

Republic FEMA Frame and Door Installation Instructions

Overview: Installation instructions

These installation instructions are only guidelines. Applicable building codes, standards and accepted practices apply. Follow typical Frame installation and ICC500-2014 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 “Prep and Installation Videos” of [SDI Videos](#).

A. FEMA Frame and Door Ordering notes:

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 (1/4” to bottom of lip) (Figure 1) or 1/8”-1/4” to the top of an LM9300 strike plate (Figure 1a). Manufacture strike must always be used and must be anchored or grouted into slab as directed by hardware instructions.
2. Installations must follow hardware manufacturer guidance and installation instructions. Follow links for [Von Duprin](#) and [Schlage](#) tornado approved hardware, or go to <http://us.allegion.com> and search in the Document Library for these and other Allegion hardware or accessory catalogs, tech data, and installation instructions. For installation into concrete foundations and shelter walls, follow ICC500-2014 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 is the horizontal dimension from rabbet to rabbet, and vertical dimension from bottom of

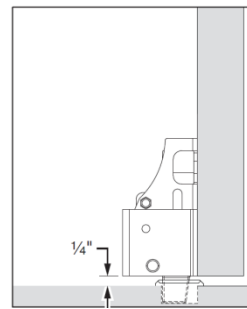


Figure 1 - WS bottom gap

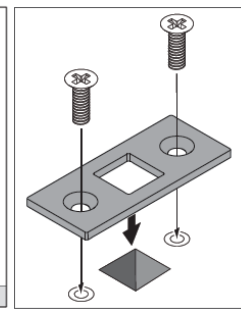
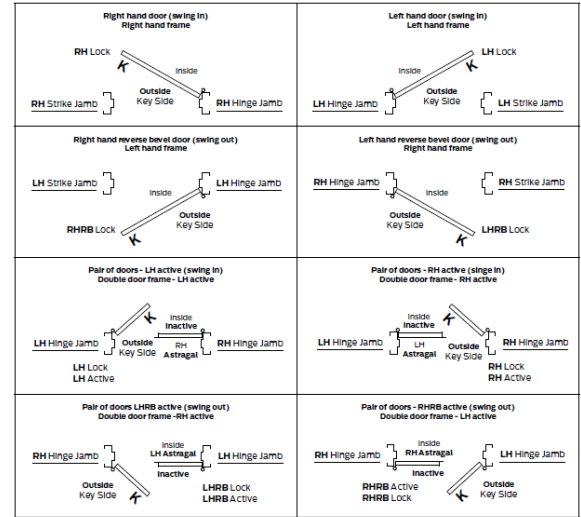


Figure 1a - LM9300 strike plate

frame to head rabbet. Typical door gaps are 3/32" to jambs, and 1/8" to the head. Undercuts may vary, typ not greater than 3/4" undercut allowed between bottom of door and finished floor. See Tech data for additional information.

4. Handing - Correctly understanding handing in ordering and installing tornado products is critical to life safety. See "Handing procedures diagrams" (Figure 2), and use the following IMPORTANT rules when considering Tornado openings. Ref also Paladin lights (Figure 3).
 - 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 PW doors may be inswing or outswing when using lever trim. But PW 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 as straight handed.
 - a) Straight handed shutters (Figure 2: Straight handed shutters): Shutters with glass in a 4-sided frame are always



K Indicates key side of the active door

Figure 2 – Handing chart

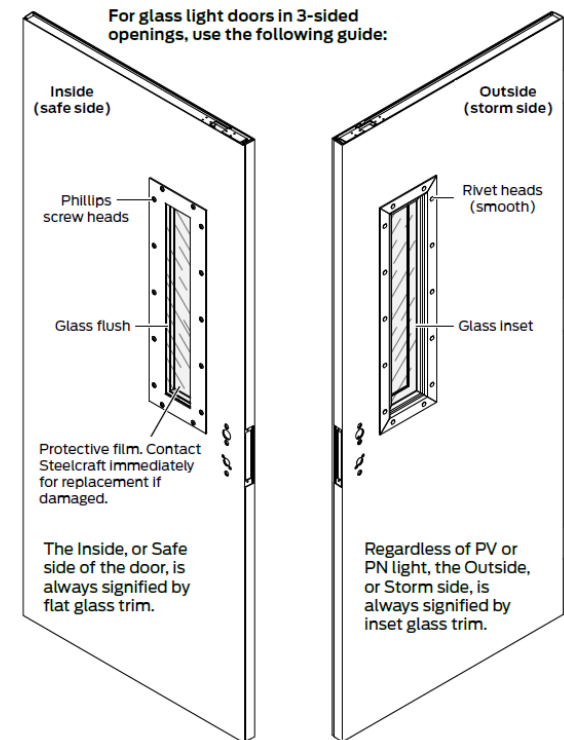


Figure 3 – Handing Reference



Figure 2 – Straight handed shutters



Figure 2a – Reverse handed shutters

straight handed. If the shutter opening does not have glass, but is still installed into the rabbet nearest to the inside/shelter/safe side of the opening, then the shutter is still straight handed.

1. Non-impact resistant glass (provided by others) can be field installed in exterior (storm side) rabbet of frame.
- b) Reverse handed shutters (Figure 2a: Reverse handed shutters) prev page: Shutters without glass that are installed into the rabbet nearest to the storm side of the opening is reverse handed. This option would not have glass.

B. FEMA Frame installation

1. Follow typical installation as a guide, noting specific differences with FEMA Frames in the instructions below. See SDI/Allegion collaborative video under [SDI Videos](#), Prep and Installation Videos, “How to Install Frames in Masonry Construction.”
2. As with any frame installation, take the time to make certain that frames are continually checked for “plumb, level and square” throughout installation.
3. Match frame and opening location by opening number or mark number (Figure 3). Verify ICC500-2014 / FEMA 361 label, as well as fire label if applicable. Confirm handing of frame to drawings/door schedule/hardware schedule
4. Verify correct reinforcement, hinge size, strike type, closer and other reinforcements for mounting hardware
5. 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) or anchored (LM strike plate) into the concrete slab, regardless of threshold or finished floor. Note when using a rabbeted, or bumper, threshold, the bottom latch assembly for WS devices will be mounted higher on the door (Figure 4).

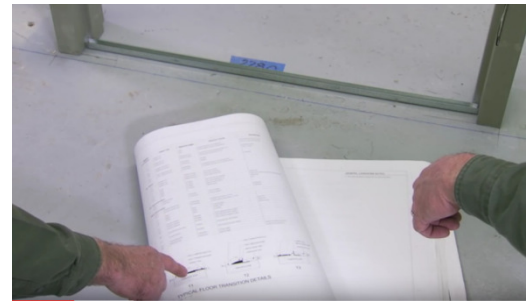


Figure 3– Match opening location and frame mark number

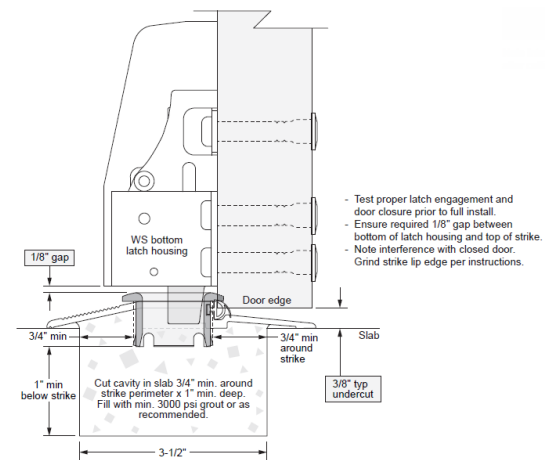


Figure 4– WS bottom latch and strike installation.

6. You may need to fix the floor prior to frame installation to avoid problems in maintaining an even gap or 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 (Figure 5).
8. KD frames are assembled using the corner tab/slots (see Tech data).
9. If installing the frame first for New masonry wall construction (e.g. grout filled CMU block walls), set your frame first and then build the grout filled CMU block walls up evenly on both jambs.
 - a) Lay out your frame on the floor per drawings prior to setting the frame.
 - b) Precisely cut an accurate/square spreader bar to maintain proper frame spacing while setting the frame (Figure 6).
 - c) Verify the jambs are plumb, the head is level, and the frame is in square. Install base anchors into concrete and adjust with screws to keep the head level and to achieve proper floor clearance. (Figure 7). You can shim the frame with a flat metal washer or fender washer.
 - d) Set your frame using back braces and spreader bars (Figure 8).
 - e) For openings with electrical components, now install conduit or flex cable.
 - f) Install a piece of tie wire at about 48" from the floor and twist tight to hold inward tension on the spreader bar (Figure 9).
 - g) Add a Mid-frame spreader to keep frame straight and aligned (Figure 9a).
 - h) Mason should check plumb, level and square before beginning (Figure 10).



Figure 5– Properly grind off shipping bar



Figure 6– Spreader placed betw Strike Jamb & Hinge jamb



Figure 7 – Adjustable base anchor and installation to concrete with (drive pin) anchor



Figure 8 – Temporarily brace frame

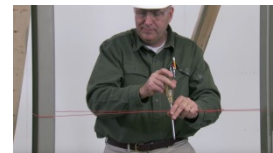


Figure 9 – Install tie wire for inward tension



Figure 9a – Add mid height spreader bar



Figure 10 – Mason should check plumb, level, square before beginning



- i) 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 (Figure 11).
- j) For your FEMA frames, you will use approved Masonry T anchors only (not wire anchors), provided in your shipment and placed between CMU blocks in order to anchor jambs securely.
- k) After laying 8-9 courses, the masonry should be allowed to set overnight. Leave spreaders and temporary back bracing in place overnight, and clean out any grout from hinge pockets and strike reinforcements, as well as on the floor.
- l) **Always remember to continue checking “plumb, level and square” and be sure the frame does not move from your layout lines on the floor (Figure 12).**
- m) On day two, carefully remove the back braces and continue laying brick. 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 (Figure 13). The head will need grout fill as well, followed by the lentil above the head. Check again for plumb, level, and square, and be sure no sagging has occurred in the head. This completes installation in new construction.

- 10. When installing into existing masonry walls (typically tilt up, pre-fab concrete, or CMU walls installed prior to frame installation), the same rules of plumb, level and square apply. 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). All EMA’s will use welded-in tube and



Figure 11 – Mason checks plumb level and square before laying block and throughout process



Figure 12 – Check for plumb, level and square every time you make an adjustment



Figure 13 – Support head with a vertical brace on any head over 42” long. Shim as needed to keep head level

strap anchors in dimpled frames provided from the factory, along with approved anchor bolts. Note the bolts provided for 4" face heads are different than those for 2" face jambs and heads. 4" face heads will need to be grout filled after installation. 2" face heads do not require grout fill.

11. You will receive packing instructions with your Masonry T or EMA anchor bolts for further clarification on installation details.

a) Bolt installation. Drill a 3/8" hole 1/2"-1" deeper than the bolt embedment depth (1-1/4" is the manufacturer's minimum but your depth may be greater depending on the configuration of your frame and bolt as supplied). 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 per install instructions received with shipment. Tighten the anchor by turning the head 3 to 5 turns past finger tight. Check shipped instructions for correct ft-lbs torque, typically 10-15 ft-lbs. (Figure 14)

b) Min edge distance is 3-1/16" for Concrete, and 4" for CMU block. Required embedment is 1-1/4" into Concrete or CMU block.

12. Notes on Lintels and concrete shelter walls.

Lintels are typically a high PSI concrete (Figure and 15) or a 3/16"-1/4" Steel plate lintel (both are OK used with our product). Typically internal concrete steel reinforcement in concrete and grout filled CMU block is 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, but this typically is allowed (does not affect the integrity of the walls).

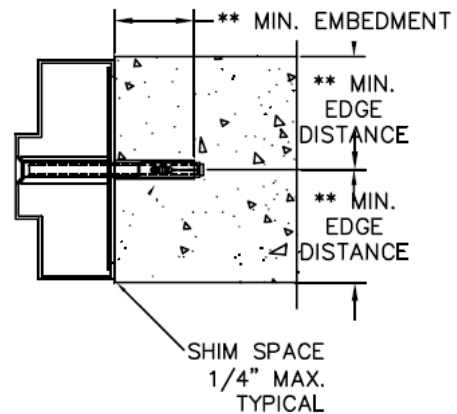


Figure 14 – Anchoring into concrete



Figure 15 – Typically a high PSI concrete lintel is used. Check that plumb, level and square is maintained to ensure no sagging

C. FEMA Door installation instructions

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FEMA Door Installation

1. Follow typical installation. See SDI/Allegion collaborative video under [SDI Videos](#), Prep and Installation Videos, “How to Install a Steel Door.” *Take care, noting that Tornado doors weigh considerably more than typical Republic doors.*
2. Locate the correct door using the mark number on the doors, and verify on the drawing and hardware schedule. Verify ICC500-2014 / FEMA 361 label, as well as fire label if applicable.
3. **Prior to beginning, check the frame for plumb, level and square (Figure 16a, 16b).** A good door installation can rarely make up for a poor frame installation, although there are several SDI/Allegion collaborative videos 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. The dimension taken from the top of the door to the top of the hinge cutout will be 1/8” less than the dimension from the rabbet to top of frame hinge cutout (Figure 17).
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 (Figure 18).
6. Check hardware schedule or submittal to verify standard or heavyweight hinges. For heavyweight hinges, remove (pull out) existing

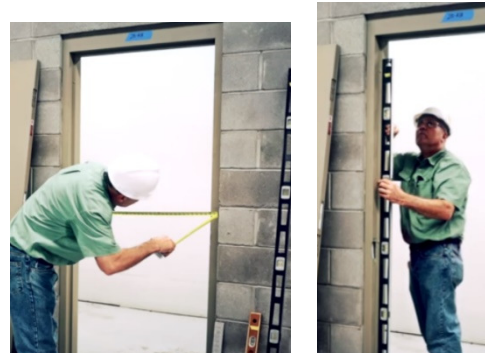


Figure 16a and 16b – Check plumb, level, square



Figure 17 – Verify hinge locations



Figure 18 – Clear foreign matter

wire spacers, adjust set screw or break off existing hinge fillers (Figure 19).

7. Attach hinges to door using Ives hardware. Install hinge pins with the 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 the top hinge on the door to the top frame hinge reinforcement (Figure 20).
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 in #3 above.
11. Install the lockset, closer or any other auxiliary hardware. After installing locksets, open and close the door to ensure the latch is engaging properly with strikes.
12. For FEMA doors with glass lights, your frame and glass kit 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.

D. Gasketing/Seals

1. Avoid special gasketing with tornado. Maintain proper latching and avoid potential binding or interference.
2. When using a threshold, refer to A.1, A.2, and B.5 above.
3. Avoid surface auto door bottoms since they can interfere with the bottom latch.
4. Door sweeps such as Zero 8192 or 8198 can be used.
5. Perimeter seals such as Zero 488 are less likely to bind versus other models.
6. Meeting edge on pairs could 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. Use a continuous hinge to seal the jamb edge.

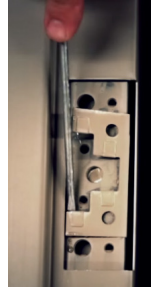


Figure 19 – Remove filler plate for heavyweight



Figure 20 – Install Ives hinge first in top location

9. Do not use a top jamb and lock jamb seal to avoid cutting around latches in the field (point of frustration for installers and architects).
10. If a regular egress, jamb applied seals are used with a mortise device or strike plate mounting bracket by top jamb closer to complete the perimeter seal.
11. See recommendations (Figure 21).

Zero Gasketing and Thresholds Recommendations for Tornado Applications		
Type	Zero Models used with tornado	Most Recommended Zero models
Saddle	545, 546, 547, 548, 655, 656, 657, 670	655a w/ or w/o "V3" full body option
Rabbeted / Bumper	566A, 568, 65A	65A. For WS device use 566A only.
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

Figure 21 – Gasketing Recommendations

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