



MIC-CU-MAH 2174664

Hilti North America
Installation Technical Manual
Technical Data
MI System

Version 1.2 08.2017



Terms of common cooperation / Legal disclaimer

The product technical data published in these Technical Data Sheets are only valid for the mentioned codes or technical data generation methods and the defined application conditions (e.g. ambient temperature load capacity not valid in case of fire, data not valid in support structures when mixed with third party products, values only apply to static loading conditions). Technical data applies to the component only -- suitability and capacity of all other components must be checked separately by the responsible engineer (e.g., other assembly components, attachments, base materials, and building structures).

Suitability of structures combining different products for specific applications needs to be verified by conducting a system design and calculation, using for example Hilti PROFIS software. In addition, it is crucial to fully respect the Instructions for Use and to assure clean, unaltered and undamaged state of all products at any time in order to achieve optimum performance (e.g. avoid misuse, modification, overload, corrosion).

As products but also technical data generation methodologies evolve over time, technical data might change at any time without prior notice. We recommend to use the latest technical data sheets published by Hilti.

In any case the suitability of structures combining different products for specific applications need to be checked and cleared by an expert, particularly with regard to compliance with applicable norms, codes, and project specific requirements, prior to using them for any specific facility. This book only serves as an aid to interpret the capacity of the components listed, without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application. User must take all necessary and reasonable steps to prevent or limit damage. The suitability of structures combining different products for specific applications need to be confirmed with a professional designer and/or structural engineers to ensure compliance with User's specific jurisdiction and project requirements.

MIC-CU-MAH Base Material Connector - Concrete

Designation	Item number
MIC-CU-MAH	2174664

Corrosion protection:

Hot dipped galvanized per DIN EN ISO 1461:

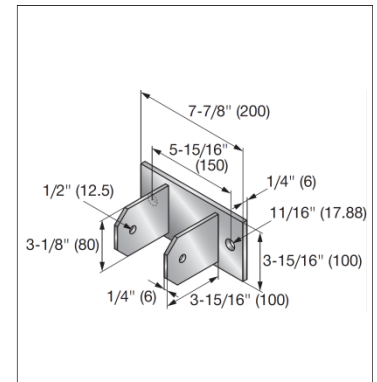
Connector:	2.2 mils (55 μm)
Bolt:	1.8 mils (45 μm)
Nut:	1.8 mils (45 μm)

Weight:

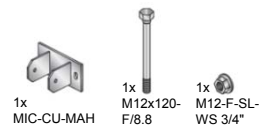
4.98 lb (2261 g) incl. components

Description:

Hilti Hot-dipped galvanized baseplate connector, used for anchoring a MI-90 girder to concrete in an angle, usually when it's used as a brace for another girder. Two round anchor holes in baseplate for attachment to concrete, and girder is connected using one bolt through a hole, which enables various angles.



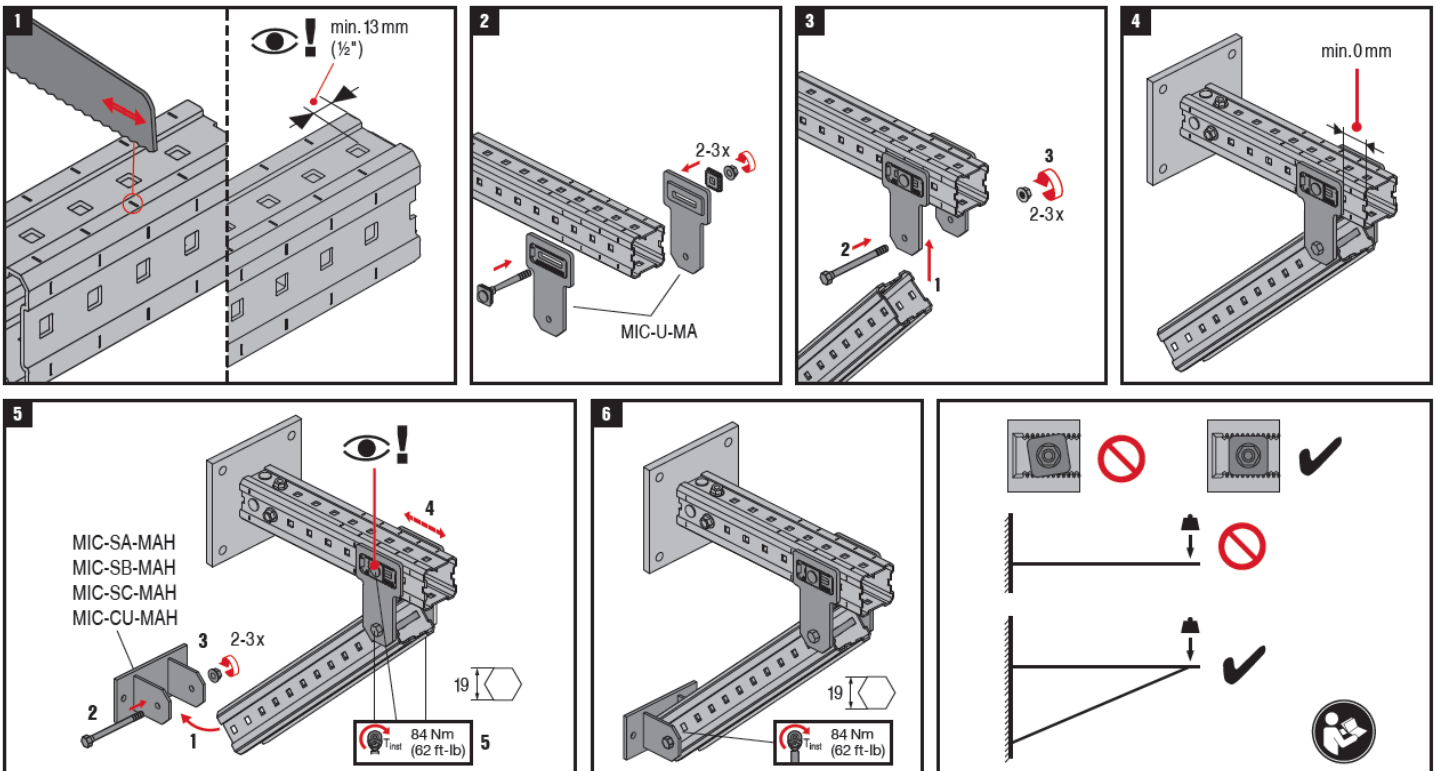
Hardware included per connector




Material properties

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector and Toothed plate: S235JR - DIN EN10025-2 2005.4	$f_y = 34.08 \text{ ksi}$ (235 $\frac{N}{\text{mm}^2}$)	$f_u = 52.21 \text{ ksi}$ (360 $\frac{N}{\text{mm}^2}$)	29000 ksi (200000 $\frac{N}{\text{mm}^2}$)	11000 ksi (75845 $\frac{N}{\text{mm}^2}$)
Hexagon head screw, prevail torque hex nut Class 8.8 - DIN EN 1993-1-8	$f_y = 92.82 \text{ ksi}$ (640 $\frac{N}{\text{mm}^2}$)	$f_u = 116.03 \text{ ksi}$ (800 $\frac{N}{\text{mm}^2}$)	29000 ksi (200000 $\frac{N}{\text{mm}^2}$)	11000 ksi (75845 $\frac{N}{\text{mm}^2}$)

Instruction For Use:



MIC-CU-MAH Base Material Connector - Concrete

Approved loading cases		
Standard		
		

Governing Conditions

Methodology:

Connection strength values are determined with a combination of simulation (ANSYS®), calculation (Microsoft Excel and Mathcad) and testing.

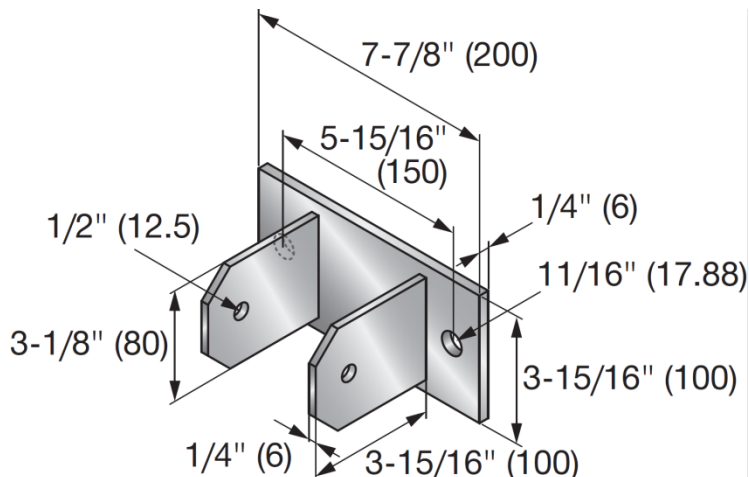
Standards and codes:

- ANSI/AISC 360-10 Specification for Structural Steel Buildings
- AISI S100-2007/2010 North American Specification for the Design of cold-formed Steel Structural Members
- AISC Steel Design Guide Series 1 Column Base Plates
- EN 1993-1-1 Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings 03.2012
- EN 1993-1-8 Eurocode 3: Design of steel structures – Part 1-8: Design of joints 03.2012
- EN 10025-2 Hot rolled products of structural steels- Part 2: technical delivery conditions for non-alloy structural steels 02-2005


Validity:



Temperature limits: -22°F (-30°C) to 200°F (+93°C).

Published allowable loads for applications are based on static loading conditions. Non-static forces, including those resulting from thermal or other expansion must be taken into account during design.



MIC-CU-MAH Base Material Connector - Concrete

Standard		
		

Loading case: Standard	Combinations covered by loading case
Bill of Material for this loading case: 1x MIC-CU-MAH 2174664 	Baseplate connector used for an angled connection of an MI-90 girder to concrete (bracing) 

Usage of Values for Design Strength and Allowable Strength

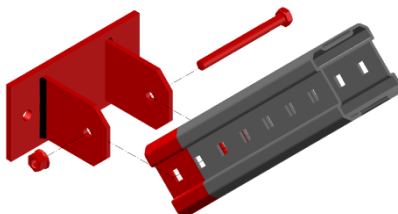
The Design Strength and Allowable Strength tables on the following pages include strength reduction factors:

- ASD:** Safety Factor (omega) > 1.0 as per AISC specifications.
- LRFD:** Strength Reduction Factor (phi) < 1.0 as per AISC specifications. $\Omega = \frac{1.5}{\phi}$ (Reference AISC 360 C-B3-5)

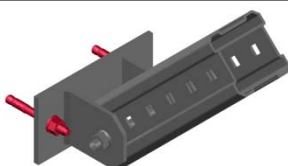
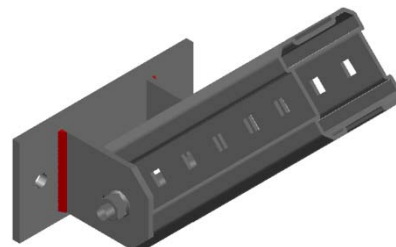
Factored loads are required for input to the given interaction equations. Factored loads are the responsibility of the user. Factored loads are noted as P, V and M

Limiting components of capacity evaluated in following tables:

1. Connection system, including connector, hardware and affected portion of MI-90 girder, per FEA simulation

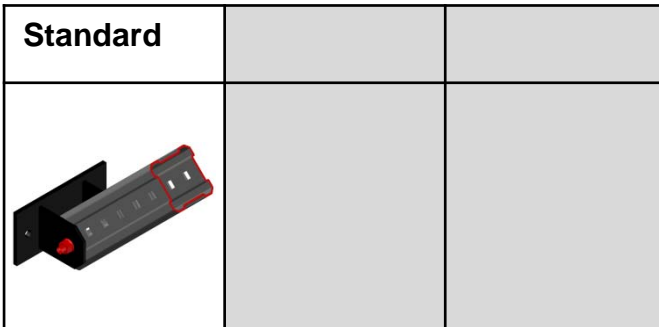


2. Welds – per analytical calculation



Anchor strength must be calculated separately using PROFIS ANCHOR.

MIC-CU-MAH Base Material Connector - Concrete

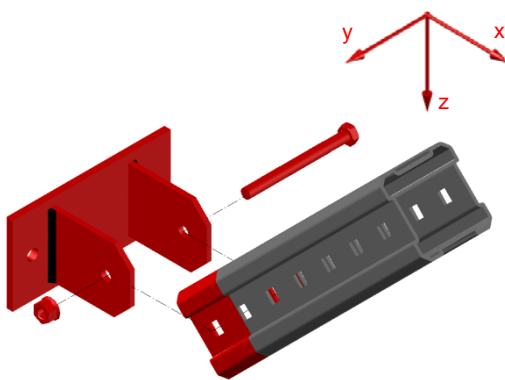


Values for Design Strength and Allowable Strength

1/2

NOTE: Calculate interaction separately for each group only using values from that group. Limiter is defined by highest interaction. Use absolute values. Values refer to the coordinate system shown.

1. Connection system, including connector, hardware and affected portion of MI-90 girder, per FEA simulation



LRFD*	+Fx [kip]	-Fx [kip]	+Fy [kip]	-Fy [kip]	+Fz [kip]	-Fz [kip]
		3.75	3.75	1.48	1.48	3.75
ASD*	+Mx [kip*ft]	-Mx [kip*ft]	+My [kip*ft]	-My [kip*ft]	+Mz [kip*ft]	-Mz [kip*ft]
		0.52	0.52	0.00	0.00	0.00

ASD*	+Fx [kip]	-Fx [kip]	+Fy [kip]	-Fy [kip]	+Fz [kip]	-Fz [kip]
		2.50	2.50	0.99	0.99	2.50
ASD*	+Mx [kip*ft]	-Mx [kip*ft]	+My [kip*ft]	-My [kip*ft]	+Mz [kip*ft]	-Mz [kip*ft]
		0.34	0.34	0.00	0.00	0.00

Note: Design Strength values for girder Torsion about the x-axis (M_{ax}) are valid for any bracing angle.

Values include verifications of bolts and concrete compression

Interaction steel for LRFD:

$$\left[\frac{P_{ux}}{F_x} \right]^2 + \left[\frac{V_{uz}}{F_z} \right]^2 + \frac{V_{uy}}{F_y} + \frac{M_{ux}}{M_x} \leq 1$$

Use of F_{ax} : In case only the force along the brace axis (ax) is known, determinate load components as follows:

$$P_{ux} = F_{ax} \times \cos(\alpha)$$

$$V_{uz} = F_{ax} \times \sin(\alpha)$$

Interaction for ASD:

$$\left[\frac{P_{ax}}{F_x} \right]^2 + \left[\frac{V_{az}}{F_z} \right]^2 + \frac{V_{ay}}{F_y} + \frac{M_{ax}}{M_x} \leq 1$$

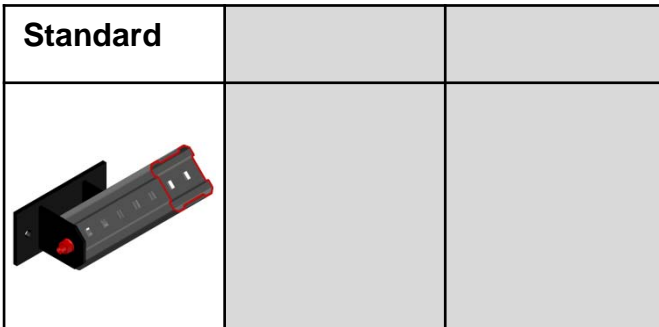
Use of F_{ax} : In case only the force along the brace axis (ax) is known, determinate load components as follows:

$$P_{ax} = F_{ax} \times \cos(\alpha)$$

$$V_{az} = F_{ax} \times \sin(\alpha)$$

*Values already include LRFD strength reduction (Φ) or ASD safety (Ω) factors in accordance with AISC, and are based on nominal geometry.

MIC-CU-MAH Base Material Connector - Concrete

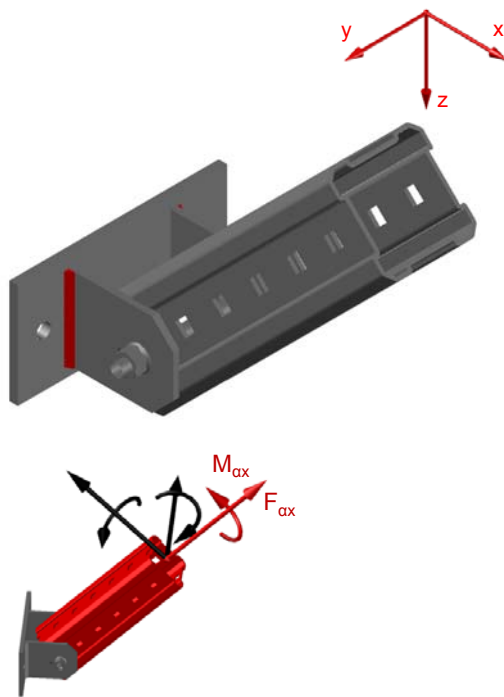


Values for Design Strength and Allowable Strength

2/2

NOTE: Calculate interaction separately for each group only using values from that group. Limiter is defined by highest interaction. Use absolute values. Values refer to the coordinate system shown.

2. Welds – per analytical calculation



	+Fx [kip]	-Fx [kip]	+Fy [kip]	-Fy [kip]	+Fz [kip]	-Fz [kip]
LRFD*	66.29	66.29	3.02	3.02	11.74	11.74
	+Mx [kip*ft]	-Mx [kip*ft]	+My [kip*ft]	-My [kip*ft]	+Mz [kip*ft]	-Mz [kip*ft]
	1.87	1.87	0.00	0.00	0.00	0.00

	+Fx [kip]	-Fx [kip]	+Fy [kip]	-Fy [kip]	+Fz [kip]	-Fz [kip]
ASD*	44.19	44.19	2.01	2.01	7.83	7.83
	+Mx [kip*ft]	-Mx [kip*ft]	+My [kip*ft]	-My [kip*ft]	+Mz [kip*ft]	-Mz [kip*ft]
	1.25	1.25	0.00	0.00	0.00	0.00

Interaction steel for LRFD:

$$\frac{P_{ux}}{F_x} + \frac{V_{uz}}{F_z} + \frac{V_{uy}}{F_y} + \frac{M_{ux}}{M_x} \leq 1$$

Use of F_a : In case only the force along the brace axis (α) is known, determine load components as follows:

$$P_{ux} = F_{ax} \times \cos(\alpha)$$

$$V_{uz} = F_{ax} \times \sin(\alpha)$$

Interaction for ASD:

$$\frac{P_{ax}}{F_x} + \frac{V_{az}}{F_z} + \frac{V_{ay}}{F_y} + \frac{M_{ax}}{M_x} \leq 1$$

Use of F_a : In case only the force along the brace axis (α) is known, determine load components as follows:

$$P_{ax} = F_{ax} \times \cos(\alpha)$$

$$V_{az} = F_{ax} \times \sin(\alpha)$$

*Values already include LRFD strength reduction (Φ) or ASD safety (Ω) factors in accordance with AISC, and are based on nominal geometry.



In the US:

Hilti, Inc. (U.S.)
P.O. Box 21148 Tulsa, OK 74121
Customer Service: 1-800-879-8000
en español: 1-800-879-5000
Fax: 1-800-879-7000

www.us.hilti.com

Hilti is an equal opportunity employer
Hilti is a registered trademark of Hilti, Corp.
©Copyright 2017 by Hilti, Inc. (U.S.)

In Canada:

Hilti (Canada) Corporation
2360 Meadowpine Blvd.
Mississauga, Ontario, L5N 6S2
Customer Service: 1-800-363-4458
Fax: 1-800-363-4459

www.hilti.ca

The data contained in this literature was current as of the date of publication. Updates and changes may be made based on later testing. If verification is needed that the data is still current, please contact the Hilti Technical Support Specialists at 1-800-879-8000 (U.S.) or 1-800-363-4458 (Canada). All published load values contained in this literature represent the result of testing by Hilti or test organizations. Local base materials were used. Because of variations in materials, on-site testing is necessary to determinate performance at any specific site.