

BMP INTERNATIONAL, INC.

MECHANICAL UNIT STEEL TIE-DOWN CLIP: AT GRADE & ROOF-TOP MOUNTED APPLICATIONS

01/05/2021



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MECHANICAL UNIT STEEL TIE-DOWN CLIPS

IBC (2015 & 2018), FBC 7TH EDITION (2020)

REMARKS	DRWN	CHKD	DATE
INT. ISSUE (11-BMP-0001)	TSB	FLB	12-11-11
REV FOR UNITS	CSL	TSB	02-15-13
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REV FOR FBC 6TH (2017)	LAO	FLB	07-21-17
2020 FBC	CCB	RWN	9/16/20

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DESIGN NOTES:

THIS PRODUCT HAS BEEN DESIGNED IN ACCORDANCE WITH ASCE 7 AND THE INTERNATIONAL BUILDING CODE (2015, & 2018). THIS PRODUCT IS ALSO IN ACCORDANCE WITH FLORIDA BUILDING CODE 2020 (7TH EDITION) FOR USE WITHIN AND OUTSIDE THE HIGH VELOCITY HURRICANE ZONE AS INDICATED IN THE ACCOMPANYING DESIGN SCHEDULES. THE DESIGN CRITERIA USED TO CALCULATE THE ALLOWABLE ROOF-TOP HEIGHTS CONSIDERS FBC SECTION 1609 FOR NON-HVHZ AND SECTION 1620 FOR HVHZ & ASCE 7 SECTION 29 FOR INSTALLATIONS AT GRADE. $(G_{cr})_{Lateral} = 1.90$ WITHIN THE HVHZ & OUTSIDE THE HVHZ, $(G_{cr})_{Wind} = 1.5$ FOR ALL LOCATIONS (CONCURRENT). ALL OTHER DESIGN VARIABLES ARE IN ACCORDANCE WITH ASCE 7 CHAPTERS 26 & 29. THE HEIGHTS LISTED IN THE DESIGN SCHEDULES REPRESENT THE ALLOWABLE HEIGHT OF THE BUILDING. THIS PRODUCT APPROVAL ALLOWS FOR EACH UNIT TO BE INSTALLED ON A MAXIMUM 30" TALL A/C STAND (CERTIFICATION BY OTHERS) ON TOP OF THE HEIGHTS LISTED IN THE DESIGN SCHEDULES.

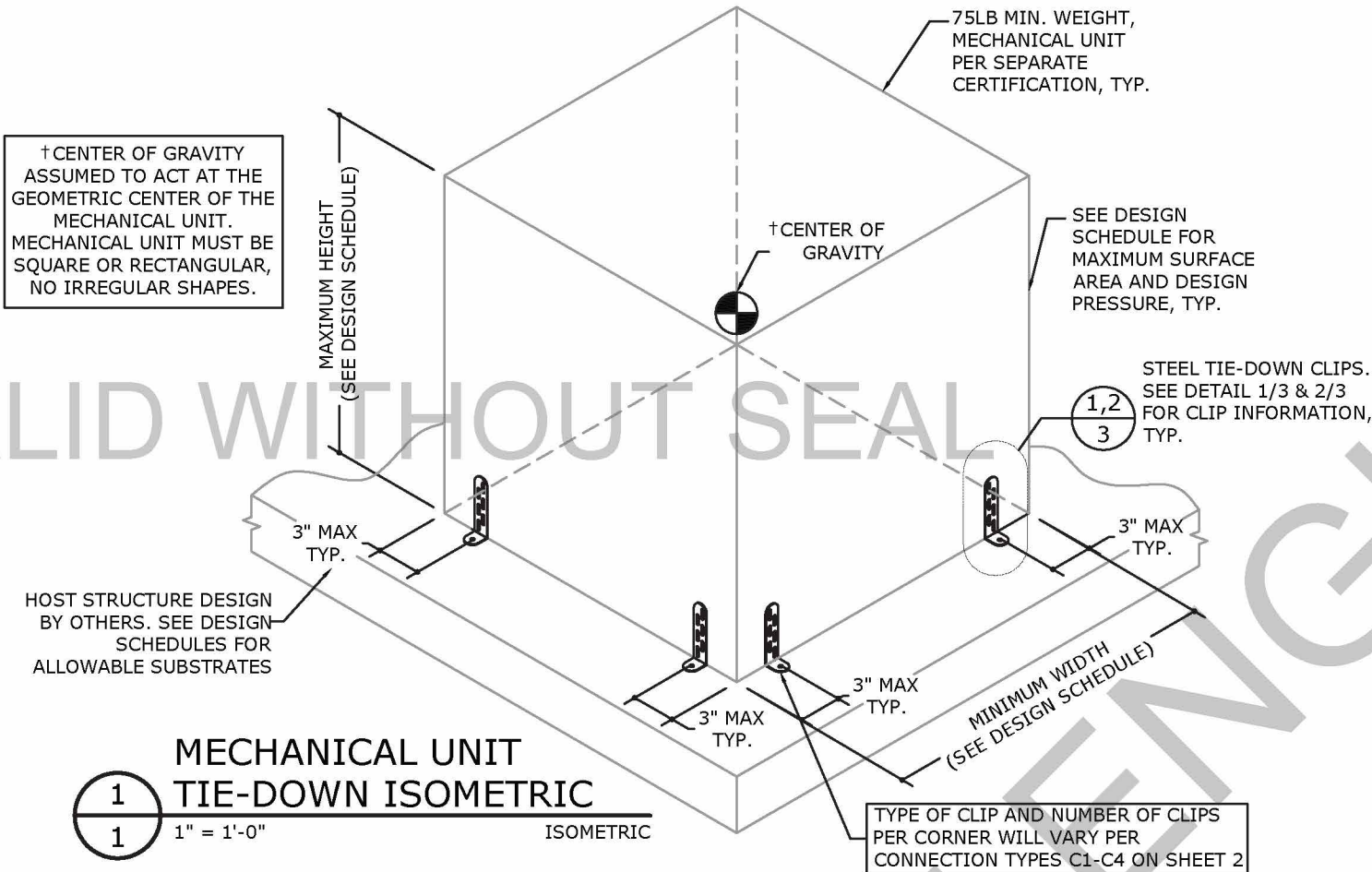
GENERAL NOTES:

- NO 33-1/3% INCREASE IN ALLOWABLE STRESS HAS BEEN USED IN THE DESIGN OF THIS SYSTEM.
- DESIGN IS BASED ON CLIENT PROVIDED PRODUCT AND DIE SHEETS FROM TEST REPORTS #TEL 01970387A, #TEL 01970387B BY TESTING EVALUATION LABORATORIES, INC.. NO SUBSTITUTIONS WITHOUT WRITTEN APPROVAL BY THIS ENGINEER SHALL BE PERMITTED.
- MAXIMUM & MINIMUM DIMENSIONS AND MINIMUM WEIGHT OF MECHANICAL UNIT SHALL CONFORM TO SPECIFICATIONS STATED HEREIN. ALL MECHANICAL SPECIFICATIONS (CLEAR SPACE, TONNAGE, ETC.) SHALL BE AS PER MANUFACTURER RECOMMENDATIONS AND ARE THE EXPRESS RESPONSIBILITY OF THE CONTRACTOR.
- FASTENERS TO BE #12 X 3/4" OR GREATER SAE GRADE 5 UNLESS NOTED OTHERWISE. TAPCONS REFERRED TO HEREIN SHALL BE ITW BUILDEX BRAND, CARBON STEEL ONLY, INSTALLED TO 3000 PSI MIN CONCRETE. SEE ANCHOR SCHEDULE FOR ANCHOR REQUIREMENTS. ALL FASTENERS SHALL HAVE APPROPRIATE CORROSION PROTECTION TO PREVENT ELECTROLYSIS.
- ALL STEEL CLIPS SHALL BE ASTM A283 STEEL (GRADE D) WITH $F_y = 33$ KSI OR BETTER. ALL STEEL MEMBERS SHALL BE PROTECTED AGAINST CORROSION WITH AN APPROVED COAT OF PAINT, ENAMEL OR OTHER APPROVED PROTECTION. G90-RATED COATING REQUIRED FOR ALL COASTAL INSTALLATIONS.
- ALL CONCRETE SPECIFIED HEREIN IS NOT PART OF THIS CERTIFICATION. AS A MINIMUM, ALL CONCRETE SHALL BE STRUCTURAL CONCRETE 4" MIN. THICK AND SHALL HAVE MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI, UNLESS NOTED OTHERWISE.
- THE CONTRACTOR IS RESPONSIBLE TO INSULATE ALL MEMBERS FROM DISSIMILAR MATERIALS TO PREVENT ELECTROLYSIS.
- ELECTRICAL GROUND, WHEN REQUIRED, TO BE DESIGNED & INSTALLED BY OTHERS.
- THE ADEQUACY OF ANY EXISTING STRUCTURE TO WITHSTAND SUPERIMPOSED LOADS SHALL BE VERIFIED BY THE ONSITE DESIGN PROFESSIONAL AND IS NOT INCLUDED IN THIS CERTIFICATION. EXCEPT AS EXPRESSLY PROVIDED HEREIN, NO ADDITIONAL CERTIFICATIONS OR AFFIRMATIONS ARE INTENDED.
- THE SYSTEM DETAILED HEREIN IS GENERIC AND DOES NOT PROVIDE INFORMATION FOR A SPECIFIC SITE. FOR SITE CONDITIONS DIFFERENT FROM THE CONDITIONS DETAILED HEREIN, A LICENSED ENGINEER OR REGISTERED ARCHITECT SHALL PREPARE SITE SPECIFIC DOCUMENTS FOR USE IN CONJUNCTION WITH THIS DOCUMENT.
- WATER-TIGHTNESS OF EXISTING HOST SUBSTRATE SHALL BE THE FULL RESPONSIBILITY OF THE INSTALLING CONTRACTOR. CONTRACTOR SHALL ENSURE THAT ANY REMOVED OR ALTERED WATERPROOFING MEMBRANE IS RESTORED AFTER FABRICATION AND INSTALLATION OF STRUCTURE PROPOSED HEREIN. THIS ENGINEER SHALL NOT BE RESPONSIBLE FOR ANY WATERPROOFING OR LEAKAGE ISSUES WHICH MAY OCCUR AS WATER-TIGHTNESS SHALL BE THE FULL RESPONSIBILITY OF THE INSTALLING CONTRACTOR.
- FOR AN EXPLANATION OF EXPOSURE CATEGORIES THAT ACCOMPANY THE Vult WIND SPEEDS USED IN THIS APPROVAL, SEE SECTION 26 OF ASCE 7.

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TIE-DOWN CLIP DIRECTIVE EXAMPLE

(THE FOLLOWING EXAMPLE ILLUSTRATES THE PROCEDURE USED TO DETERMINE THE MAXIMUM ALLOWABLE ROOF-TOP INSTALLATION HEIGHT, H, FOR ANY GIVEN MECHANICAL UNIT THAT CONFORMS TO THE DIMENSION RESTRICTIONS AND DESIGN CRITERIA LISTED HEREIN. SEE SHEETS 4-5 FOR DESIGN SCHEDULES.)

MECHANICAL UNIT CRITERIA:

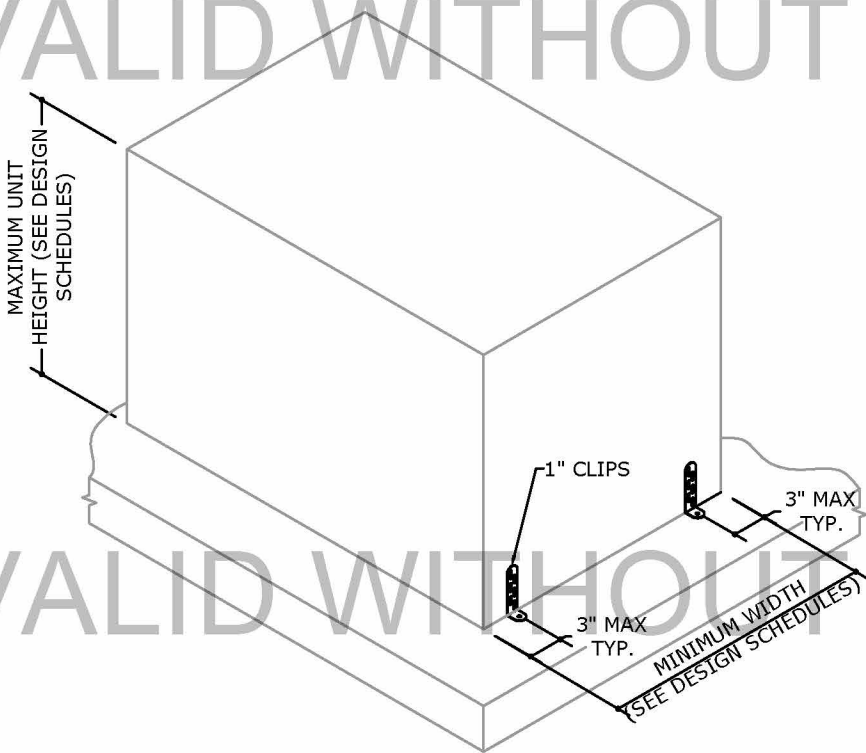
CONSIDER THE INSTALLATION OF (1) MECHANICAL UNIT WITH THE FOLLOWING CRITERIA=

- Vult=170 MPH, EXPOSURE 'B'
- 48" TALL x 48" DEEP x 48" WIDE, 100 LB (WEIGHT AS VERIFIED BY OTHERS)
- INSTALLED TO 3000 PSI MIN CONCRETE WITH (1)-2" CLIP AT EACH CORNER OF UNIT (TOTAL OF (4) CLIPS)

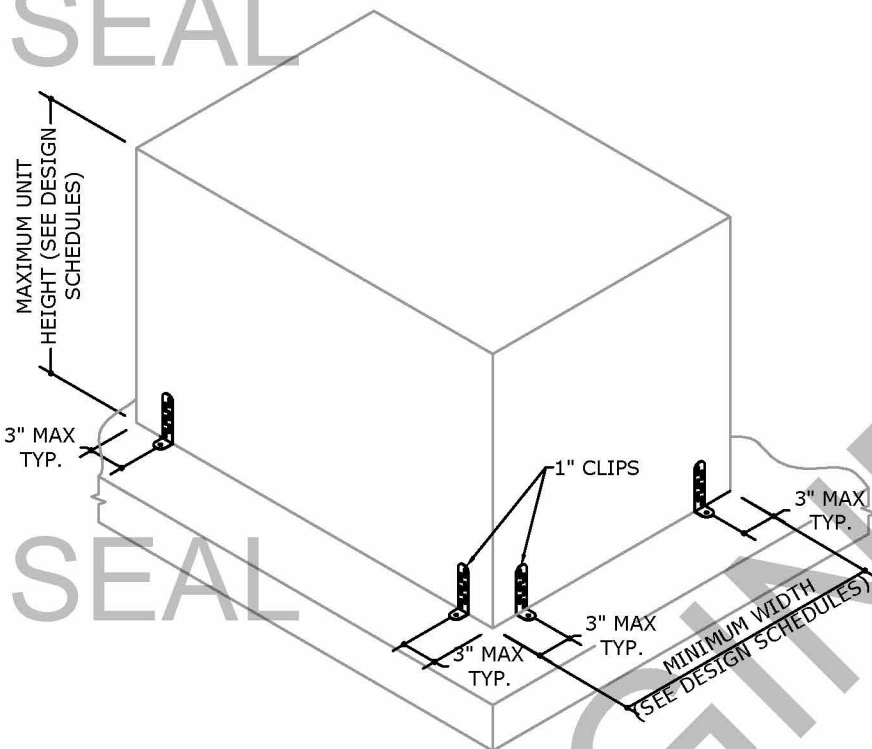
PROCEDURE:

PROCEDURE STEP	RESULT
1 DETERMINE THE CONNECTION TYPE BASED ON THE DIAGRAMS ON SHEET 2	CONNECTION TYPE 3
2 DETERMINE WHICH DESIGN SCHEDULE TABLE TO USE	THIS INSTALLATION IS INTENDED FOR A Vult=170 MPH, EXPOSURE 'B'. THIS DESIGN CRITERIA CORRESPONDS TO TABLE 5
3 DETERMINE LARGEST FACE AREA OF MECHANICAL UNIT TO BE INSTALLED	48"x48"=16FT ²
4 CHECK MAXIMUM UNIT HEIGHT RESTRICTION	THIS UNIT HEIGHT OF 48" IS EQUAL TO THE MAXIMUM ALLOWABLE HEIGHT OF 48". NOTE: THIS PRODUCT APPROVAL ALLOWS THE UNIT TO BE INSTALLED ON TOP OF AN A/C STAND THAT IS A MAXIMUM 30" TALL. IF AN A/C STAND IS UTILIZED, CHECK TO SEE THAT THE STAND DOES NOT EXCEED 30" IN HEIGHT
5 CHECK MINIMUM UNIT WIDTH RESTRICTION	UNIT WIDTH IS 48" WHICH IS GREATER THAN THE MINIMUM ALLOWABLE WIDTH OF 24"
6 DETERMINE THE ALLOWABLE ROOF-TOP HEIGHT OF THE INSTALLATION	THIS UNIT MAY BE INSTALLED AT ROOF HEIGHTS LESS THAN OR EQUAL TO 15 FT. SEE (*) ON TABLE 5 FOR THE NUMERICAL VALUES OF THIS DESIGN EXAMPLE

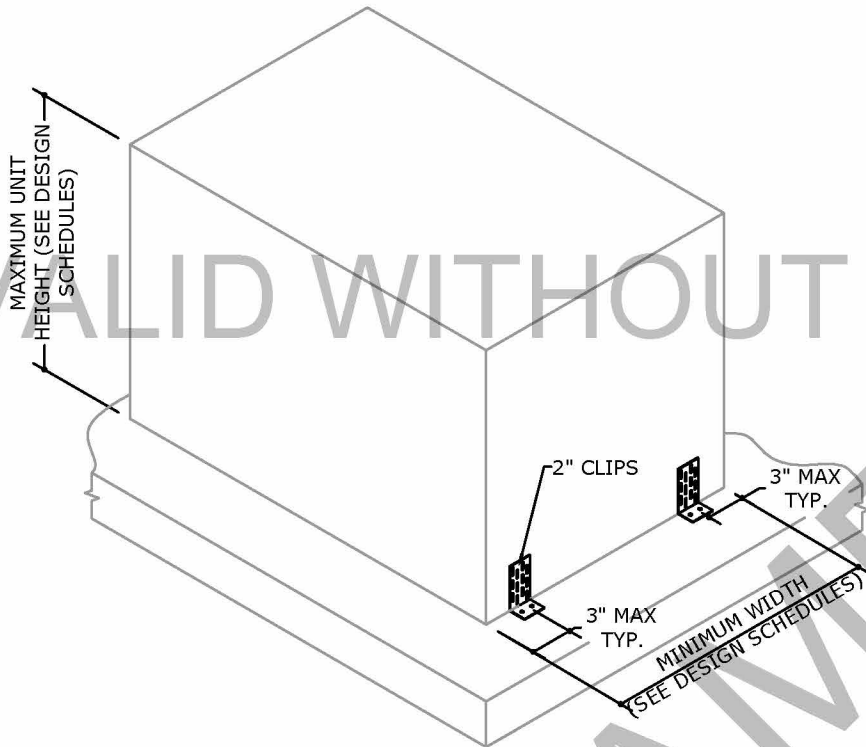
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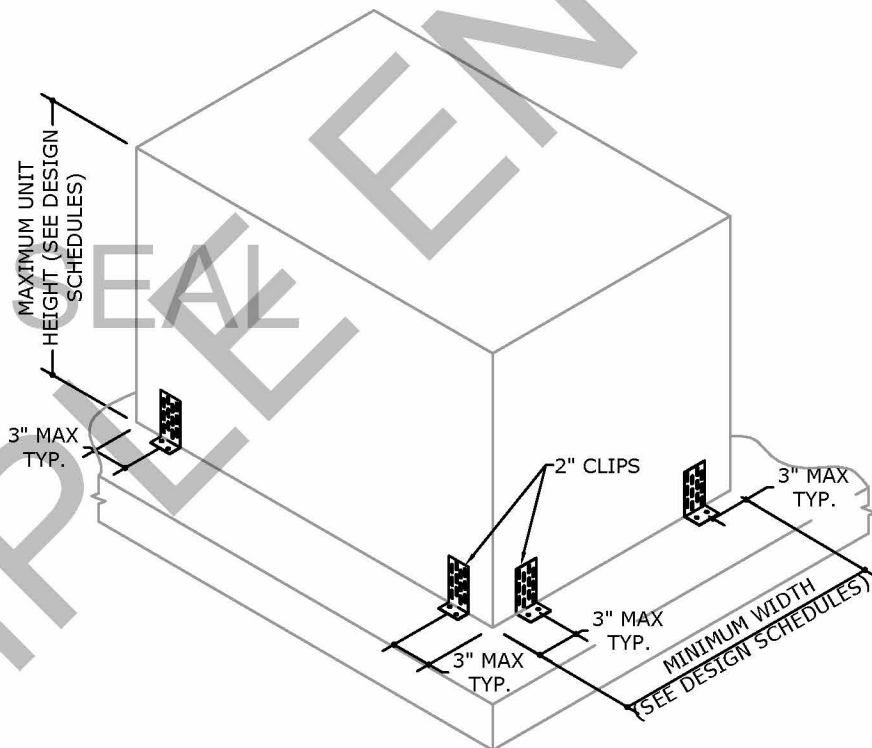
C1 CONNECTION TYPE C1
1" CLIP - UTILIZE (1) AT EACH CORNER FOR A TOTAL OF (4) PER UNIT



C2 CONNECTION TYPE C2
1" CLIP - UTILIZE (2) AT EACH CORNER FOR A TOTAL OF (8) PER UNIT



C3 CONNECTION TYPE C3
2" CLIPS - UTILIZE (1) AT EACH CORNER FOR A TOTAL OF (4) PER UNIT



C4 CONNECTION TYPE C4
2" CLIPS - UTILIZE (2) AT EACH CORNER FOR A TOTAL OF (8) PER UNIT

ANCHOR SCHEDULE:

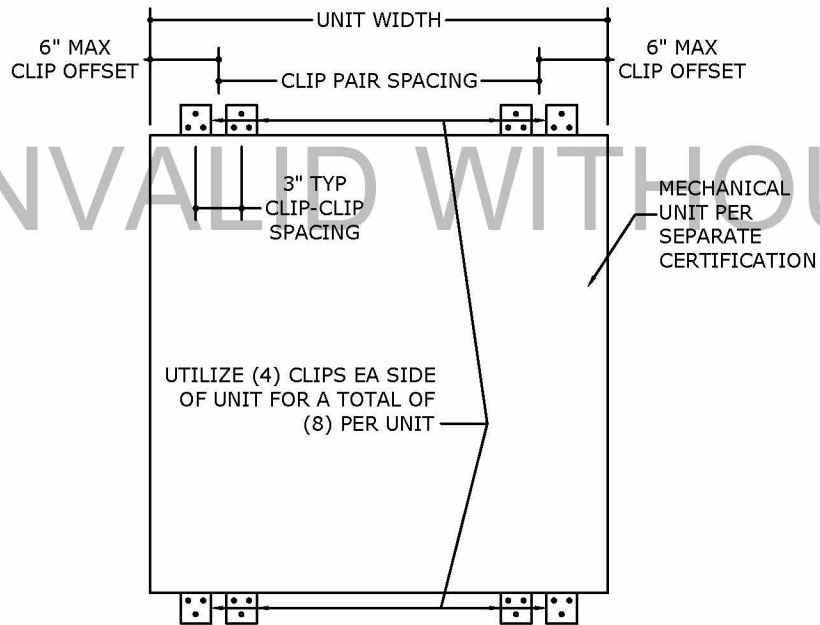
1" CLIPS

SUBSTRATE	DESCRIPTION
CONCRETE: (4" THICK MIN, 3000 PSI MIN.)	(1)-5/16"Ø CARBON STEEL ITW BUILDDEX TAPCON, 2 1/4" FULL EMBED TO CONCRETE, 3/8" MIN. EDGE DISTANCE, 3 3/4" MIN. SPACING TO ANY ADJACENT ANCHOR.
ALUMINUM: (0.125" MIN. THICK, 6061-T6 MIN. ALUMINUM)	(1)-#14 SAE GRADE 5 SHEET METAL SCREW TO ALUMINUM, PROVIDE (5) PITCHES MIN. PAST THREAD PLANE
STEEL: (0.125" MIN. THICK, 33 KSI MIN. STEEL)	(1)-#14 SAE GRADE 5 SHEET METAL SCREW TO STEEL, PROVIDE (5) PITCHES MIN. PAST THREAD PLANE

2" CLIPS

SUBSTRATE	DESCRIPTION
CONCRETE: (4" THICK MIN, 3000 PSI MIN.)	(1)-5/16"Ø CARBON STEEL ITW BUILDDEX TAPCON, 2 1/4" FULL EMBED TO CONCRETE, 3/8" MIN. EDGE DISTANCE, 3 3/4" MIN. SPACING TO ANY ADJACENT ANCHOR.
ALUMINUM: (0.125" MIN. THICK, 6061-T6 MIN. ALUMINUM)	(2)-#14 SAE GRADE 5 SHEET METAL SCREWS TO ALUMINUM, PROVIDE (5) PITCHES MIN. PAST THREAD PLANE
STEEL: (0.125" MIN. THICK, 33 KSI MIN. STEEL)	(2)-#14 SAE GRADE 5 SHEET METAL SCREWS TO STEEL, PROVIDE (5) PITCHES MIN. PAST THREAD PLANE

1. EMBEDMENT AND EDGE DISTANCE EXCLUDES FINISHES, IF APPLICABLE.
2. ENSURE MINIMUM EDGE DISTANCE AS NOTED IN ANCHOR SCHEDULE.
3. SEE DETAILS ON SHEET 3 FOR ANCHORS ATTACHING TO MECHANICAL UNIT.



5 ALTERNATE (8) CLIP DETAIL
3 N.T.S. PLAN VIEW

THIS DETAIL MAY BE USED AS AN ALTERNATE GEOMETRIC PATTERN FOR ALL CONNECTION TYPES THAT UTILIZE (2) CLIPS AT EACH CORNER FOR A TOTAL OF (8) CLIPS PER UNIT.

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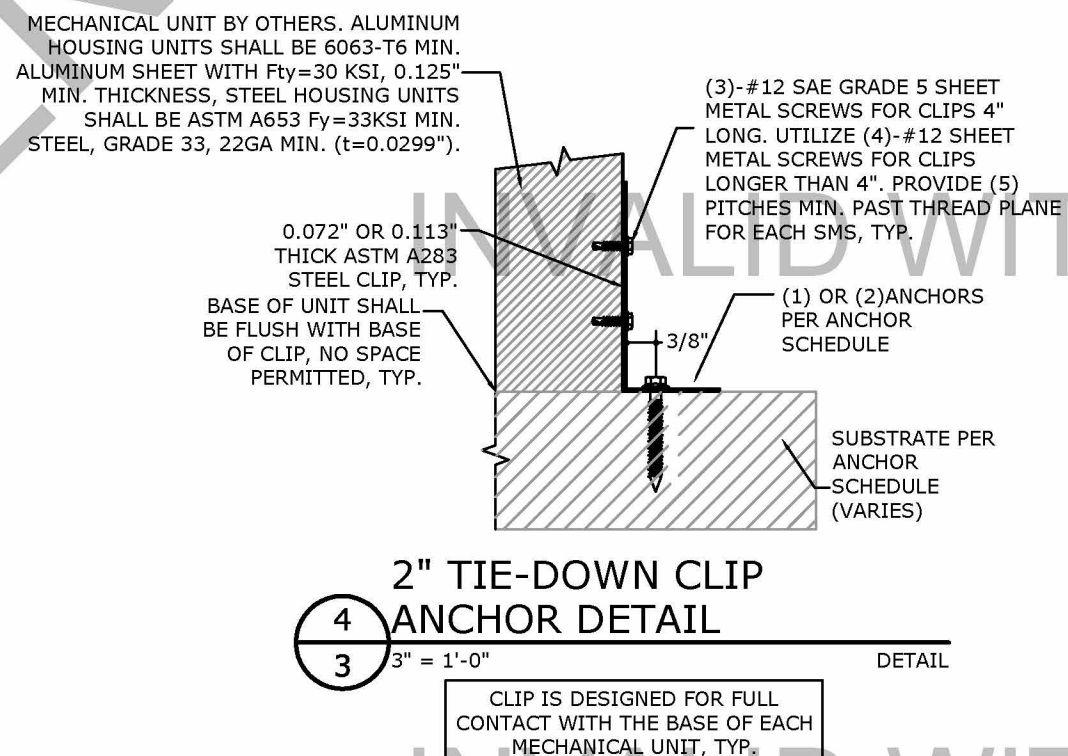
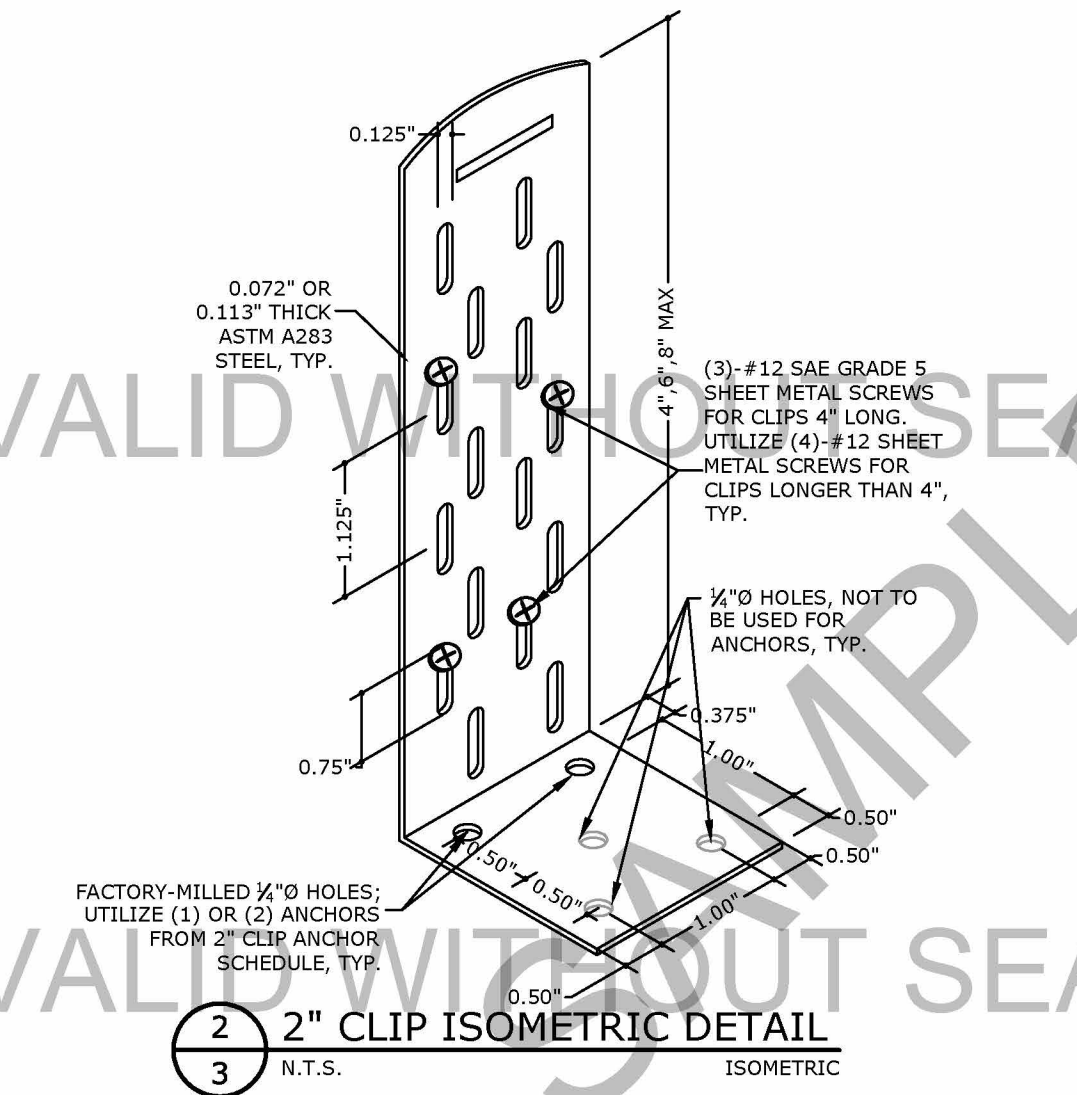
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TABLE 1: Vult=175 MPH, EXPOSURE C

(FOR USE WITH A RISK CATEGORY II STRUCTURE IN THE HIGH VELOCITY HURRICANE ZONE*)

MAXIMUM SURFACE AREA OF UNIT'S LARGEST FACE	UNIT HEIGHT	UNIT WIDTH	ALLOWABLE ROOF-TOP HEIGHT (H) TIE-DOWN CONFIGURATION TYPE			
			C1	C2	C3	C4
6 FT²	24" MAX	12" MIN	N/A	H ≤ 100 FT	AT GRADE	H ≤ 200 FT
9 FT²	32" MAX	15" MIN	N/A	H ≤ 15 FT	AT GRADE	H ≤ 200 FT
4 FT²	48" MAX	24" MIN	AT GRADE	H ≤ 200 FT	H ≤ 200 FT	H ≤ 200 FT
6 FT²			N/A	H ≤ 200 FT	H ≤ 30 FT	H ≤ 200 FT
9 FT²			N/A	H ≤ 40 FT	AT GRADE	H ≤ 200 FT
12 FT²			N/A	AT GRADE	N/A	H ≤ 200 FT
16 FT²	60" MAX	48" MIN	N/A	AT GRADE	N/A	H ≤ 60 FT
20 FT²			N/A	AT GRADE	N/A	H ≤ 60 FT
25 FT²			N/A	N/A	N/A	H ≤ 15 FT
30 FT²			N/A	N/A	N/A	AT GRADE
36 FT²			N/A	N/A	N/A	AT GRADE

*THIS TABLE IS PERMISSIBLE TO BE USED WITHIN THE HVHZ WHICH CONTAINS BROWARD AND MIAMI-DADE COUNTIES. CHECK WITH LOCAL AUTHORITY HAVING JURISDICTION FOR THE APPLICABILITY OF THIS TABLE WITHIN CERTAIN FLORIDA COUNTIES.

TABLE 2 : Vult=175 MPH, EXPOSURE D

(FOR USE WITH A RISK CATEGORY II STRUCTURE IN THE HIGH VELOCITY HURRICANE ZONE*)

MAXIMUM SURFACE AREA OF UNIT'S LARGEST FACE	UNIT HEIGHT	UNIT WIDTH	ALLOWABLE ROOF-TOP HEIGHT (H) TIE-DOWN CONFIGURATION TYPE			
			C1	C2	C3	C4
6 FT²	24" MAX	12" MIN	N/A	H ≤ 40 FT	AT GRADE	H ≤ 200 FT
9 FT²	32" MAX	15" MIN	N/A	AT GRADE	N/A	H ≤ 200 FT
4 FT²	48" MAX	24" MIN	AT GRADE	H ≤ 200 FT	H ≤ 160 FT	H ≤ 200 FT
6 FT²			N/A	H ≤ 200 FT	AT GRADE	H ≤ 200 FT
9 FT²			N/A	H ≤ 15 FT	AT GRADE	H ≤ 200 FT
12 FT²			N/A	AT GRADE	N/A	H ≤ 140FT
16 FT²	60" MAX	48" MIN	N/A	N/A	N/A	H ≤ 15 FT
20 FT²			N/A	N/A	N/A	H ≤ 30 FT
25 FT²			N/A	N/A	N/A	AT GRADE
30 FT²			N/A	N/A	N/A	AT GRADE
36 FT²			N/A	N/A	N/A	N/A

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TABLE 3 : Vult=170 MPH, EXPOSURE C

(FOR USE WITH A RISK CATEGORY II STRUCTURE*)

MAXIMUM SURFACE AREA OF UNIT'S LARGEST FACE	UNIT HEIGHT	UNIT WIDTH	ALLOWABLE INSTALLATION ROOF HEIGHT TIE-DOWN CONFIGURATION TYPE			
			C1	C2	C3	C4
6 ft²	24 in	12 in	N/A	≤ 140 FT	AT GRADE	≤ 200 FT
9 ft²	32 in	15 in	N/A	H ≤ 15 FT	AT GRADE	≤ 200 FT
4 ft²	48" MAX	24" MIN	AT GRADE	≤ 200 FT	N/A	≤ 200 FT
6 ft²			AT GRADE	≤ 200 FT	H ≤ 40 FT	≤ 200 FT
9 ft²			N/A	> 60 FT	AT GRADE	≤ 200 FT
12 ft²			N/A	AT GRADE	N/A	≤ 200 FT
16 ft²	60" MAX	48" MIN	N/A	AT GRADE	N/A	≤ 80 FT
20 ft²			N/A	AT GRADE	N/A	≤ 100 FT
25 ft²			N/A	N/A	N/A	H ≤ 30 FT
30 ft²			N/A	N/A	N/A	AT GRADE
36 ft²			N/A	N/A	N/A	AT GRADE

*AS AN EXAMPLE, THIS TABLE IS PERMISSIBLE TO BE USED WITHIN PALM BEACH COUNTY. CHECK WITH LOCAL AUTHORITY HAVING JURISDICTION FOR THE APPLICABILITY OF THIS TABLE WITHIN CERTAIN FLORIDA COUNTIES.

TABLE 4 : Vult=170 MPH, EXPOSURE D

(FOR USE WITH A RISK CATEGORY II STRUCTURE*)

MAXIMUM SURFACE AREA OF UNIT'S LARGEST FACE	UNIT HEIGHT	UNIT WIDTH	ALLOWABLE INSTALLATION ROOF HEIGHT TIE-DOWN CONFIGURATION TYPE			
			C1	C2	C3	C4
6 ft²	24 in	12 in	N/A	> 60 FT	AT GRADE	≤ 200 FT
9 ft²	32 in	15 in	N/A	AT GRADE	N/A	≤ 200 FT
4 ft²	48" MAX	24" MIN	AT GRADE	≤ 200 FT	≤ 200 FT	≤ 200 FT
6 ft²			N/A	≤ 200 FT	H ≤ 15 FT	≤ 200 FT
9 ft²			N/A	H ≤ 15 FT	AT GRADE	≤ 200 FT
12 ft²			N/A	AT GRADE	N/A	≤ 200 FT
16 ft²	60" MAX	48" MIN	N/A	N/A	N/A	H ≤ 40 FT
20 ft²			N/A	AT GRADE	N/A	H ≤ 40 FT
25 ft²			N/A	N/A	N/A	AT GRADE
30 ft²			N/A	N/A	N/A	AT GRADE
36 ft²			N/A	N/A	N/A	AT GRADE

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TABLE 5 : Vult=140 MPH, EXPOSURE B

(FOR USE WITH A RISK CATEGORY II STRUCTURE)

MAXIMUM SURFACE AREA OF UNIT'S LARGEST FACE	UNIT HEIGHT	UNIT WIDTH	ALLOWABLE INSTALLATION ROOF HEIGHT TIE-DOWN CONFIGURATION TYPE			
			C1	C2	C3	C4
6 ft²	24 in	12 in	H ≤ 15 FT	≤ 200 FT	≤ 200 FT	≤ 200 FT
9 ft²	32 in	15 in	AT GRADE	≤ 200 FT	> 60 FT	≤ 200 FT
4 ft²	48" MAX	24" MIN	≤ 200 FT	≤ 200 FT	≤ 200 FT	≤ 200 FT
6 ft²			H ≤ 40 FT	≤ 200 FT	≤ 200 FT	≤ 200 FT
9 ft²			AT GRADE	≤ 200 FT	≤ 120 FT	≤ 200 FT
12 ft²			AT GRADE	≤ 200 FT	H ≤ 40 FT	≤ 200 FT
* 16 ft²	60" MAX	48" MIN	N/A	≤ 80 FT	H ≤ 15 FT	≤ 200 FT
20 ft²			N/A	≤ 100 FT	H ≤ 15 FT	≤ 200 FT
25 ft²			N/A	H ≤ 40 FT	AT GRADE	≤ 200 FT
30 ft²			N/A	H ≤ 15 FT	AT GRADE	≤ 200 FT
36 ft²			N/A	AT GRADE	AT GRADE	≤ 120 FT

TABLE 6 : Vult=140 MPH, EXPOSURE C

(FOR USE WITH A RISK CATEGORY II STRUCTURE)

MAXIMUM SURFACE AREA OF UNIT'S LARGEST FACE	UNIT HEIGHT	UNIT WIDTH	ALLOWABLE INSTALLATION ROOF HEIGHT TIE-DOWN CONFIGURATION TYPE			
			C1	C2	C3	C4
6 ft²	24 in	12 in	AT GRADE	≤ 200 FT	≤ 80 FT	≤ 200 FT
9 ft²	32 in	15 in	N/A	≤ 180 FT	H ≤ 15 FT	≤ 200 FT
4 ft²	48" MAX	24" MIN	≤ 80 FT	≤ 200 FT	≤ 200 FT	≤ 200 FT
6 ft²			AT GRADE	≤ 200 FT	≤ 200 FT	≤ 200 FT
9 ft²			AT GRADE	≤ 200 FT	H ≤ 40 FT	≤ 200 FT
12 ft²			N/A	≤ 100 FT	AT GRADE	≤ 200 FT
16 ft²	60" MAX	48" MIN	N/A	H ≤ 15 FT	AT GRADE	≤ 200 FT
20 ft²			N/A	H ≤ 30 FT	AT GRADE	≤ 200 FT
25 ft²			N/A	AT GRADE	AT GRADE	≤ 200 FT
30 ft²			N/A	AT GRADE	N/A	≤ 80 FT
36 ft²			N/A	AT GRADE	N/A	H ≤ 30 FT

TABLE 7 : Vult=140 MPH, EXPOSURE D

(FOR USE WITH A RISK CATEGORY II STRUCTURE)

MAXIMUM SURFACE AREA OF UNIT'S LARGEST FACE	UNIT HEIGHT	UNIT WIDTH	ALLOWABLE INSTALLATION ROOF HEIGHT TIE-DOWN CONFIGURATION TYPE			
			C1	C2	C3	C4
6 ft²	24 in	12 in	N/A	≤ 200 FT	H ≤ 30 FT	≤ 200 FT
9 ft²	32 in	15 in	N/A	≤ 100 FT	AT GRADE	≤ 200 FT
4 ft²	48" MAX	24" MIN	H ≤ 40 FT	≤ 200 FT	≤ 200 FT	≤ 200 FT
6 ft²			AT GRADE	≤ 200 FT	≤ 200 FT	≤ 200 FT
9 ft²			N/A	≤ 200 FT	H ≤ 15 FT	≤ 200 FT
12 ft²			N/A	H ≤ 40 FT	AT GRADE	≤ 200 FT
16 ft²	60" MAX	48" MIN	N/A	AT GRADE	N/A	≤ 200 FT
20 ft²			N/A	AT GRADE	AT GRADE	≤ 200 FT
25 ft²			N/A	AT GRADE	N/A	≤ 120 FT
30 ft²			N/A	N/A	N/A	H ≤ 40 FT
36 ft²			N/A	N/A	N/A	AT GRADE

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REV FOR FBC 5TH (2014)	RWN	CSL	04-06-15
REV FOR FBC 6TH (2017)	LAO	FLB	07-21-17
2020 FBC	CCB	RWN	9/16/20

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