

The Soft Story Brace Company

Installation Instructions for Earthquake Resisting Columns

SAFETY WARNING

The installer is responsible for protecting workers and property during the ERC installation. ERCs are much heavier than components that most residential contractors are accustomed to working with.

If the ERC is to be supported by existing framing, either during hoisting and installation or when set in place before concrete is placed for the permanent foundation, a design professional should confirm that the existing members are strong enough to support the ERC weight.

Chains, ropes, and cables under extreme tension can snap and whip around a workspace and injure people outside the reach of where the objects they were supporting could fall.

The ERC should only be set in place by competent workers using proper tools for the job.

Failure to follow safe installation practices could result in severe injury or death.

Parts included with every ERC kit:

- Assembled ERC (See Assembly Diagram)
- Wide Channel with welded end plate
- Narrow Channel with welded end plate
- Structural screws (quantity and length based on ERC size, see Table 1 below)
- (4) High-strength ASTM A3125, Grade A325 bolts (size depends on ERC, see table)
- (4) 2½" square x 5/16" thick plate washers
- (4) Hardened round washers (ASTM F436)
- (4) Direct-tension-indicating washers (ASTM F959)
- (4) High-strength nuts to match bolt diameter, ASTM A563
- Aluminum feeler gauge, 0.015 inches thick

TABLE 1 ERC Weights and Fastener Information *(Note: Figures in blue are subject to final testing)*

ERC Size	Approx. Wt. ¹ (pounds)	# of Screws	Screw length	Bolt size ²	Socket ³ size	Torque ⁴ (Approx., ft. lbs.)
A	390	34	2"	1/2	7/8"	60—115
B	350		2"	1/2	7/8"	60—115
C	550		2½"	5/8	1-1/16"	100—240
D	825	82	2½"	5/8	1-1/16"	100—240

Notes:

1. Weight of pre-assembled ERC components of stock column size, for 8-foot ceiling height (does not include Connector Channels).
2. Bolt size for connection from Loading Tee to Connector Channels (bolts are provided).
3. Socket sizes are given for heavy hex nuts and bolts provided with the ERC.
4. Installation torque varies depending on thread lubrication and other factors. Proper compression of direct-tension-indicating washers is required, which may occur at a higher or lower torque than the listed value.

Tools needed for ERC installation:

- Tape Measure
- Plumb bob or other means to locate top column connection relative to column base
- Impact driver with 3/8" hex socket

- Level
- (2) Wrenches; sizes needed for bolts and nuts provided (see Table 1)
- Impact wrench, or socket wrench with extension handle as needed to tighten bolts at Loading Tee connection. See Table 1 for approximate torque needed.

Tools and equipment for lifting and shoring heavy steel into place:

- Come-along, chain hoist, or block-and-tackle
- Jacks
- Pry bars
- C-clamps
- Pipe clamps or bar clamps
- Wood shims, blocks & shoring
- Ropes, chains, slings, hooks

Tools and Supplies that may be needed for certain installations, or would be helpful in general:

- ½-inch rebar (#4 US, #13 Metric) to run through holes in column web where embedded into concrete footing
- “Ufer” copper grounding electrode to run in new grade beam (if used, do not clamp to any of the required foundation rebar or to the ERC)
- Laminated Veneer Lumber (LVL) or Laminated Strand Lumber (LSL) stock for doubling up existing floor joists
- Construction adhesive and fasteners for joining above to existing joists
- Drill and 3/16” diameter bit
- Magnetic level

Step I. Locate the Column position.

The Earthquake Resisting Column (“ERC”) must be centered in the space between a pair of joists, or “joist bay” in the framed floor above the column, as shown in Figure I. The Designer Professional may specify location of the ERC anywhere along the joist bay centerline, as needed to clear existing obstructions. Use a plumb bob to determine where the new foundation will be located. Follow requirements given by the Design Professional.

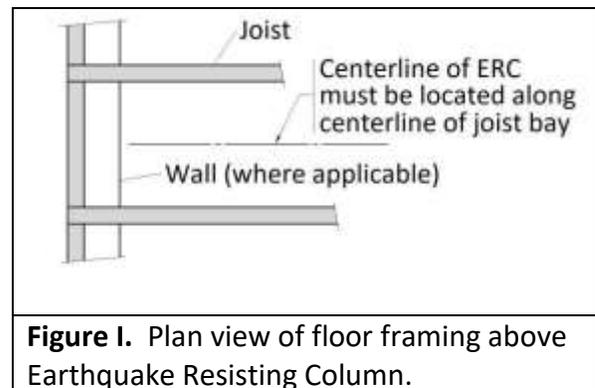


Figure I. Plan view of floor framing above Earthquake Resisting Column.

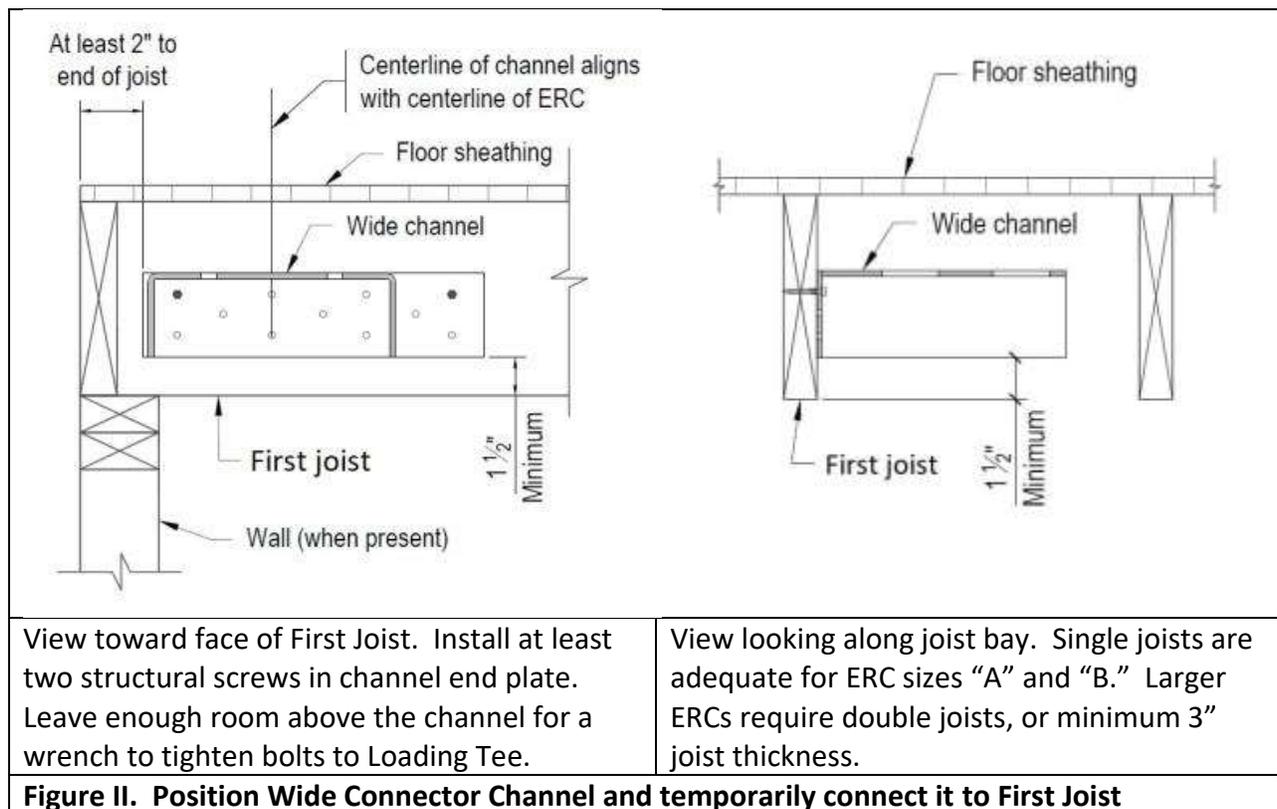
Step II. Fasten Connector Channel End Plates to floor joists.

The Connector Channel end plates must be installed at least 2" from ends of joists.

The Connector Channels have slotted holes that allow adjustment for installation where the clear dimension between the joists is as narrow as 11½" and as wide as 15½". Single joists,

2x8 or larger, are acceptable for ERC sizes A and B. Double joists or new “sister” members are required for ERC Series C and D; see General Notes.

Step II-a. Position Wide Connector Channel. Locate the Wide Connector Channel as shown in Figure II. (The exact location of the Connector Channels will be set by the location of the ERC—refer to the Design Professional’s drawings.) Position the centerline of the Connector Channel in line with the desired location of the ERC. The bottom edge of the Connector Channel end plate must be be at least 1½” above the bottom edge of the first joist. The Channel may be installed higher in the joist bay, but the top edge of the end plate must be at least 1½” below the top edge of the joist. (Leaving at least 1¾” above the Channels will make it easier to install the bolts and square washers that will connect the Loading Tee.)

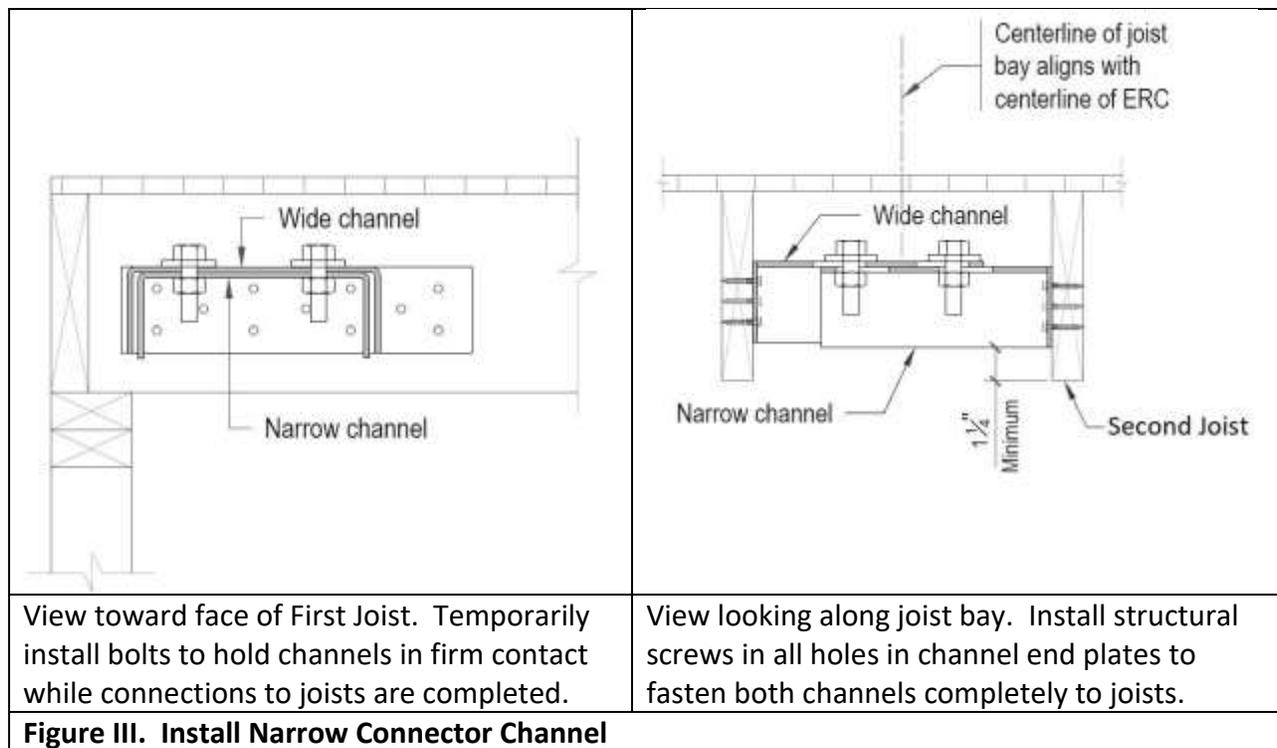


Step II-b. Temporarily fasten the Wide Connector Channel in place. Connect the channel end plate with at least two of the structural screws provided. Install one screw at each end of the top row of holes in the end plate. If the face of the joist is uneven, install additional screws as needed to hold the end plate firmly in place. Wait until the Narrow Channel is positioned before installing all the screws, in case the channels to be repositioned. Do not over-drive the screws. Do not place any shims or spacers between the joist and the Connector Channel.

NOTE: Structural screws provided with ERC sizes “A” and “B” are 2” long. For 1½” net joist thickness, the tips of the screws may extend through the joist. Load capacities are based on tests of this installation. Backing material is not needed on joists for ERC sizes “A” or “B.” Confirm that the screws will not damage anything on the back of the joist!

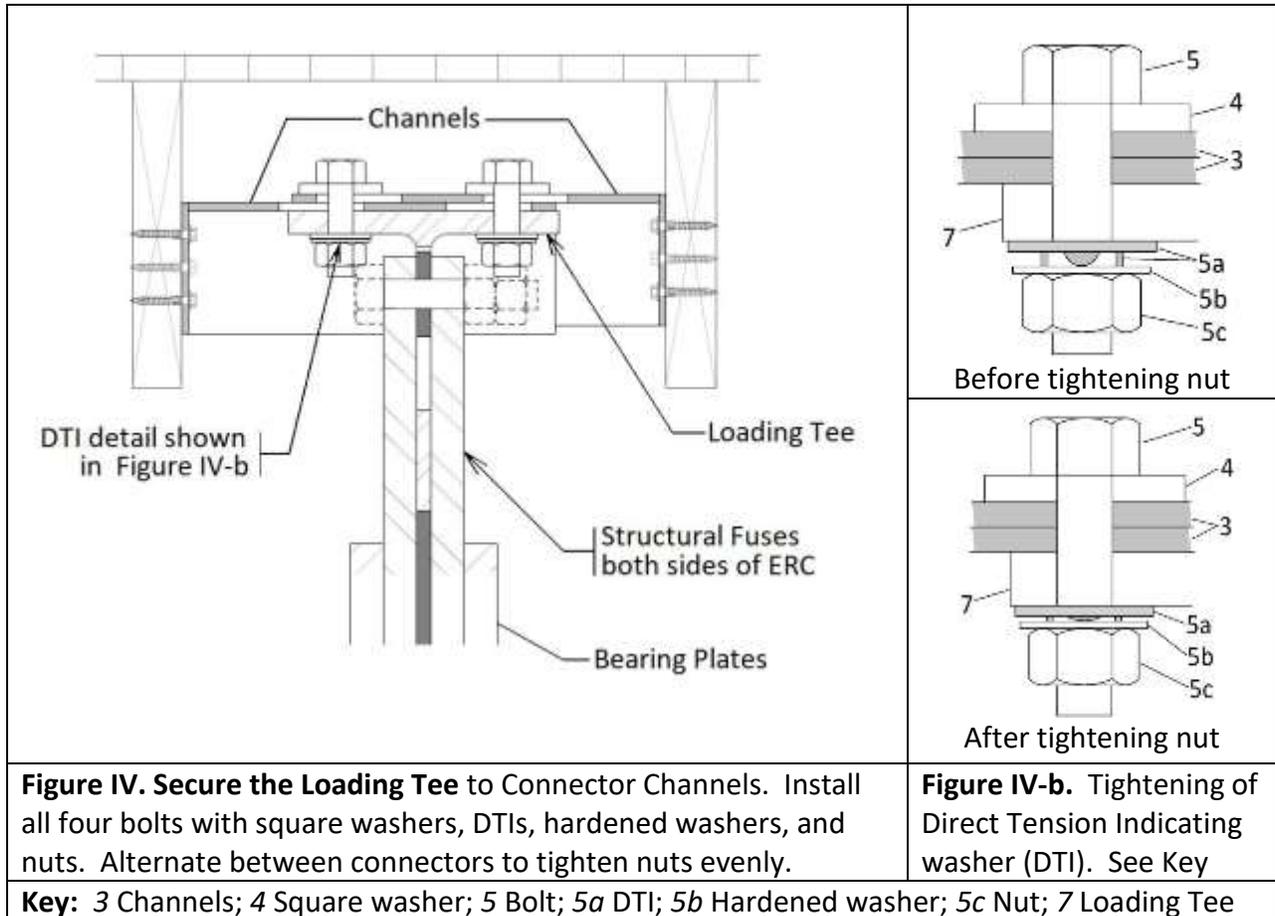
Step III. Install Narrow Connector Channel, and finish fastening Wide Connector Channel.

- A. Position the Narrow Connector Channel inside Wide Connector Channel.
- B. Loosely install the four bolts for Loading Tee through the slotted holes in both channels to keep channels aligned while the channels are fastened to the joists.
- C. Slide the narrow channel so its end-plate bears against the Second Joist.
- D. Tighten the bolts closest to the Second Joist snug-tight so the tops of both channels are in firm contact.
- E. Install structural screws provided in all holes in end plates of both channels. DO NOT pre-drill for the screws unless they must be driven into existing knots; in that case pre-drill 3/16" diameter holes. To help prevent splitting the wood member, screws along each row may be driven at alternating angles up or down.



Step IV. Connect the Loading Tee and ERC Assembly

Bolt the Loading Tee to the underside of the Connector Channels. **The Column Web Extension must be in firm contact with the bottom of the Loading Tee when the installation is finished.** Brace the Column to hold it plumb and firmly supported until the concrete foundation has set.



Connect the Loading Tee to the Connector Channels using the high-strength bolts, square washers, high-strength nuts, hardened washers, and DTI (direct tension indicator) washers supplied with the ERC, installed as follows (refer to **Figure IV-b**):

NOTE: Some or all of the following steps may be subject to Special Inspection and Structural Observation requirements, depending on local regulations.

- A. Place a square washer on top of the wide Connector Channel.
- B. Insert a bolt through the washer, the slots in both Connector Channels, and the matching hole in the Loading Tee.
- C. Place a DTI washer over the bolt threads, with the domes facing down.
- D. Place a hardened washer (marked "F436") against the domes on the DTI.
- E. Place a high-strength nut on the bolt and tighten hand-tight. Using WD-40 or oil on the bolt threads will make it MUCH easier to achieve proper tension in the bolts.

NOTE: The high-strength nuts are marked "DH." Install nuts with the marks facing down, so the inspector can see them!

- F. Install all four bolts in the same way.

- G. Tighten the nuts on all the bolts, alternating between bolts as you go. Follow an “X” pattern and tighten the group evenly. If needed, place a wrench on the head of the bolt to prevent it from turning as the nuts are tightened.
- H. Tighten nuts until the gap between the hardened washer and the DTI is less than 0.015 inches. Use the aluminum feeler gauge provided with the ERC kit to check the gap at four or more equally spaced locations around the bolt. If the feeler gauge can be inserted into the gap between the DTI and the hardened washer at more than half of the locations, the nut must be tightened further.
- I. If DTIs are supplied with silicone gel that squeezes out during tightening, the gap must still be checked with the feeler gauge. The gel is only meant as a guide for the installer to know that installation is almost complete.

Step V: Place concrete foundation for ERC assembly.

When the ERC is installed in existing buildings it is often easiest to suspend the ERC from the framing above the soft story level, assemble the foundation reinforcement around the ERC, and then place the concrete. Whatever manner is chosen, **the Column Web Extension must be in firm contact with the bottom of the Loading Tee when the installation is finished.** The Design Professional should be consulted to determine whether the existing framing is adequate to temporarily support the ERC, if suspending the ERC assembly from existing framing is desired.

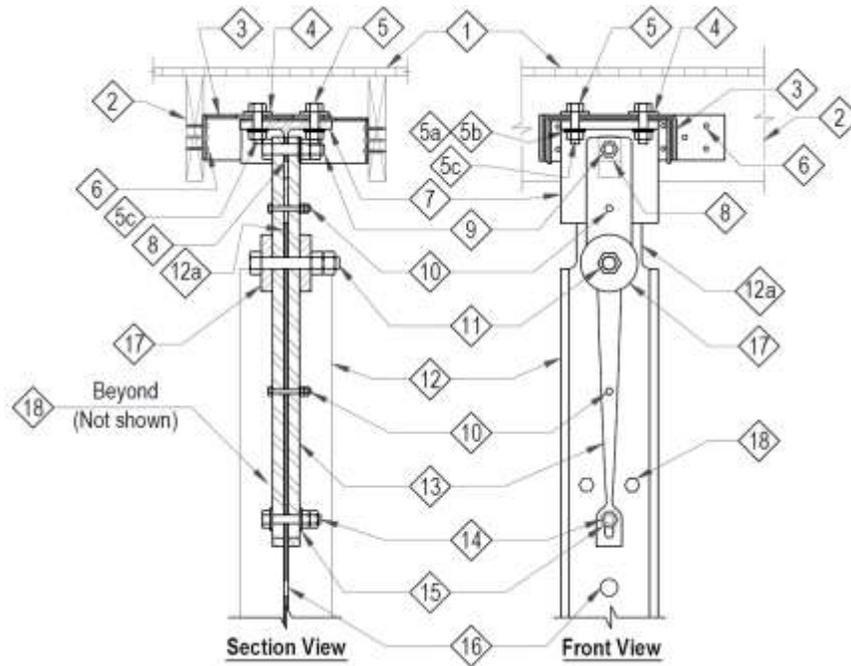
General Installation Notes

1. ERCs are tested only for lateral loads. The system was designed to upgrade the earthquake-resistance of existing buildings with adequate gravity load-carrying systems in place.
2. The Design Professional is responsible for confirming that the existing framing has adequate size and strength for delivering the calculated forces to the ERC. This includes collector design, supplementary diaphragm connections, and connections of double joists (when required) to the existing framing.
3. Foundation concrete must be allowed to cure at least 24 hours before any temporary supports for the ERC are removed.

Special Inspection Items:

To comply with the code evaluation report (TER 1711-02) the following items must be inspected by a properly-qualified Special Inspector. Engineering licensing laws in most states allow the Design Professional to perform Special Inspections, if he or she wishes to do so.

Special Inspection Checklist		
Item	Nature of Inspection	Chk. ✓
General	Confirm that ERC is located as shown on the approved drawings; correct model of ERC; Base embedment in concrete grade beam per Design Professional’s drawings is provided for	
Connector Channels	Minimum joist size at connector channels; Fasteners of proper length in all holes from channel end plates to wood framing	
Loading Tee: Bolts & Connection Hardware	Four ASTM A3125, Grade A325 bolts of proper size (see Table 1, “ERC Weights and Fastener Information” on Page 1) connect Loading Tee to Connector Channels. Bolt heads have three equally spaced hash-marks, and may also be marked “A325”.	
	Square washers are present on top of Connector Channels	
	Hardened, heavy hex nuts are used. Hardened nuts are marked “DH”	
	DTI is placed against Loading Tee	
	Hardened washer is placed between Hardened Nut and DTI	
	Nuts are tightened to the degree that DTIs are properly tensioned (0.015-inch thick feeler gauge cannot be inserted between hardened washer and DTI). Note that no thread “stick-out” is required (end of bolt may be flush with bottom of nut).	
Footing (per Design Professional)	Footing must be designed by the Design Professional. Follow special inspection requirements specified by Design Professional	
Collector elements (per Design Professional)	If the Design Professional designated framing members that connect to the top of the ERC as collectors or drag ties, these members and connections along them require special inspection.	



ASSEMBLY DIAGRAM Assembled ERC and Connections to Floor Framing Above

Item #	Description	Item #	Description
1	Floor sheathing	11	<i>Top Bolt in Column, through Fuse Plates, Bearing Plates and Column Web, with double nuts</i>
2	Floor joists		
3	Connector Channels	12	<i>Column</i>
4	Square washers	12a	<i>Column Web Extension (Column web and web extension shown shaded in Section View)</i>
5	Connection bolts at Loading Tee		
5a	Direct Tension Indicating Washer	13	<i>Fuse Plates both sides of Column</i>
5b	Hardened Washer	14	<i>Bottom Bolt through Column Web and slotted holes in Fuse Plates, with double nuts</i>
5c	Hardened Nut		
6	Structural Screws from Connector Channels to joist	15	<i>Standard Round Washers against Fuse Plates at both ends of bolt</i>
7	<i>Loading Tee</i>		
8	<i>Square or Rectangular Bushing (concealed between Fuse Plates)</i>	16	<i>Hole provided in web for utilities</i>
9	<i>Ceiling Bolt through Bushing and Fuse Plates, with double nuts</i>	17	<i>Bearing Plate on both sides</i>
10	<i>Shear Bolt, with double nuts (number and location varies with ERC size)</i>	18	<i>Guide bolts and spacers</i>

Items 3 through 6 are supplied with the ERC kit.
 Items 7 through 18 are pre-assembled. Installer must fasten the Connector Channels to the building framing, and connect the Loading Tee to the Connector Channels.