SECTION 32 94 13
LANDSCAPE EDGING
FORTRESS OPEN-GRADED AGGREGATE BASE WITH EDGE RESTRAINTS

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GUIDE SPECIFICATIONS:

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CAREFULLY REVIEW AND EDIT THIS SECTION TO MEET THE REQUIREMENTS OF THE PROJECT, LOCAL BUILDING CODE AND AUTHORITIES HAVING JURISDICTION. COORDINATE THIS SECTION WITH OTHER SPECIFICATION SECTIONS AND DRAWINGS.

DELETE ALL "SPECIFIER NOTES" WHEN EDITING THIS SECTION.

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

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

1.2 SUMMARY

A. Section Includes:

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SPECIFIER NOTES: RETAIN ONLY THOSE ITEMS BELOW THAT REMAIN AFTER EDITING TEXT OF SECTION.

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1. Engineered 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.
   b. StrypRAIL® STANDARD Edge Restraint Anchoring System.

1.3 RELATED SECTIONS

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SPECIFIER NOTES: IN THIS ARTICLE, SPECIFY WORK SPECIFIED IN OTHER SECTIONS THAT IS RELATED TO WORK OF THIS SECTION.
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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 printed 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: Samples requested shall be [1 foot] or [3 feet] in length. Samples will [not] be returned after review.
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 QUALITY ASSURANCE

A. Qualifications: Installers shall have a minimum of 5 years experience installing edge restraint systems.

1.7 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: FORTRESS Engineering – Design Edge Restraint Systems are shipped in boxes by United Parcel Service (UPS) or on pallets by less-than-truckload (LTL) or full truckload (FTL) freight. Mode of shipping is determined by the manufacturer and based on the quantity ordered. A shipping name and contact information shall be provided to Fortress at the time of order.

1.8 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.
B. Manufacturer Warranty:
   1. The manufacturer warrants this product to be free from defects in workmanship and materials, under normal intended use and conditions for a period of 1 year from the original invoice date.
   2. 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. This excludes a fee for shipping, handling, packing, return postage and insurance which will be incurred by the customer.

3. Such repair or replacement is subject to verification of the defect or malfunction and proof of purchase as confirmed by the model number on original dated sales receipt.

C. Warranty Limitations:
   1. This warranty does not include:
      a. 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.
      b. Any condition resulting from incorrect or inadequate maintenance or care.
      c. Damage resulting from misuse, abuse, negligence, accidents, or shipping damage.
      d. Dissatisfaction due to buyer's remorse.
      e. Normal wear and tear.
      f. Damages incurred during transportation.
      g. Any used, previously displayed items the manufacturer makes no express warranty or condition whether written or oral and expressly disclaims all warranties and conditions not stated in this limited warranty.
      h. To the extent allowed by the local law of jurisdictions outside the United States, the manufacturer 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 our 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 the extend 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.
      i. 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 or replacement. The manufacturer will not handle claims directly from the consumer.
      j. Retain invoices for a minimum of one year for warranty purposes.
   2. Claim Procedures:
      a. Claims for defective merchandise must be made within 1 year from invoice date.
      b. Claims for missing parts must be made within 60 calendar days after the merchandise is received.
      c. Any claim for defective merchandise returns must be packed in original packaging.
      d. The manufacturer reserves the right to specify items be returned to the original warehouse for inspection or be inspected by a manufacturer's representative in the field.
      e. Pictures are required to claim defective merchandise, along with a copy of the original invoice.
      f. If the claim is justified, the item(s) or part(s) will be repaired or replaced, or a credit will be issued.
      g. The manufacturer's policy is to replace parts whenever possible.
      h. This warranty grants the purchaser specific legal rights. The purchase may have additional rights as granted by their state.

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. Web: www.fortressedging.com.

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SPECIFIER NOTES: DELETE ONE OF THE FOLLOWING TWO PARAGRAPHS.

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B. Substitutions: Not Permitted.
C. Requests for approved substitutions will be considered in accordance with provisions specified in Section 01 62 00 – Product Options.

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 restraint 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 millimeters) 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 millimeters) long by 3/8 inch (10 millimeter) diameter steel spikes.
            1) Maximum spike spacing for Straight style edging: 24 inches (600 millimeters).
            2) Maximum spike spacing for Versa flexible style edging: 12 inches (300 millimeters).
    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 millimeters).
    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 millimeters) in each direction.

2.3 ENGINEERED EDGE RESTRAINT SYSTEM DESIGN CRITERIA

A. Provide an engineered edge restraint system designed for permeable and open-graded aggregate base with edge restraint designed for hardscape edging of segmental pavers. The edge restraint system must:
    1. Be a single contained 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 (1016 millimeters) under the segmental paving installation such that the system is continuous and connected to all perimeters where edge restraints are installed to prevent the 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 millimeters) 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.

2.4 ENGINEERED EDGE RESTRAINT SYSTEMS

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SPECIFIER NOTES: THREE EDGE RESTRAINT SYSTEMS ARE DESCRIBED IN THE PARAGRAPHS BELOW. DELETE PARAGRAPHS AND OPTIONS NOT REQUIRED FOR THIS PROJECT.

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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 millimeters)
   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 millimeters).
      b. Maximum Deformation for Versa Edge Restraint Style: Less than 0.0214 inches (0.54 millimeters).
      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 millimeters).
         2) Height: 2.625 inches (67 millimeters).
         3) Length: 84 inches (2134 millimeters).
         4) Weight: 4.7 pounds (2.1 Kilograms).
      b. HEAVY VERSA:
         1) Width: 4.25 inches (108 millimeters).
         2) Height: 2.625 inches (67 millimeters).
         3) Length: 84 inches (2134 millimeters).
         4) Weight: 3.5 pounds (1.6 Kilograms).
   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 3/4 inches to 2 inches (20 millimeters to 50 millimeters).
   2. Edging Profile Minimum Height: 1-3/4 inches (44 millimeters).
   3. Edge Restraint Styles: [STRAIGHT], or [VERSA].
   4. Edge Restraint Deflection Load Requirements:
      a. Maximum Deformation for Straight Edge Restraint Style: Less than 0.0064 inches (0.16 millimeters).

   b. Maximum Deformation for Versa Edge Restraint Style: Less than 0.0214 inches (0.54 millimeters).
   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 millimeters).
      2) Height: 1.75 inches (44 millimeters).
      3) Length: 84 inches (2134 millimeters).
      4) Weight: 2 pounds (0.91 Kilograms).
   b. PAVER VERSA:
      1) Width: 2.0 inches (51 millimeters).
      2) Height: 1.75 inches (44 millimeters).
      3) Length: 84 inches (2134 millimeters).
      4) Weight: 1.85 pounds (0.84 Kilograms).
6. StrypRAIL® Edge Restraint Anchoring System: Standard.
7. Geo-Grid Edge Restraint Anchoring System: [Textile for installation over aggregate, fine gravel, or any base], or [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, concrete of 2 inches to 2-3/4 inches (50 millimeters to 70 millimeters) and porcelain of 3/4 inches to 2 inches (20 millimeters to 50 millimeters).
2. Edging Profile Minimum Height: 1-3/8 inches (35 millimeters).
3. Edge Restraint Styles: [Straight] or [Versa].
4. Edge Restraint Deflection Load Requirements:
   a. Maximum Deformation for Straight Edge Restraint Style: Less than 0.0064 inches (0.16 millimeters).
   b. Maximum Deformation for Versa Edge Restraint Style: Less than 0.0214 inches (0.54 millimeters).
   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 millimeters).
      2) Height: 1.375 inches (35 millimeters).
      3) Length: 84 inches (2134 millimeters).
      4) Weight: 1.85 pounds (0.84 Kilograms).
   b. THIN VERSA:
      1) Width: 1.75 inches (45 millimeters).
      2) Height: 1.375 inches (35 millimeters).
      3) Length: 84 inches (2134 millimeters).
      4) Weight: 1.6 pounds (0.73 Kilograms).
6. StrypRAIL® Edge Restraint Anchoring System: Standard.
7. Geo-Grid Edge Restraint Anchoring System: [Textile for installation over aggregate, fine gravel, or any base], or [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 the substrate is to plan and specification grade. 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 aggregate base with edge restraint. Refer to ICPI base guidelines in the absence of sufficient project specifications regarding base, base extension preparation, compaction, and flatness.

3.3 INSTALLATION

A. Install Fortress Engineering – Design Engineered Edge Restraints 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 restraints before bedding layer and pavers following manufacturers 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 24 inches (533 millimeters to 600 millimeters).
    2. VERSA Edging Style: Spike with a spacing of 9 inches to 12 inches (229 millimeters to 300 millimeters).
F. 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. Spike Edging (without use of optional StrypRAIL®):
    1. 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.
    2. Anchor FORTRESS Edging with one of the four methods below:

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SPECIFIER NOTES: FOUR ANCHORING METHODS ARE DESCRIBED IN THE PARAGRAPHS BELOW. DELETE PARAGRAPHS AND OPTIONS NOT REQUIRED FOR THIS PROJECT.

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a. Standard Paver Installation (compacted aggregate base): Anchor with 3/8 inch (9.5 millimeters) diameter by 12 inch (305 millimeter) steel spikes.
b. Standard Permeable / Hybrid Paver Base Installation: StrypRAIL® Geo-Grid anchoring system on aggregates.

c. 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 StrypRAIL® systems to attach and anchor the Fortress edging to the StrypRAIL® Geo-Grid.
d. Combination Anchoring (Strongest): Using both 3/8 inch (9.5 millimeters) diameter by 12 inch (305 millimeter) steel spikes and the StrypRAIL® provides the strongest anchoring of a manufactured edge restraint.

J. StrypRAIL® Installation:
1. Set geo-grid on top of the base before screeding the bedding material.
2. Install edge restraints following manufacturers instructions.

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SPECIFIER NOTES: TWO INSTALLTION OPTIONS ARE DESCRIBED IN THE PARAGRAPHS BELOW. DELETE PARAGRAPHS NOT REQUIRED FOR THIS PROJECT.

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a. Install edge restrains before setting pavers and cutting to fit. Wrap the bi-directional polyester geogrid 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. 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.

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SPECIFIER NOTES: THE PARAGRAPH BELOW DETAILS INSTALLTION WITHOUT AN EDGE RESTRAINT ANCHORING SYSTEM. DELETE PARAGRAPHS NOT REQUIRED FOR THIS PROJECT.

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K. If the StrypRAIL® edge restraint anchoring system is not used:
1. Install the bedding layer using project specifications.
2. For concrete overlays, 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.

3.4 ADJUSTMENT AND CLEANING

A. Cleaning: Remove any debris created during installation. Thoroughly clean the Work specified in this Section and adjoining surfaces and areas affected by installation.

END OF SECTION