

Architectural Product Specification



Engineered Paver Edge Restraints

Lock it in with **STRYPRAIL®**

Segmental Paver Edge Restraints and Edge Restraint Anchoring Systems

Fortress Edging is made of strong, durable, and environmentally responsible PVC that contains a controlled amount of recycled material, designed, produced and proudly manufactured in the USA.

- Strong
- Light
- Easy to handle
- Easy to install
- "Grypper®" technology





Engineered Edge Restraints

A typical engineered segmental pavement system includes a sub-base, base, bedding layer, jointing material, pavers, bond pattern, as well as an edge restraint. In a standard segmental pavement, maintaining the interlock between pavers is key to long-term performance of the pavement system.

Edge restraints are used to withstand the horizontal loads created by inherent pavement energy, which is the constant pressure of pavers against each other, and the momentary dynamic forces caused by traffic. An independent engineering and testing company tested the leading plastic paver edge restraints to measure Deformation (permanent edge restraint shift) and Load (pavement energy). When horizontal shifting creates permanent deformation under load, edge restraint failure occurs. This edge restraint deformation negatively impacts pavement interlock: when the pavement shifts out, joints open and interlock along the perimeter deteriorates. As the edge continues to shift over time, deterioration—at an accelerating rate—continues into the pavement.

Manufactured plastic edge restraints are a proven and accepted evolution in a well-established engineered pavement system. This architectural specification for edge restraints is based on the performance of properly engineered constructed segmental pavements using a proven high-quality edge restraint.

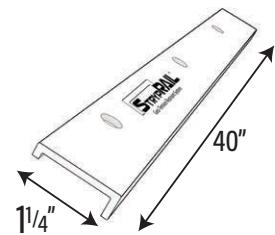
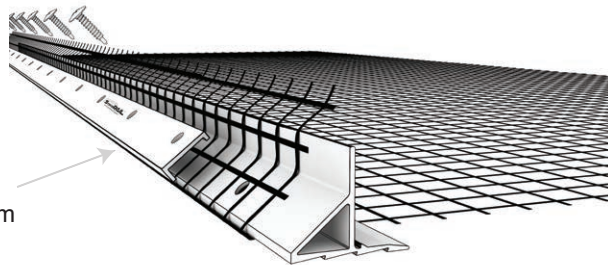
Edging Sizes*

- HEAVY
- PAVER
- THIN

*Two styles: Straight and Versa

STRYPRAIL® Geo-Tension Paver Edge Restraint Anchoring System

- Heavy (for HEAVY Fortress edging)
- Standard (for PAVER and THIN edging profiles as offered by Fortress Engineering-Design)



DIMENSIONS ARE SHOWN IN INCHES

Specifications for Segmental Paver Edge Restraints

Part 1: General Conditions and Requirements

The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.

1.2 SUMMARY

A. Section Includes:

1. Edge Restraints for installation on [dense-graded aggregate base], [open-graded aggregate base], or [overlaid on existing pavement].
 - a. HEAVY Edge Restraint System
 - b. PAVER Edge Restraint System
 - c. THIN Edge Restraint System
2. StrypRAIL® Edge Restraint Anchoring System
 - a. StrypRAIL® HEAVY Edge Restraint Anchoring System for use with Fortress HEAVY Version edge restraint
 - b. StrypRAIL® STANDARD Edge Restraint Anchoring System for use with Fortress STANDARD and THIN versions

1.3 RELATED SECTIONS

- A. Section 07 76 00 – Roof Pavers
- B. Section 32 11 00 – Base Courses
- C. Section 32 14 00 – Unit Paving
- D. Section 32 15 00 – Aggregate Surfacing
- E. Section 32 16 00 – Curbs, Gutters, Sidewalks, and Driveways
- F. Section 32 17 00 – Paving Specialties

1.4 REFERENCES

A. Abbreviations and Acronyms

- 1. ICPI: Interlocking Concrete Pavement Institute
- 2. PVC: Polyvinyl Chloride

1.5 SUBMITTALS

- A. **Product Data:** Submit manufacturer's product literature, specifications, and data sheet.
- B. **Shop Drawings:** Submit installation drawings indicating location of installation. Shop drawings shall indicate surrounding construction as provided for the project.
- C. **Manufacturer's Samples:** Submit
Samples will [not] be returned after review. Samples shall be requested in either 1 foot or 3 foot in lengths.
- D. **Project Record Drawings:** Refer to Section 01 77 00 - Closeout Procedures.
- E. **Operation and Maintenance Data:**
Comply with general requirements of Section [01 78 36 - Warranties] [01 77 00 - Closeout Procedures].

1.6 DELIVERY, STORAGE AND HANDLING

- A. **Packing and Shipping:**
FORTRESS Engineering – Design Edge Restraint Systems are shipped in boxes by United Parcel Service (UPS) Or by LTL freight. Delivery address details must be specified and provided. A shipping name and contact information shall be provided to Fortress at time of order.

1.7 WARRANTY [OR] BOND

- A. Provide Edge Restraint System's manufacturer's standard limited warranty as per manufacturer's published warranty document in force at the time of purchase, subject to change.

MANUFACTURER WARRANTY: The manufacturer warrants this product to be free from defects in workmanship and materials, under normal intended use and conditions, for a period of one (1) year for the original invoice date. Shipping and handling fees are to be paid for by the customer. The manufacturer agrees, at its option during the warranty period, to furnish a replacement product of equal value in exchange without charge (except for a fee for shipping, handling, packing, return postage, and insurance which will be incurred by the customer). Such repair or replacement is subject to verification of the defect or malfunction and proof of purchase as confirmed by showing the model number on original dated sales receipt **WARRANTY LIMITATIONS** This warranty does not include:

- Any condition resulting from other than ordinary wear or any use for which the product was not intended, such as use in rental or contract trade or commercial use
- Any condition resulting from incorrect or inadequate maintenance or care
- Damage resulting from misuse, abuse, negligence, accidents or shipping damage
- Dissatisfaction due to buyer's remorse
- Normal wear and tear
- Damages incurred during transportation
- Any used, previously displayed items

The Company makes no express warranty or condition whether written or oral and the company expressly disclaims all warranties and conditions not stated in this limited warranty. To the extent allowed by the local law of jurisdictions outside the United States, the Company disclaims all implied warranties or conditions, including any implied warranties of merchantability and fitness for a particular purpose. For all transactions occurring in the United States, any implied warranty of condition of merchantability, satisfactory quality, or fitness for a particular purpose is limited to the duration of the express warranty set forth above. Some states or countries do not allow a limitation on how long an implied warranty lasts or the exclusion of limitation of incidental or consequential damages for consumer products. In such states or countries, some exclusions or limitations of this limited warranty may not apply to the Purchaser. For consumer transaction, the limited warranty terms contained in this statement, except to the extent lawfully permitted, do not exclude, restrict, or modify but are in addition to the mandatory statutory rights applicable to the sale of this Product to the Purchaser. All warranty claims must be filed by the consumer to the retailer of this product, who in turn is to contact the manufacturer regarding any warranty return or replacement. We will not handle claims from the consumer directly. Please retain invoices for a minimum of one year for warranty purposes. **CLAIM PROCEDURES:**

- Claims for defective merchandise must be made within ONE year from invoice date. Claims for missing parts must be made within 60 calendar days after the merchandise is received
- Any claim for defective merchandise returns must be packed in original packaging
- We reserve the right to specify that items be returned to the original warehouse for inspection or be inspected by our representative in the field
- Pictures are required to claim defective merchandise, along with a copy of the original invoice
- If the claim is justified, the item(s) or part(s) will be repaired or replaced or a credit will be issued. It is our policy to replace parts whenever possible

This warranty gives you specific legal rights. You may have other rights, which vary from state to state.

2.4 ENGINEERED EDGE RESTRAINT SYSTEMS

A. HEAVY Edge Restraint System:

1. Usage: Commercial segmental pavers, permeable pavers, large natural stone sets, when using open-graded aggregates.
2. Edging Profile Minimum Height: 2-3/4 inches (70 mm).
3. Edge Restraint Styles: [Straight], [Versa], or [Straight and Versa]
4. Edge Restraint Deflection Load Requirements:
 - a. Maximum Deformation for Straight Edge Restraint Style: Less than 0.0064 inches (0.16 mm)
 - b. Maximum Deformation for Versa Edge Restraint Style: Less than 0.0214 inches (0.54 mm)
 - c. Minimum Spiked Restraining Load for Straight Edge Restraint Style: 205 pounds-force (912 Newtons)
 - d. Minimum Spiked Restraining Load for Versa Edge Restraint Style: 190 pounds-force (845 Newtons)
5. Edge Restraint Dimensions:
 - a. HEAVY STRAIGHT:
 - 1) Width: 4.25 inches (108 mm)
 - 2) Height: 2.625 inches (67 mm)
 - 3) Length: 84 inches (2134 mm)
 - 4) Weight: 4.7 pounds (2.1 kg)
 - b. HEAVY VERSA:
 - 1) Width: 4.25 inches (108 mm)
 - 2) Height: 2.625 inches (67 mm)
 - 3) Length: 84 inches (2134 mm)
 - 4) Weight: 3.5 pounds (1.6 kg)
6. StrypRAIL® Edge Restraint Anchoring System: HEAVY
7. Geo-Grid Edge Restraint Anchoring System: For Geo-Grid installation over aggregate, fine gravel, or any base.
8. Non-Woven Geotextile Fabric: For overlay use over concrete or asphalt to prevent material migration.

B. PAVER Edge Restraint System:

1. Usage: Standard hardscape paving, including clay, stone, concrete, and porcelain of 2 inches to 2-3/4 inches (50 mm to 70 mm)
2. Edging Profile Minimum Height: 1-3/4 inches (44 mm)
3. Edge Restraint Styles: [Straight], [Versa]
4. Edge Restraint Deflection Load Requirements:
 - a. Maximum Deformation for Straight Edge Restraint Style: Less than 0.0064 inches (0.16 mm)
 - b. Maximum Deformation for Versa Edge Restraint Style: Less than 0.0214 inches (0.54 mm)
 - c. Minimum Spiked Restraining Load for Straight Edge Restraint Style: 205 pounds-force (912 Newtons)
 - d. Minimum Spiked Restraining Load for Versa Edge Restraint Style: 190 pounds-force (845 Newtons)
5. Edge Restraint Dimensions:
 - a. PAVER STRAIGHT:
 - 1) Width: 2.0 inches (51 mm)
 - 2) Height: 1.75 inches (44 mm)
 - 3) Length: 84 inches (2134 mm)
 - 4) Weight: 2 pounds (0.91 kg)
 - b. PAVER VERSA:
 - 1) Width: 2.0 inches (51 mm)
 - 2) Height: 1.75 inches (44 mm)
 - 3) Length: 84 inches (2134 mm)
 - 4) Weight: 1.85 pounds (0.84 kg)



- 6. StrypRAIL® Edge Restraint Anchoring System: Standard
- 7. Geo-Grid Edge Restraint Anchoring System: Textile for installation over aggregate, fine gravel, or any base. Non-Woven Geotextile Fabric for overlay use over concrete or asphalt to prevent material migration.

C. THIN Edge Restraint System:

- 1. Usage: Standard hardscape paving materials, including clay, stone, and concrete of 2 inches to 2-3/4” inches (50 mm to 70 mm)
- 2. Edging Profile Minimum Height: 1-3/8 inches (35 mm)
- 3. Edge Restraint Styles: [Straight], [Versa]
- 4. Edge Restraint Deflection Load Requirements:
 - a. Maximum Deformation for Straight Edge Restraint Style: Less than 0.0064 inches (0.16 mm)
 - b. Maximum Deformation for Versa Edge Restraint Style: Less than 0.0214 inches (0.54 mm)
 - c. Minimum Spiked Restraining Load for Straight Edge Restraint Style: 205 pounds-force (912 Newtons)
 - d. Minimum Spiked Restraining Load for Versa Edge Restraint Style: 190 pounds-force (845 Newtons)

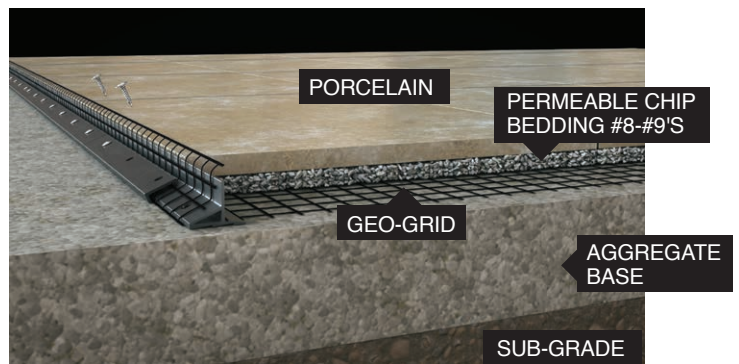
5. Edge Restraint Dimensions:

a. THIN STRAIGHT:

- 1) Width: 1.75 inches (45 mm)
- 2) Height: 1.375 inches (35 mm)
- 3) Length: 84 inches (2134 mm)
- 4) Weight: 1.85 pounds (0.84 kg)

b. THIN VERSA:

- 1) Width: 1.75 inches (45 mm)
- 2) Height: 1.375 inches (35 mm)
- 3) Length: 84 inches (2134 mm)
- 4) Weight: 1.6 pounds (0.73 kg)



- 6. StrypRAIL® Edge Restraint Anchoring System: Standard.
- 7. Geo-Grid Edge Restraint Anchoring System: Geo-Grid for installation over aggregate, fine gravel, or any base.
- 8. Non-Woven Geotextile Fabric: For overlay use over concrete or asphalt to prevent material migration.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine project conditions and completed work and verify that substrate is plumb and level. Verify the location of edging installation will not interfere with existing underground utility lines.
- B. Immediately correct all deficiencies and conditions which would cause improper execution of work specified in this section and subsequent work.
- C. Proceeding with work specified in this Section shall be interpreted to mean that all conditions were determined to be acceptable prior to start of work.

3.2 PREPARATION

- A. Follow project Engineer’s specifications for dense-graded or open-graded base extension. Refer to ICPI base guidelines in the absence of sufficient project specifications regarding base, base extension preparation, compaction, and flatness.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Specified Manufacturer: FORTRESS Engineering – Design,
15354 Flag Avenue South, Prior Lake, MN, 55372 Tel: (952) 226-7226 Email: info@fortressedging.com
- B. Web: www.fortressedging.com
- C. Substitutions: Not Permitted.
- D. Requests for approved substitutions will be considered in accordance with provisions specified in Section 01 62 00 – Product Options.



Drawings show hard surface anchors not spikes. Spike and anchors are available through general hardware supply sources.

2.2 ENGINEERED EDGE RESTRAINT SYSTEM DESCRIPTION

- A. Product: Engineered Edge Restraint Systems as manufactured by FORTRESS Engineering – Design.
- B. System Description: A PVC edge restraint system for segmental pavers.
- C. Provide an engineered edge restraint system designed for hardscape edging of segmental pavers. The edge restraint system must include the components:
 - 1. A Geo-Grid edge restraint anchoring system
 - 2. Anchor edge restraints with StrypRAIL®
 - a. The anchoring system shall be comprised of a polyester bi-directional Geo-Grid. The grid shall be a minimum width of 42 inches (1067 mm) and shall be mechanically connected to the back of the edge restraint using stainless steel screws as provided with the StrypRAIL® system.
 - b. Anchoring shall be completed with a minimum of 10 inches (250 mm) long by 3/8 inch (10 millimeter) diameter steel spikes.
 - 1) Maximum spike spacing for Straight style edging: 24 inches (600 mm).
 - 2) Maximum spike spacing for Versa flexible style edging: 12 inches (300 mm)
 - 3. Grypper® directional resistance teeth.
 - 4. Straight continuous style edging for straight runs and gradual curves and Versa flexible edge restraints for sweeping and tight radius curves as small as 24 inches (600 mm)
 - 5. Connector tube providing complete end-to-end contact on all pavement facing edges without piece-to-piece lippage. The connector shall extend beyond splice by a minimum of 2 inches (50 mm) in each direction.

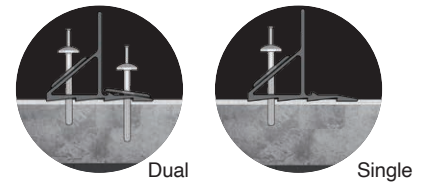
2.3 ENGINEERED EDGE RESTRAINT SYSTEM DESIGN CRITERIA

- A. Provide an engineered edge restraint system designed for permeable, open-graded base, dense-graded base and overlay designs for segmental pavers.
 - 1 The edge restraint system must be a system that does not move independently from the segmental paving.

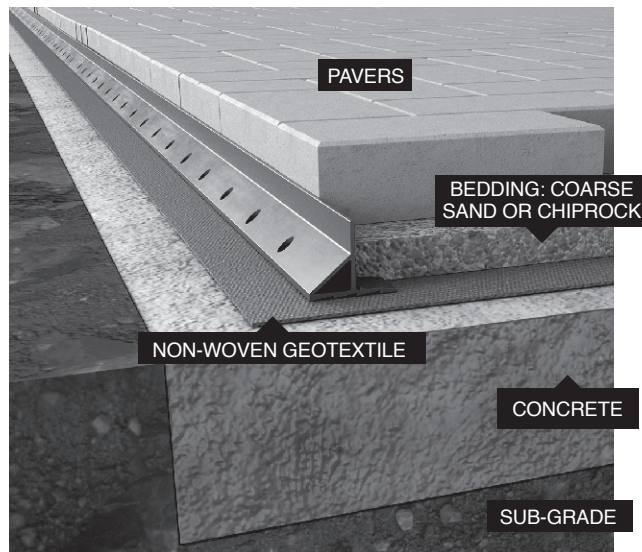
For additional strength and longevity, the bedding layer of the edge restraints shall also be able to be secured to a geotextile that extends a minimum of 40 inches under the segmental paving installation such that the system is continuous and connected to all perimeters where edge restraints are installed to prevent pavers from moving independently from edging.
 - 2. Resist the heave and movement of pavers due to:
 - a. Load from vehicles
 - b. Moisture
 - c. Freeze and thaw cycles
 - 3. Straight edge restraint footprint surface that must be solid and uniform and contain voids no larger than 35 percent of the bottom surface.
 - 4. Design must include a No Heave Lip that extends a minimum of 1/2 inch (13 mm) under the bedding layer with a minimum of 75 percent coverage along the length of the edging to be placed under the pavers. The lip must have directional frictional resistance ribs having a minimum of one rib under the lip and two or more ribs under the entire bottom of the edge restraint.
 - 5. Use the weight and friction of pavers and bedding to secure and anchor the edge restraint.

3.3 INSTALLATION

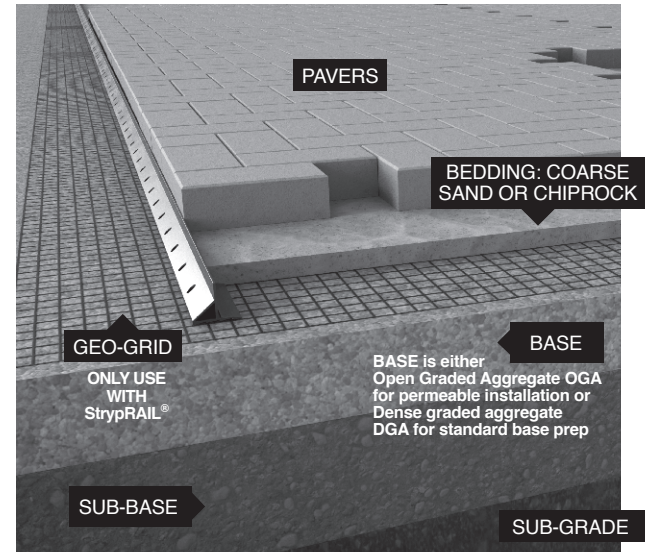
Pavement overlay anchoring



NON-WOVEN GEOTEXTILE



GEO-GRID



A. Install FORTRESS Edging:

Install in accordance with manufacturer's instructions and recommendations, and the authorities having jurisdiction. Instructions for specialty installations should be obtained from the manufacturer.

B. Install in accordance with approved submittals and in proper relationship with adjacent construction.

C. Install before bedding: Install edge restraint before bedding layer and pavers following edge manufacturer's instructions.

D. Place edging on a prepared base: Edging must not be installed on top of the bedding layer.

E. Spike Spacing:

1. STRAIGHT Edging Style:
Spike using pre-drilled holes with a spacing of 21 inches to 27 inches
2. VERSA Edging Style:
Spike with a spacing of 9 inches to 15 inches

F. Connect additional sections: Connect additional sections of edging as needed.

G. Remove excess: Using a trowel or flat head shovel, cut down along the back of the paver, pulling away excess bedding layer without disturbing the base material. Connect sections together.

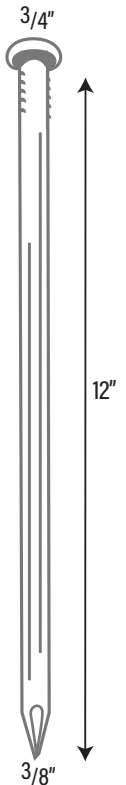
H. Place edging directly on base material: If using StrypRAIL® with edging, place edging on top of the bi-directional polyester Geo-Grid. Slide the retention lip under the bedding layer. Edging must not be installed on top of the bedding layer.

I. Spiking Edging: (without use of optional StrypRAIL®)

When installing edging after bedding layers and pavers, nail the spike at an angle with the point driven inward toward the pavement to keep edging tight to the pavement.

Four (4) methods to anchor FORTRESS Edging:

1. Standard Paver Installation (compacted aggregate base)
Anchor with 3/8" dia. x 12" STEEL SPIKES (see section A-E for spacing)
2. Standard Permeable / Hybrid Paver Base installation
StrypRAIL® Geo-Grid anchoring system on aggregates
3. Pavement Overlay
Overlay the existing hard surface pavement with a non-woven geo-textile to stop migration of aggregate from the bedding and jointing materials. Next use the StrypRAIL® system to attach and anchor the Fortress edging to the StrypRAIL® geo-grid
4. Combination Anchoring (Strongest)
Using both 3/8" x 12" steel spikes and the StrypRAIL system provides the strongest anchoring of a manufactured edge restraint

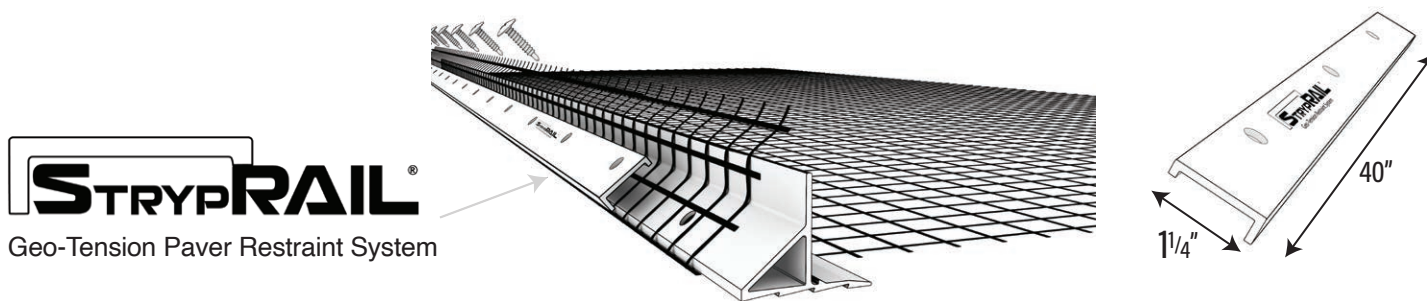


J. StrypRAIL® Edge Restraint Anchoring System Installation:

1. Set Geo-Grid on top of the base before screeding the bedding material.
2. Install edge restraints following manufacturers instructions.
 - a. Install edge restrains before setting pavers and cutting to fit. Wrap the bi-directional polyester Geo-Grid over the back of the edge restraint, sandwiched between the StrypRAIL® pieces and edge restraint. Secure using the supplied stainless-steel screws.
 - b. Install bedding and pavers and cut to design. Install edge restraints after the bedding and pavers. Using StrypRAIL®, attach the grid to the back of the edge restraint. The grid shall be wrapped over the back of the edge restraint and sandwiched between the StrypRAIL® pieces and edge restraint using the supplied stainless-steel screws.

K. If the StrypRAIL® Edge Restraint Anchoring System is not used:

1. Install the bedding layer using project specifications.
2. Drill through the edging to install the engineered edge restraints and attach the edging with anchors to the pavement or surface below using the recommended spike spacing.
3. Install pavers in accordance with project specifications.



4. ADJUSTMENT AND CLEANING

- A. Cleaning:** Remove any debris created during installation. Thoroughly clean the specified work area in this section and adjoining surfaces as well as areas affected by installation.

