ENGINEERING EXPRESS®

ENGINEERINGEXPRESS.COM
POSTAL ADDRESS: 401 W. ATLANTIC AVE R10 #219
DELRAY BEACH, FL 33444

Technical Evaluation Report

DIVISION: 23 08 00 – COMMISSIONING OF HVAC

THIS DOCUMENT CONTAINS (8) PAGES.
ENGINEER DIGITAL OR ORIGINAL HAND SEAL REQUIRED FOR USE.
COPIES NOT VALID FOR PERMIT.

(Subject to Renew November 1, 2023 or next code cycle)

EVALUATION SUBJECT: TRANE Nv-SERIES SYSTEMS

TER-20-34994

REPORT HOLDER:
MITSUBISHI ELECTRIC TRANE US HVAC LLC
1340 SATELLITE BLVD
SUWANEE, GA 30024, USA
678-376-2912 | METAHVAC.COM

Florida Building Code Seventh Edition (2020)
International Building & Residential Codes (2012, 2015 & 2018)

NOTE: THE GRAPHICAL DEPICTIONS IN THIS REPORT ARE FOR ILLUSTRATIVE PURPOSES ONLY AND MAY DIFFER IN APPEARANCE.

SCOPE OF EVALUATION (compliance with the following codes):

THIS IS A STRUCTURAL (WIND) PERFORMANCE EVALUATION ONLY. NO ELECTRICAL OR TEMPERATURE PERFORMANCE RATINGS OR CERTIFICATIONS ARE OFFERED OR IMPLIED HEREIN.

This Product Evaluation Report is being issued in accordance with the requirements of the **Florida Building Code Seventh Edition (2020)** per ASCE 7, FBC Building Ch. 16, FBC Building Sections 104.11 & 1522.2, FBC Existing Building Sections 707.1 & 707.2, FBC Mechanical 301.15, FBC Residential M1202.1 & M1301.1, FS 471.025, and Broward County Administrative Provisions 107.3.4. This report is also in accordance with the **International Building & Residential Codes (2012, 2015, & 2018).** The product noted on this report has been tested and/or evaluated as summarized herein.

IN ACCORDANCE WITH THESE CODES EACH OF THESE REPORTS MUST BEAR THE ORIGINAL SIGNATURE & RAISED SEAL OR DIGITAL SEAL OF THE EVALUATING ENGINEER.

SUBSTANTIATING DATA:

• Product Evaluation Documents
Substantiating documentation has been submitted to provide this TER and is summarized in the sections below.

• Structural Engineering Calculations
Structural engineering calculations have been prepared which evaluate the product based on comparative and/or rational analysis to qualify the following design criteria:

- Max. allowable lateral & uplift wind pressures certified herein
- Max. allowable sliding forces, uplift forces, & overturning moments (see Unit Reactions from Wind Guide on last page)
- Tie-down configuration and anchor capacity for various substrates
- Unit panel wind pressure connection integrity

Calculation summary is included in this TER and appears herein. NOTE: No 33% increase in allowable stress has been used in the design of this product.

LIMITATIONS & CONDITIONS OF USE:
Use of the product(s) listed herein shall be in strict accordance with this TER as noted herein and manufacturer-provided model specifications. Installation shall conform to the minimum standards stated in the referenced building code(s) in addition to the specifications and limitations stated herein. See herein for complete limitations & conditions of use.

OPTIONS:
This evaluation is valid for the Trane models described herein. The critical unit designs have been determined and used in this evaluation. Any structural changes outside of the design as described herein would void this certification.

UNIT CASING MATERIALS:
25ga galv. steel equivalent to ASTM A653 CS cold-rolled steel. Removable top & side covers secured with #8 SAE 1016 SMS screws. Unit integrated feet shall be 0.039" galv. steel equivalent to ASTM A653 CS cold-rolled steel. Knockouts provided for utility & control connections. Contact Report Holder for further unit construction information.

TERMINOLOGY:
See herein for definitions of terms and abbreviations used in this report.

STRUCTURAL PERFORMANCE:
Models referenced herein are subject to the following design limitations:

Maximum Rated Wind Pressures*:
± 119 psf Lateral, 94 psf Uplift

- Required design wind pressures shall be determined according to the guide provided in the Appendix (see last page of this report) or on a site-specific basis in accordance with ASCE 7 and applicable sections of the building code(s) being referenced in accordance with ASD methodology.
- Required design pressures shall be less than or equal to the maximum pressures listed herein.
- *Maximum Rated Wind Pressures indicate the maximum pressures that all units listed herein are approved for. Valid for at-grade, wall-mounted, and rooftop applications. See limitations herein.
- Valid for use inside and outside the High-Velocity Hurricane Zone (HVHZ).
- Site-specific wind analysis may produce alternate limitations provided maximum rated wind pressures stated herein are not exceeded.

VISIT ECALC.IO/TRANE

FOR ENGINEER CERTIFIED ORIGINALS & MORE INFORMATION ABOUT THIS DOCUMENT OR SCAN THE QR CODE TO THE RIGHT >

VISIT ENGINEERINGEXPRESS.COM/STORE **FOR ADDITIONAL PLANS, REPORTS & RESOURCES**

ORIGINAL SIGNATURE AND RAISED SEAL
OR DIGITAL SEAL REQUIRED TO BE VALID PER CODE:

FRANK L. BENNARDO LICENSE No 0046549 STATE OF FLORIDA PROFESSIONAL ENGINEER EXP: 2/28/2023

Digitally signed by Frank Bennardo PE
Reason: Printed copies of this document are not considered sigend and sealed. Sigature must be verified on any electronic copies.
Date: 2023.02.15 13:30:47-05'00'

VALID ONLY FOR: MITSUBISHI ELECTRIC TRANE US HVAC LLC FOR PERMIT USE

DIGITAL SEAL NOTICE: IF THIS DOCUMENT IS DIGITALLY SIGNED, THIS SHEET IS PART OF A DIGITALLY SIGNED FILE. IT SHALL REMAIN IN DIGITAL FORMAT, SHALL BE VERIFIED BY ELECTRONIC MEANS, & **PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED**. VISIT ECALC.IO/DS FOR MORE INFORMATION.
PRINTED DOCUMENT NOTICE: IF THIS DOCUMENT IS PRINTED **& DOES NOT CONTAIN AN ENGINEER'S ORIGINAL SIGNATURE & SEAL, THIS DOCUMENT IS VOID & NOT VALID FOR USE. PHOTOCOPIES ARE NOT PERMITTED FOR USE.**

Copyright © Engineering Express® All Rights Reserved

MODEL INFORMATION

Cabinet Group	Model Number	Unit Dimensions (in)			Operating Weight (lb)
		Width	Depth	Height	
Group I	NTXSPF09/12A112AA	31.50	11.25	21.63	83
	NTX/YSST09/12/15A112A/B	31.50	11.25	21.63	81
	NTXSMT09/12/15/18A112A/B	31.50	11.25	21.63	73~81
	NTXSPB/H06/09/12B112AA	31.50	11.25	21.63	81~83
	NTXSKS09/12/15A112AA	31.50	11.25	21.63	66~80
	NTXSMT09/12A111AA	31.50	11.25	21.63	73
	NTXSEL09/12/18A112AB	31.50	11.25	21.63	73~81
Group II	NTX/YSST30/36B112AA	33.06	13.00	33.44	121
	NTXSKS18/24/30/36A112AA	33.06	13.00	34.63	129
	NTX/YSST18/24A112AA	33.06	13.00	34.63	119~121
	NTXSMT24A112AA	33.06	13.00	34.63	121
	NTXSPB/H15/18B112AA	33.06	13.00	34.63	124
	NTXMMX20A122BA	33.06	13.00	27.94	126
	NTXSPF15/18A112AA	33.06	13.00	34.63	124
	NTXSEL24A112AA	33.06	13.00	34.63	121
Group III	NTXMMX24/30A132BA	37.41	13.00	31.34	137
	NTXMMX36A142BA	37.41	13.00	31.34	139
	NTXSKH09/12/15/18A112A*	37.41	13.00	34.63	129~131
	NTXSKH24A112A*	37.41	13.00	37.13	190
	NTXMMX42A152BA	37.41	13.00	41.27	189
	NTXMPH20A122BA	37.41	13.00	41.27	187
	NTXMPH24/30A132BA	37.41	13.00	41.27	189
Group IV	NTXSKH30/36A112A*	41.34	13.00	52.69	261
	NTXMPH48A182BA	41.34	13.00	52.69	276
	NTXMMX48A182BA	41.34	13.00	52.69	269
	NTXMMX60A182BA	41.34	13.00	52.69	309
	NTXMPH36A142BA	41.34	13.00	52.69	276
	NTXMPH42A152BA	41.34	13.00	52.69	276
	NTXMSM36/48/60A14/82AA	41.34	13.00	52.69	271~302
	NTXMSH36/42/48A14/5/82AA	41.34	13.00	52.69	278

MODEL INFORMATION NOTES

Unit dimensions listed are unit net dimensions (as opposed to packing/shipping dimensions). Unit weights listed are unit operating weights (as opposed to unit shipping weights).

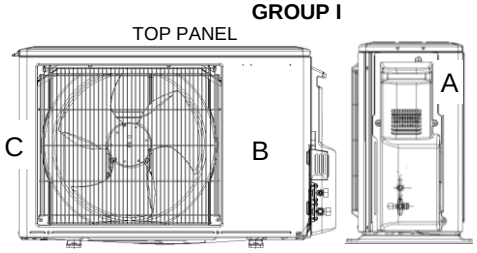
Cabinet Groups were designated by this firm based on unit size, exterior panel layout, and unit construction. See details on this page for sample units from each Cabinet Group and Panel Designations (designated for reference in the Panel Integrity Summary section; see herein).

Model information listed herein is based on information provided by the client. Unit appearance may vary. Please contact Report Holder for more information.

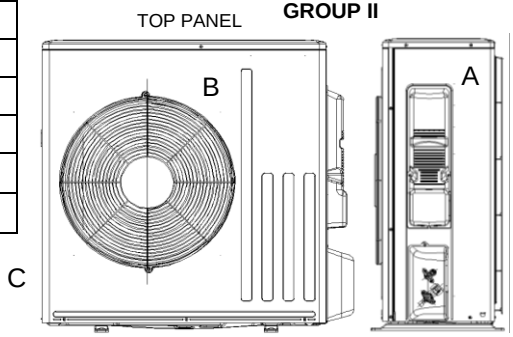
CABINET GROUPS & PANEL DESIGNATIONS

Note: Images for illustration purposes, actual units may differ.

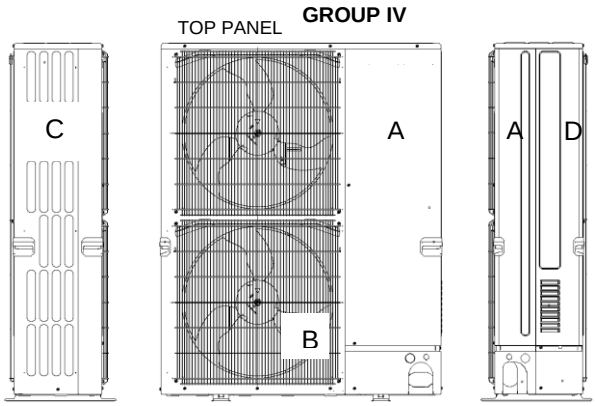
GROUP I



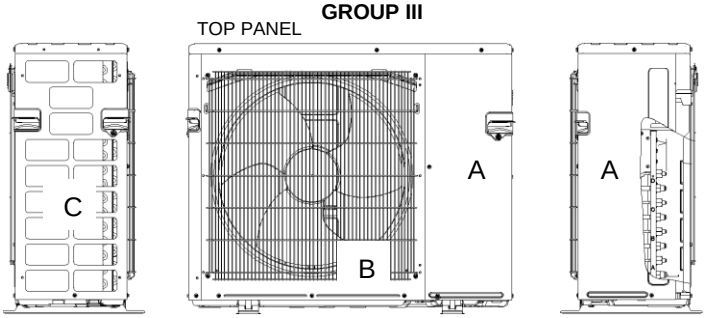
GROUP II



GROUP IV



GROUP III



Copyright © Engineering Express® All Rights Reserved

TIE-DOWN SCHEDULE

Cabinet Group	Max. Wind Pressures Lateral (Uplift)	Anchor Schedule to Host Structure By Others			# of Tie-Down Clips Required	# of Tie-Down Straps Required	Min. WLL per Strap
		3000 psi min. Concrete Host	1/8" min. thick UTS = 58 ksi min. Steel Host	1/8" min. thick 6061-T6 Aluminum Host			
Groups I & II	± 43 psf (0 psf)	A or C	N/A	N/A	0	0	N/A
	± 89 psf (70 psf)	N/A	B	B	0	2	500 lb
	± 106 psf (84 psf)	N/A	B	B	0	2	600 lb
	± 119 psf (94 psf)	N/A	B	B	0	2	700 lb
Group III	± 43 psf (0 psf)	C	N/A	N/A	0	0	N/A
	± 89 psf (70 psf)	N/A	B	B	0	2	600 lb
	± 106 psf (84 psf)	N/A	B	B	0	2	800 lb
	± 119 psf (94 psf)	N/A	B	B	0	2	1000 lb
Group IV	± 43 psf (0 psf)	C	N/A	N/A	2	0	N/A
	± 89 psf (70 psf)	N/A	B	B	0	2	1500 lb
	± 106 psf (84 psf)	N/A	B	B	0	2	2000 lb
	± 119 psf (94 psf)	N/A	B	B	0	2	2000 lb

TIE-DOWN SCHEDULE NOTES (Continued Next Page)

TIE-DOWN SCHEDULE DIRECTIVE: The Tie-Down Schedule table above is divided into maximum wind pressure tiers (each row of table) for each Cabinet Group. Site-specific wind pressures up to ± 43 psf lateral & 0 psf uplift shall use, at-minimum, the tie-down specifications as stated in the ± 43 psf lateral (0 psf uplift) pressure tier row. Site-specific wind pressures that fall in-between pressure tiers shall use, at-minimum, the tie-down specifications as specified by the higher pressure tier. Ensure the host structure by others meets the minimum specifications as stated in the Tie-Down Schedule table. This schedule applies to all units described in this evaluation. See tie-down specifications and Details herein.

Example 1: Say your particular installation site has site-specific wind pressures of ± 37 psf lateral and 0 psf uplift and you are installing a Group I unit. In this case, you would need to follow, at-minimum, the tie-down specifications corresponding to the ± 43 psf (0 psf) wind pressure tier row for Group I. This row only permits anchoring to concrete host structures. If your host structure is aluminum or steel, you would need to use, at-minimum, the tie-down specifications corresponding to the ± 89 psf (70 psf) wind pressure tier row for Group I.

Example 2: Say your particular installation site has site-specific wind pressures of ± 96 psf lateral and 76 psf uplift and you are installing a Group III unit. In this case, you would need to follow, at-minimum, the tie-down specifications corresponding to the ± 106 psf (84 psf) wind pressure tier row for Group III. This row permits aluminum and steel host structures only. Anchoring to a concrete host structure would not be permitted in this example.

ANCHOR SCHEDULE NOTES: In all cases, host structure is by others. Anchor shall be selected per Cabinet Group, site-specific wind pressures, and host structure substrate. Utilize (1) anchor per unit integrated foot - (4) anchors per unit. Also utilize (1) anchor per tie-down clip (if applicable). Anchor specifications as represented in the Tie-Down Schedule are as follows:

A: 1/4" Ø DeWalt (formerly Elco) UltraCon SS4 anchor or equivalent with 1-3/4" embedment, 2-1/2" min. edge distance to any edge of concrete, and 4" min. spacing from neighboring concrete anchors typ. Use (1) washer under each anchor head as follows:

- Unit integrated feet anchors: 1" min. OD fender washer sized for 1/4" Ø anchors.
- Tie-down clip anchors (if applicable): 5/8" min. OD washer

B: 3/8" Ø, SAE Gr. 5 or stronger Thru-Bolt with 1" min. OD fender washers sized for 3/8" Ø bolts top and bottom and SAE Gr. 5 or stronger locking nut sized for 3/8" Ø bolts, typ. Provide 1" min. edge distance to any edge of host structure and 1" min. spacing from neighboring Thru-Bolts, typ.

C: 1/4" Ø DeWalt (formerly Stanley/Powers) Wedge Bolt or equivalent with 2" min. embedment, 2" min. edge distance to any edge of concrete, and 4" min. spacing from neighboring concrete anchors typ. Use (1) washer under each anchor head as follows:

- Unit integrated feet anchors: 1" min. OD fender washer sized for 1/4" Ø anchors.
- Tie-down clip anchors (if applicable): 5/8" min. OD washer

N/A: Not applicable.

Copyright © Engineering Express® All Rights Reserved

TIE-DOWN SCHEDULE (Reproduced from the previous page for ease of reference)

Cabinet Group	Max. Wind Pressures Lateral (Uplift)	Anchor Schedule to Host Structure By Others			# of Tie-Down Clips Required	# of Tie-Down Straps Required	Min. WLL per Strap
		3000 psi min. Concrete Host	1/8" min. thick UTS = 58 ksi min. Steel Host	1/8" min. thick 6061-T6 Aluminum Host			
Groups I & II	± 43 psf (0 psf)	A or C	N/A	N/A	0	0	N/A
	± 89 psf (70 psf)	N/A	B	B	0	2	500 lb
	± 106 psf (84 psf)	N/A	B	B	0	2	600 lb
	± 119 psf (94 psf)	N/A	B	B	0	2	700 lb
Group III	± 43 psf (0 psf)	C	N/A	N/A	0	0	N/A
	± 89 psf (70 psf)	N/A	B	B	0	2	600 lb
	± 106 psf (84 psf)	N/A	B	B	0	2	800 lb
	± 119 psf (94 psf)	N/A	B	B	0	2	1000 lb
Group IV	± 43 psf (0 psf)	C	N/A	N/A	2	0	N/A
	± 89 psf (70 psf)	N/A	B	B	0	2	1500 lb
	± 106 psf (84 psf)	N/A	B	B	0	2	2000 lb
	± 119 psf (94 psf)	N/A	B	B	0	2	2000 lb

TIE-DOWN SCHEDULE NOTES (Continued from Previous Page)

TIE-DOWN CLIP NOTES: No tie-down clips are required for Cabinet Group I, II, and III units. For Group IV units, tie-down clips are required only for at-grade installations to concrete host structures up to ± 43 psf lateral & 0 psf uplift wind pressures.

Tie-down clips shall be 1" min. wide, 4"-12" tall, 0.068" min. thick, UTS = 45 ksi min. galv. steel. *Note: Miami-Tech steel 1" wide CUTD clips have been reviewed by Engineering Express and are pre-approved to meet the aforementioned clip specifications.*

Fasten clip to host structure with (1) anchor per tie-down clip according to the "Anchor Schedule to Host Structure" specifications stated herein. Ensure anchor is placed at center of tie-down clip leg to provide 1/2" min. edge distance, typ. Fasten clip to unit base rail with (4) #10, SAE Gr. 2 min. or SS self-drilling screws, typ. Utilize (4) slots that have flush, solid contact with unit, (1) screw per slot, typ. Care must be taken to avoid screw contact with internal piping and components. Exercise caution with screw installation. Ensure all screws fully engage with unit. Tie-down clips shall sit flush on host structure and flush against unit.

Position tie-down clips at corners of unit, (1) per unit long side*, typ. See sample at-grade installation detail for sample tie-down clip locations. *Note: For tie-down clips to concrete hosts, it is permitted for tie-down clips to be installed on corners of unit short sides instead of unit long sides in order to provide the required minimum anchor spacing. Ensure all other specifications listed herein are achieved.

TIE-DOWN STRAP NOTES: No tie-down straps are required for at-grade installations.

Strap material shall be high strength webbing and shall be compliant for exterior grade use if they contain plastic components in accordance with FBCB Chapter 26.

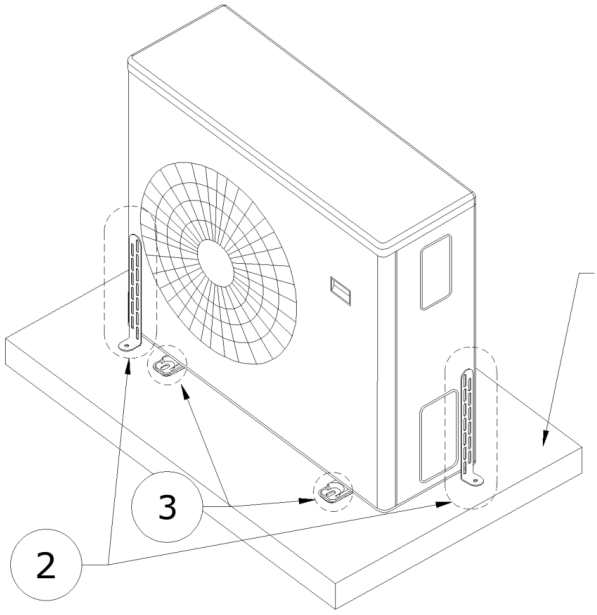
Working load limit (WLL) is per strap's manufacturer, specified per strap. If the strap is rated to a capacity or breaking strength instead of WLL, the capacity or breaking strength shall be divided by the strap manufacturer's specified safety factor to obtain an equivalent WLL that complies with the parameters above. Select strap from the Tie-Down Schedule based on the minimum WLL requirements.

Strap length shall be verified on-site for all units. Straps shall be wrapped around the unit and host structure member and shall be tightened to a snug fit using the strap's buckle. Neoprene pads may be placed between the unit and strap to protect the unit from damage/distortion. Tie-down straps may be removed for maintenance purposes but shall be replaced following maintenance. **Tie-down straps must be in place before any named storm or similar high-wind event.**

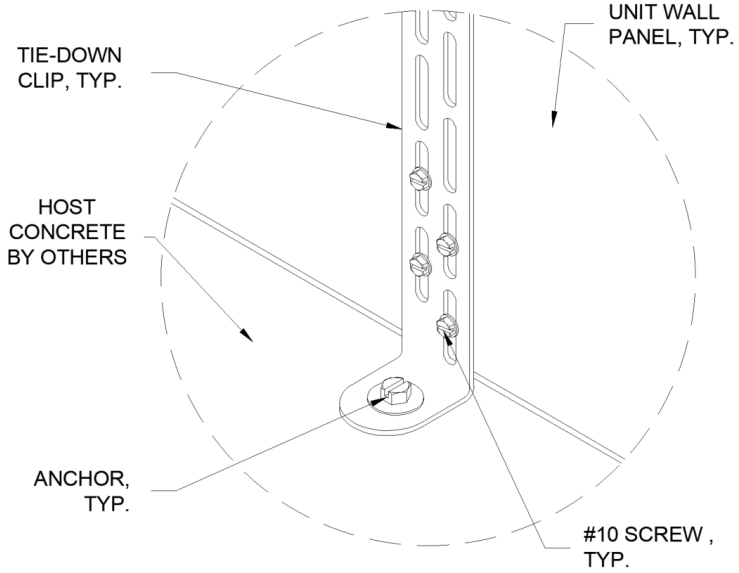
SEE TIE-DOWN DETAILS NEXT PAGE

Copyright © Engineering Express® All Rights Reserved

TIE-DOWN DETAILS

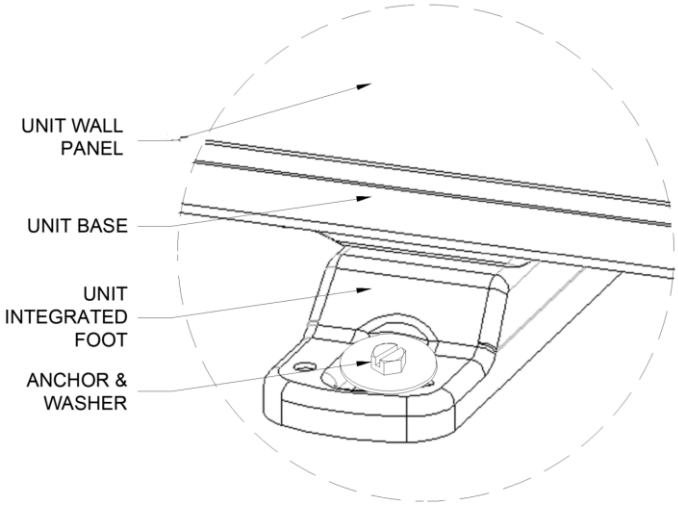


1 SAMPLE AT-GRADE INSTALLATION, TYP.
SCALE: NTS ISOMETRIC VIEW

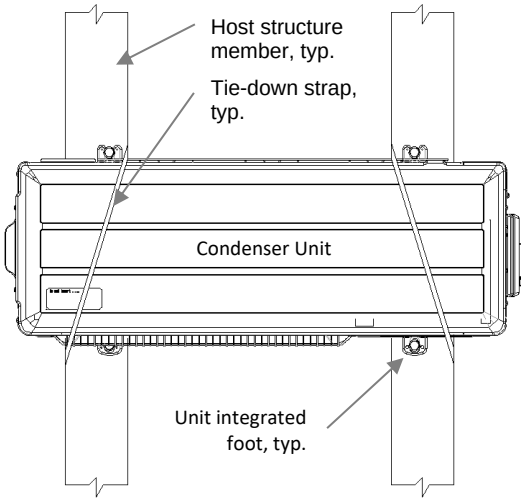


2 TIE-DOWN CLIP ATTACHMENT, TYP.
SCALE: NTS ISOMETRIC VIEW

(If applicable - tie-down clips are required for Cabinet Group IV units at-grade only).



3 UNIT INTEGRATED FOOT ATTACHMENT, TYP.
SCALE: NTS ISOMETRIC VIEW



4 SAMPLE WALL/ROOF INSTALLATION, TYP.
SCALE: NTS ISOMETRIC VIEW

TIE-DOWN DETAILS - NOTES

For each Detail in this section, consult Tie-Down Schedule and Notes herein for all tie-down components & specifications required.

The units depicted in the Details on this page are for illustrative purposes only. Units may vary in appearance. Tie-down system may not be depicted in full. Sample tie-down layout shown in Details 1 and 4 are for illustrative purposes only. Tie-down locations may vary per the specifications of the Tie-Down Schedule and Notes herein.

Note: For Detail 1, the tie-down clip illustrated on the front long side may need to be positioned elsewhere to achieve the minimum anchor spacing requirements; tie-down clip is shown in this location to include (2) tie-down clips in the same illustration.

Copyright © Engineering Express® All Rights Reserved

PANEL INTEGRITY SUMMARY

No additional screws are required for Cabinet Groups I, II, and III for wind pressures up to ± 118 psf lateral & 94 psf uplift.

No additional screws are required for Cabinet Group IV for wind pressures up to ± 43 psf lateral & 0 psf uplift.

For Cabinet Group IV with site-specific pressures greater than ± 43 psf lateral & 0 psf uplift, follow the directives and specifications as noted in the Panel Integrity Summary Tables and Notes below:

Up to ± 89 psf Lateral & 74 psf Uplift Wind Pressures		
Panel Designation	**Additional Screws Required**	**Additional Screws Directive**
Panel A	1	Install (1) addtl. screw into bottom of panel to join with unit base.
Panel B	1	Install (1) addtl. screw into bottom of panel to join with unit base.
(2) Addtl. Screws Required in Total per Cabinet Group IV Unit. Additional screws shall be #8 min. Ø, SAE 1016 or stronger SMS. See notes below for addtl. specifications.		

Up to ± 119 psf Lateral & 94 psf Uplift Wind Pressures		
Panel Designation	**Additional Screws Required**	**Additional Screws Directive**
Panel A	2	Install (2) addtl. screws into bottom of panel to join with unit base.
Panel B	2	Install (2) addtl. screws into bottom of panel to join with unit base.
(4) Addtl. Screws Required in Total per Cabinet Group IV Unit. Additional screws shall be #8 min. Ø, SAE 1016 or stronger SMS. See notes below for addtl. specifications.		

PANEL INTEGRITY SUMMARY NOTES

Panel integrity calculations were based on information provided by the client and manufacturer-listed specifications. Specifications herein apply to all unit models listed herein (see "Model Information" on page 2). All exterior panels were considered in the calculations and are covered by this certification. Panels were assigned various porosities depending on the ratio of louver/aperture area to total panel area, for the purposes of calculating the acting wind force on each panel. Screw sizes, quantities on panels, and panel characteristics were considered based on client-provided information and additional conservative assumptions. Screw quantities were checked to reinforce unit panels as needed.

"Additional screws" are screws that are required to be installed ***in addition to*** the existing screws present as part of the original unit design(s) submitted to this office, unless noted otherwise (U.N.O.). The purpose of additional screws is to ensure panel connection integrity, referred to herein as "panel integrity", is sufficiently validated, such that the panel in question can withstand a high-speed wind gust and not detach or otherwise become flying debris.

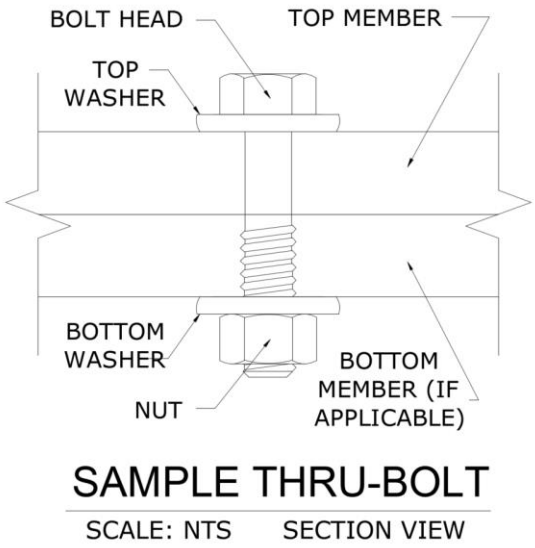
1000 hours of ASTM B117 with zero red rust is required for all additional screws. Position additional screw(s) as directed by the respective "Additional Screws Directive" specifications for the panel in question. Provide 1" min. spacing between neighboring screws (existing or additional). Validate that each additional screw joins the panel in question to the other specified member (as specified in the "Additional Screws Directive" where applicable).

SEE "TERMINOLOGY, CONTINUED" AND
"LIMITATIONS & CONDITIONS OF USE, CONTINUED" ON NEXT PAGE

Copyright © Engineering Express® All Rights Reserved

TERMINOLOGY, CONTINUED

The following abbreviations may appear in this report: “Addtl.” for “additional”, “AHJ” for “Authority Having Jurisdiction”, “alum” for “aluminum”, “ASCE” for “American Society of Civil Engineers”, “ASD” for “Allowable Stress Design”, “ASTM” for “American Society for Testing and Materials”, “EA.” for “each”, “E.D.” for edge distance”, “EDDS” for “extra deep drawing steel”, “e.g.” for “*exempli gratia*” or “for example”, “equiv.” for “equivalent”, “FBC” for “Florida Building Code”, “FEA” for “Finite Element Analysis”, “FLCA” for “Florida Certificate of Authorization”, “FS” for “Florida Statutes”, “Fu” for “ultimate tensile strength” or “ultimate tensile stress”, “Fy” for “yield strength” or “yield stress” “GA” for “gauge”, “GR." or “Gr.” for “grade”, “HVAC” for “heating, ventilation, and air conditioning”, “HVHZ” for “High-Velocity Hurricane Zone”, “i.e. ” for “*id est*” or “in other words”, “in” for “inch”, “lb” for “pound (force)”, “max.” for “maximum”, “min.” for “minimum”, “mm” for “millimeter”, “NTS” for “not to scale”, “O.C. ” for “on center”, “OD” for “outer diameter”, “PE” for “Professional Engineer”, “qty” for “quantity”, “SAE” for “Society of Automotive Engineering”, “SECB” for “Structural Engineering Certification Board”, “SMS” for “sheet metal screws”, “SS” for “stainless steel”, “TER” for “Technical Evaluation Report”, “typ.” for “typical”, “U.N.O.” for “unless noted otherwise”, “UTS” for “ultimate tensile strength” or “ultimate tensile stress”, “WLL” for “working load limit”, “w/o” for “without”, “YS” for “yield strength” or “yield stress”, “#” for “number”, “&” for “and”, and “Ø” for “diameter”. For additional abbreviation/terminology clarifications, please contact this office.



Note: The term “Thru-Bolt” or through bolt, if used herein, refers to a bolt passing through the member(s) in contact and is fastened by a nut at the end opposite the screw head. Nut shall be equivalent to or exceed the strength of the bolt U.N.O. Nut shall be sized to accommodate the same nominal diameter as the bolt U.N.O. See diagram above-right for a sample thru-bolt configuration.

LIMITATIONS & CONDITIONS OF USE, CONTINUED

Use of this product shall be in strict accordance with this TER as noted herein. The supporting host structure shall be designed to resist all superimposed loads as determined by others on a site-specific basis as may be required by the authority having jurisdiction. Host structure conditions which are not accounted for in this product’s respective anchor schedule shall be designed for on a site-specific basis by a registered Professional Engineer. No evaluation is offered for the host supporting structure by use of this document. Adjustment factors noted herein and the applicable building codes must be considered, where applicable. Product components shall be of the material(s) specified in the manufacturer-provided product specifications. All supporting components which are permanently installed shall be protected against corrosion, contamination, and other such damage at all times. All fasteners and anchors shall be installed in accordance with the applicable provisions specified herein in addition to the anchor/fastener manufacturers’ published installation instructions. Fasteners must penetrate the supporting members such that the full length of the threaded portion is embedded within the main member. This evaluation does not offer any evaluation to meet large missile impact debris requirements under any circumstances.

All of the wind-resisting exterior panels (with accompanying retrofits) individually meet or exceed their capacity to resist the design wind loads as stated in the calculations as required by the codes and standards stated herein. Due to the indeterminate nature of these units, distortion and deflection cannot be accurately evaluated, but with diaphragm action of external components and internal stiffeners, the base unit has the capacity to withstand these forces with individual external parts being contained. Inspections shall be implemented during annual equipment maintenance or after a named storm; all fasteners and cabinet components are to be verified, and all damaged, loose, corroded and/or broken fasteners and cabinet components shall be replaced to ensure structural integrity against hurricane wind forces. Contact this office for any reevaluation needs as designated by the Authority Having Jurisdiction.

SEE APPENDIX ON NEXT PAGE

Proj. #	Remarks	By	Checked	Date	Proj. #	Remarks	By	Checked	Date
17.5131.5	Initial Issue	LAO	FLB	7/30/19	20-34994	Update Model Numbers	EPR	EPR	7/13/21
20-34994	2020 FBC	CCB	RWN	1/25/21	20-34994	Update/Add Model Numbers	EPR	RWN	4/1/22

Copyright © Engineering Express® All Rights Reserved

APPENDIX A: DESIGN WIND PRESSURE GUIDE

Max. Ult. Wind Speed (V_{ult})	Max. MRH (Roof Height)	Exposure Category	Required Design Wind Pressures (ASD)	
			Lateral Pressure	Uplift Pressure
140 mph	At-Grade (0 ft)	C	± 26 psf	0* psf
		D	± 31 psf	0* psf
	100 ft	C	± 63 psf	50 psf
		D	± 71 psf	56 psf
	200 ft	C	± 72 psf	57 psf
		D	± 80 psf	63 psf
175 mph	At-Grade (0 ft)	C	± 40 psf	0* psf
		D	± 49 psf	0* psf
	100 ft	C	± 98 psf	77 psf
		D	± 111 psf	87 psf
	200 ft	C	± 113 psf	89 psf
		~~D~~	~~± 124 psf~~	~~98 psf~~
186 mph	At-Grade (0 ft)	C	± 46 psf	0* psf
		D	± 55 psf	0* psf
	100 ft	C	± 111 psf	87 psf
		~~D~~	~~± 125 psf~~	~~99 psf~~
	~~200 ft~~	~~C~~	~~± 127 psf~~	~~100 psf~~
		~~D~~	~~± 140 psf~~	~~111 psf~~

~~100 psf~~

Note: Any table values with the format shown left, if present, indicate design wind pressures and site conditions that are **not approved for use** by this evaluation. Seek additional engineering or contact this office for design solutions.

DIRECTIVE: This design pressure guide is for reference only and shall be approved for use by the Authority Having Jurisdiction (AHJ). If the design pressures listed in this guide are not used, required design pressures shall be calculated separately. For site-specific scenarios classified as Exposure Category B, the required design pressures stated for Exposure Category C in the above guide shall be used or design pressures shall be calculated separately. For heights and parameters beyond the parameters listed in this guide, visit our Online Calculator via the website link (https://ecalc.io/forces) or QR Code below, or obtain calculations separately by others.

The required ASD design pressures listed in this guide were calculated per the table's listed corresponding site conditions. The project design professional or permitting contractor shall verify that the site-specific conditions are equal to or less than the approved design parameters listed in the guide. Per the note below table: any values shown as "~~XX psf~~", indicate wind pressures and corresponding site conditions that are **not valid for use** with this evaluation (exceeds the max. rated pressures).

*Note: Per the codes and standards referenced herein, uplift is optional for mechanical equipment at-grade. At the discretion of the AHJ, uplift may be taken as 0 psf or as the value listed in the guide.

At-Grade (0 ft MRH) Required Design Pressures:

- ASCE 7 "Design Wind Loads: Other Structures"
- Structure Shape = Square, flat terrain
- Height of structure (unit + stand or curb, if used) = 6 ft max.
- Width of unit = 1 ft min., Depth of unit = 11 in min.

Rooftop (>15 ft MRH) Required Design Pressures:

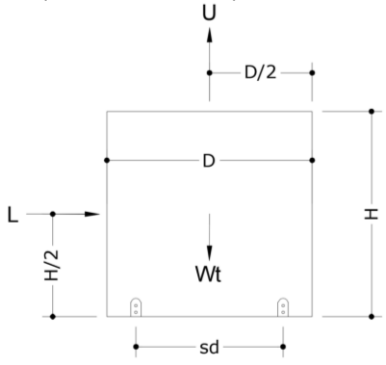
- ASCE 7 "Design Wind Loads: Other Structures: Rooftop Structures and Equipment for Buildings"
- Structure Shape = Square, flat terrain
- z = up to 7 ft, where z = height of stand or curb + ½ unit height
- Lateral GC_f = 1.90; Uplift GC_f = 1.50

VISIT ECALC.IO/FORCES

FOR DESIGN AID CALCULATORS AND RESOURCES RELATED TO THIS TER & GUIDES HEREIN, OR SCAN THE QR CODE RIGHT >

UNIT REACTIONS FROM WIND GUIDE

DIRECTIVE: This guide is intended for use by a design professional. Design parameters shall abide all specifications and limitations stated in this report. Design professional shall consider all forces, including seismic and snow loads, per the governing building code. Unit reactions obtained from this guide shall be verified by a registered Professional Engineer. Reactions are applicable for unit-to-host connections only. Sample calculations are provided below.



Design Parameters:

- Lateral Wind Pressure, P_lat
- Unit Height, H
- Unit Width, W
- Support Spacing across Depth, sd
- Uplift Wind Pressure, P_up
- Unit Depth, D
- Unit Weight, Wt
- Support Spacing across Width, sw

Unit Reaction Equations:

Long Side (Width x Height):

- Sliding Force, L = P_lat x W x H
- Uplift Force, U = P_up x W x D
- Total Tension per Long Side = (L x H/2 + U x sd/2 – Wt x 0.6 x sd/2) / sd

Short Side (Depth x Height):

- Sliding Force, L = P_lat x D x H
- Uplift Force, U = P_up x W x D
- Total Tension per Short Side = (L x H/2 + U x sw/2 – Wt x 0.6 x sw/2) / sw

Example: A (48" W x 36" D x 42" H), 250 lb net weight unit at wind pressures of 120 psf lateral and 95 psf uplift, on a 24" wide roof stand, shall have the following unit reactions:

Long Side (Width x Height):

1. Sliding Force, L = P_lat x W x H
   = (120 psf) x (48 in) x (42 in) x (1 in^2 / 144 ft^2) = **1680 lb**
2. Uplift Force, U = P_up x W x D
   = (95 psf) x (48 in) x (36 in) x (1 in^2 / 144 ft^2) **= 1140 lb**
3. Total Tension per Long Side =
   = (L x H/2 + U x sd/2 – Wt x 0.6 x sd/2) / sd
   = ((1680 lb x 42/2 in) + (1140 lb x 24/2 in) – (250 lb x 0.6 x 24/2 in)) / 24 in **= 1965 lb**

Short Side (Depth x Height):

1. Sliding Force, L = P_lat x D x H
   = (120 psf) x (36 in) x (42 in) x (1 in^2 / 144 ft^2) **= 1260 lb**
2. Uplift Force, U = P_up x W x D
   = (95 psf) x (48 in) x (36 in) x (1 in^2 / 144 ft^2) **= 1140 lb**
3. Total Tension per Short Side =
   = (L x H/2 + U x sw/2 – Wt x 0.6 x sw/2) / sw
   = ((1260 lb x 42/2 in) + (1140 lb x 48/2 in) – (250 lb x 0.6 x 48/2 in)) / 48 in **= 1046 lb**

IN ALL CONDITIONS IT IS THE RESPONSIBILITY OF THE PERMIT HOLDER TO ENSURE THE HOST STRUCTURE IS CAPABLE OF WITHSTANDING THE RATED GRAVITY, LATERAL, AND UPLIFT FORCES BY SITE-SPECIFIC DESIGN. NO WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED, IS OFFERED BY ENGINEERING EXPRESS AS TO THE INTEGRITY OF THE HOST STRUCTURE TO CARRY DESIGN FORCE LOADS INCURRED BY THIS UNIT.

Copyright © Engineering Express® All Rights Reserved