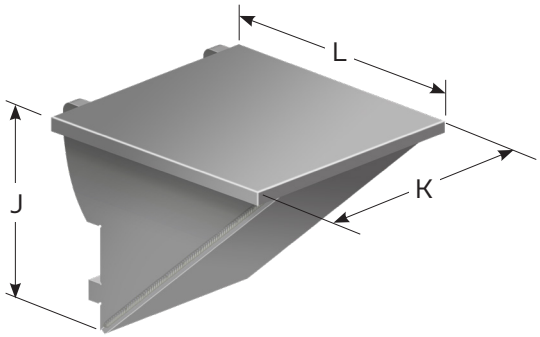
Dimensions - Embed Plate

Product	Item Number	A	B	C*	E	F	G	H	I	Number of Studs	Stud Size	Weight
RLU-8 & RLU-10	MBRLUP8G	11"	12"	3"	1"	4.50"	0.63"	6.81"	9"	5**	0.75x6.13"	26 lbs
RLU-M	MBRLUPMG	6"	6"	1.63"	1"	4"	0.50"	5.69"	4.50"	4	0.50x5.19"	6 lbs

*Tri-cut at dimension C indicates the bearing surface of the angle.
**5th stud is non-structural; it provides stability during up-in-form installation.

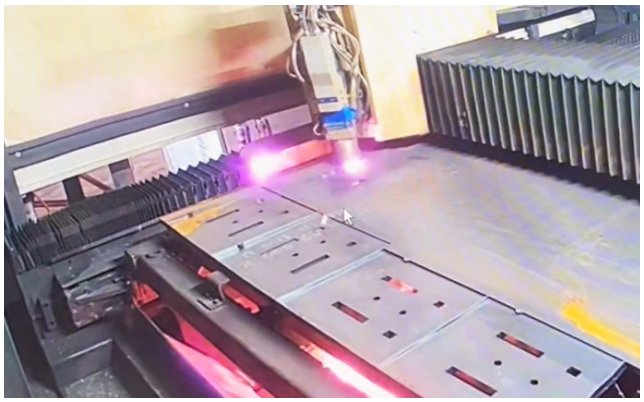
Dimensions - Bearing Angle

Product	Item Number	J	K	L	Weight
RLU-8	MBRLUA8G	8.40"	8"	8"	25 lbs
RLU-10	MBRLUA10G	8.40"	10"	8"	26 lbs
RLU-M	MBRLUAMG	4.11"	4"	4"	5 lbs



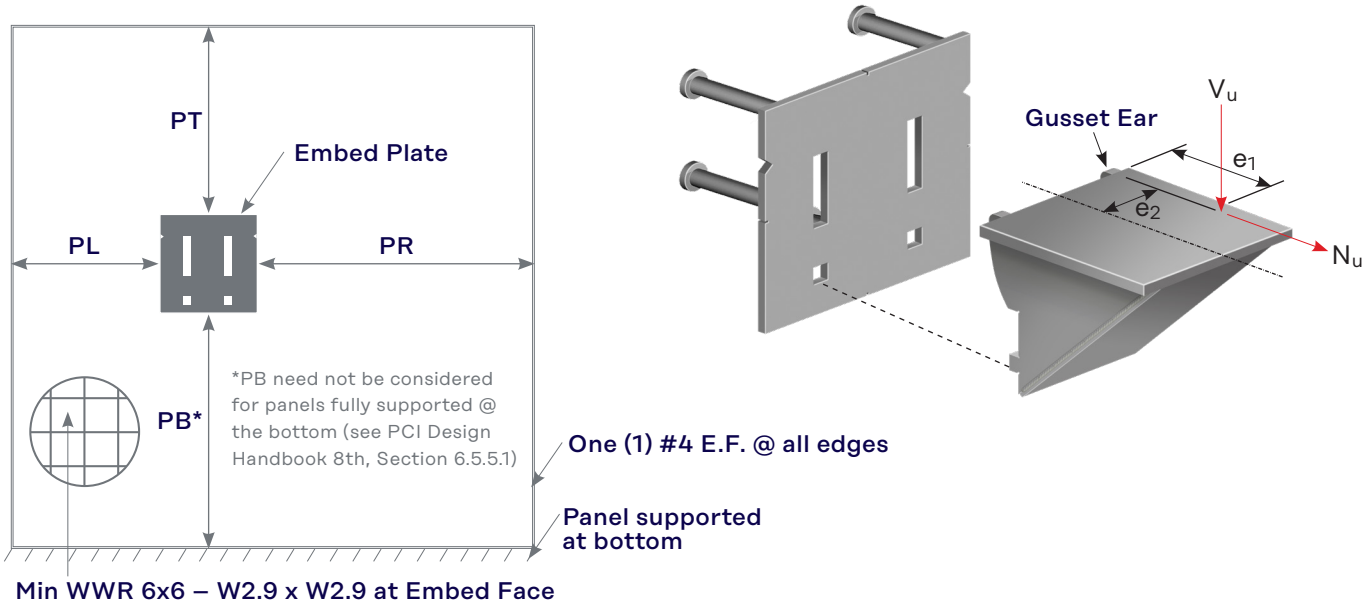
Quality Assurance

- **100% Dimensional Inspection:** Every unit undergoes rigorous dimensional checks to ensure compliance to specifications.
- **Full Traceability:** Each product is individually marked, ensuring all quality records are accessible.
- **Material & Strength Testing:** Our products undergo comprehensive testing to guarantee optimal performance and durability.



RLU-8 & RLU-10 Panel Fully Supported at Bottom

Wall, Lite Wall, Column



RLU-8 & RLU-10 Capacities

Table values are based on physical tests using ACI's 5% Fractile Analysis and ACI 318 calculations. **Minimum member thickness = 8"**

1. Tabulated capacities must be coordinated with applicable support conditions
2. ASTM E119 fire duration for all assemblies is 3 hrs with $V_{service}$ = 30 kips
3. Tables are only to be used by qualified structural engineers who understand and apply all applicable codes
4. Table values apply to fully factored ultimate loads (V_u and N_u)

						RLU-8 $e_1 \le 6"$ and $e_2 \le 2"$			RLU-10 $e_1 \le 6"$ and $e_2 \le 3"$		
Condition	**Description**	**PL**	**PR**	**PT**	**PB**	**ΦV_{nf} [a,b,c]**	**ΦN_{nf} [a,b,c,d]**	**Failure Mode**	**ΦV_{nf} [a,b,c]**	**ΦN_{nf} [a,b,c,d]**	**Failure Mode**
BES 1	Not near a free edge	≥9.5"	≥9.5"	≥9"	N/A	42.1 kips	5.3 kips	Steel	42.1 kips	5.3 kips	Steel
BES 2	Free edge on two sides	≥6.5"	≥6.5"	≥9"	N/A	42.1 kips	5.3 kips	Steel	39.4 kips	4.9 kips	Concrete
BES 3	Free edge on one side	≥2"	≥9.5"	≥9"	N/A	37.8 kips	4.7 kips	Concrete	32.4 kips	4.1 kips	Concrete
BES 4	Top edge	≥19"	≥19"	≥3"	N/A	28.6 kips	3.6 kips	Concrete	27.1 kips	3.4 kips	Concrete

A. Capacity values table BES use a Φ-factor = 0.70
If the structural engineer determines a Φ = 0.75 may be used, then the table values may be multiplied by a factor = (0.75/0.70) = 1.071, **but ΦV_n must not exceed the bearing angle's steel capacity of 42.1 kips.** Typical ACI 318 Φ-factors are: (Reference ACI 318-14 Section 17.3.3)
Φ-factor = 0.70 for members without confinement reinforcing
Φ-factor = 0.75 for members with adequate confinement reinforcing

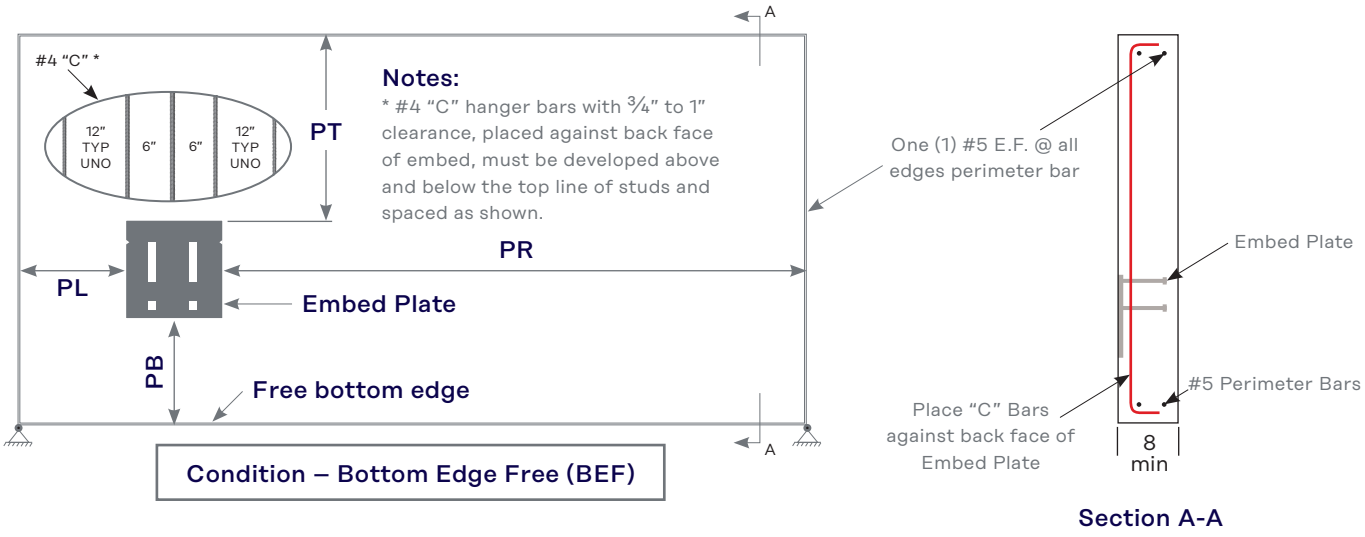
B. All values apply to fc' = 5000 psi. Concrete capacity values may be modified by $\sqrt{f'_c/5{,}000\ psi}$, **but ΦV_n must not exceed the bearing angle's steel capacity of 42.1 kips.** Steel capacity includes Φ = 0.90

C. Capacity values for concrete failures may be increased by adding additional reinforcing, (Reference ACI 318-14 Section 17.4.2.9 and 17.5.2.9), **but ΦV_n must not exceed the bracket's steel capacity of 42.1 kips.**

D. Tested values N_u are based on 12.5% of V_u. The test loads were applied simultaneously.

RLU-8 & RLU-10 Panel with Free Edge at Bottom

Spandrel, Wall Opening Below



RLU-8 & RLU-10 Capacities

Table values are based on physical tests using ACI's 5% Fractile Analysis and ACI 318 calculations. **Minimum member thickness = 8"**

1. Tabulated capacities must be coordinated with applicable support conditions
2. ASTM E119 fire duration for all assemblies is 3 hrs with $V_{service}$ = 30 kips
3. Tables are only to be used by qualified structural engineers who understand and apply all applicable codes
4. Table values apply to fully factored ultimate loads (V_u and N_u)

							RLU-8 $e_1 \le 6"$ and $e_2 \le 2"$			RLU-10 $e_1 \le 6"$ and $e_2 \le 3"$		
Condition		**Description**	**PL**	**PR**	**PT**	**PB**	**ΦV_{nf} [a,b,c,d]**	**ΦN_{nf} [a,b,c,d,e]**	**Failure Mode**	**ΦV_{nf} [a,b,c,d]**	**ΦN_{nf} [a,b,c,d,e]**	**Failure Mode**
Condition 1 Unreinforced	BEF 6	Bottom Edge	≥22.5"	≥22.5"	≥9"	≥4.5"	17.6 kips	2.2 kips	Concrete	15.6 kips	2.0 kips	Concrete
	BEF 7	Side Edge-Bottom Edge	≥6"	≥22.5"	≥9"	≥4.5"	14.8 kips	1.9 kips	Concrete	13.1 kips	1.6 kips	Concrete
Condition 2 Reinforced with #4 "C" Bars	BEF 8	Bottom Edge	≥22.5"	≥22.5"	≥9"	≥4.5"	41.1 kips	5.1 kips	Concrete	36.4 kips	4.6 kips	Concrete
	BEF 9	Side Edge-Bottom Edge	≥12.5"	≥22.5"	≥9"	≥4.5"	40.8 kips	5.1 kips	Concrete	36.2 kips	4.5 kips	Concrete
	BEF 10	Bottom Edge	≥22.5"	≥22.5"	≥9"	≥3"	30.0 kips	3.7 kips	Concrete	26.5 kips	3.3 kips	Concrete

A. Capacity values Condition 1 use a Φ-factor = 0.70
If the structural engineer determines a Φ = 0.75 may be used, then the table values may be multiplied by a factor = (0.75/0.70) = 1.071, **but ΦV_n must not exceed the bearing angle's steel capacity of 42.1 kips.** Typical ACI 318 -factors are: (Reference ACI 318-14 Section 17.3.3)
Φ-factor = 0.70 for members without confinement reinforcing
Φ-factor = 0.75 for members with adequate confinement reinforcing

B. Capacity values Condition 2 use a Φ-factor = 0.75 due to use of confinement reinforcement

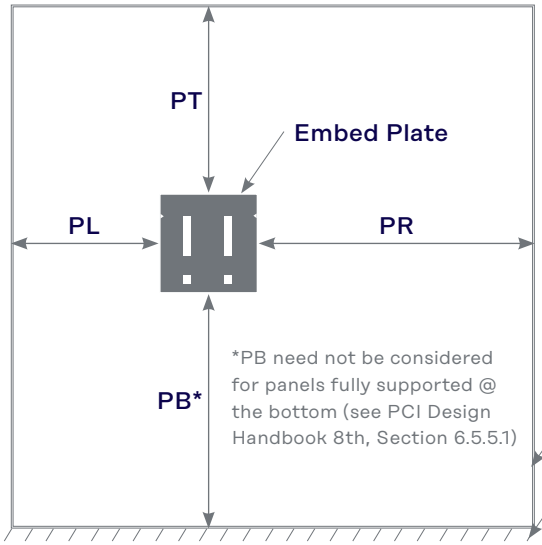
C. All values apply to fc' = 5000 psi. Concrete capacity values may be modified by $\sqrt{f'_c/5{,}000\ psi}$, **but V_n must not exceed the bearing angle's steel capacity of 42.1 kips.** Steel capacity includes Φ = 0.90

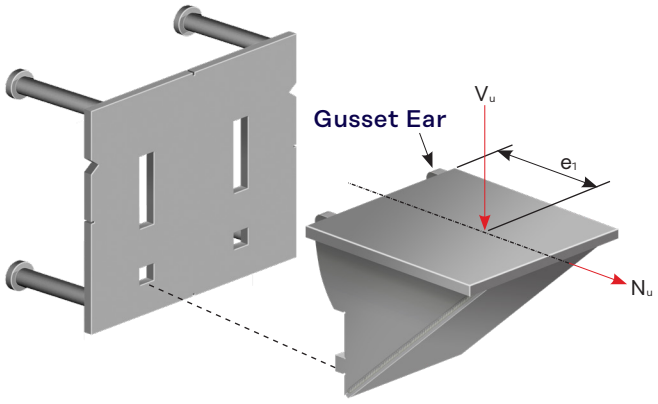
D. Capacity values for concrete failures may be increased by adding additional reinforcing, (Reference ACI 318-14 Section 17.4.2.9 and 17.5.2.9), **but V_n must not exceed the bracket's steel capacity of 42.1 kips.**

E. Tested values N_u are based on 12.5% of V_u. The test loads were applied simultaneously

RLU-M Panel Fully Supported at Bottom

Wall, Lite Wall, Column





RLU-M Capacities

Table values are based on physical tests using ACI's 5% Fractile Analysis and ACI 318 calculations. **Minimum member thickness = 8"**

1. Tabulated capacities must be coordinated with applicable support conditions
2. Tables are only to be used by qualified structural engineers who understand and apply all applicable codes
3. Table values apply to fully factored ultimate loads (V_u and N_u)

						2-Hour Fire Rating ASTM E119 $V_{service}$ = 7.5kips $e_1 \le 3$"			No Fire Rating $e_1 \le 3$"		
Condition	**Description**	**PL**	**PR**	**PT**	**PB**	**ΦV_{nf} [a,e]**	**ΦN_{nf} [a,d,e]**	**Failure Mode[e]**	**ΦV_{nf} [a,b,c]**	**ΦN_{nf} [a,b,c,d]**	**Failure Mode**
BES 1	Free edge on one side	≥8.5	≥0.0	≥17.0	N/A	10.0 kips	1.3 kips	N/A	18.6 kips	2.3 kips	Steel
BES 2	Free edge on one side & Top edge (Top Corner)	≥8.5	≥0.0	≥5.0	N/A	10.0 kips	1.3 kips	N/A	12.9 kips	1.6 kips	Concrete
BES 3	Top edge	≥8.5	≥8.5	≥5.0	N/A	10.0 kips	1.3 kips	N/A	18.6 kips	2.3 kips	Steel

A. Capacity values table BES use a Φ-factor = 0.70
If the structural engineer determines a Φ = 0.75 may be used, then the table values may be multiplied by a factor = (0.75/0.70) = 1.071, **but ΦV_n must not exceed the bearing angle's steel capacity of 18.6 kips.** Typical ACI 318 Φ-factors are: (Reference ACI 318-14 Section 17.3.3)
Φ-factor = 0.70 for members without confinement reinforcing
Φ-factor = 0.75 for members with adequate confinement reinforcing

B. All values apply to fc' = 5000 psi. Concrete capacity values may be modified by $\sqrt{f'_c / 5{,}000\ psi}$, **but ΦV_n must not exceed the bearing angle's steel capacity of 18.6 kips.** Steel capacity includes Φ = 0.90

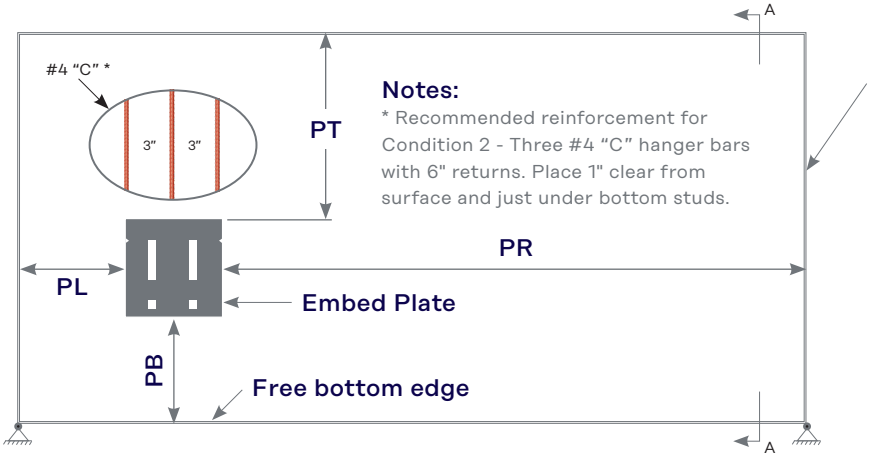
C. Capacity values for concrete failures may be increased by adding additional reinforcing, (Reference ACI 318-14 Section 17.4.2.9 and 17.5.2.9), **but ΦV_n must not exceed the bracket's steel capacity of 18.6 kips.**

D. Tested values N_u are based on 12.5% of V_u. The test loads were applied simultaneously.

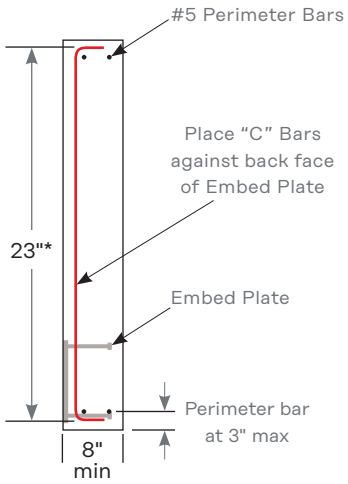
E. Design load capacity was reduced to match Fire Test load $V_{service}$ = 7.5 kips

RLU-M Panel with Free Edge at Bottom

Spandrel, Wall Opening Below



Condition – Bottom Edge Free (BEF)



Section A-A

RLU-M Capacities

Table values are based on physical tests using ACI's 5% Fractile Analysis and ACI 318 calculations. **Minimum member thickness = 8"**

1. Tabulated capacities must be coordinated with applicable support conditions
2. Tables are only to be used by qualified structural engineers who understand and apply all applicable codes
3. Table values apply to fully factored ultimate loads (V_u and N_u)

							2-Hour Fire Rating ASTM E119 $V_{service}$ = 7.5kips $e_1 \le 3"$			No Fire Rating $e_1 \le 3"$		
Condition		**Description**	**PL**	**PR**	**PT**	**PB**	**ΦV_{nf} [a,e]**	**ΦN_{nf} [a,d,e]**	**Failure Mode[e]**	**ΦV_{nf} [a,b,c]**	**ΦN_{nf} [a,b,c,d]**	**Failure Mode**
Condition 1 Unreinforced	BEF 5	Spandrel - Bottom edge	≥15.0	≥15.0	≥17.0	≥1.0	3.7 kips	0.5 kips	Concrete	3.7 kips	0.5 kips	Concrete
Condition 2 Reinforced [f]	BEF 6	Spandrel - Bottom edge	≥15.0	≥15.0	≥17.0	≥1.0	10.0 kips	1.3 kips	N/A	18.6 kips	2.3 kips	Steel

A. Capacity values Condition 1 use a Φ-factor = 0.70 If the structural engineer determines a Φ = 0.75 may be used, then the table values may be multiplied by a factor = (0.75/0.70) = 1.071, **but ΦV_n must not exceed the bearing angle's steel capacity of 18.6 kips.**
Typical ACI 318 -factors are: (Reference ACI 318-14 Section 17.3.3)
Φ-factor = 0.70 for members without confinement reinforcing
Φ-factor = 0.75 for members with adequate confinement reinforcing

B. All values apply to fc' = 5000 psi. Concrete capacity values may be modified by $\sqrt{f'_c/5{,}000\ psi}$, **but V_n must not exceed the bearing angle's steel capacity of 18.6 kips.** Steel capacity includes Φ = 0.90

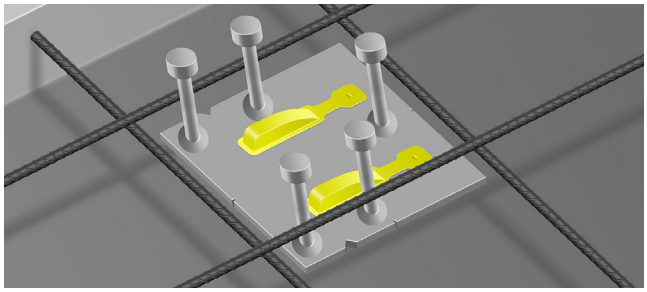
C. Capacity values for concrete failures may be increased by adding additional reinforcing, (Reference ACI 318-14 Section 17.4.2.9 and 17.5.2.9), **but V_n must not exceed the bracket's steel capacity of 18.6 kips.**

D. Tested values N_u are based on 12.5% of V_u. The test loads were applied simultaneously

E. Design load capacity limited by Fire Test load $V_{service}$ = 7.5 kips

F. Increased capacities based on reinforcement calculations per ACI 318

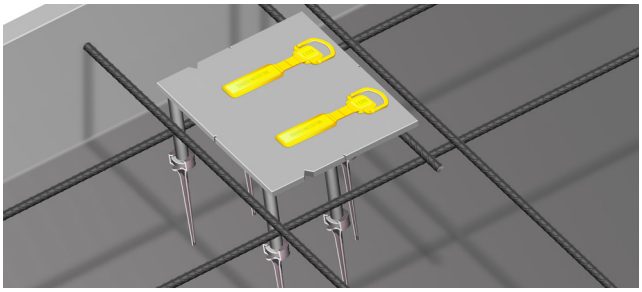
Installation Instructions



Down-in-Form Embed Plate Installation

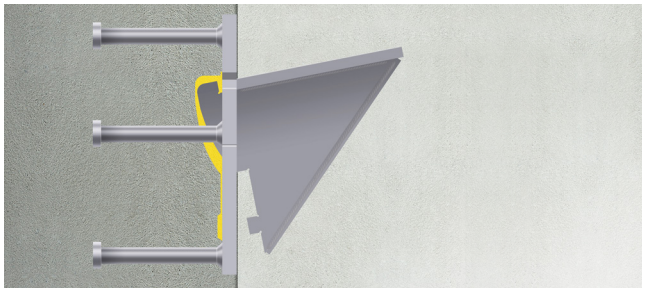
- Place the face of the Embed Plate upon the base of the casting bed, aligning the Tri-Cut to the correct bearing elevation of where the stem of the double tee or concrete element will sit
- Secure Embed Plate in place
- Caulk around the base of the Embed Plate to avoid concrete leakage underneath
- The plastic void formers cause the face of the embed plate to be approximately ⅛" off the form face
- Finish preparing the panel and pour concrete

WARNING: TO AVOID DAMAGE, DO NOT PLACE REINFORCING ON TOP OF VOID FORMERS



Up-in-Form Embed Plate Installation

- Attach Stud Extenders to the Embed Plate Round Head Studs. If necessary, adjust the height by cutting the legs of the Stud Extender to ensure the face of the Embed Plate lies flush to the panel surface
- Place the Round Head Studs down and position in the casting bed aligning the Tri-Cut to the correct bearing elevation where the double tee or concrete element will sit
- Secure Embed Plate to the rebar cage
- Finish preparing the panel and pour concrete



Bearing Angle Installation

- Prior to wall erection remove the plastic void former cover by pulling the plastic tabs
- Leading with the front of the Bearing Angle Ears, using a slotting motion, engage the Ears of the Bearing Angle into the Rectangular Openings of the Embed Plate
- Seat the bottom Square Posts of the Bearing Angle into the Square Openings of the Embed Plate
- The Rapid-Lok Ultimate is now ready for the double tee to be erected and placed upon the shelf of the Bearing Angle

North American Locations

California
3611 E La Palma Ave
Anaheim CA 92806
(800) 804-6565

Florida Corporate
6467 S Falkenburg Road
Riverview FL 33578
(800) 282-7213

Georgia
3080 N Lanier Parkway
Decatur GA 30034
(800) 241-5662

Iowa
1000 Technology Drive
Boone IA 50036
(800) 232-1748

New Jersey
526 US Route 46
Teterboro NJ 07608
(800) 207-7778

Oregon
155 SE Hazel Dell Way
Canby OR 97013
(888) 232-9991

Pennsylvania
565 Oak Ridge Road
Hazle Township PA 18202
(800) 550-0060

Texas
7000 Will Rogers Blvd
Fort Worth TX 76140
(800) 993-9641

Texas
8521 FM 1976
Converse TX 78109
(800) 323-6896

Contact Information

Customer Service
(877) 518-7665

Engineering Support
(813) 212-5866

Email
info@leviat.us

Web
www.leviat.com

Leviat.com

For information on certified management systems and standards see www.meadowburke.com | www.halfen.com | www.thermomass.com

Leviat®
A CRH COMPANY

L284-A001

Imagine. Model. Make.

Leviat.com