SECTION 32 32 23

SEGMENTAL RETAINING WALLS

Display hidden notes to specifier. (Don't know how? [Click Here](https://www.arcat.com/sd/display_hidden_notes.shtml))

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This section is based on the Unilock products available for quick ship in Canada and the USA. Additional products or finish and color options may be available locally and added to the spec. Unilock has 18 manufacturing plants in 7 locations:  
Greater Toronto Area, Ontario  
Uxbridge, MA  
Brewster, NY  
Rittman, OH  
Brighton, MI  
Aurora, IL  
Elkhorn, WI  
Toll Free: 800-864-5625  
Email: customerservice@unilock.com  
Web: www.unilock.com  
[Click Here] for additional information.  
Unilock introduced paving stones to North America in 1972 and continues to lead the styles, trends and technologies in the hardscape industry.   
Our exclusive palette of textures, colors, styles and a wide array of customizable solutions will allow you to showcase your creativity. Combined with the most advanced manufacturing technologies in the industry, delivering exceptional strength, beauty and resilience, you are assured that your projects will look great for years to come.  
From traditional unit paving, to linear plank and large format pavers, for heavy duty, traditional and permeable applications, retaining walls to garden wall, there is a product for every situation and style.   
Our expertise is available as a resource to your team from design concept through to installation. Committed and collaborative reps will work closely with you to understand exactly what you need for success. Designers and architects trust Unilock to bring their vision to life.

1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Low segmental retaining wall systems including the following:
       1. Segmental retaining wall units.
       2. Leveling base.
       3. Backfill aggregate.
       4. Drainage aggregate fill.
       5. Underdrainage pipe.
       6. Geotextile filter.
       7. Geosynthetic reinforcement.
       8. Concrete Adhesive.
    2. Engineered segmental retaining wall systems including the following:
       1. Segmental retaining wall units.
       2. Reinforced fill.
       3. Leveling base.
       4. Drainage fill.
       5. Drainage pipe.
       6. Geotextile filter.
       7. Geosynthetic reinforcement.
       8. Concrete adhesive.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 02 20 00 - Assessment.
    2. Section 31 20 00 - Earth Moving.
    3. Section 32 14 23 - Asphalt Unit Paving.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. ASTM International (ASTM):
       1. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
       2. ASTM C1372 - Standard Specification for Dry-Cast Segmental Retaining Wall Units.
       3. ASTM C1262 - Standard Test Method for Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units.
       4. ASTM C1372 - Standard Specification for Dry-Cast Segmental Retaining Wall Units.
       5. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.
       6. ASTM D698 - Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
       7. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
       8. ASTM D1557 - Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (44.5 N) Rammer and 18 in. (457 mm) drop.
       9. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
       10. ASTM D3034 - Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe.
       11. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
       12. ASTM D4491 - Standard Test Method for Water Permeability of Geotextiles by Permittivity.
       13. ASTM D4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-With Strip Method.
       14. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
       15. ASTM D5261 - Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
       16. ASTM D5262 - Standard Test Method for Evaluating the Unconfined Tension Creep Rupture Behavior of Geosynthetics.
       17. ASTM D5321 - Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by Direct Shear Method.
       18. ASTM D5818 - Standard Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics.
       19. ASTM D6637 - Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.
       20. ASTM D6638 - Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks).
       21. ASTM 6706 - Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil.
       22. ASTM D6918 - Standard Test Method for Determining the Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks).
       23. ASTM D6919 - Standard Test Methods for Particle-Size Distribution (gradation) of Soils Using Sieve Analysis.
       24. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods.
       25. ASTM D6992 - Standard Test Method for Accelerated Tensile Creep and Creep-Rupture of Geosynthetic Materials Based on Time-Temperature Superposition Using Stepped Isothermal Method.
       26. ASTM F405 - Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings.
       27. ASTM F667 - Standard Specification for 3 through 24 inch Corrugated Polyethylene (PE) Pipe and Fittings.
       28. ASTM F758 - Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage.
       29. ASTM G51 - Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing.
    2. National Concrete Masonry Association (NCMA):
       1. NCMA Design Manual - Design Manual for Segmental Retaining Walls, National Concrete Masonry Association, Third Edition.
  1. DEFINITIONS
     1. Segmental Retaining Wall (SRW): The entire retaining wall structure(s) including: SRW Units, Coping, Drainage Pipe, Geotextile Filter, Geosynthetic Reinforcement and Drainage, Reinforced, Retained, and Base Fills.
     2. Segmental Retaining Wall Units: Modular, solid, dry-cast concrete blocks, designed specifically for the task of earth retention, that form the external facia of an SRW system.
     3. Coping Units: The last course of concrete units used to finish the top of the SRW. Coping Units are also referred to as cap units.
     4. Leveling Base: The compacted granular soil, or if specified in the Construction Documents, an unreinforced concrete footing, placed beneath the first course of SRW units.
     5. Drainage Fill: A free draining aggregate with high permeability placed directly behind the modular concrete units. This will include a Drainage Pipe and may be separated from other Fill with a suitable Geotextile Filter.
     6. Reinforced Fill: Fill placed directly behind the Drainage Fill, placed in layers and compacted, that will include horizontal layers of Geosynthetic Reinforcement. If the Reinforced Fill is considered to be a draining material, the Drainage Fill may not be required.
     7. Retained Fill: The soil placed between the Reinforced Fill and the Retained Soil in Reinforced SRWs or between the Drainage Fill and Retained Soil in Conventional SRWs.
     8. Retained Soil: The undisturbed native soil embankment. In soil fill situations this will be the compacted engineered site fill.
     9. Foundation Soil: The undisturbed native soil or engineered fill beneath the SRW structure.
     10. Drainage Pipe: A perforated pipe used to carry water, collected from within the SRW, to outlets, to prevent pore water pressures from building up within the SRW and specifically behind the SRW Units.
     11. Geotextile Filter: A permeable planar polymer structure that will allow the passage of water from one soil medium to another while preventing the migration of fine particles that might clog the downstream fill. Selection of a Geotextile Filter is based on the characteristics of the different soils used in and surrounding the SRW.
     12. Geosynthetic Reinforcement: An open planar polymer structure having tensile strength and durability properties that are suitable for soil reinforcement applications. Geogrid is a commonly used type of Geosynthetic Reinforcement.
  2. SUBMITTALS
     1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
     2. Product Data:
        1. Manufacturer's data sheets on each product to be used.
        2. Preparation instructions and recommendations.
        3. Storage and handling requirements and recommendations.
        4. Typical installation methods.
        5. Test results indicating compliance with specified requirements.

\*\* NOTE TO SPECIFIER \*\* Delete selection samples if colors have already been selected.

* + 1. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
    2. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.
    3. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.
  1. QUALITY ASSURANCE
     1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum ten years documented experience.
     2. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
     3. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

\*\* NOTE TO SPECIFIER \*\* Include mock-up if the project size or quality warrant the expense. The following is one example of how a mock-up on might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project. Delete if not required.

* + 1. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
       1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
       2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
       3. Retain mock-up during construction as a standard for comparison with completed work.
       4. Do not alter or remove mock-up until work is completed or removal is authorized.

\*\* NOTE TO SPECIFIER \*\* Paragraph below is for Engineered Segmental Retaining Wall systems. Modify as required. Delete if not required.

* + 1. Segmental Retaining Wall Design Review
       1. General Review Engineer (GRE): GRE is responsible to review and understand the design as required to ensure design is followed in the field.
       2. Site Geotechnical Engineer (SGE): SGE shall review design to verify that site soil and groundwater conditions assumed in design are correct for the site.
          1. If data assumed in design is not correct, provide corrected values to wall designer.
          2. SGE shall determine if a Global Stability analysis is required.
       3. Civil Engineer: The Civil Engineer shall review the design for the following elements:
          1. All surface drainage must direct water away from the SRW including slopes and paved surfaces.
          2. The SRW drainage system delivers outflow to approved locations.
          3. All site services must be located outside of SRW construction area unless otherwise noted in Design.

d.The SRW structure or excavation limits must not cross over property boundaries unless approved prior to construction.

* + - * 1. All structures located near the SRW must be shown in the Construction Documents.
        2. Anticipated use above wall during and after construction must be as shown in the Construction Documents.
      1. Landscape Architect: The Civil Engineer shall review the design for the following elements:
         1. Ensure plant and tree species to be placed above the SRW are suited to the environment created by the SRW.
         2. Limit irrigation near SRW structure.
         3. Grading above and below the SRW structure.
         4. It may be necessary to incorporate a root barrier (as required by others) to prevent the migration of tree roots into the drainage layer.
         5. Larger plants and trees must be kept outside of the Reinforced Fill to ensure the geosynthetic reinforcement is not damaged and SRW is not subjected to additional loads from plants or trees.
  1. DELIVERY, STORAGE, AND HANDLING
     1. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
     2. Protect from damage due to weather, excessive temperature, and construction operations.
  2. PROJECT CONDITIONS
     1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1. PRODUCTS

\*\* NOTE TO SPECIFIER \*\* Delete locations not required

* 1. MANUFACTURER
     1. Acceptable Manufacturer: UNILOCK®, which is located at:401 The West Mall, Suite 610Toronto, ON, Canada M9C 5J5Toll Free Tel: 800-864-5625Fax: 888-477-1707Email: [request info (Emily.Moed@unilock.com)](https://arcat.com/rfi?action=email&company=UNILOCK%25C2%25AE&message=RE%253A%2520Spec%2520Question%2520(02830uni)%253A%2520&coid=49478&spec=02830uni&rep=&fax=888-477-1707);Web: <https://commercial.unilock.com>
        1. Unilock Ltd, 287 Armstrong Avenue, Georgetown, ON L7G 4X6. 416-646-9000
        2. Unilock New England, 35 Commerce Dr., Uxbridge, MA 01569. 508-278-4536
        3. Unilock New York, 51 International Blvd., Brewster NY 10509. 845-278-6700
        4. Unilock Inc., 510 Smith Street, Buffalo, NY 14210. 716-826074
        5. Unilock Ohio, 12560 Sheets Rd, Rittman, OH 44270. 330-927-4000
        6. Unilock Michigan, 12591Emerson Dr., Brighton, MI 48116 248-437-7037
        7. Unilock Chicago, 301 E Sullivan Rd, Aurora, IL 60505. 630-892-9191
        8. Unilock W4814 County Rd A, Elkhorn, WI 53121. 262-742-3890
        9. email: customerservice@unilock.com
        10. Web: www.unilock.com.

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.
  1. PERFORMANCE REQUIREMENTS
     1. Standards Compliance:
        1. Provide segmental retaining walls meeting the requirements set forth in ASTM C1372.
        2. Provide segmental retaining walls meeting the physical properties listed below as tested using ASTM C140:
           1. Dimensional tolerance shall be +/- 3 mm (1/8 inch) for height, width, and length.
           2. The minimum 28-day compressive strength of 35 MPa (5000 psi).
           3. The maximum moisture absorption shall be 1.0 kN/cubic m (6.5 lbs/cubic ft).
        3. Pigments shall conform to ASTM C 979

\*\* NOTE TO SPECIFIER \*\* Article below is for segmental retaining wall systems of no more than 30 inches in height. Delete if not required.

* 1. LOW SEGMENTAL RETAINING WALL SYSTEMS

\*\* NOTE TO SPECIFIER \*\* The built-in setback design of Concord Wall automatically forms the correct slope, ensuring a highly stable retaining wall. Utilizing the product's tapered components, you can form curved walls and steps. Manufactured regionally (New York & New England) under license from RisiStone. Delete if not required.

* + 1. Basis of Design: Concord Wall; as manufactured by Unilock.

\*\* NOTE TO SPECIFIER \*\* Delete color options not required.

* + - 1. Color: Almond Grove.
      2. Color: Granite.
      3. Color: Sierra.
      4. Color: To be selected by Architect.
      5. Color: \_\_\_\_\_.
      6. Surface: Standard.
      7. Shapes and Sizes: (width x height x depth)

\*\* NOTE TO SPECIFIER \*\* Delete shapes and sizes not required.

* + - * 1. Tapered: 20 x 15 x 30 cm ( 7.875 x 5.875 x 11.75 inches).
        2. XL Tapered Unit: 40 x 15 x 30 cm (15.75 x 5.875 x 11.75 inches).
        3. Corner: 20 x 15 x 30 cm (7.875 x 5.875 x 11.75 inches).
        4. Coping Step Tread: 60 x 7.5 x 30 cm (23.625 x 3 x 11.75inches).
        5. Wedge Cap Unit: 24.8 x 8.6 x 33 (9.75 x 3.375 x 13 inches).

\*\* NOTE TO SPECIFIER \*\* The large size of Dura-Hold makes it an excellent choice for demanding structures up to 40ft (12.19m). Proper engineering and a good selection of components make this an exceptional wall system. It's a great alternative to 'poured' in place concrete. Manufactured regionally under license from RisiStone. Delete if not required.

* + 1. Basis of Design: DuraHold; as manufactured by Unilock.
       1. Color: Natural.
       2. Surface: Standard.
       3. Thickness: 6 cm (2.375 inches).

\*\* NOTE TO SPECIFIER \*\* Delete shapes and sizes not required.

* + - 1. Shapes and Sizes: (width x height x depth)
         1. Standard: 183 x 30 x 60 cm (72 x 11.75 x 23.625 inches).
         2. Coping 72: 183 x 30 x 60 cm (72 x 11.75 x 23.625 inches).
         3. Coping Closed End 72: 183 x 30 x 60 cm (72 x 11.75 x 23.625 inches).
         4. Wall Tieback: 183 x 30 x 60 cm (72 x 11.75 x 23.625 inches).
         5. 1/2 Standard: 91.5 x 30 x 60 cm (36 x 11.75 x 23.625 inches).
         6. 1/2 Coping: 91.5 x 30 x 60 cm (36 x 11.75 x 23.625 inches).
         7. Corner 90: 152 x 30 x 60 cm (59.875 x 11.75 x 23.625 inches).
         8. Corner 45: 152 x 30 x 60 cm (59.875 x 11.75 x 23.625 inches).

\*\* NOTE TO SPECIFIER \*\* DuraHold 2 is similar to DuraHold in appearance, but is just over half the size, making it economical for low walls. Concrete tie-backs or geogrid reinforcement gives this wall various engineering options. . Manufactured regionally under license from RisiStone. Delete if not required.

* + 1. Basis of Design: DuraHold 2; as manufactured by Unilock.
       1. Color: Natural.
       2. Surface: Standard.
       3. Thickness: 6 cm (2.375 inches).

\*\* NOTE TO SPECIFIER \*\* Delete shapes and sizes not required.

* + - 1. Shapes and Sizes: (width x height x depth)
         1. Wall Standard: 183 x 30 x 36 cm (72 x 11.75 x 14.125 inches).
         2. Coping 72: 183 x 30 x 36 cm (72 x 11.75 x 14.125 inches).
         3. Coping Closed End 72: 183 x 30 x 36 cm (72 x 11.75 x 14.125 inches).
         4. Wall Tieback: 183 x 30 x 36 cm (72 x 11.75 x 14.125 inches).
         5. Corner 90: 90 x 30 x 36 cm (35.375 x 11.75 x 14.125 inches).

\*\* NOTE TO SPECIFIER \*\* Ledgestone is Unilock's universal coping system that is turning heads with its remarkably natural appearance. Featuring pitched edges to work interchangeably with any wall, the design selections are optimized. Delete if not required.

* + 1. Basis of Design: Ledgestone; as manufactured by Unilock.

\*\* NOTE TO SPECIFIER \*\* Delete color options not required.

* + - 1. Color: Buff.
      2. Color: Grey.
      3. Color: To be selected by Architect.
      4. Color: \_\_\_\_\_.
      5. Surface: Reala Flagstone.

\*\* NOTE TO SPECIFIER \*\* Delete shapes and sizes not required.

* + - 1. Shapes and Sizes: (width x height x depth)
         1. Pillar Cap: 61 x 9 x 61 cm (24 x 3.5 x 24 inches).
         2. Fullnose Coping: 60.5 x 4.5 x 30.5 cm (23.875 x 1.75 x 12 inches).
         3. Coping Closed End 24 inch: 61 x 7.5 x 30.5 cm (24 x 3 x 12 inches).
         4. Coping 24 inch: : 61 x 7.5 x 30.5 cm (24 x 3 x 12inches).
         5. 36x18 Step: 91.4 x 15.2 x 45.7 cm (36 x 6 x 18 inches).
         6. 48x24 Step: 122 x 15.2 x 61 cm (48 x 6 x 24 inches).
         7. 72x24 Step: 183 x 15.2 x 61 cm (72 x 6 x 24 inches).
         8. \_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Contemporary and sleek lines define Lineo Dimensional Stone with a linear multi-length plank look. Ideal for garden walls, pillars, other outdoor vertical elements, Lineo Dimensional Stone offers up modern design and exceptional flexibility. Delete if not required.

* + 1. Basis of Design: Lineo Dimensional Stone; as manufactured by Unilock.

\*\* NOTE TO SPECIFIER \*\* Delete color options not required. Additional colors may be available regionally. Contact the local representative for more details.

* + - 1. Color: Midnight Charcoal.
      2. Color: Sandstone
      3. Color: Granite
      4. Color: To be selected by Architect.
      5. Color: \_\_\_\_\_.
      6. Surface: Standard.

\*\* NOTE TO SPECIFIER \*\*

* + - 1. Shapes and Sizes: (width x height x depth)
         1. Lineo Dimensional Random Bundle (the following units are sold together)

Unit: 30 x 10 x 20 cm (24 x 3.875 x 7.875 inches).

Unit: 40 x 10 x 20 cm (15.75 x 3.875 x 7.875 inches).

Unit: 50 x 10 x 20 cm (19.675 x 3.875 x 7.875 inches).

Unit 4: 61 x 10 x 20 cm (24 x 4 x 38 inches).

\*\* NOTE TO SPECIFIER \*\* Stacked flagstone has been used for centuries for small garden walls and pillars. With Rivercrest Wall, you get the character and flexibility of natural stone combined with the durability and affordability of concrete. Delete if not required.

* + 1. Basis of Design: Rivercrest Wall; as manufactured by Unilock.

\*\* NOTE TO SPECIFIER \*\* Delete color options not required.

* + - 1. Color: Coastal Slate.
      2. Color: Buff.
      3. Color: To be selected by Architect.
      4. Color: \_\_\_\_\_.
      5. Surface: Reala Stone finish.

\*\* NOTE TO SPECIFIER \*\* Delete shapes sizes not required.

* + - 1. Shapes and Sizes: (width x height x depth)
         1. Jumper Corner Unit: 31 x 11.4 x 25 cm (12.25 x 4.5 x 9.875 inches).
         2. Pillar Unit: see local specs for unit configuration
         3. Corner Unit Bundle (the following units are sold together)
         4. Long Corner Unit: 31 x 25 x 5.7 cm (12.25 x 9.875 x 2.25 inches).
         5. Short Corner Unit: 25 x 25 x 5.7 cm (9.875 x 9.875 x 2.25 inches).
         6. Wall Standard Bundle: (the following units are sold together)

Standard Unit 1: x 5.7 x 25 cm (7.875 x 2.25 x 9.875 inches).

Standard Unit 2: 31 x 5.7 x 25 cm (12.25 x 2.25 x 9.875 inches).

Standard Unit 3: 31 x 5.7 x 25 cm (12.25 x 2.25 x 9.875 inches).

Standard Unit 4: 42.5 x 5.7 x 25 cm (16.75 x 2.25 x 9.875 inches).

* + - * 1. Wall Jumper Unit Bundle: (the following units are sold together)
        2. Jumper Unit 1: 20 x 11.4 x 25 cm (7.875 x 4.5 x 9.875 inches).
        3. Jumper Unit 2: 31 x 11.4 x 25 cm (12.25 x 4.5 x 9.875 inches).
        4. Jumper Unit 3: 31 x 11.4 x 25 cm (12.25 x 4.5 x 9.875 inches).
        5. Jumper Unit 4: 42.5 x 11.4 x 25 cm (16.75 x 4.5 x 9.875 inches).
        6. \_\_\_\_\_.

\*\* NOTE TO SPECIFIER Split and weathered-looking, RomanWall boasts a distressed appearance that gives the impression that it has been around for decades. Admired as much for its versatility as its look, RomanWall can be used to form straight or curved walls, as well as planters and steps. Manufactured regionally (New York & New England) under license from RisiStone. Delete if not required.

* + 1. Basis of Design: RomanWall; as manufactured by Unilock.

\*\* NOTE TO SPECIFIER \*\* Delete color options not required.

* + - 1. Color: Almond Grove.
      2. Color: Granite.
      3. Color: Sierra.
      4. Color: To be selected by Architect.
      5. Color: \_\_\_\_\_.
      6. Surface: Split and Weathered.

\*\* NOTE TO SPECIFIER \*\* Delete shapes and sizes not required.

* + - 1. Shapes and Sizes: (width x height x depth)
         1. Corner Unit: 30 x 15 x 20 cm (11.75 x 5.875 x 7.875 inches).
         2. Tapered: 20 x 15 x 30 cm (7.875 x 5.875 x 11.75 inches).
         3. Roman Cap: 25 x 8.5 x 33 (9.75 x 3.375 x 13 inches).
         4. \_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Bold and dramatic, SienaStone (over 450 lbs ea.) strikes an impressive profile when used for a wall or as treads in large outdoor staircases. An attractive solution for most heavy-duty load-bearing applications. Manufactured regionally under license from RisiStone. Delete if not required.

* + 1. Basis of Design: SienaStone; as manufactured by Unilock.

\*\* NOTE TO SPECIFIER \*\* Delete color options not required. Additional colors may be available regionally. Contact the local representative for more details.

* + - 1. Color: Natural
      2. Color: To be selected by Architect.
      3. Color: \_\_\_\_\_.
      4. Surface: Standard.

\*\* NOTE TO SPECIFIER \*\* Delete shapes and sizes not required.

* + - 1. Shapes and Sizes: (width x height x depth)
         1. Wall 333 - 39: 100 x 18.5 x 33 cm (39.375 x 7.25 x 13 inches).
         2. Wall 500 - 39: 100 x 18.5 x 50 cm (39.375 x 7.25 x 19.625 inches).
         3. Coping 39: 100 x 18.5 x 50 cm (39.375 x 7.25 x 19.625 inches).
         4. Coping Closed End 48: 120 x 18.5 x 50 cm (47.25 x 7.25 x 19. inches).
         5. Corner 90: 92.5 x 18.5 x 50 cm (36.375 x 7.25 x 19.625inches).
         6. \_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* The patented U-Cara system, exclusive to Unilock, is comprised of two basic components: Sure Track backer blocks provide dimensionally accurate structure and U-Cara fascia panels provide unlimited design options. Delete if not required.

* + 1. Basis of Design: U-Cara Multi-Face Wall System; as manufactured by Unilock.

\*\* NOTE TO SPECIFIER \*\* Delete finish and color options not required. Additional finishes and colors may be available regionally. Contact the local representative for more details.

* + - 1. Finish: Umbriano.
         1. Color: French Grey.
         2. Color: Winter Marvel.
         3. Color: Summer Wheat.
         4. Color:\_\_\_\_\_\_\_\_\_\_\_\_
      2. Finish: Smooth.
         1. Color: Granite Fusion.
         2. Color: Tuscany
         3. Color:\_\_\_\_\_\_\_\_\_\_\_\_
      3. Finish: Pitched face
         1. Color: Granite Fusion.
         2. Color:\_\_\_\_\_\_\_\_\_\_\_\_
      4. Finish & Color: To be selected by Architect.
      5. Finish:\_\_\_\_\_\_\_\_\_\_
         1. Color: \_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Delete shapes and sizes not required.

* + - 1. Shapes and Sizes: (width x height x depth)
         1. Sure Track Standard Backer: 15 x 15 x 20 cm (5.875 x 5.875 x 7.875 inches).
         2. Sure Track Large Backer: 15 x 17.5 x 30 cm (5.875 x 6.875 x 11.75 inches).
         3. Universal Base Unit: 48.2 x 5.5 x 35.5 cm (19 x 2.125 x 14 inches).
         4. Standard Fascia Panel: 46.6 x 15 x 6 cm (18.375 x 5.875 x 2.375 inches).
         5. Closed-End Fascia Panel Bundle (includes Half & Standard Panels)

Closed-End Half Fascia Panel 23.3 x15 x 6 cm (9.125 x .875 x 2.375 inches).

Closed-End Standard Fascia Panel: 53 x 15 x 6 cm (20.875 x 5.875 x 2.375 inches).

* + - * 1. Universal Coping: 48.2 x 7 x 35.5 cm (19 x 2.75 x 14 inches).
    1. Leveling Base:
       1. Provide non-frost susceptible, well-graded, compacted angular gravel-sand mixture, GW as per ASTM D2487, Leveling Base.
       2. Gradation Requirements per ASTM D2940. Percent Passing Sieve Size:
          1. 2 inch (50 mm): 100 percent.
          2. 1-1/2 inch (37.5 mm): 95 to 100 percent.
          3. 3/4 inch (19 mm): 70 to 92 percent.
          4. 3/8 inch (9.5 mm): 50 to 70 percent.
          5. No. 4 (4.75 mm): 35 to 55 percent.
          6. No. 30 (0.600 mm): 12 to 25 percent.

\*\* NOTE TO SPECIFIER \*\* In order to prevent damage by frost heave it may be necessary to limit percent passing No. 200 sieve to less than 8 percent. Modify as required.

* + - * 1. No. 200 (0.075 mm): 0 to 8 percent.
    1. Backfill Aggregate:
       1. Provide Base Aggregate materials conforming to ASTM D2940.
       2. Gradation Requirements: Percent Passing Sieve Size:
          1. 2 inch (50 mm): 100 percent.
          2. 1-1/2 inch (37.5 mm): 95 to 100 percent.
          3. 3/4 inch (19 mm): 70 to 92 percent.
          4. 3/8 inch (9.5 mm): 50 to 70 percent.
          5. No. 4 (4.75 mm): 35 to 55 percent.
          6. No. 30 (0.600 mm): 12 to 25 percent.

\*\* NOTE TO SPECIFIER \*\* In order to prevent damage by frost heave it may be necessary to limit percent passing No. 200 sieve to less than 8 percent. Modify as required.

* + - * 1. No. 200 (0.075 mm): 0 to 8 percent.
    1. Drainage Aggregate Fill:
       1. Provide Base Aggregate materials conforming to ASTM C33.
       2. Gradation Requirements per ASTM D 448 No. 8. Percent Passing Sieve Size:
          1. 1/2 inch (12.5 mm): 100 percent.
          2. 3/8 inch (9.5 mm): 85 to 100 percent.
          3. No. 4 (4.75 mm): 10 to 30 percent.
          4. No. 8 (2.36 mm): 0 to 10 percent.
          5. No. 16 (1.18 mm): 0 to 5 percent.
    2. Underdrainage Pipe: Provide a minimum 100 mm (4 inches) Underdrainage Pipe.

\*\* NOTE TO SPECIFIER \*\* Delete material options not required.

* + - 1. Material: Perforated corrugated high density polyethylene (HDPE) meeting ASTM F667.
      2. Material: Perforated polyvinyl chloride (PVC) pipe meeting ASTM D3034.
      3. Material: Perforated corrugated high density polyethylene (HDPE) meeting ASTM F667 or perforated polyvinyl chloride (PVC) pipe meeting ASTM D3034.
      4. Protect with Geotextile Filter to prevent the migration of soil particles into the Underdrainage Pipe.
    1. Geotextile Filter: Conforming to the following performance characteristics, measured per the test methods referenced:
       1. Nonwoven, needle punched, 4 ounce geotextile composed of 100% polypropylene staple fibers that are inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.
       2. Grab Tensile Strength: ASTM D4632: 115 lbs.
       3. Grab Tensile Elongation: ASTM D4632: 50 percent.
       4. Trapezoidal Tear: ASTM D4533: 50 lbs.
       5. Puncture: ASTM D4833: 65 lbs.
       6. Apparent Opening Size: ASTM D4751: 0.212 mm, 70 U.S. Sieve.
       7. Permittivity: ASTM D4491: 2.0 sec -1.
       8. Flow Rate: ASTM D4491: 140 gal/min/s.f.
    2. Geosynthetic Reinforcement: Provide Geosynthetic Reinforcement as supplied by Unilock:
       1. Product: Stratagrid 200.
    3. Concrete Adhesive:
       1. Products:
          1. LePage PL 9000 Heavy Duty Construction Adhesive.
          2. Alliance Gator Glue XP Polyurethane Construction Adhesive.
          3. Unilock Concrete Adhesive.

\*\* NOTE TO SPECIFIER \*\* Article below is for segmental retaining wall systems which require engineered design. Delete if not required.

* 1. ENGINEERED SEGMENTAL RETAINING WALL SYSTEMS
     1. Performance and Design Requirements:
        1. Design life of structure shall be 75 years.
        2. Design shall be in accordance with NCMA Design Manual for Segmental Retaining Walls, for Internal, External, and Internal Compound Stability under Static and Seismic conditions.
        3. See Drawings for Design Assumptions.
        4. Site Parameters:
           1. The length, height, and overall elevations of the SRW Design shall be as indicated on Drawings.
           2. Surcharges, anticipated usage and slopes above, as well as slopes below, all sections of the SRW to be as indicated on Drawings.
           3. The minimum SRW embedment shall be the greater of:

The height of one segmental retaining wall unit.

The minimum embedment based on slope below the wall:

No Slope: Height/10.

Slope of 3:1: Height/10.

Slope of 2:1: Height/7.

Embedment depth recommended by Geotechnical Engineer.

* + - 1. Site Soil Parameters:
         1. Site soil parameters shall be stated in design documents. Include soil classification (ASTM D2487), effective friction angle, compacted density, and cohesion.
         2. Comply with site specific soil parameters provided by Geotechnical Engineer.
         3. If on-site soils are to be used as fill materials, test re-compacted soil to ensure correct parameters are used in design.
      2. Product Parameters:
         1. All values used shall be obtained from testing conducted in accordance with the Reference Standards identified. If product test results are not available, assumed parameters may be used and the Design Drawings shall state the assumed values and that assumed product design parameters have been used.
    1. Segmental Retaining Wall Units:

\*\* NOTE TO SPECIFIER \*\* Modify as required for project requirements.

* + - 1. Basis of Design: \_\_\_\_\_\_; as manufactured by Unilock.
      2. Color: \_\_\_\_\_.
      3. Surface: \_\_\_\_\_.
      4. Shapes and Sizes:
         1. \_\_\_\_\_.
         2. \_\_\_\_\_.
         3. \_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* If SRW Units by themselves provide sufficient stability, Reinforced Fill may be omitted. Modify requirements to meet design parameters. Delete if not required.

* + 1. Reinforced Fill: Unified Soil Classification System designation per ASTM D2487.
       1. Percent Passing #200 Sieve: \_\_\_\_\_.
       2. Effective Friction Angle: \_\_\_\_\_.
       3. Minimum Compacted Density: \_\_\_\_\_.
       4. Soil Gradation Curve (ASTM D422): \_\_\_\_\_.
       5. Liquid Limit, Plastic Limit, and Plasticity Index (ASTM D4318): \_\_\_\_\_.
       6. Soil pH (ASTM G51): \_\_\_\_\_.
       7. Permeability Coefficient (Q): \_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Modify requirements to meet design parameters. Select one of the two Paragraphs below. Delete leveling base option not required.

* + 1. Leveling Base: Non-frost susceptible, well-graded, compacted angular gravel-sand mixture, GW per ASTM D2487.
       1. Effective Friction Angle: \_\_\_\_\_.
       2. Soil Gradation Curve (ASTM D422): \_\_\_\_\_.
       3. Soil pH (ASTM G51): \_\_\_\_\_.
       4. Permeability Coefficient (Q): \_\_\_\_\_.
       5. Potential for Consolidation: \_\_\_\_\_.
    2. Leveling Base: Concrete footing as indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Modify requirements to meet design parameters. If reinforced fill has adequate drainage characteristics Drainage Fill may be omitted. Delete if not required.

* + 1. Drainage Fill: Free-draining, angular, gravel material of uniform particle size smaller than 25 mm (1 inch) and greater than 6mm (1/4 inch). If shown in the Construction Documents, the Drainage Fill shall be separated from the Reinforced Fill or Retained Fill by a specified Geotextile Filter.
       1. Effective Friction Angle: \_\_\_\_\_.
       2. Soil Gradation Curve (ASTM D422): \_\_\_\_\_.
       3. Soil pH (ASTM G51): \_\_\_\_\_.
       4. Permeability Coefficient (Q): \_\_\_\_\_.
       5. Potential for Consolidation: \_\_\_\_\_.
    2. Drainage Pipe: As indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Modify requirements to meet design parameters. If gradation of adjacent soils permits, Geotextile Filter may be omitted. Delete if not required.

* + 1. Geotextile Filter:
       1. Apparent Opening Size (ASTM D4751): \_\_\_\_\_.
       2. Unit Weight (ASTM D5261): \_\_\_\_\_.
       3. Coefficient of Permeability (ASTM D4491): \_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Modify requirements to meet design parameters. If SRW Units by themselves provide sufficient stability, Geosynthetic Reinforcement may be omitted. Delete if not required.

* + 1. Geosynthetic Reinforcement: As indicated on Drawings.
       1. Tensile strength (ASTM D6637): \_\_\_\_\_.
       2. Creep potential reduction factor (ASTM D5262): \_\_\_\_\_.
       3. Installation Damage Reduction Factor: \_\_\_\_\_.
       4. Durability Reduction Factor, Chemical and Biological: \_\_\_\_\_.
       5. Soil Pullout Resistance (ASTM D6706) : \_\_\_\_\_.
       6. Connection Strength (ASTM D6638): \_\_\_\_\_.
       7. Coefficient of Interaction, Ci: \_\_\_\_\_.
       8. Coefficient of Interaction, Cds: \_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Modify requirements to meet design parameters. If coping by itself provides sufficient stability, Concrete Adhesive may be omitted. Delete if not required.

* + 1. Concrete Adhesive: Used to permanently secure the coping unit to the top course of the segmental retaining wall. The adhesive must provide sufficient strength and remain flexible for the expected life of the segmental retaining wall.

1. EXECUTION
   1. EXAMINATION
      1. Do not begin installation until substrates have been properly constructed and prepared.
      2. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
   2. PREPARATION
      1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
      2. Prevent damage to underdrain pipes, overflow pipes, observation wells, or inlets and other drainage appurtenances during installation.
   3. INSTALLATION
      1. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction.
         1. Prepare site in compliance with all current Federal, Provincial/State, and local regulations for execution of the work, including local building codes and excavation regulations and in accordance with Design and SRW manufacturer recommendations.
         2. Install drainage system in accordance with Design and SRW manufacturer recommendations.
         3. Set leveling base in accordance with Design and SRW manufacturer recommendations.
         4. Install segmental retaining wall units in accordance with Design and SRW manufacturer recommendations.
         5. Install drainage fill in accordance with Design and SRW manufacturer recommendations.
         6. Install backfill aggregate in accordance with Design and SRW manufacturer recommendations.
         7. Install geosynthetic reinforcement in accordance with Design and SRW manufacturer recommendations Provide spacing recommended by paver manufacturer.
         8. Compact retained fill in accordance with Design and SRW manufacturer recommendations Cut pavers as recommended by manufacturer.
         9. Secure coping in accordance with Design and SRW manufacturer recommendation..
      2. Tolerances:
         1. Vertical Control: +/- 1.25 inches (31.8 mm) over a 10 foot (3048 mm) distance.
         2. Horizontal Control: Straight lines: +/- 1.25 inches (31.8 mm) over a 10 foot (3048 mm) distance.
         3. Rotation of the SRW face: Maximum 2.0 degrees from established SRW plan batter or +/-10.0 percent from total established horizontal setback.
         4. Bulging: +/- 1.25 inches (31.8 mm) over a 10 foot (3048 mm) distance.

\*\* NOTE TO SPECIFIER \*\* Article below is for Engineered Segmental Retaining Wall systems. Modify as required. Delete if not required.

* 1. FIELD QUALITY CONTROL
     1. Geotechnical Inspection: Performed by Geotechnical Engineer (SGE) for review of the following:
        1. Verifying assumed Design soil parameters and groundwater conditions are acceptable for the Site, or provide the Wall Designer with alternate values/conditions.
        2. Verifying subgrade Bearing Capacity meets or exceeds values required by the Design, or provide recommendations to the Installer to achieve the required values.
        3. Determining the need for Global Stability Analysis, and supplying this analysis if necessary per the NCMA Guidelines, Section 12.
        4. Providing Construction inspection and testing of on-site and fill soils.
        5. Ensuring groundwater conditions and/or other water sources have been identified and compared with the assumptions made in the design. Additional water sources noted on site such as seepage from the cut embankment must be identified and the Designer notified if these are not noted in the Construction Documents.
     2. General Review of Construction: Performed by General Review Engineer (GRE):
        1. The GRE shall ensure that the Site Geotechnical Engineer (SGE) has verified the Geotechnical conditions as noted above.
        2. The GRE shall ensure that the SGE has determined if Global Stability analysis is required and conducted if need be.
        3. Testing and acceptance of all materials used to construct the SRW.
        4. Inspection of the methods used to construct the SRW.
        5. Determine if the wall is constructed in general conformance with the Construction Documents.
        6. The GRE shall contact the Designer to address any outstanding issues, questions, or concerns regarding the SRW Design and resolve these issues prior to issuing Construction Documents or authorize the SRW Design to be used as Construction Documents. During construction, the GRE should notify the Designer of any discrepancies between the Design and actual Site Conditions.
        7. Ensure the SRW and associated excavation remains outside of the loading influence of other adjacent structures, unless they have been specifically accounted for in the SRW Design and shown in the Construction Documents and ensure stability of excavations and conformance with applicable regulations.
        8. Ensure that surface water runoff and/or other sources of water are being controlled during construction and directed away from the SRW to a functioning drain.
     3. Installers Quality Assurance Program:
        1. The Installer shall ensure the SRW is constructed in accordance with the Construction Documents. The Installer must be qualified in the construction of SRWs, knowledgeable of acceptable methods of construction, and have thoroughly reviewed and understood the Construction Documents.
        2. It is recommended that the Installer shall keep a construction journal to document the construction of the SRW as part of a thorough quality control program. The General Review Engineer shall be provided with copies of the construction journal throughout the construction process.
        3. The Installer's field construction supervisor shall have demonstrated experience and be qualified to direct all work related to the SRW construction.
        4. The Installer must notify the General Review Engineer of critical stages in the construction of the SRW in order that they may be present to observe and inspect the work. The General Review Engineer must be notified reasonably well in advance of the scheduled date(s) for construction.
  2. CLEANING AND PROTECTION
     1. Protect completed work from damage due to subsequent construction activity on the site.
     2. Clean products in accordance with the manufacturers recommendations.
     3. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION