Steel Moment Frames

High Quality
Steel Foundations
For Your Home
Safe, Trusted and
Manufactured in the USA

www.magnumpiering.com/MomentFrame

800-822-7437

MAGNUM® PIERING
designed to support

Hurricane Warning

You may have recently purchased or are considering installation of a MAGNUM® Moment Frame for support of your home in a hurricane prone region. This document provides some basic information to help increase your awareness about the engineering behind the MAGNUM® Moment Frame.

Description and History

Steel moment frames have been in use for more than one hundred years, practically since structural steel started being used in building construction. The invention of the steel moment frame brought about the advent of the modern skyscraper. This technology allowed buildings to be constructed over 8 stories tall. By inventing a pre-engineered, interchangeable system that is easy to erect, MAGNUM® Piering, Inc. has made this advanced technology affordable to the homeowner.

Code Performance

Every MAGNUM® Moment Frame is designed in accordance with FEMA P55, ASCE24, New York State Building Code, New York City Building Code, Florida Building Code, New Jersey Edition of the International Building Code, 2009 IBC, and 2010 ASCE7 codes for hurricane wind loading. These are the same codes used to design the modern skyscraper.

Performance in Hurricane Winds

The maximum story drift (lateral sway motion) allowed under building codes is 1% of the frame height during the worst load conditions. This means a 9 ft (108") tall moment frame has been designed for maximum story drift of 108" x 1% = 1". The worst load conditions prescribed by code for your home is a hurricane event which may produce 130 to 150 mph, 3 second gusts in open coastal exposure. For a typical 60-foot wide, 2 story home (5 moment frame bents) this equates to a lateral force of over 40,000 lbs on the side of your home. This force is about the thrust of a 747 jet engine or the pulling power of a CAT336E, 40 ton excavator. The top of your MAGNUM® Moment Frame will only move a maximum of 1" under these severe lateral loading conditions. This movement is completely elastic and is well below the yielding strength of your frame so it will return to neutral/plumb conditions after the hurricane gale force wind dissipates.

Sky Scraper Technology For Your Home

Strength and Corrosion
MAGNUM® Moment Frames and helical piling systems are designed to provide a factor of safety for strength that meets applicable codes after 75 years of corrosion. The American Institute of Steel Construction standard specifications requires factors of safety between 1.7 and 2.0 depending on stress conditions. What this means is that your MAGNUM® Moment Frame is predicted to have 1.7 to 2 times the allowable strength required to resist the next hurricane even after 75 years of corrosion. It is also important to note that MAGNUM® engineers evaluated corrosion data for galvanized steel published by the National Bureau of Standards and applied the worst 5% of the data to come up with corrosion rates.

"Steel moment-resisting frames have been in use for more than one hundred years, dating to the earliest use of structural steel in building construction. Steel building construction with the frame carrying the vertical loads initiated with the Home Insurance Building in Chicago, a 10-story structure constructed in 1884 with a height of 138 ft, often credited with being the first skyscraper. This and other tall buildings in Chicago spawned an entire generation of tall buildings, constructed with load bearing steel frames supporting concrete floors and non-load bearing, unreinforced masonry infill walls at their perimeters. Framing in these early structures typically utilized "H" shapes..."
- Wikipedia®

US Patent 9,249,593

Basic Foundation Designs by Zone

A - ZONE

No Piling

Patented Moment Connections

Concrete Footing with an 8" column

US Patent 9,249,593

MAGNUM PIERING
designed to support

Basic Foundation Designs by Zone

V - ZONE

Piling

US Patent 9,249,593

MAGNUM PIERING
designed to support

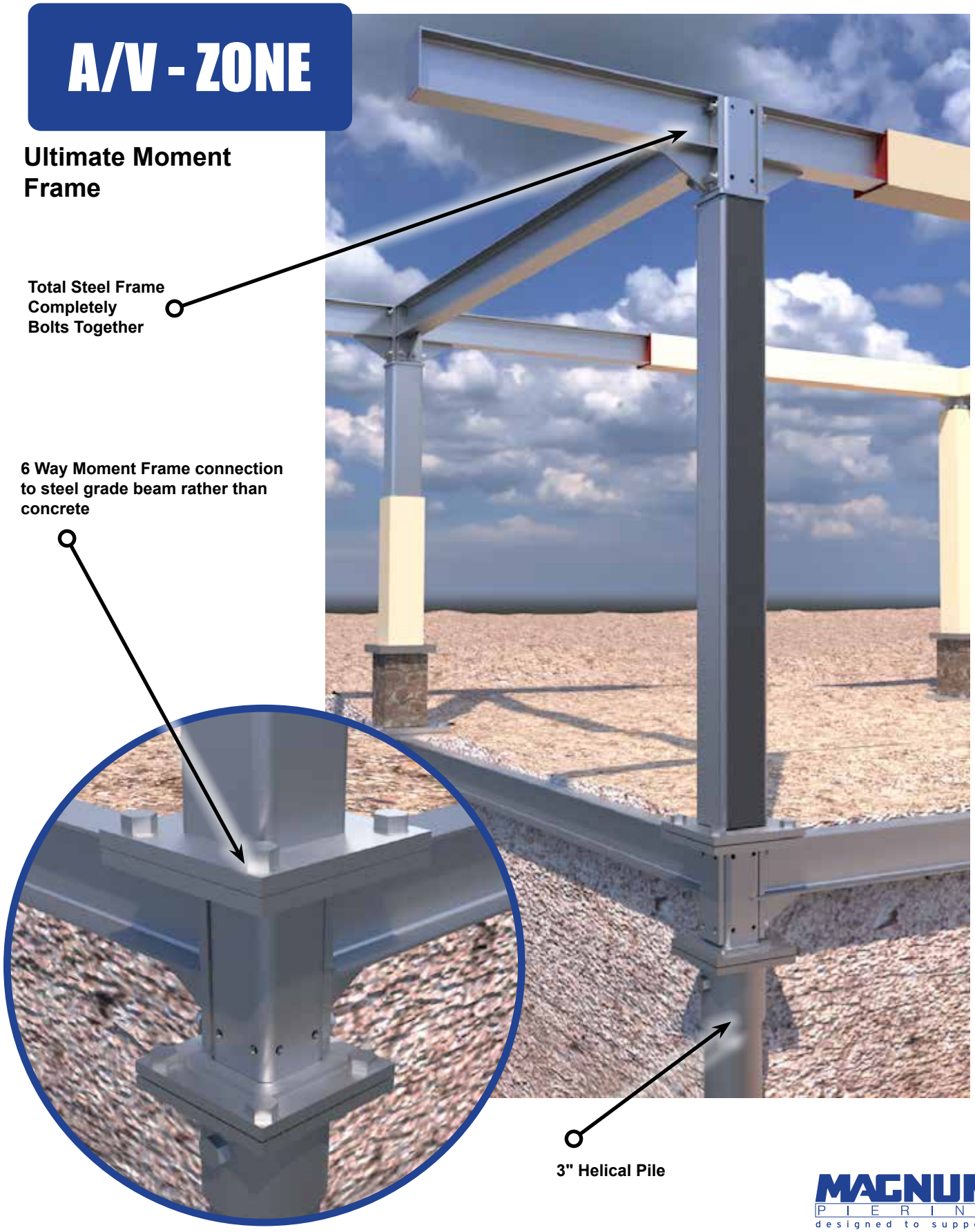
Basic Foundation Designs by Zone

A/V - ZONE

Ultimate Moment Frame

Total Steel Frame Completely Bolts Together

6 Way Moment Frame connection to steel grade beam rather than concrete



3" Helical Pile

US Patent 9,249,593

MAGNUM PIERING designed to support

Optional Accessories

Cantilever support fittings can be added for a variety of uses

Walkways and Stairways

Deck And Balconies

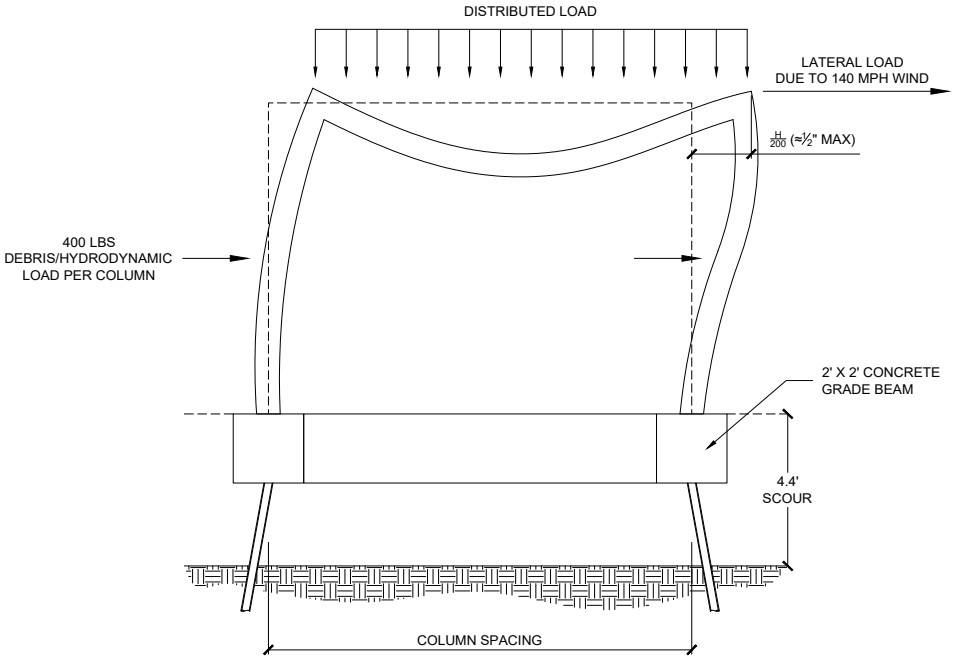
Pool Equipment and AC Units

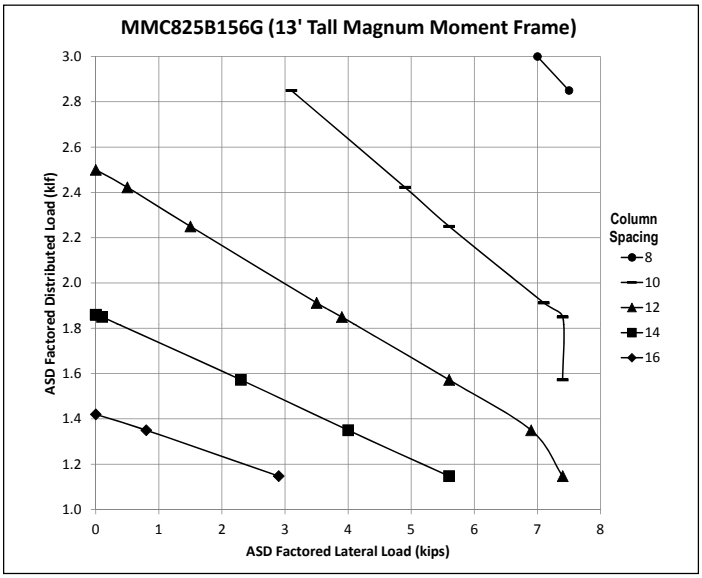
US Patent 9,249,593

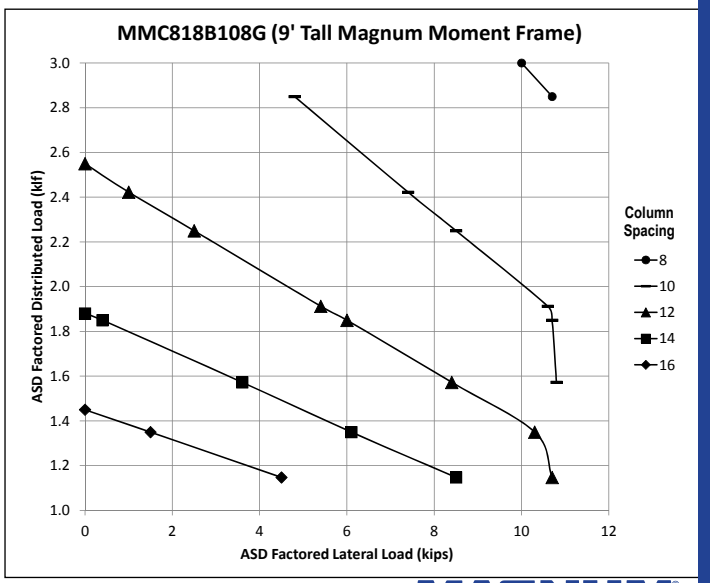
Designed To Support

MAGNUM® Moment Frame Design Considerations

Description: Moment frames are sized and spaced for live load and dead loads distributed along the beams and also lateral wind load to be resisted by the frames. Frames with higher distributed load resist lower lateral loads. The relationship between maximum factored allowable distributed load and maximum allowable factored wind load for MAGNUM® Moment FramesTM are given in the charts. For example, the 9' tall moment frame with 12' column spacing can resist a factored wind load of 8 kips and a factored distributed load of 1.6 klf. These charts were derived by applying various combinations of load to a model of the moment frame and checking allowable flexural strength of the beam and combined flexure and buckling of the columns. The charts can be used to size moment frames for support of homes. Frames need to be checked for wind loads in both directions.



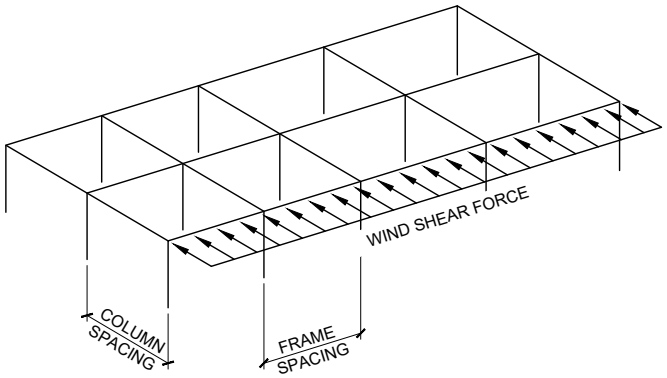




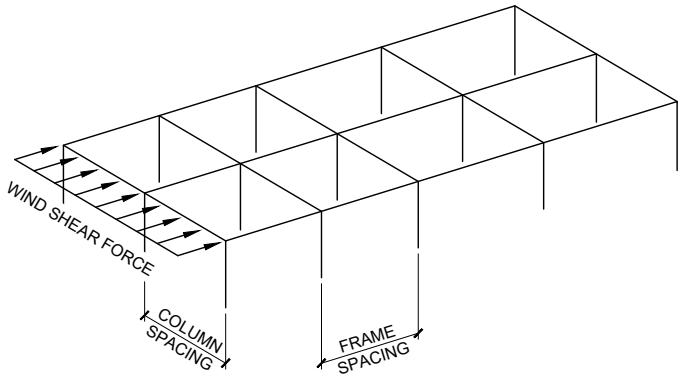
US Patent 9,249,593

Description: A number of example home sizes have been worked out for reference. These examples are contained in the tables. The examples are for 1-story, 2-story, 3-story, and 3.5-story homes. Exposure height used in these examples are given in the second column of the tables. Typical total distributed loads and wind loads are given in the next two columns. Per the allowable stress load combinations contained in ASCE 7, the load case combining dead (D), live (L), and wind (W) loads on structures is given by D+0.75L+0.75W. Factored distributed loads for this combination (D+0.75L) are given in the 5th column and factored wind loads (0.75W) are given in the 6th column. The remaining columns contain maximum frame spacing for different column spacings.

Primary Wind Direction



Secondary Wind Direction



Mmc818b108g (9' Tall) MAGNUM® Moment Frame™ Column And Frame Spacing Guide									
Load Case	Exposure Height, H (ft)	Typical Total Loads		Factored Loads		Column Spacing (ft)			
		Distributed Load w/ Grade Beam [D+L] (klf)	Lateral Load1 [W] (klf)	Distributed Load2 [D+0.75L] (klf)	Lateral Load [0.75W] (klf)	10	12	14	16
						Maximum Frame Spacing (ft)			
1-story	12	1.8	0.24	1.15	0.18	16	16	16	16
2-story	20	2.3	0.40	1.57	0.30	14	14	12	N/A
3-story	28	2.7	0.56	1.91	0.42	12	12	N/A	N/A
3.5-story	32	3.3	0.64	2.42	0.48	10	N/A	N/A	N/A

1Wind pressure times exposure height (20 psf x H)
2Factored weight of home without grade beam

Mmc825b156g (13' Tall) MAGNUM® Moment Frame™ Column And Frame Spacing Guide									
Load Case	Exposure Height, H (ft)	Typical Total Loads		Factored Loads		Column Spacing (ft)			
		Distributed Load w/ Grade Beam [D+L] (klf)	Lateral Load1 [W] (klf)	Distributed Load2 [D+0.75L] (klf)	Lateral Load [0.75W] (klf)	10	12	14	16
						Maximum Frame Spacing (ft)			
1-story	12	1.8	0.24	1.15	0.18	16	16	16	16
2-story	20	2.3	0.40	1.57	0.30	12	12	N/A	N/A
3-story	28	2.7	0.56	1.91	0.42	10	8	N/A	N/A
3.5-story	32	3.3	0.64	2.42	0.48	10	N/A	N/A	N/A

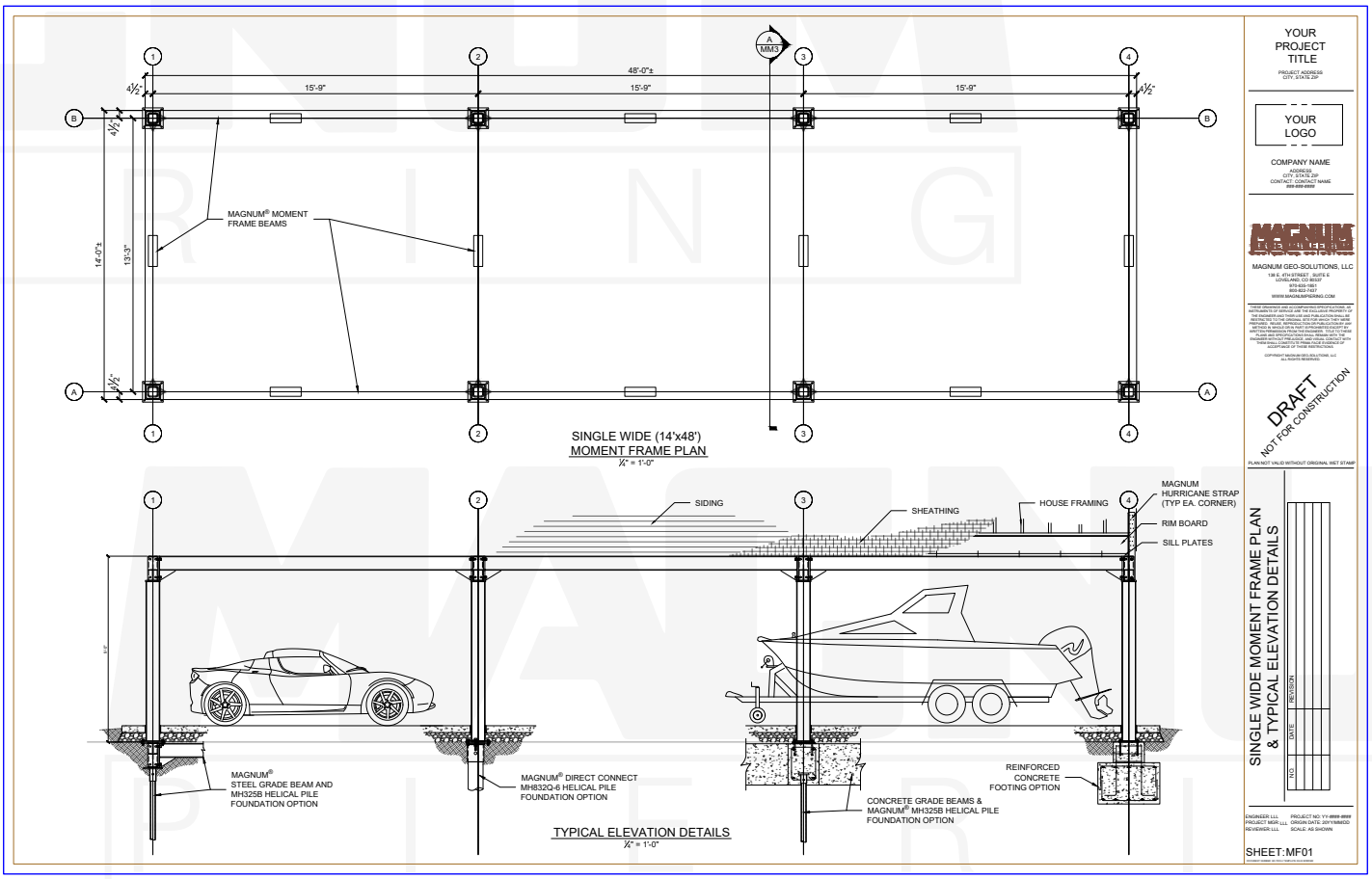
1Wind pressure times exposure height (20 psf x H)
2Factored weight of home without grade beam

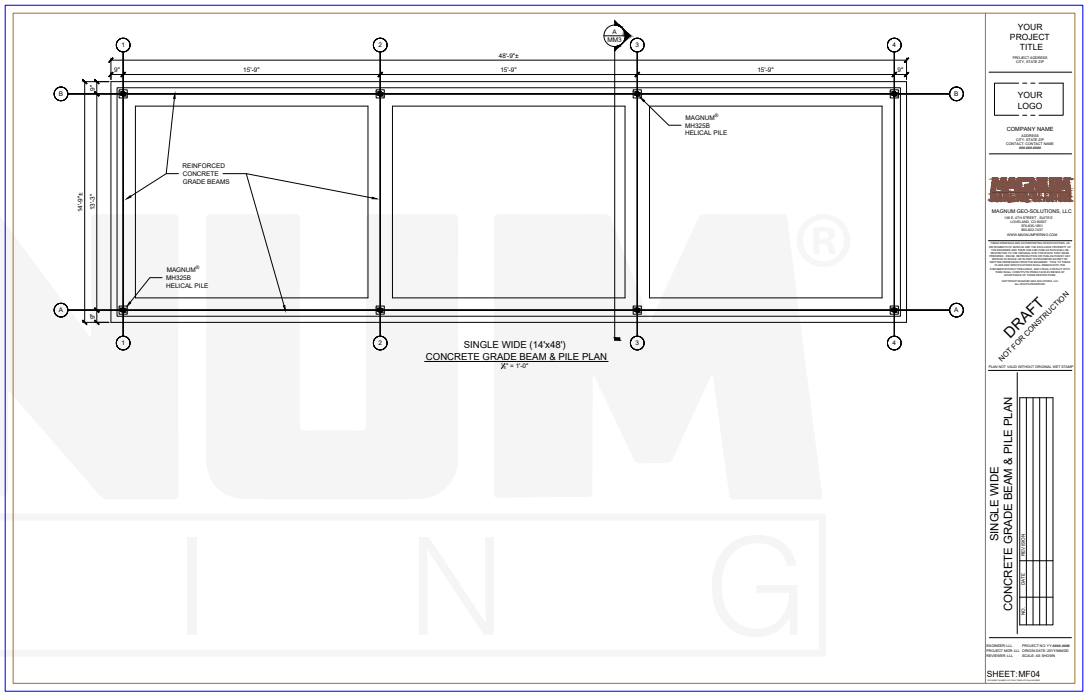
The tables show that a 9' tall moment frame with column and frame spacing of 16 feet can be used for the example 1-story home with 12' exposure height. The 2-story example home can be supported with a 9' moment frame with frame spacing of 12 feet and a column spacing of 14 feet.

MAGNUM PIERING designed to support

US Patent 9,249,593

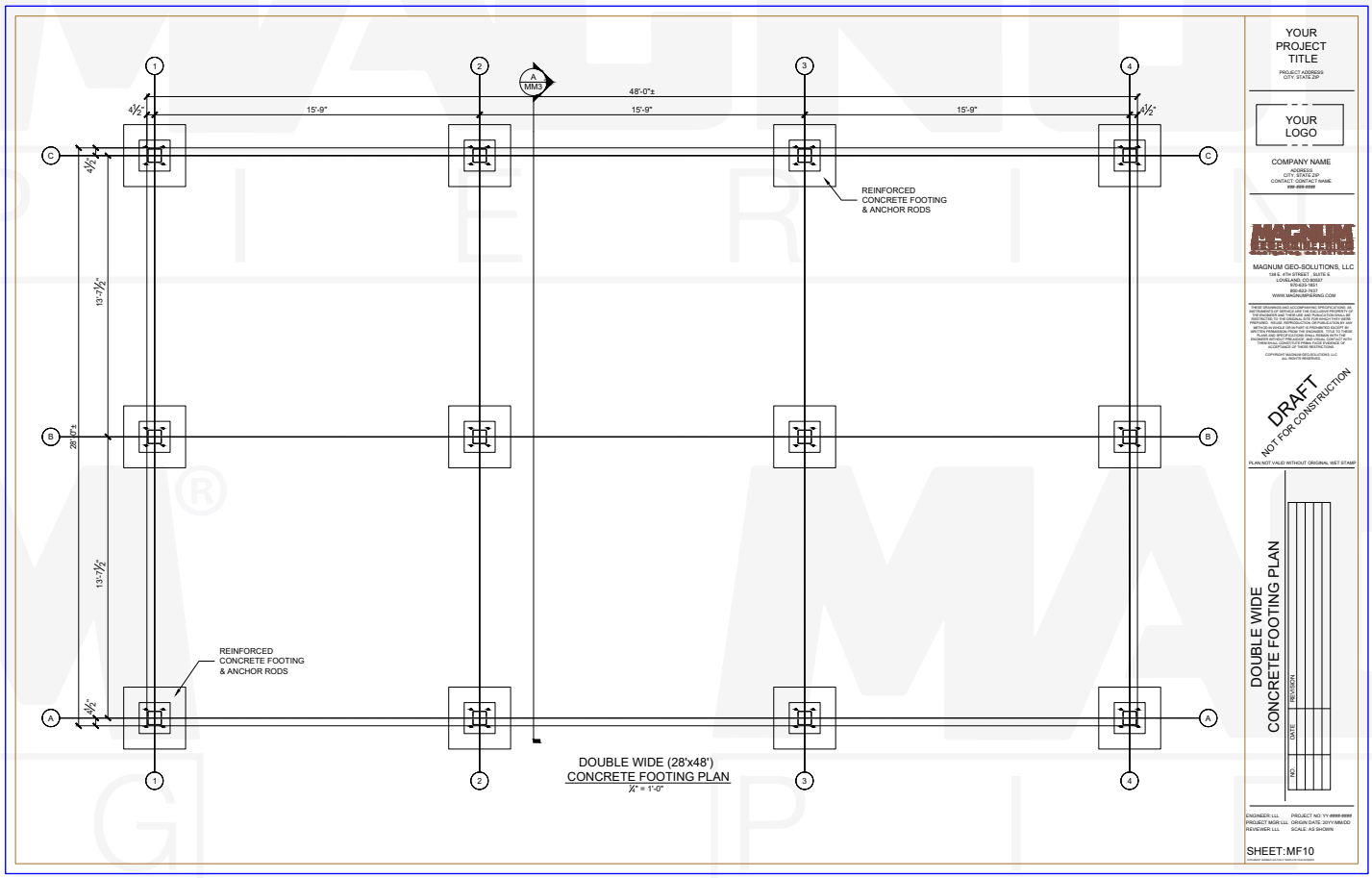
14 x 48 Layout concept w/ optional pilings and footings.

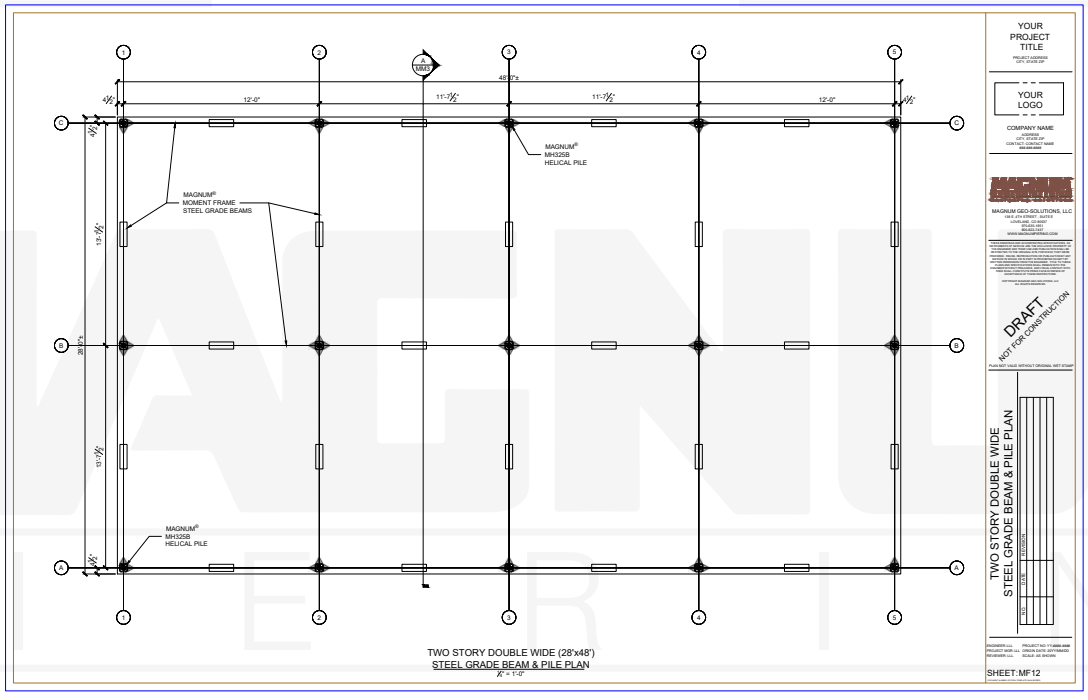




156 Circle Freeway Dr.
Cincinnati, OH. 45246
800-822-7437
www.MagnumPiering.com

Optional larger concrete footing plan.





156 Circle Freeway Dr.
Cincinnati, OH. 45246
800-822-7437
www.MagnumPiering.com

MAGNUM® MMC825B Column
HSS8x8x1/4 and Connection Box with (4) Tapped Holes Each Side for 7/8" - 9 UNC Bolts

Description: The MAGNUM® MMC825B Moment Frame Columns are made of Hollow Structural Sections (HSS) with bearing plates welded to the bottom of the column. The top of the column is fitted with a MAGNUM® Moment Frame Column Cap, which is designed for an easy and secure connection between the column and beam of the MAGNUM® Moment Frame. The Column, Column Cap, and Bearing Plate are galvanized steel. Allowable axial compression load for a 13 foot column height is 83 tons.

Specifications	
Shape	HSS8x8x1/4 Column ASTM A500 Gr. B 46 ksi, or Equivalent
I	New = 70.7 in^4
A_g	New = 7.10 in^2
S	New = 17.7 in^3
Height	Custom
Bolts	(4) 3/4"-16 UNF SAE J429 Grade 5 Zinc Coated to ASTM B695/F1941
Surface Coating	Galvanized per ASTM A153/A123 (G)

Installation Notes: Determine the minimum column length based on the elevation certificate for the project. The bottom flange of the beam shall be one foot higher than the Base Flood Elevation (BFE). BFE is determined based on Coastal Construction Zone and FEMA flood mapping for specific project location.

MAGNUM PIERING
designed to support

156 Circle Freeway Dr.
Cincinnati, OH. 45246
800-822-7437
www.MagnumPiering.com

Beams, Base Plate, and Concrete Anchor Bolts Sold Separately

MAGNUM® MMB818B Beam

W8x18 Beam and (2) 7/8" End Plates with (4) Holes Each for 7/8" - 9 UNC Bolts

Description: The MAGNUM® MMA818B Moment Frame Beam consists of a W8x18 wide flange beam with (2) 7/8" end plate with gussets, one on each end. The gusseted end plates have (4) 15/16" bolt holes for connection to a MAGNUM® Moment Frame Column. Allowable lengths vary and are the responsibility of the registered design professional.

Specifications	
Shape	W8x18 Wide Flange Beam ASTM A992 50 ksi, or Equivalent
I	New = 61.9 in^4
Ag	New = 5.26 in2
S	New = 15.2 in3
Length	Custom
Bolts	(8) 7/8"-9 UNC SAE J429 Grade 5 Zinc Coated to ASTM B695/F1941
Connection	Torque Bolts to 365 ft-lbs
Surface Coating	Galvanized per ASTM A153/A123 (G)

Installation Notes: MAGNUM® MMB818B Moment Frame Beams are installed onto pre-installed Moment Frame Columns. Beams are hoisted into position, attach each beam with (4) 7/8" - 9 UNC bolts and lock washers, torque to 365 ft-lbs. Continue until all beams are installed. Architectural finishing varies by project. Ramset or PAF is acceptable for use on securing finishes to frame.

Column, Base Plate, and Concrete Anchor Bolts Sold Separately

MAGNUM PIERING
designed to support
156 Circle Freeway Dr.
Cincinnati, OH. 45246
800-822-7437
www.MagnumPiering.com

MAGNUM® MHC1304-8M105B1 Bearing Plate Cap

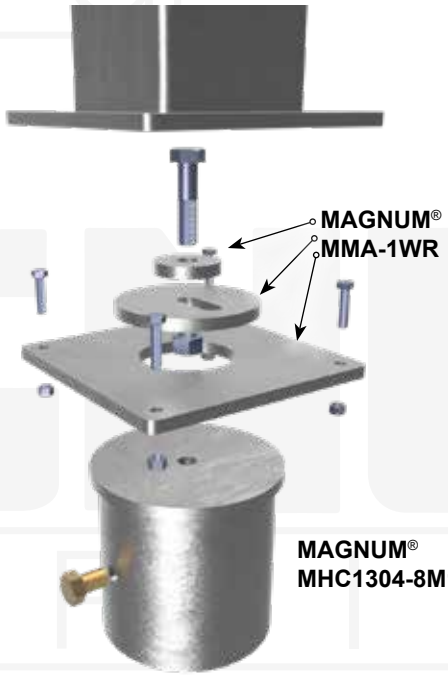
Allowable Capacity 80 Tons Compression / 30 Tons Tension

12” x 12” x 3/4” Bearing Plate & 8.835-Inch I.D. Collar

Fits MH832 & MH850 Helical Screw Piles

Description: MAGNUM® Bearing Plate Caps consist of a collar tube with bolt holes for connection to MAGNUM® helical screw piles and steel bearing plate for embedment in cast-in-place concrete. MAGNUM® products are manufactured in the USA according to our ISO 9001 approved quality program. Structural capacities are developed according to AISC 360 and ACI 318 considering an average design life of 75 years for bare steel in most soil conditions. Hot-dip galvanizing is available upon request. Design and detailing of the structure to which the bearing plate cap is embedded in varies by project and is the responsibility of the registered design professional.

Specifications	
Collar Tube	0.395” x 8.835” I.D. ASTM A252, Fy = 50 ksi or Better
End Effecter	12” x 12” x 3/4” Steel Bearing Plate
Pile Connection	(2) 1-1/2” ASTM A193 B7 Zinc Coated to ASTM B695/F194
Coating	Galvanized per ASTM A153/A123 (G), Bare Steel (NG), or Epoxy Coated per ICC-ES AC228 (EP)
Compatibility	MH832-6, MH850-6
Capacity	
Ultimate Compression/ Tension	160 Tons / 60 Tons
Allowable Compression/ Tension	80 Tons / 30 Tons



MAGNUM®
MHC1304-8M105B1

Notes: Cap capacity is developed using the ASD design method and considers strength of collar, end effecter, and pile connection. Capacity may be limited by the helical pile, bearing/pullout capacity of soil, or strength of the concrete the cap is embedded in.

Installation Notes: After installation of a MAGNUM® Helical Pile to the correct depth, torque, and capacity, cut-off the pile shaft at the proper elevation. Drill (2) 1-9/16” diameter holes through the shaft using a MAGNUM® drill template, place the cap over the shaft and secure with (2) 1-1/2” bolts. Snug tighten nut. Ensure direct bearing of plate on shaft. Place reinforcing steel, cast concrete and consolidate around the pile cap per project requirements.

MAGNUM PIERING
designed to support

156 Circle Freeway Dr.
Cincinnati, OH. 45246
800-822-7437
www.MagnumPiering.com

MAGNUM® MH325B Helical Piles

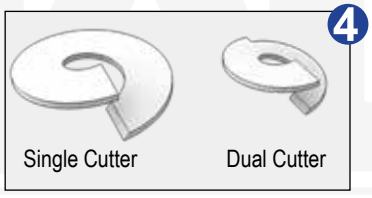
33 Ton Ultimate - 16.5 Ton Allowable Capacity

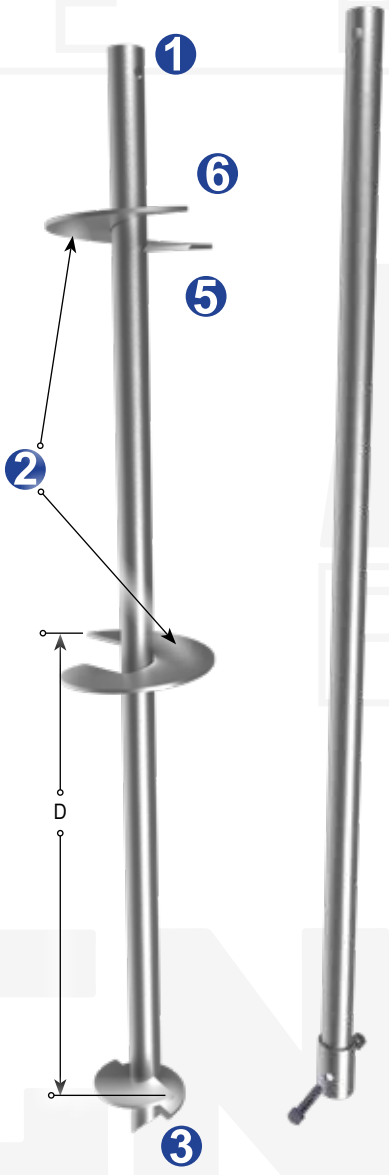
High-Strength 3.0" Diameter, 0.27" Wall, Round-Shaft with Rigid Coupler

Description: MAGNUM® Helical Piles offer a number of unique advantages as shown below. MAGNUM® products are manufactured in the USA according to our ISO 9001 approved Quality Program. Our Helical Piles utilize rigid bolted couplings to join extension sections and the lead section, extending the helical bearing plates down to the desired bearing stratum. Structural capacities are developed according to AISC 360 and ICC-AC358 considering buckling of 5 ft unbraced length after 75 years of corrosion in moderate to high aggressive soils. Various coatings, custom lengths and helix configurations are available upon request. See Magnum Technical Reference Manual for additional information.

1. **Round shafts offer increased lateral and buckling resistance compared to square shafts.**
2. **Patented alternating helix pattern reduces wobble and improves plumbness and tracking.**
3. **45-degree miter pilot point aids pile positioning and advancement.**
4. **Patented MAGNUM® Dual-Cutting Edge helical bearing plates (DCE) enhance penetration through dense soils with occasional cobbles and debris.**
5. **Sharpened edge on each helix slices through problem soils.**
6. **Conforming helix shape limits auguring and provides better quality assurance through valid capacity to torque correlations.**

Drawing shows an example pile lead and extension section. Section lengths and number of helices vary with project requirements and soil conditions.





Specifications	
Shaft	HSS 3.00" x 0.27" Nominal ASTM A513, Fy = 65 ksi, or Better
Bolts	(1) 7/8" Diameter SAE J429 Grade 5 Zinc Coated to ASTM B695/F1941
Helices	3/8" Thick, Helix Die-Pressed ASTM A36, or Better 8", 10", 12", 14" & 16" Diameters Available
Spacing 'D'	* 25-1/2" TYP
Pitch	3"
Coating	Galvanized (G), Bare Steel (NG), Epoxy Powder Coated (EP)
Properties	
8 ft^{-1}	Ultimate Capacity-to-Torque Ratio
** 8,300ft-lbs	Maximum Installation Torque
Capacity by Torque	
33 Tons	Ultimate Capacity
16.5 Tons	Allowable Capacity
Structural Capacity	
*** 33 Tons	Ultimate Capacity
16.5 Tons	Allowable Capacity

Notes: Helical piles shall be installed to appropriate depth into suitable bearing stratum as determined by geotechnical engineer or local practice. Capacity by torque is based on advancing pile to maximum installation torque. A minimum factor of safety of 2.0 is recommended for determining allowable capacity from correlations with final installation torque. Deflections of 0.5" are typical at allowable capacity; a higher factor of safety may be required to achieve smaller deflections. For tension capacity, helical bearing plates must be deeply embedded (5 ~ 7 x ave. helix diameter or as specified by geotechnical engineer).
Load tests are recommended when practical..

* Spacing = 34-1/2" with 16" Ø helix.
** Maximum Installation Torque rating considers Maximum Driving Stress per ASCE 20.
*** Structural capacity is shown for galvanized product after 75 years of corrosion. Structural capacity of bare steel product is less due to increased corrosion losses.

MAGNUM PIERING
designed to support

156 Circle Freeway Dr.
Cincinnati, OH. 45246
800-822-7437
www.MagnumPiering.com

MAGNUM PIERING
designed to support

2 Story, 2 Family Modular Home | Long Island, NY

MAGNUM PIERING
designed to support

MAGNUM PIERING
designed to support

MAGNUM PIERING
designed to support

MAGNUM®
PIERING
designed to support

For more information or to talk with a representative:
800-822-7437 | www.magnumpiering.com