

Overview: Installation instructions

These installation instructions are only guidelines. Errors and Omissions statement from [Tech Data](#) p.6 applies to this document. Applicable building codes, standards and accepted practices apply. Follow installation and ICC500 requirements. Align with the architect, project engineer and other contractors. The Authority Having Jurisdiction is the final authority in issues related to the installation and use of any building products. This doc is supported by typical installations found in our collaboration with the Steel Door Institute (SDI). Reference "Prep and Installation Videos" of [SDI Videos](#) (*referenced videos are not tornado specific*)

A. FEMA FRAME AND DOOR ORDERING:

1. For ordering the correct undercut and installing correctly, reference Tech data notes on Door Undercuts under Door, Standard Specifications. Verify correct frame size and undercut. The door gap is a max 1/8" from bottom of door to top of lip on a WS 304L cup strike (see section F.12) ([FIG. 1](#)) or 1/8"-1/4" to the top of an LM9300 strike plate ([FIG. 2](#)). Manufacture strike must always be used and must be anchored (LM9300) or grouted (WS98/9927/57) into slab as directed by hardware instructions.
2. Installations must follow hardware & accessory manufacturer guidance and installation instructions. Follow links to [Von Duprin](#), [Schlage](#) or [Securitech](#) latching hardware and Allegion hardware. See <http://us.allegion.com> and search in the Document Library for Allegion hardware or accessory catalogs, tech data, and installation instructions. For installation into concrete foundations and shelter walls, follow ICC500 industry code which includes references to other industry codes such as ACI 318 for structural concrete and ACI 530 for masonry structures. Verify any requirements with your local AHJ (Authority Having Jurisdiction), the final authority in issues related to the installation and use of any building products.
3. As with all Tornado Doors and Frames, order frames and doors based on opening size, which

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HELPFUL LINKS

- TORNADO SECTION OF [REPUBLICDOOR.COM](#)
- TECH DATA FEMA/TORNADO SECTION, DOWNLOAD AT [REPUBLICDOOR.COM](#)
- [INTERTEK ONLINE PUBLIC LISTING](#)
- FILE – [APPROVED DOORS & HARDWARE CHARTS \(PDF\)](#)
- FILE – [FP STANDARD ANCHOR LOCATIONS \(PDF\)](#)
- [SDI INSTALLATION VIDEOS \(NOT TORNADO SPECIFIC\)](#)
- ALWAYS FOLLOW HARDWARE INSTALLATION INSTRUCTIONS / TEMPLATES [ALLEGION LIBRARY \(link\)](#)
 - [VON DUPRIN WS98/9927/57](#)
 - [SCHLAGE LM9300](#)
 - [ZERO PERIMETER SEALING AND THRESHOLDS](#)
 - [GLYNN JOHNSON CLOSERS AND HOLDERS](#)
 - [IVES HINGES](#)
 - SECURITECH - CONTACT [SECURITECH](#) OR SUPPORT
- SUPPORT – [email REPUBLIC CUSTOMER SUPPORT](#) OR CALL (800) 733-3667

FIG. 1 – WS98/9927/57: BOTTOM GAP about 1/4" to finished floor when strike lip sits on slab (max 0.285" when using max .125 required distance from bottom of latch housing to top of 0.16" thick strike lip).

See Section F.11 – Grouting procedure used with and without thresholds. Threshold configurations shown affecting door undercut.

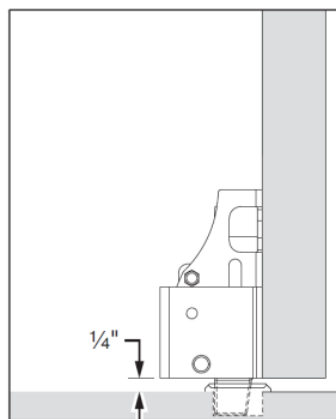
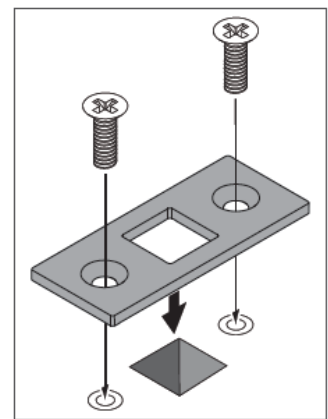


FIG. 2 - LM9300: BOTTOM GAP 1/8"-1/4" from bottom of door to top of strike.

See Section F.11 – grouting procedure shown must be used when using thresholds to ensure connection of strike to slab (no cavity/grout used when attaching strike directly to slab).



is the horizontal dimension from rabbet to rabbet, and vertical dimension from bottom of frame to head rabbet. Typical door gaps are 3/32" to jambs, and 1/8" to the head. ICC500 limits gap from door to threshold/slab to 3/4" to limit airflow in a storm, but hardware drives smaller allowable undercuts.

4. Handing – Generally reference [FIGS 3 and 5](#). Correctly understanding handing in ordering and installing tornado products is critical to life safety. See "Handing procedures diagrams" ([FIG. 3](#)) and use the following IMPORTANT rules when considering Tornado openings. Ref also FEMA lights ([FIG. 4](#)).
 - a) The Exterior, or Outside, is always the Storm side (the side of the door that faces a storm). Typically, this is the Key Side, but not always (e.g. not typical, but if the shelter is the hallway and a connected classroom is outside of the shelter, the outside of your door would face the classroom since that is the side facing the outside, or storm side, of the shelter).
 - b) The Interior, or Inside, is always the Safe side (the side on the inside of your shelter or safe room). Typically, this is the non-Key Side, but not always (e.g. not typical, but if the shelter is the hallway and a connected classroom is outside of the shelter, the inside of your door would face the hall since that is the side facing the inside, or safe side, of the shelter).
 - c) Note that DF doors may be inswing or outswing when using lever trim. But DF doors with panic exit hardware will always be outswing with the panic bar on the safe side and the door opening out towards the Outside, or Storm side.
5. Shutter frames – Shutter handing. Most shutter applications should be ordered straight handed ([FIG. 4](#)). Shutters with glass in a 4-sided frame are always straight handed. Straight handed without glass and Reverse handed is less common ([FIG. 5](#)).
See figures on the next page, including locks.

FIG 3. – GENERAL HANDING CHART

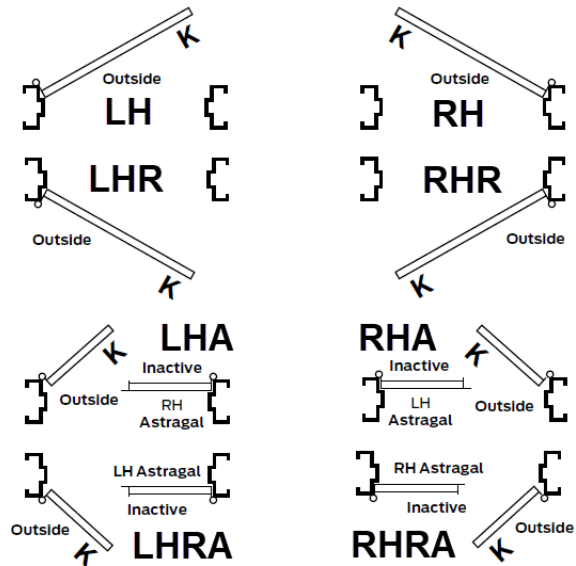


FIG. 4 – HANDING CHART, FACTORY INSTALLED FEMA LIGHT
For glass light doors in 3-sided openings, use the following guide:

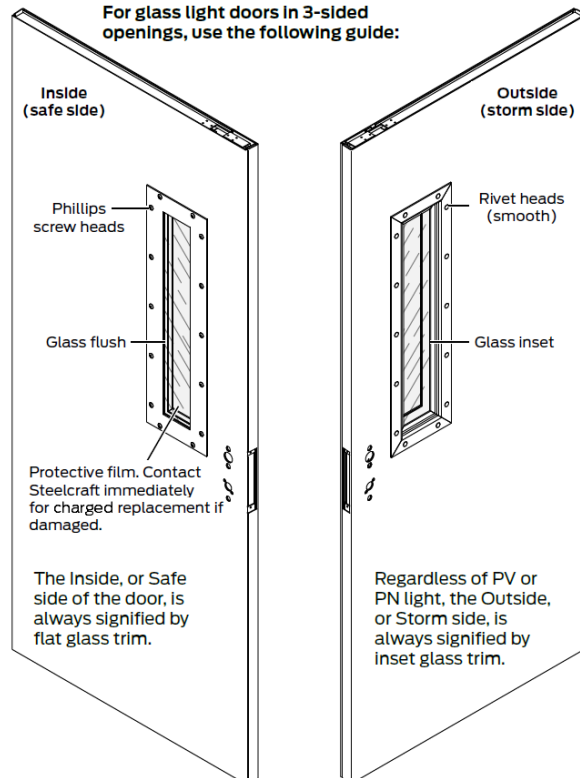
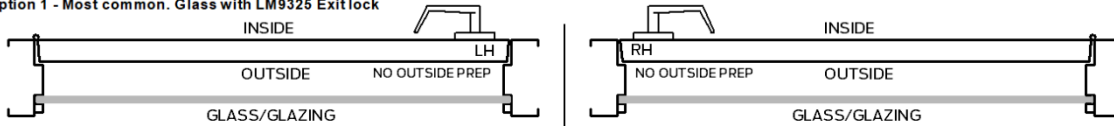


FIG. 5 – STRAIGHT HANDED, OPTION 1 & 2 ; FIG. 6 – REVERSE HANDED, OPTION 3 & 4

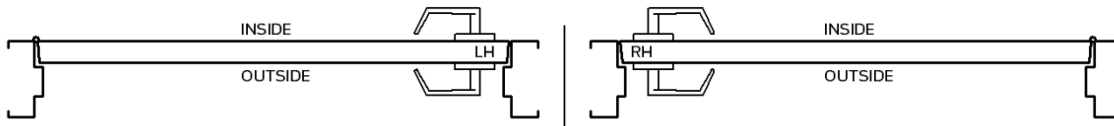
Shutter Handing with Schlage LM9300 exit devices - typical configurations

Straight handed shutters - most common

Option 1 - Most common. Glass with LM9325 Exit lock

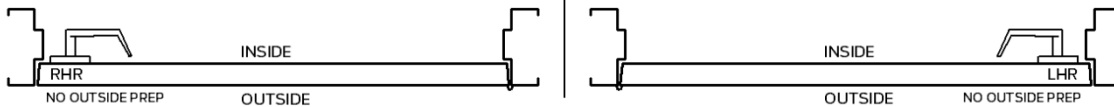


Option 2 - May add outside trim if no glass with LM9350, LM9370, LM9371, or LM9380

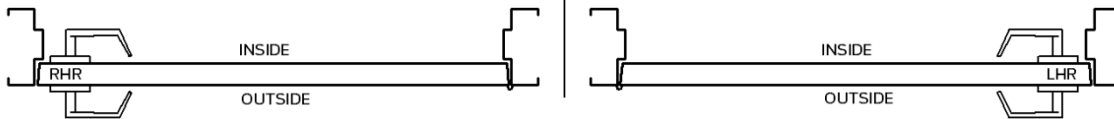


Reverse handed shutters

Option 3 - No glass with LM9325 Exit lock

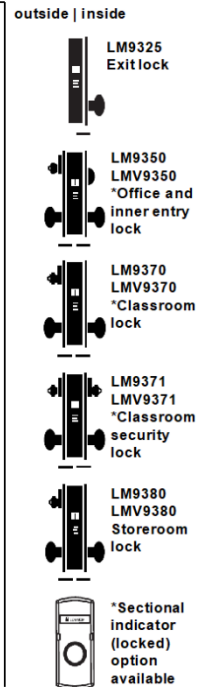


Option 4 - No glass with LM9350, LM9370, LM9371, or LM9380



Note: 1) Inside = Safe side; Outside = Storm side
2) Lock options Sectional indicator (locked) and Vandgard (e.g. LMV9371) must be specified when ordering locks

LM9300 Multi-point Lock Functions
See Schlage L-Series Catalog, LM9300



B. FEMA DF Frame installation

- Follow installation as a guide, noting differences with FEMA Frames in the instructions below. See SDI/Allegion collaborative video under [SDI Videos](#) > Steel Door and Frame Installation > How to Install Frames in Masonry Construction (videos not tornado specific)
- As with any frame installation, take the time to make certain that frames are continually checked for “plumb, level and square” throughout installation.
- Match frame and opening location by opening number or mark number (FIG. 7). Verify ICC500 / FEMA 361 label, as well as fire label if applicable. Confirm handing of frame to drawings/door schedule/hardware schedule.
- Verify correct reinforcement, hinge size, strike type, closer and other reinforcements for mounting hardware.
- Determine floor finish (concrete, wood, tile, etc.). Verify correct frame size and undercut. The latch must always engage the strike which must be securely embedded (WS 304L, FIG. 26) or anchored (LM strike plate, FIG. 2) into the

FIG. 7 – MATCH OPENING LOCATION AND FRAME MARK NUMBER

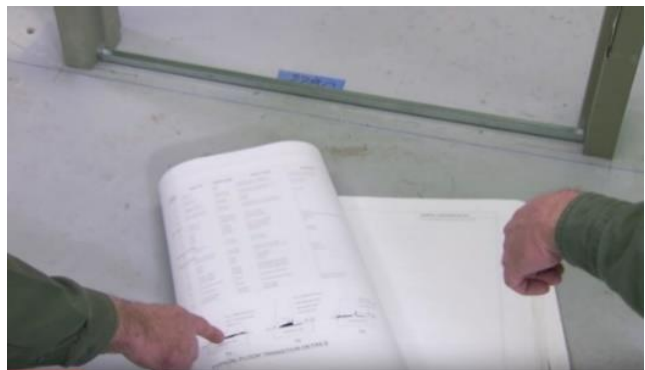


FIG. 8 – PROPERLY GRIND OFF SHIPPING BAR



concrete slab, regardless of threshold or finished floor. See [FIG. 29](#) for a typical Saddle less common rabbeted (bumper) thresholds with WS98/9927/57 latching, with ADA install.

6. You may need to fix uneven floors prior to frame installation to avoid problems in closure, latching and maintaining an even gap/undercut.
7. Frames may be ordered KD or SUA (Welded). Refer to Tech data. An SUA frame will arrive with a shipping bar welded to the base of the frame to prevent collapsing and twisting in transit. Do not use this bar to set the frame. Grind it off; do not hammer it off to avoid damage to the frame, prior to setting the frame ([FIG. 8, previous page](#)).
8. KD frames are assembled using the corner tab/slots (see Tech data).
9. **New masonry wall construction install** (e.g. grout filled CMU block walls), set your frame first and then build 3000 psi grout filled CMU block walls up evenly on both jambs.
 - a) Any frame backing to avoid drilling grout, 1" max at holes & soffit, min 3" from anchors
 - b) Lay out your frame on the floor per drawings prior to setting the frame.
 - c) Precisely cut square spreader to maintain proper frame spacing setting frame ([FIG. 9](#)).
 - d) Verify the jambs are plumb, head level, and frame in square. Install base anchors into concrete ([FIG. 10](#)), adjust with screws to keep head level and to achieve proper floor clearance. You can shim the frame with a flat metal washer or fender washer.
 - e) Set your frame using back braces and spreader bars ([FIG. 11](#)).
 - f) For openings with electrical components, now install conduit or flex cable.
 - g) Install a piece of tie wire at about 48" from the floor and twist tight to hold inward tension on the spreader bar ([FIG. 12](#)).
 - h) Add a Mid-frame spreader to keep frame straight an aligned ([FIG. 13](#)).
 - i) Mason should check plumb, level and square before beginning ([FIG. 14](#)).

FIG. 9 – CUT ACCURATE SPREADER BAR TO NOMINAL WIDTH



FIG. 11 – TEMPORARILY BRACE FRAME



FIG. 12 – INSTALL TIE WIRE FOR INWARD TENSION



FIG. 10 – ADJUSTABLE BASE ANCHOR INSTALL WITH DRIVE PIN ANCHOR



FIG. 13 – ADD MID-HEIGHT SPREADER

FIG. 14 – MASON SHOULD CHECK PLUMB, LEVEL, SQUARE BEFORE BEGINNING



FIG 15. LAY BLOCK, CHECKING FOR PLUMB, LEVEL AND SQUARE EVERY TIME YOU MAKE AN ADJUSTMENT



- j) Lay block and fill with grout evenly on both sides, lightly tapping the frame to settle the grout fill as you go. Mason should check plumb, level and square before starting and throughout laying block (FIG. 15).
- k) For FEMA frames, See TABLE 2 DF Anchoring Options at end of guide for anchors approved in various applications.
 - For jambs in new masonry with CMU block, your order will include approved Masonry T anchors to be placed between top 2 blocks, bottom 2 blocks, and every other block as evenly as possible for nominal 8"x8"x16" CMU blocks (FIG. 16). Masonry T's are provided in your order and keep jambs in place by holding tight against stops.
 - For heads, use EMA's or Lintel wedge anchor assembly (FIG. 17 – see E.4).
 - 4-sided shutters come std with EMA bolts for heads and sills, but for heads, you may specify the same Lintel wedge specified in 3-sided masonry frames.
- l) After laying 8-9 courses, the masonry should be allowed to set overnight. Leave spreaders and temporary back bracing in place overnight. Clean out any grout from hinge pockets and strike reinforcements, as well as on the floor. Always remember to continue checking "plumb, level and square" and be sure the frame does not move from your layout lines on the floor (FIG. 18).
- m) On day two, carefully remove the back braces and continue laying brick. The head will need grout fill as well, followed by the lintel above the head (FIG. 19). Check again for plumb, level, and square, and be sure no sagging has occurred in the head. Remember that any time you fill a head > 42" length with grout, you need to use a vertical brace from head to floor to prevent sagging in the head (FIG. 20). This

FIG. 16 – MASONRY T IN JAMBS SHOWN WITH 4" FACE IN LINE WITH BLOCK COURSING

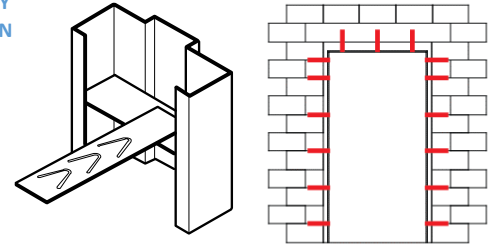


FIG. 17 – LINTEL WEDGE ANCHOR ASSEMBLY IN HEADS FOR NEW MASONRY APPLICATIONS

LINTEL WEDGE ANCHOR ASSEMBLY

Lintel anchor system for use in Masonry T jamb applications for CMU block walls

Illustration for 5" bolt assembly and notes for 7" assy

Install at typical Concrete EMA head locations

Illustration not to scale

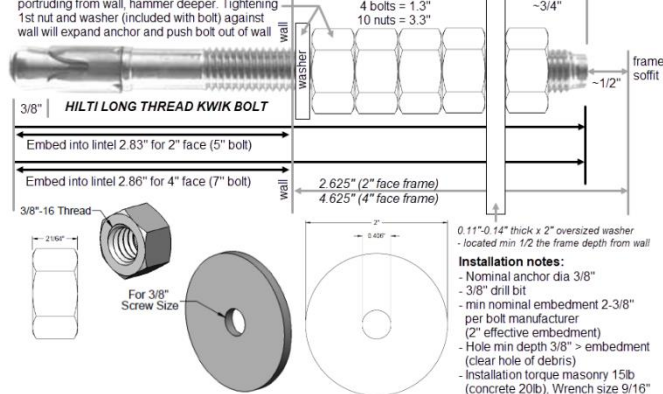


FIG. 18 – MASON CHECKS PLUMB, LEVEL, SQUARE BEFORE LAYING BLOCK AND THROUGH BUILD PROCESS



FIG. 19 – TYP A HIGH PSI PREFAB CONCRETE LINTEL IS USED, ALTHOUGH PROPER STEEL LINTELS MAY ALSO BE SPECIFIED. REF NON-TORNADO SDI/ALLEGION MASONRY INSTALL VIDEO min 7:50-8:30. ENSURE NO SAGGING.



completes installation in new construction.

10. **Existing masonry wall construction install**

(typically tilt up, pre-fab concrete, or CMU walls installed prior to frame installation), the same rules of plumb, level and square apply.

- a) You must provide the wall condition with your order for proper anchor quantities and locations. These specific anchors and locations will be provided automatically from the factory at the time of your order and will appear on your OA and invoice.
- b) If any anchor interference is possible [with hardware or other], please contact product tech support to receive your locations prior to ordering. We can adjust locations within a range as allowed by our approvals.
- c) For quantity of EMA anchors. See anchor type/quantity at E.1 of this document.
- d) Min edge distance and other requirements are listed in the anchor tables in section E.4.
- e) You will install the KD or SUA frames using Existing Masonry Anchors. The bottom EMA serves as the base anchor (typ located approximately 2.5" above the bottom of the frame).
- f) All EMA's will use welded-in tube and strap anchors in dimpled frames provided from the factory (FIG. 21), along with approved Hilti anchor bolts (FIG. 21-22). 2" face bolts will use our 5" bolt and do not require grout filled frames.
- g) 4" face heads use our 6" bolt with extender requiring minor assembly (FIG. 21).
- h) Unlike 2" face, 4" face heads require full grout fill using standard practice methods (hole in head, later plug welded & finished smooth). Rust preventative frame back coating is recommended but not required.
- i) EMA anchor bolts (quantity reference chart at E.1 of installation instructions). Contact support for bolt manufacturer tech data.
- j) Max allowable shim, 1/4" at head and each jamb, and 3/8" max across both jambs. Use to determine rough opening.

FIG. 20 – SUPPORT HEAD WITH VERTICAL BRACCE ON ANY HEAD OVER 42" LONG. SHIM AS NEEDED TO KEEP HEAD LEVEL.

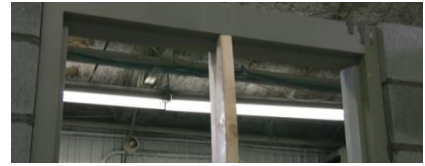
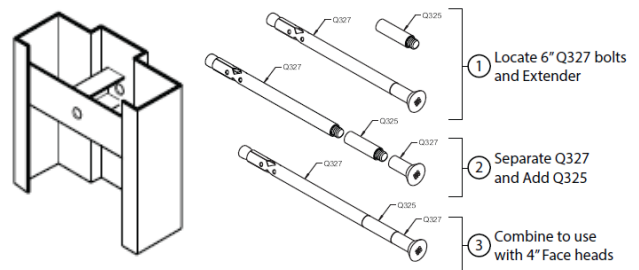


FIG. 21 – WELD-IN TUBE AND STRAP (TSTRAP) ANCHORS IN DIMPLED FRAME TO ACCEPT TAPERED FLAT HEAD SLEEVE ANCHORS, INCLUDING ASSEMBLY FOR 4" FACE HEAD APPLICATIONS



- k) Bolt installation (FIG. 22). Drill a 3/8" hole approx. 3-4" deep, or the manufacturer recommended 1" min deeper than the bolt embedment depth. Bolt manufacturer required embedment is 1-1/4" into Concrete or CMU block, although your typical embedment, using approved bolts and 1/4" shims, will be approx 2-1/8" with 2" face frames, and approx 2-3/8" using 4" face frames. Plan wall construction to avoid any steel reinforcement within 1/2" of this wall depth or as recommended by engineer. See ANSI B212.15 for drill bit tolerances. Blow the hole clean. Do not expand the anchor prior to installation. Drive the anchor through the frame and tube and strap anchor until anchor is firmly seated and to the required embedment depth. Tighten the anchor by turning the head 3 to 5 turns past finger tight, to manuf rec of 10 ft-lbs. max torque (FIG. 22).

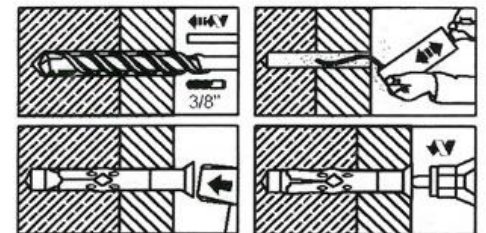
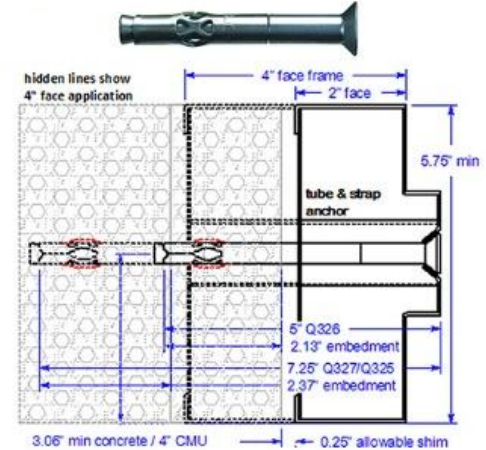
- 11. Notes on Lintels and concrete shelter walls. Lintels are typically a high PSI concrete (FIG. 19), bond beams, or a 3/16"-1/4" Steel plate lintel (all are OK used with our product). Shelter planning should keep internal concrete steel reinforcement in concrete and grout filled CMU block deep enough not to interfere with anchor bolts, but if they are hit when drilling for your EMA bolts, you must drill through these reinforcements to install your anchor. Check with the shelter contractor, architect, structural engineer, or licensed professional engineer, but this typically is allowed (does not affect the integrity of the walls).

C. **FEMA DF Door installation**

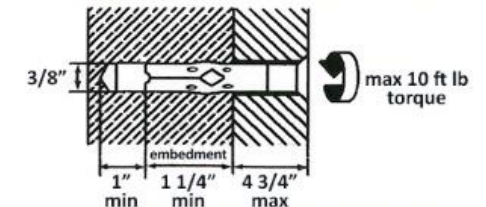
These installation instructions are only guidelines. Applicable building codes, standards and accepted practices apply. Follow typical Door installation and ICC500 requirements. The Authority Having Jurisdiction is the final authority in issues related to the installation and use of any building products. Typical installation details are supported by a video collaboration with the Steel Door Institute (SDI). See "Steel Doors and Frame Installation" of [SDI Videos](#). These are not tornado-specific installation videos but are good reference.

FIG. 22 – EMA BOLT INSTALLATION (2" AND 4" FACE HEADS OPTION) WITH BOLT MANUFACTURER'S MIN REQUIREMENTS

Windstorm sleeve anchor masonry bolts
 Steelcraft Q326 (2" face) and Q327/Q325 (4" face)
 (Hilti HLC-FPH Sleeve Anchors)



- 1) Drill 3/8" hole 1" min deeper than bolt embedment
- 2) Clean debris from hole
- 3) Tap bolt through hole back of frame into concrete
- 4) Screw in to expand sleeve anchor – 10 ft lb max



original graphic and general install instructions/images provided by Hilti

FEMA DF Door Installation

1. In the SDI video link above, see (*not tornado video*) installation "[How to Install a Steel Door,](#)" but review callouts of this guide. *Take care, noting that Tornado doors weigh considerably more than typical doors.*
2. Locate the correct door using the mark number on the doors and verify on the drawing and hardware schedule. Verify ICC500 / FEMA 361 label, as well as fire label if applicable.
3. **Prior to beginning, check the frame for plumb, level and square (FIG. 23).** A good door installation can rarely make up for a poor frame installation, see SDI/Allegion collaborative videos (*not tornado specific*) to reference in this situation. See [SDI Videos](#), Prep and Installation Videos, Troubleshooting Videos.
4. Verify correct hinges and locations on drawings and the hardware schedule. Dimension taken from top of the door to top of the hinge cutout will be 1/8" less than the dimension from the rabbet to top of frame hinge cutout (FIG. 24).
5. Check screw holes and reinforcements to be sure they are clear. Use the correct tap and machine screw provided by Ives, the approved hinge manufacturer (FIG. 25).
6. Check hardware schedule or submittal to verify standard or heavyweight hinges. For heavyweight hinges, remove (pull out) existing wire spacers, adjust set screw or break off existing hinge fillers (FIG. 26).
7. Attach Ives hinges to door. Install hinge pins with open end toward the bottom of the door.
8. To begin installing the door, set it up on end and onto a wood wedge or similar spacer to line up door and frame hinges. Align and install top hinge on door to top frame hinge reinf (FIG. 27).
9. Install middle and bottom hinges to the frame.
10. Remove the wedge spacer under the door and test for proper door closure and proper gaps. Reference SDI-122 for Bind or Alignment issues, as well as [SDI/Allegion Troubleshooting Videos](#).
11. Install the lockset, closer or any other auxiliary hardware. After installing locksets, open and close the door to ensure the latch is engaging.

FIG. 23 – CHECK PLUMB, LEVEL AND SQUARE PRIOR TO DOOR INSTALLATION



D. FEMA doors with glass lights

1. Glass kit with frame will be installed from the factory. Care instructions are provided on the glass sticker and in tech data. Stickers should be removed after installation and finish paint. See FIG. 4 handing chart.

E. Approved Tornado Frame Anchoring

1. Type/Quantity based on wall condition:
2. Standard locations ([PDF link to FIG. 28](#))

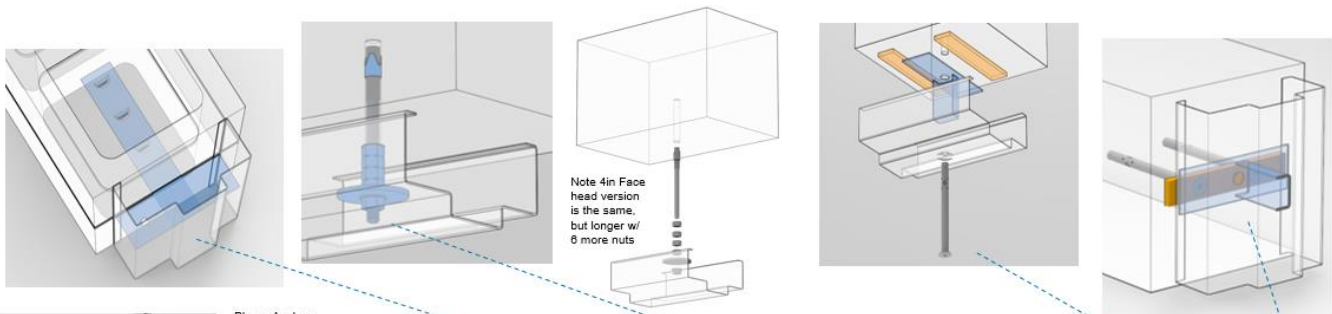


FIG.28 - DF anchor locations_190204.pc

3. Approved anchoring summary – Anchoring to New and Existing Masonry, Concrete, and Steel Buildings

Anchor Quantities				
Per Jamb				
Nominal Opening Height (singles or pairs)	Wall Condition			
	New Masonry/CMU	Existing Masonry/CMU	Concrete	*Structural Steel
4'3" - 6'4" shutter	4-5 (top/bot and every other block)	5	4	4
6'4-1/8" - 8'0" shutter	5-6 (top/bot and every other block)	7	5	5
6'8" - 8'0" 3-sided				
Per Head				
Nominal Opening Width	Wall Condition			
	New Masonry/CMU	Existing Masonry/CMU	Concrete	*Structural Steel
2'8" - 4'0" shutter single	3	4	3	3
3'0" - 4'0" 3-sided single				
5'4" - 8'0" shutter pair	4	5	4	4
6'0" - 8'0" 3-sided pair				

*Includes welding frame to steel plates (by others) that are anchored to existing CMU or Concrete. See Install Instructions.

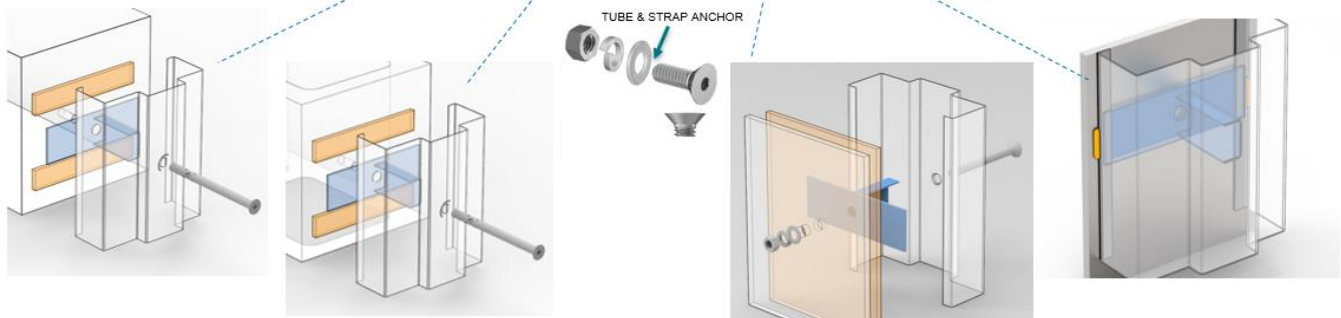


Note 4in Face head version is the same, but longer w/ 6 more nuts

Blue = Anchors
Orange = Allowable Shims

Typical wall construction and anchoring types

Profile	Steel Thickness	Wall Construction	Typical Wall Anchors in Jamb and Heads (and sills if 4-sided)
FP14	14 Gauge [0.067" (1.7 mm)]	New Masonry - CMU Block	**Masonry T jombs / Lintel wedge anchor system or EMAs in heads/sills
		New Concrete	Steel Embed Plates (by others)
		*Existing Masonry - Concrete or CMU block	Bolts flush through dimples in soffit and Tube & Strap EMA anchors Steel plates (by others) bolted to concrete or CMU block wall, then frame welded to steel plates. T&S EMAs required per location. No dimple holes.
		Structural Steel	Frame bolted or welded to steel structure. T&S EMAs required per location. No dimple holes when welded.



Blue = anchoring; Orange = shimming and embed plate

a) Anchoring Details Chart – Anchoring to new masonry & new concrete

Note SDI Videos [Link](#) and Steelcraft “How to install a Steel Door Frame in Masonry Construction” [Link](#) (video reference is not tornado specific). See larger anchor images on previous page if needed.

Blue = anchoring; Orange = shimming and embed plate

WALL CONDITION	FRAME ANCHORING METHOD	IMAGE REFERENCE	PART	SINGLE /PAIR	ANCHOR QUANTITY PER JAMB/HEAD PER OPENING HEIGHT		MINIMUM REQUIREMENTS		
					4'3" - 6'4" (SHUTTERS)	6'4-1/8" - 8'0" (3-SIDED & SHUTTERS)	EDGE DISTANCE	EMBEDMENT	
New Masonry (CMU Block) Also allowed in New Concrete (tilt-up/pre-fab/poured in place)	Masonry T in CMU jambs • In fully grouted 3000lb min concrete mix/no water based grout • Adjustable base anchor standard		Jambs	Single or Pair	4-5 (top/bottom and every other block)	5-6 (top/bottom and every other block)	3"	6"	
	<i>INSTALL NOTE (for above item): Locate anchors between bottom 2, top 2 and every other CMU block, typical 8"x16" nominal size concrete filled block. Reference min 7:50-8:30 in above non-tornado video link for grouting the head & similar install.</i>								
	Lintel Wedge in CMU head • Assembly used w/o P&D in frame • 3-sided option • Shutter option • Use this head anchor or Bolted thru EMA (below), not both		Heads	Single	3	3"	approx. 2-7/8"		
			Pair	4					
<i>INSTALL NOTE (for above item): Prior to installing lintel, hammer in assembly (bolt with washer, stacked nuts, oversized washer, and nut stack at 20 ft lb into Lintel at EMA frame anchor location. Grout head and drop in the sill with lintel/bolt assy. Must accompany Masonry T in jambs (and EMA's in sills for shutters). Reference min 7:50-8:30 in above non-tornado video link for grouting the head & similar install (no lintel bolts).</i>									
Bolted thru EMA in CMU head/sill • Requires P&D, TStrap EMA, sleeve anchors • 4-sided Shutter default • 3-sided option		Heads/Sills	Single	3	3-1/8"	1.25" 2" bolts provide 2-1/8" with 2" face; 2-5/8" with 4" face • 1/4" shim/jamb or 3/8" max both jambs			
		Pair	4						
<i>INSTALL NOTE (for above item): Frame will have welded-in tube and strap anchors at typical EMA locations with punch and dimple from the factory. Sleeve anchors installed at the site. Do not use epoxy with expansion anchors. Drill hole for EMA expansion anchors min 1" deeper than the anchor sleeve final actual embedment, blow out dust, and install expansion anchor bolts to 10 ft lb max. Grout heads per SDI; only required for 4" face.</i>									
New Concrete (tilt-up/pre-fab/poured in place)	Embed Plates in Concrete • Plates by others • Tstrap anchors, no P&D, no bolts • Base anchor omitted (bottom EMA ~2.5" from floor, serves as base anchor)		Jambs	Single or Pair	4	5	3-1/8"	1.25"	
			Heads/Sills	Single	3				
				Pair	4				
<i>INSTALL NOTE (for above item): Frame will have welded-in tube and strap anchors at typical EMA locations but without punch and dimple and without bolts. Plates supplied by others. Min embed plates are 4" tall x 1/2" greater than JD. Plate studs 1/4" min thick, 2" apart and 2" from each edge. Locate at frame anchor locations. Weld frame to plate using min 1/8" E70XX fillet weld 1" in length on both sides of frame per location, SMAW (stick) welding process.</i>									
WALL CONDITION	FRAME ANCHORING METHOD	IMAGE REFERENCE	PART	SINGLE /PAIR	4'3" - 6'4" (SHUTTERS)	6'4-1/8" - 8'0" (3-SIDED & SHUTTERS)	EDGE DISTANCE	EMBEDMENT	

(See next page for anchoring to existing masonry & existing concrete. See 2 pages ahead for anchoring to structural steel.)

b) Anchoring Details Chart – Anchoring to existing masonry & existing concrete


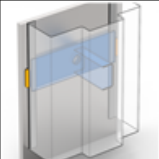
Blue = anchoring; Orange = shim and embed plate

WALL CONDITION	FRAME ANCHORING METHOD	IMAGE REFERENCE	PART	SINGLE /PAIR	ANCHOR QUANTITY PER JAMB/HEAD PER OPENING HEIGHT		MINIMUM REQUIREMENTS	
					4'3" - 6'4" (SHUTTERS)	6'4-1/8" - 8'0" (3-SIDED & SHUTTERS)	EDGE DISTANCE	EMBEDMENT
Existing Masonry (CMU Block)	Bolted through EMA in CMU • TStrap anchors, P&D, sleeve anchor bolts • Base anchor omitted (bottom EMA ~2.5" from floor, serves as base anchor)		Jambs	Single or Pair	5	7	3-1/8"	1.25"
			Heads/Sills	Single	4			
	Heads/Sills	Pair		5				
		<i>INSTALL NOTE (for above item): Frame will have welded-in tube and strap anchors at typical EMA locations with punch and dimple from the factory. Sleeve anchors installed at the site. Do not use epoxy with expansion anchors. Drill hole for EMA expansion anchors min 1" deeper than the anchor sleeve final actual embedment, blow out dust, and install expansion anchor bolts tightened to 10 ft lb max</i>						
Existing Masonry (CMU Block)	Welded to Steel Plates in CMU • Plates (by others) bolted to wall, then Frame weld to plates • TStrap anchors, no P&D, bolts • Base anchor omitted (bottom EMA ~2.5" from floor, serves as base anchor) • Weld min 1/8" x 1" bead on each side of frame per anchor location • If shimming, similarly weld using metal shims.		Jambs	Single or Pair	4	5	3-1/8" bolt to opposite side of block	2 1/2" from nearest bolt and 5-1/8" from furthest bolt • TYP 5-3/4" from furthest bolt for 5-3/4" min JD frame
			Heads/Sills	Single	3			
	Heads/Sills	Pair		4				
		<i>INSTALL NOTE (for above item): Plates are 1/4" thick to allow taper head x 1" wide min and 1/2" wider than JD. Bolts are 1.5" OC from plate edge. Bolts lock plate to wall then use 1/8" E70XX fillet weld 1" in length on both sides of frame per location, SMAW (stick) welding process, to attach frame to metal plates. Omit P&D. Plate supplied by others. If shorter bolts needed to avoid concrete steel support, 2-7/8" length is available from bolt manuf. Call Steelcraft tech support for spec.</i>						
Existing Concrete	Bolted through EMA in Concrete • TStrap anchors, P&D, sleeve anchor bolts • Base anchor omitted (bottom EMA ~2.5" from floor, serves as base anchor)		Jambs	Single or Pair	4	5	3-1/8"	1.25"
			Heads/Sills	Single	3			
	Heads/Sills	Pair		4				
		<i>INSTALL NOTE (for above item): Frame will have welded-in tube and strap anchor at typical EMA locations with punch and dimple from the factory. Sleeve anchors installed at the site. Do not use epoxy with expansion anchors. Drill hole for EMA expansion anchors min 1" deeper than the anchor sleeve final actual embedment, blow out dust, and install expansion anchor bolts tightened to 10 ft lb max.</i>						
Existing Concrete	Welded to Steel Plates in Concrete • Plates (by others) bolted to wall, then, Frame welded to plates • TStrap anchors, no P&D, bolts • Base anchor omitted (bottom EMA ~2.5" from floor, serves as base anchor) • Weld min 1/8" x 1" bead on each side of frame per anchor location • If shimming, similarly weld using metal shims		Jambs	Single or Pair	4	5	3-1/8" bolt to opposite side of block	2 1/2" from nearest bolt and 5-1/8" from furthest bolt • TYP 5-3/4" from furthest bolt for 5-3/4" min JD frame
			Heads/Sills	Single	3			
	Heads/Sills	Pair		4				
		<i>INSTALL NOTE (for above item): Plates are 1/4" thick to allow taper head x 1" wide min and 1/2" wider than JD. Bolts are 1.5" OC from plate edge. Bolts lock plate to wall then use 1/8" E70XX fillet weld 1" in length on both sides of frame per location, SMAW (stick) welding process, to attach frame to metal plates. Omit P&D. Plate supplied by others. If shorter bolts needed to avoid concrete steel support, 2-7/8" length is available from bolt manuf. Call Steelcraft tech support for spec.</i>						
WALL CONDITION	FRAME ANCHORING METHOD	IMAGE REFERENCE	PART	SINGLE /PAIR	4'3" - 6'4" (SHUTTERS)	6'4-1/8" - 8'0" (3-SIDED & SHUTTERS)	EDGE DISTANCE	EMBEDMENT

(See previous page for anchoring to new masonry & new concrete. See next page for anchoring to structural steel.)

c) Anchoring Details Chart – Anchoring to structural steel

Blue = anchoring; Orange = shimming and embed plate

WALL CONDITION	FRAME ANCHORING METHOD	IMAGE REFERENCE	PART	SINGLE /PAIR	ANCHOR QUANTITY PER JAMB/HEAD PER OPENING HEIGHT		MINIMUM REQUIREMENTS	
					4'3" - 6'4" (SHUTTERS)	6'4-1/8" - 8'0" (3-SIDED & SHUTTERS)	EDGE DISTANCE	EMBEDMENT
Structural Steel	Bolted through EMA in Steel Structure • Tstrap anchors, P&D, mach bolt assy • Base anchor omitted (bottom EMA ~2.5" from floor, serves as base anchor)		Jambs	Single or Pair	4	5	1"	Washers and nut must fully engage and pass bolt end, revealing at least two full thread rotations.
			Heads/ Sills	Single	3			
	Pair	4						
	<i>INSTALL NOTE (for above item): Frame will have welded-in tube and strap EMAs at typical EMA locations with frame P&D from the factory. At site install 3/8" Grade 5 120 PSI Tensile strength machine bolts through soffit dimples and tube & strap anchors, 1/8" min steel structure with 1/4" max shim space, washer, lock washer, and grade 5 nut. Tighten to 30 ft lb. May thread structural steel in lieu of nuts.</i>							
Structural Steel	Welded to Steel Structure • Tstrap anchors, no P&D, no bolts • Weld min 1/8" x 1" bead on each side of frame per anchor location • If shimming, similarly weld using metal shims.		Jambs	Single or Pair	4	5	3-1/8"	n/a
			Heads/ Sills	Single	3			
				Pair	4			
<i>INSTALL NOTE (for above item): Frame will have welded-in tube and strap EMAs at typical EMA locations without P&D and without bolts. Weld frame to steel structure with min 1/8" E70XX fillet weld 1" in length on both sides of frame per location, SMAW (stick) welding process.</i>								
WALL CONDITION	FRAME ANCHORING METHOD	IMAGE REFERENCE	PART	SINGLE /PAIR	4'3" - 6'4" (SHUTTERS)	6'4-1/8" - 8'0" (3-SIDED & SHUTTERS)	EDGE DISTANCE	EMBEDMENT

(End of anchoring details charts. See previous pages for anchoring to new masonry/concrete and existing masonry/concrete.)

d) Anchoring notes

- 1. Communicate with Contractors well in advance of manufacturing and construction to avoid interference that might hinder proper installation and anchoring, causing expensive fixes or required replacements later. For example, placement of concrete or CMU block reinforcement (rebar) should be clear of the frame's anchor locations and embedment including some tolerance per the contractor. If rebar interferes it typically must be drilled through, but the contractor may need to hire a professional engineer to comply with ICC500 requirements. Solutions may be more complicated and require reordering/replacing frames. Contact Steelcraft Technical Product Support for guidance [email Republic Customer Support](#) or call (800) 733-3667.
- 2. Locations and quality of installation should be checked and verified prior to and during installation to ensure quality of anchoring/installation.
- 3. Min 3000 PSI is typical for any concrete, concrete filled CMU, lintel, slab, as well as filling bottom strike cavities and thresholds as needed. Verify alternate requirements with architect or professional engineer.
- 4. Fill gaps between frame and wall from fit and shimming with caulk. Fill larger gaps with backer rod, wood filler strips, or similar as recommended by engineer or architect for aesthetics and to resist airflow in a windstorm.
- 5. Max allowable shim, 1/4" at head and each jamb, and 3/8" max across both jambs.
- 6. Do not use epoxy with expansion anchors. Drill hole for EMA expansion anchors min 1" deeper than the anchor sleeve final actual embedment, blow out dust, and install expansion anchor bolts tightened to 10 ft lb max.
- 7. Frames do not require grouting except in 4" face heads and in new masonry jambs, heads or sills, which must be grouted full.

- 8. (2) anchors per location typical for JD greater or equal to 9-1/8". Available JD 5-3/4" thru 10-3/4". Edge distance is measured from center of bolt to opposite side of CMU block.
- 9. ADA/Fire rated glass lights available with 3-sided openings (not available on shutters).
- 10. Additional information available at Republicdoor.com. For general video installation reference (not tornado specific), see [SDI Videos](#).

F. Gasketing/Seals and Bottom latching details
(commonly specified for tornado applications)

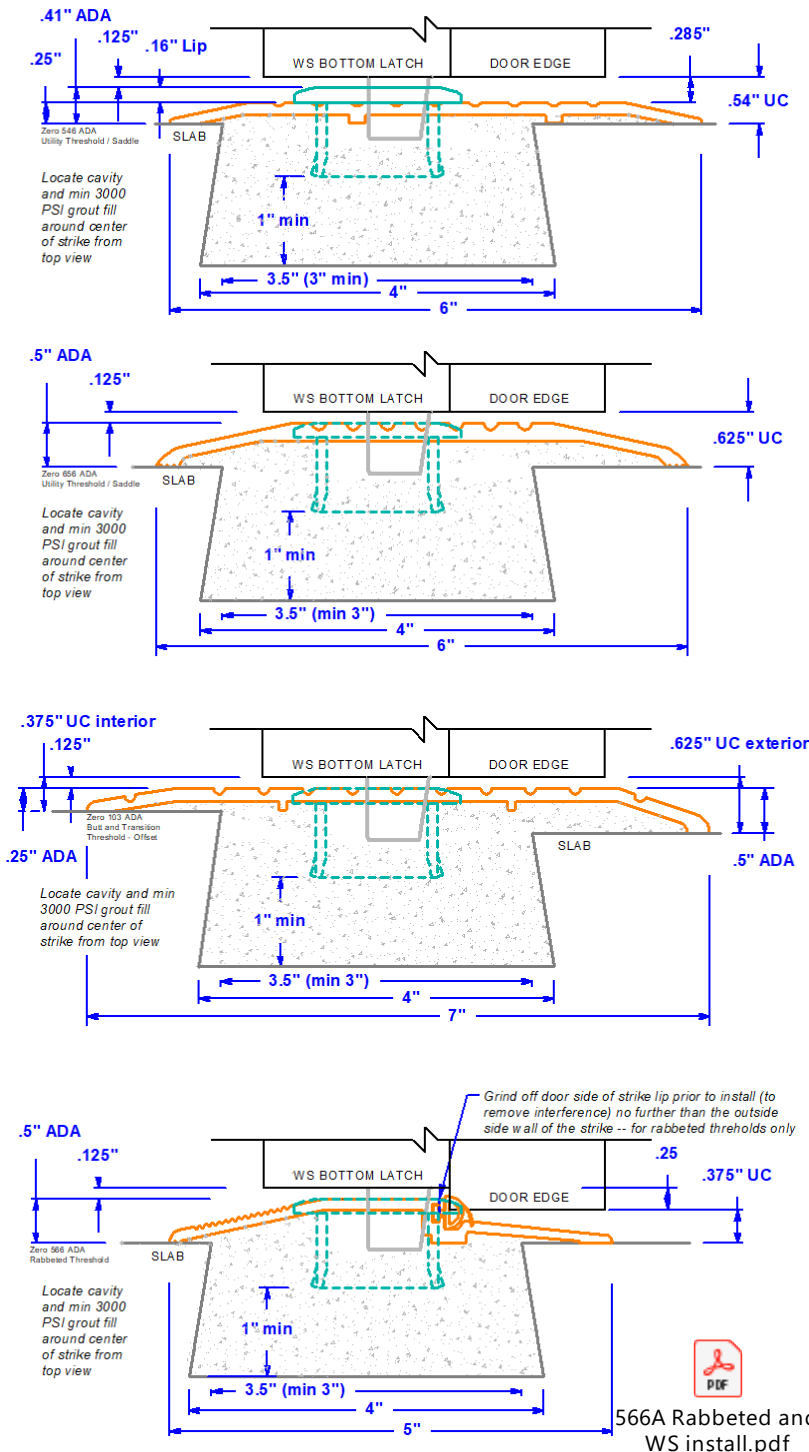
1. Avoid special gasketing to tornado. Maintain proper latching and avoid potential binding or interference.
2. **When using a threshold, refer to hardware installation of strikes (page 1 help links) and sections A.1, A.2, B.5, item 11 below. With or without threshold, the bottom strike must always be anchored into the slab with bolts (LM) or concrete (WS) to ensure a direct structural connection of door and frame to slab.**
3. Avoid surface auto door bottoms since they can interfere with the bottom latch.
4. Door sweeps Zero 8192 or 8198 can be added.
5. Perimeter seals such as Zero 488.
6. Meeting edge pairs use Zero 8217 or 328.
7. Surface mounted seals (Zero 475AA) works well but needs to be cut short to fit around the closer mounting and sometimes the WS RIM strike mounting.
8. A continuous hinge may be used to seal the jamb edge.
9. Do not use a top jamb and strike jamb seal to avoid cutting around latches in the field.
10. Additional gasketing may be added. Any Zero brand gaskets, seals, or thresholds may be used, but must not impede or affect the function of the opening or latching hardware. The following are commonly used:

Zero Gasketing and Threshold Recs for Tornado Applications		
- Zero recommends thresholds extend 3/8" past the door thickness if possible		
- V3 Full body strength option available for thresholds (rec for heavy duty commercial traffic, schools, etc.)		
Type	Zero Models available for tornado openings	Recommended Zero models
Saddle	1/4" high: 545 (LM9300 only), 546, 547, 548 1/2" high: 655 (LM9300 only), 656, 647, 657, 6570, 6575. Offset versions: 102, 103, 104	Use 6" wide versions or greater when using surface vertical rods: 546, 656
Rabbeted / Bumper for water infiltration	566, 568, 65 (65 with LM9300 only)	566 when ADA is required 568 when ADA is not required
Perimeter head and jamb (self-adhesive)	188S, 488S, 8145S, 117S, 8042S, 8150S, 8144S	488
Perimeter head and jamb (screw-applied)	50, 139, 312, 314, 326, 328, 429, 8303, 485, 870, 475AA	475AA
Meeting edge (screw applied)	55/555, 55FS/555FS, 326, 328, 99, 100, 873	8217, 328
Sweeps and door bottoms & auto door bottom	39, 339, 328, 329, 50M, 539, 8191, 8197, 8198, 8192, 8193, 111, 153, 354A, 355A	8192, 8198

11. **Thresholds and WS98/9927/57 bottom strike install notes:** First set threshold in place to mark strike location per hardware install instructions. Cut hole and mark slab under threshold. Remove and mark slab to cut 3"x3" min cavity with undercut as shown below, centered around strike 1" min below strike. Clean, fill with 3000 psi grout, & re-attach threshold so min 3" area around strike is grouted full up to threshold. Insert strike and use 1"x1" square wood post to push grout down about 3/4"-7/8" so that engaged latch

will rest within 1/4" of grout but not hit grout. Clean area and let set. It is acceptable to run 1/4" finished floor between threshold and concrete slab, but not closer than 1" to strike). The structural connection of the slab to door through bottom strike must be maintained through the grout filled cavity and strike.

FIG. 29 – WS98/9927/57 BOTTOM STRIKE INSTALLATION WITH THRESHOLD OPTIONS. See FIG. 2 for LM9300 strike install. Threshold placements may vary to best suit opening. Reference ADA link [2010 ADA Standards for Accessible Design](#).



Zero 546 (6" wide version shown)
1/4" ADA Threshold - Utility / Saddle type
 Other 1/4" saddle models:
 545=5" wide, 547=7", 548=8"

ADA COMPLIANT THRESHOLD & INSTALLATION
 Strike sits on threshold, under 1/2" to floor

Zero 656 (6" wide version shown)
1/2" ADA Threshold - Utility / Saddle type
 Other 1/2" saddle options: 5" wide=655 for LM9300 only, 7" wide=647, 657, 6570, 7.5" wide=6575

ADA COMPLIANT THRESHOLD & INSTALLATION
 Strike mounted flush with top of threshold

Mounting strike lip on threshold may not be ADA compliant since total height of threshold and strike would be over 1/2".
 - See your local AHJ for approval as ADA standard is unclear. Refer to ADA sections 404.2.5, 303.1-3.
 - If used, in drawing move door edge, latch and strike up 0.16" to satisfy "1/8" latch housing to top of strike" requirement.

Zero 103 ADA (7" wide version shown)
1/4"/1/2" Butt & Transition Threshold -Offset
 7" wide x 0.25" offset step shown
 Other offset options: 5.5"x0.25" step=102, 6"x0.5"=104

ADA COMPLIANT THRESHOLD & INSTALLATION
 Strike mounted flush with top of threshold

Mounting strike lip on threshold may not be ADA compliant since total height of threshold and strike would be over 1/2".
 - See your local AHJ for approval as ADA standard is unclear. Refer to ADA sections 404.2.5, 303.1-3.
 - If used, in drawing move door edge, latch and strike up 0.16" to satisfy "1/8" latch housing to top of strike" requirement.

Zero 566 (5" wide, for water infiltration)
1/2" ADA Threshold - Rabbeted type
 NOTE: SADDLE TYPE IS RECOMMENDED UNLESS REQUIRED FOR WATER INFILTRATION
 Other 1/2" rabbeted option: 6" wide (not ADA)=568

ADA COMPLIANT THRESHOLD & INSTALLATION
 Strike mounted flush with top of threshold

Mounting strike lip on threshold may not be ADA compliant since total height of threshold and strike would be over 1/2".
 - See your local AHJ for approval as ADA standard is unclear. Refer to ADA sections 404.2.5, 303.1-3.
 - If used, in drawing move door edge, latch and strike up 0.16" to satisfy "1/8" latch housing to top of strike" requirement.
 - See "566A Rabbeted and WS install.pdf" below for install



566A Rabbeted and WS install.pdf

END OF DOCUMENT