

32-32-23

## Segmental Retaining Wall

For the U-Cara Wall System

For any additional information or assistance with this spec please contact your Unilock Representative.

**\*\*\* Delete all text in RED after modifying the text in BLUE. All BLUE text requires modification. \*\*\***

## **FOREWORD**

*This three-part specification has been prepared for the general guidance of specifiers, engineers, contractors and superintendents associated with the construction retaining walls under 30 inches in height without surcharge. Hire a qualified structural engineer for walls over 30 inches or when the suitability of the design, site conditions and installation are critical to life-safety.*

*Unilock is not responsible for the information in this specification meeting local or national building codes. The Architect, Landscape Architect or Engineer of Record is responsible selecting products that meet any and all building code requirements to gain occupancy permit and updating this specification as necessary.*

## **INTRODUCTION**

*Unilock® segmental retaining walls and decorative seat walls are manufactured in a variety of shapes and colors for residential, commercial, municipal and industrial applications. They offer design professionals several engineered segmental retaining systems that are efficient, durable, economical and aesthetically attractive.*

## **DESIGN**

*This specification is only intended for U-Cara Wall Systems 30 inches or less in height that do not require engineering such as seatwalls and planters. A qualified structural engineer is required for any U-Cara Wall System over 30 inches in height intending to support loads such as retaining walls. Please refer to Unilock's structural U-Cara Wall System reference specification for any walls requiring engineering.*

**SECTION 32 32 23****U-CARA WALL SYSTEMS (30 inch specification)****PART 1 GENERAL****1.01 SUMMARY**

- A. Section includes the following:
  - 1. Unilock U-Cara Wall System (UWS)
  - 2. Provide Leveling Base Aggregate
  - 3. Provide Geotextile Fabric
  - 4. Provide Drainage System
  - 5. Provide Geosynthetic Reinforcement
  - 6. Provide Backfill and Drainage Aggregate

**1.02 REFERENCES**

ASTM International, latest edition:

- A. U-Cara Wall Systems
  - 1. C 33, Standard Specification for Concrete Aggregates
  - 2. C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
  - 3. C 936, Standard Specification for Solid Concrete Interlocking Paving Units.
  - 4. C 979, Standard Specification for Pigments for Integrally Colored Concrete.
  - 5. C 1372, Standard Specification for Dry-Cast Segmental Retaining Wall Units
- B. Geotextile Fabric:
  - 1. D 4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - 2. D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- C. Drainage Pipe:
  - 1. D 3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) and Sewer Pipe Fittings.
  - 2. F 667 Standard Specification for Large Diameter Corrugated Polyethylene (PE) Pipe and Fittings
- D. Granular Aggregate Materials:
  - 1. D 2940, Graded Aggregate Material for Bases or Subbases for Highways or Airports.
- E. Soils
  - 1. D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 2. D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

**1.03 SUBMITTALS**

- A. U-Cara Wall Systems:
  - 1. Samples for verification: Three representative full-size samples of each type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
  - 2. Approved samples become the standard of acceptance for the product produced.
  - 3. Test results from an independent testing laboratory for compliance of U-Cara Wall System Components with ASTM C936 and C1372.

4. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.
- B. Adhesive and Sealant:
  1. Provide manufacturer's technical data sheets indication the physical properties and performance.
  2. Test results from an independent testing laboratory indicating the product strength.
- C. Geotextile Fabric
  1. Provide product data sheets.
  2. Provide three representative samples 6in by 6in.
- D. Geosynthetic Reinforcement (Geogrid):
  1. Provide product data sheets.
  2. Provide three representative samples 8in by 12in.
- E. Structural Engineer Design:
  1. Provide signed and sealed (stamped) drawings include all detailed design calculations for UWS's over 30 inches from a licensed structural engineer as required by local building codes.
- F. Wall Installation Contractor:
  1. Job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.
  2. Furnish sealed construction documents with detailed structural design calculations.
- G. LEED: (required only for LEED projects, delete otherwise)
  1. Submit manufacturer data or certification letter for Segmental Retaining Wall materials meeting LEED (latest edition) criteria for:
    - a. Sourcing of Raw Materials: Responsible Sourcing of Raw Materials – Recycled Content: product recycled content percentage by weight of post-consumer and pre-consumer recycled content.
    - b. Material Ingredients: Option 1. Material Ingredient Reporting – Health Product Declaration (HPD): HPD 2.1 or latest transparency data sheet

#### 1.04 QUALITY ASSURANCE

- A. Utilize a Manufacturer having at least ten years of experience manufacturing segmental wall systems on projects of similar nature or project size.
- B. Source Limitations:
  1. Obtain UWS from one source location with the resources to provide products of consistent quality in appearance and physical properties.
  2. Obtain all UWS to entirely complete the wall.
  3. Obtain only natural Base and Subbase Aggregates quarried from an approved supplier. Recycled Crushed Concrete Base and Crushed Concrete Subbase Aggregates are not acceptable.
- C. Wall Contractor Qualifications:
  1. Utilize an installer having successfully completed UWS installations similar in design, material and extent indicated for this project. (Consider exceptions since U-Cara was available for installation starting in 2018.)
- D. Mockups:
  1. Install a 2 ft x 5 ft wall area per each color and/or style.
  2. Use this area to evaluate plumbness and levelness of the wall. This area will serve as the standard by which the workmanship will be judged.
  3. Subject to acceptance by owner, mock-up may be retained as part of finished work.
  4. If mock-up is not retained, remove and dispose legally.

#### 1.05 DELIVERY, STORAGE & HANDLING

- A. In accordance with Conditions of the Contract and Division 1 Product Requirement Section.
- B. Deliver UWS in manufacturer's original, unopened and undamaged container packaging with identification labels intact.

1. Coordinate delivery and schedule to minimize interference with other construction activities.
2. Unload UWS at job site in such a manner that no damage occurs to the product or adjacent surfaces.
3. Store materials in accordance with manufacturer's recommendations and in a manner to prevent damage.

#### 1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
  1. Install Leveling Base Aggregates only over unfrozen and dry subgrade soils.
  2. Install Universal Base Units only when temperature is above 32 degrees Fahrenheit (0 degrees Celsius).
  3. Install SRW on Universal Base Units only over unfrozen and dry subgrade soils.
- B. Weather Limitations:
  1. Install only when no heavy rain or snowfalls are forecast within 24 hours.

#### 1.07 U-CARA OVERAGE AND ATTIC STOCK

- A. Provide a minimum of 5% additional material for overage to be used during construction.
- B. Contractor to provide 50 face feet of each product and size used to owner for maintenance and repair. Furnish UWS from the same production run as installed materials.
- C. Manufacture to supply maintenance and reinstatement manuals for UWS units.

## PART 2 PRODUCTS

#### 2.01 U-CARA WALL SYSTEM

- A. Basis-of-Design Product: The U-Cara Wall System (UWS) are based on:
  1. Unilock U-Cara Wall Components:
    - a. Large SureTrack Backer Block
    - b. Standard SureTrack Backer Block
    - c. Fascia Panels
  2. As manufactured by:  
Unilock (Add location)  
Address  
City, State and Zip  
Contact: (insert Unilock representative name and phone number) or your local Territory Manager
  3. The specified products establish minimum requirements that substitutions must meet to be considered acceptable.
    - a. To obtain acceptance of unspecified products, submit written requests at least 7 days before the Bid Date.

Note: Unless required by the owner, an "or equal" line is not necessary when using a basis-of-design specification with the above information is listed and outline in Division 1, Product Substitution Procedures.

Or choose number 3 below and delete above number 3.

3. Substitutions: No substitutions permitted.

- B. U-Cara Fascia Panel Product requirements:
  1. UWS Type 1: Fascia Panel
    - a. Fascia Panel Finish: Insert Fascia Panel finish
      1. Umbriano
      2. Series 3000
      3. Premier Smooth
      4. Premier Pitched
    - b. Color: Insert local available product color or
      1. Umbriano
        - a. French Grey

- b. Winter Marvel
    - c. Midnight Sky
    - d. Summer Wheat
    - e. Harvest Brown
  - 2. Series
    - a. Black Granite
    - b. Peppered Granite
  - 3. Premier Smooth
    - a. Almond Grove Fusion
    - b. Bavarian
    - c. Cream
    - d. Granite Fusion
    - e. Graphite
    - f. Opal Blend
    - g. Sierra
    - h. Tuscany
  - 4. Premier Pitched
    - a. Almond Grove Fusion
    - b. Bavarian
    - c. Granite Fusion
    - d. Opal Blend
    - e. River
    - f. Sierra
    - g. Steel Grey
    - h. Steel Mountain
- c. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.
  - 1. Standard Façade Panel: 15cm x 46.6cm x 6cm (6in x 18in x 2-3/8in)
  - 2. Corner Façade Panel: 15cm x 53cm x 6cm (6in x 21in x 2-3/8in)

Note: Imperial dimensions are nominal equivalents to the metric dimensions.
- d. LEED: HPD 2.1 or latest transparency data
- 2. UWS Type 2: Fascia Panel
  - a. Fascia Panel Finish: [Insert Fascia Panel finish](#)
    - 1. Umbriano
    - 2. Series 3000
    - 3. Premier Smooth
    - 4. Premier Pitched
  - b. Color: [Insert local available product color or](#)
    - 1. Umbriano
      - a. French Grey
      - b. Winter Marvel
      - c. Midnight Sky
      - d. Summer Wheat
      - e. Harvest Brown
    - 2. Series
      - a. Black Granite
      - b. Peppered Granite
    - 3. Premier Smooth
      - a. Almond Grove Fusion
      - b. Bavarian
      - c. Cream
      - d. Granite Fusion
      - e. Graphite
      - f. Opal Blend
      - g. Sierra
      - h. Tuscany

4. Premier Pitched
  - a. Almond Grove Fusion
  - b. Bavarian
  - c. Granite Fusion
  - d. Opal Blend
  - e. River
  - f. Sierra
  - g. Steel Grey
  - h. Steel Mountain
- c. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.
  1. Standard Façade Panel: 15cm x 46.6cm x 6cm (6in x 18in x 2-3/8in)
  2. Corner Corner Façade Panel: 15cm x 53cm x 6cm (6in x 21in x 2-3/8in)
 Note: Imperial dimensions are nominal equivalents to the metric dimensions.
  - d. LEED: HPD 2.1 or latest transparency data
3. (Insert additional UWS Types here as necessary or delete this line)
- C. Provide UWS Fascia Panels meeting the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.
  1. Average compressive strength 8000 psi (55MPa) with no individual unit under 7,200 psi (50 MPa).
  2. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
  3. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C1645.

Note: Efflorescence is a whitish powder-like deposit that sometimes appears on concrete products. Calcium hydroxide and other water-soluble materials form or are present during the hydration of Portland cement. Pore water becomes saturated with these materials, and diffuses to the surface of the concrete. When this water evaporates, the soluble materials remain as a whitish deposit on the concrete surface. The calcium hydroxide is converted to calcium carbonate during a reaction with carbon dioxide from the atmosphere. The calcium carbonate is difficult to remove with water. However, the efflorescence will wear off with time, and it is advisable to wait a few months before attempting to remove any efflorescence. Commercially available cleaners can be used, provided directions are carefully followed. Some cleaners contain acids that may alter the color of the pavers.
- D. Accept only pigments in concrete pavers conforming to ASTM C 979.  
Note: ACI Report No. 212.3R provides guidance on the use of pigments.
- E. U-Cara Backer Block Product Requirements:
  1. UWS Component: Backer Blocks
    1. Standard Backer Block with SureTrack
    2. Large Backer Block with SureTrack
  - a. Connection: Tongue and Groove
  - b. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/8 in all directions.
    1. Standard Backer Block: 15cm x 20cm x 15cm (6in x 8in x 6in)
    2. Large Backer Block: 15cm x 17.5cm x 30cm (6in x 7in x 12in)
 Note: Imperial dimensions are nominal equivalents to the metric dimensions.
  - c. LEED: HPD 2.1 or latest transparency data
- F. Provide UWS Backer Blocks meeting the minimum material and physical properties set forth in ASTM C 1372, Standard Specification for Dry-Cast Segmental Retaining Wall Units.
  1. Compressive strength: a minimum 28-day compressive strength of 5,000 psi (35 MPa) as tested in accordance with ASTM C 140.
  2. Absorption: a maximum moisture absorption rate of 5 percent to ensure adequate freeze-thaw protection.

2.02 UNIVERSAL COPING UNIT

- A. Provide UWS Universal Coping Units as follows:
- B. Color: [Insert local available product color](#)
- C. Size: 48.2cm x 35.5cm x 7cm (19in x 14in x 2-3/4in)
- D. Provide Universal Base Unit meeting the minimum material and physical properties set forth in ASTM C 1372, Standard Specification for Dry-Cast Segmental Retaining Wall Units.
  - 1. Compressive strength: a minimum 28-day compressive strength of 5,000 psi (35 MPa) as tested in accordance with ASTM C 140.
  - 2. Absorption: a maximum moisture absorption rate of 5 percent to ensure adequate freeze-thaw protection.

2.03 UNIVERSAL BASE UNIT

- A. Provide UWS Universal Base Units as follows:
- B. Size: 48.2cm x 35.5cm x 5.5cm (19in x 14in x 2in)
- C. Provide Universal Base Unit meeting the minimum material and physical properties set forth in ASTM C 1372, Standard Specification for Dry-Cast Segmental Retaining Wall Units.
  - 1. Compressive strength: a minimum 28-day compressive strength of 5,000 psi (35 MPa) as tested in accordance with ASTM C 140.
  - 2. Absorption: a maximum moisture absorption rate of 5 percent to ensure adequate freeze-thaw protection.

OR

2.03 [CAST-IN-PLACE LEVELING SLAB](#)

- A. [Provide a Cast-in-place Leveling Slab for the UWS for walls 30 inches or less in height.](#)
  - 1. [Install a Cast-in-place Leveling Slab.](#)
  - 2. [Utilize concrete meeting the requirement of Cast-In-Place concrete Section 03 33 00.](#)

2.04 LEVELING BASE AGGREGATE

- A. Provide non-frost susceptible, well-graded, compacted angular gravel-sand mixture (GW as per ASTM D2487) Leveling Base conforming to ASTM D 2940 and gradation requirements as presented in Table 1.

**TABLE 1  
LEVELING BASE AGGREGATE  
GRADATION REQUIREMENTS**

<b>ASTM D 2940</b>	
<b>Sieve Size</b>	<b>Percent Passing</b>
2 in (50 mm)	100
1-1/2 in (37.5 mm)	95 to 100
3/4 in (19 mm)	70 to 92
3/8 in (9.5 mm)	50 to 70
No. 4 (4.75 mm)	35 to 55
No. 30 (600 µm)	12 to 25
No. 200 (75 µm)	0 to 8*

\* In order to prevent damage by frost heaving, it may be necessary to limit the percentages of material passing the No. 200 sieve to less than shown in the tables.

2.05 BACKFILL AGGREGATE



- A. Provide Base Aggregate materials conforming to ASTM D 2940 and gradation requirements as presented in Table 2.

**TABLE 2  
BACKFILL AGGREGATE  
GRADATION REQUIREMENTS**

<b>ASTM D 2940</b>	
<b>Sieve Size</b>	<b>Percent Passing</b>
2 in (50 mm)	100
1-1/2 in (37.5 mm)	95 to 100
3/4 in (19 mm)	70 to 92
3/8 in (9.5 mm)	50 to 70
No. 4 (4.75 mm)	35 to 55
No. 30 (600 µm)	12 to 25
No. 200 (75 µm)	0 to 8*

\* In order to prevent damage by frost heaving, it may be necessary to limit the percentages of material passing the No. 200 sieve to less than shown in the tables.

#### 2.06 DRAINAGE AGGREGATE FILL

- A. Provide Drainage Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No. 8 as presented in Table 3.

**TABLE 3  
DRAINAGE AGGREGATE  
GRADATION REQUIREMENTS**

<b>ASTM No. 8</b>	
<b>Sieve Size</b>	<b>Percent Passing</b>
½ in (12.5 mm)	100
3/8 in (9.5 mm)	85 to 100
No. 4 (4.75 mm)	10 to 30
No. 8 (2.36 mm)	0 to 10
No. 16 (1.18 mm)	0 to 5

#### 2.07 UNDERDRAINAGE PIPE

- A. Provide a minimum 100 mm (4 inches) Underdrainage Pipe using:
1. Perforated corrugated high density polyethylene (HDPE) meeting ASTM F667.
  2. Perforated polyvinyl chloride (PVC) pipe meeting ASTM D3034.
- B. Protect with Geotextile Fabric to prevent the migration of soil particles into the Underdrainage Pipe.

#### 2.08 GEOTEXTILE FABRIC

- A. Provide Geotextile material conforming to the following performance characteristics, measured per the test methods referenced:
1. 4 oz., nonwoven needle punched 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 D 4632: 115 lbs.

3. Grab Tensile Elongation: ASTM D 4632: 50%
4. Trapezoidal Tear: ASTM D4533: 50 lbs.
5. Puncture: ASTM D4833: 65 lbs.
6. Apparent Opening Size: ASTM D 4751: 0.212 mm, 70 U.S. Sieve
7. Permittivity: ASTM D 4491: 2.0 sec -1
8. Flow Rate: ASTM D 4491: 140 gal/min/s.f.

**Geotextile Fabric as manufactured by the following:**

1. Carthage Mills – FX-40HS
2. U.S. Fabrics – US 115NW
3. Mirafi – 140N
4. OR APPROVED EQUAL

## 2.09 GEOSYNTHETIC REINFORCEMENT

- A. Provide Geosynthetic Reinforcement as supplied by Unilock (add location, address, City, State and Zip)  
Contact: Insert name of local Territory Manager
  1. Stratagrid SGU 60

## 2.10 CONCRETE ADHESIVE

- A. Provide a Concrete Adhesive manufactured by the following:
  1. LePage:
    - a. Product Type: PL Premium Polyurethane construction adhesive
    - b. LePage PL 9000 Heavy Duty construction adhesive
  2. Alliance:
    - a. Product Type: Gator Glue XP Polyurethane construction adhesive
  3. Unilock Concrete Adhesive

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine areas indicated to receive the UWS for compliance with installation tolerances and other conditions affecting performance for the following items before placing any units.
  1. Verify that subgrade preparation, compacted density and elevations conform to minimum specified requirements.
  2. Verify all site services are located outside of UWS construction area unless otherwise noted.
  3. Verify that the Base Aggregate material, thickness, compacted density, surface tolerances and elevations conform to specified requirements.
  4. Verify the Leveling Base Aggregate horizontal alignment conforms to the UWS alignment.
  5. Provide written density test results for soil subgrade, Base Aggregate materials to the Owner, General Contractor and UWS installation subcontractor.
  6. Verify that the subgrade soil is free from standing water.
  7. Verify the UWS structure or excavation limits are within property boundaries and do not cross into adjacent properties unless approved prior to construction.
  8. Verify the UWS drainage system delivers outflow to approved location.
  9. Verify the UWS and associated excavation remains outside of the loading influence of other adjacent structures and ensure stability of excavations and conformance with applicable regulations.
- B. Geotechnical Inspection.
  1. Verify soil parameters and groundwater conditions are acceptable for UWS.
  2. Verify subgrade Bearing Capacity meets or exceeds values required for area to receive UWS.
  3. Identify groundwater conditions and/or other water source prior to UWS installation. Note additional water sources such as seepage from the cut embankment.

4. Ensure that surface water runoff and/or other sources of water are being controlled during construction and directed away from the UWS to a functioning drain.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
  1. Beginning of Level Base Aggregate and Universal Base Units signifies acceptance of the subgrade soil elevations.

### 3.02 CONSTRUCTION TOLERANCES

- A. Verify final elevations for conformance to the drawings after sweeping the surface clean.
  1. Prevent final UWS finished grade elevations from deviating more than  $\pm 3/8$  in. ( $\pm 10$  mm) for finished elevation of top of wall.
- B. Install UWS within the following maximum allowable deviation from:
  1. Vertical control:  $\pm 0.25$  inches over a 10 feet distance,  $\pm 1$  inch total.
  2. Horizontal control:  $\pm 0.25$  over a 10 feet distance,  $\pm$
  3. Rotation:  $\pm 2.0$  degrees
  4. Bulging:  $\pm 0.25$  over a 10 feet distance.
- C. Batter for vertical walls: Plumb wall to eliminate batter.
  1. Rotation:  $\pm 0.5$  degrees from plumb

### 3.03 CONSTRUCTION

#### A. SITE PREPARATION

1. Comply with all current Federal, Provincial/State, and local regulations for execution of the work, including local building codes and excavation regulations. Provide excavation support as required to maintain stability of the area during excavation and SRW construction and to protect existing structures, utilities, landscape features, property, or improvements.
2. Prior to grading or excavation of the site, confirm the location of the SRW and all underground features, including utility locations within the area of construction. Ensure surrounding structures are protected from effects of SRW excavation.
3. Coordinate installation of underground utilities with SRW installation.
4. Control surface water drainage and prevent inundation of the SRW construction area during the construction process.
5. Excavate the foundation soil to the required grades. Trim the subgrade to within 0 to  $1/2$  in. (0 to 13mm) of the specified grades. Do not deviate the surface of the prepared subgrade by more than  $3/8$  in. (10mm) from the bottom edge of a 39 in. (1m) straight edge laid in any direction.
6. Excavated the native soils to the lines and grades indicated in cut situations. Document and remove from the site.
7. Prevent excavated soils being reused onsite from contamination or overly saturate the stockpiled fill material.
8. Prevent damage to underdrain pipes, overflow pipes, observation wells, or inlets and other drainage appurtenances during installation. Report all damage immediately.
9. Compact soil subgrade uniformly to at least 95 percent of Standard Proctor Density per ASTM D 698. Stabilization of the subgrade and/or base material may be necessary with weak or saturated subgrade soils.
10. Do not proceed with further SRW construction, under any circumstances, until the subgrade has been inspected.

**Note:** Base compaction of the subgrade soil on the recommendations of the Design Engineer. Inspect subgrade preparations, elevations and conduct density tests for conformance to specifications.

#### B. GEOTEXTILE FABRIC (Delete if not being used)

1. Provide separation geotextile on bottom and sides of prepared soil subgrade. Secure in place to prevent wrinkling or folding from equipment tires and tracks.
2. Overlap ends and edges a minimum of 18 in. (450 mm) in the direction of drainage.

#### C. LEVELING BASE AGGREGATE

1. Spread Leveling Base aggregate in areas indicated for UWS in accordance with horizontal and vertical alignments.
  2. Compact the Leveling Base Aggregate material with at least two passes per lift using a vibratory plate compactor applying a minimum of 4,000lbs.(18kN) over compacted subgrade soil material. Compact to at least 98 percent Standard Proctor Density as per ASTM D 698.
  3. Tolerance: Do not exceed the specified surface grade of the compacted Base Aggregate material more than  $\pm 3/8$  in. (10 mm) over a 10 ft. (3 m) long straightedge laid in any direction.
- D. UNIVERSAL BASE UNIT (Choose this or Cast-in-place Leveling Slab)
1. Place Universal Base Unit on Leveling Base Aggregate.
  2. Level units in all directions. Do not pitch.
- OR
- D. CAST-IN-PLACE LEVELING SLAB (Choose this or Universal Base Unit)
1. Install formwork for Cast-in-place Leveling Slab to finished grades.
  2. Level formwork in both directions.
  3. Pour Cast-in-place Leveling Slab into the formwork. Consolidate placed concrete using mechanical vibrating equipment.
  4. Strike off excess concrete using screed board, uniform and level to top of formwork.
  5. Finish Cast-in-place Leveling Slab with a smooth trowel surface.
  6. Remove all excess Cast-in-place Leveling Slab concrete remaining outside of formwork from screeding.
- E. U-CARA WALL SYSTEM
1. Place and level Universal Base Unit in both directions over compacted granular base.
    - a. Apply two evenly spaced 1/4 inch beads of Concrete Adhesive top of Universal Base Unit in location of Backer Block base course.
  2. Place Backer Block base course on Concrete Adhesive in the center of the Universal Base Unit alignment grooves in a straight and continuous line.
    - a. Set Backer Block units adjoining unless gap is indicated. Do not exceed two inch opening between Backer Block units. Provide a 1/4 inch expansion gap between units every 50 linear feet.
    - b. Apply one 1/4 inch continuous bead of Concrete Adhesive on each side of Backer Block alignment tongue.
  3. Stack each proceeding Backer Block row with 1/2 unit offset in a running bond pattern. Include 1/4 inch expansion gap each proceeding Backer Block course with alternating alignment.
    - a. Set Backer Block units in vertical or batter application using tongue and groove channels.
  4. Repeat unit desired height is achieved.
    - a. Do not exceed four Standard Backer Block units in heights
    - b. Engineer Large Backer Blocks units to required heights taller than five units in heights.
    - c. Place Geosynthetic Reinforcement layer to overlap Backer Block tongue and groove channels at indicated locations. Roll Geosynthetic Reinforcement layer from back of wall to required length.
  5. Brush Backer Block SureTrack rails to remove any debris. Scrap off any concrete burs.
  6. Prevent U-Cara Fascia Panel exposed face from contacting backs or edges of other units when handling. Protect edges from chipping.
  7. Provide U-Cara Fascia Panels using surface finish and colors as indicated. Set laying patterns as indicated and adjust edges to minimize cutting.
  8. Place Fascia panels on Backer Block SureTrack rails starting at the bottom of the wall. Provide a 1/4 inch expansion gap between Fascia Panel units every 50 linear feet to allow for thermal expansion.

NOTE: Interlock (or Row Lock) Fascia Panels and Backer Block units by overlapping Fascia Panel vertically on two Backer Block units creating a sturdier connection. Check Cut Fascia panels in half for initial row at bottom of the wall.

9. Mix Fascia panels using a minimum of two (2) bundles simultaneously to produce uniform blend of colors and textures.

NOTE: Color variation occurs with all concrete products. This phenomenon is influenced by a variety of factors, e.g. moisture content, curing conditions, different aggregates and, most commonly, from different production runs. By installing from a minimum of two bundles simultaneously, variation in color is dispersed and blended throughout the project.

10. Cut UWS units with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to fit adjoining work. Use full units without cutting where possible.
11. Remove any cracked or structurally damaged UWS units and replace with new units prior to Concrete Adhesive curing.

#### F. UNIVERSAL COPING UNITS

1. Place Universal Coping Units directly on top of UWS unit without using any spacer unit. Fix with Concrete Adhesive.

#### G. DRAINAGE SYSTEM

1. Place the approved Geotextile against the back of the first UWS Unit, over the prepared foundation soil extending towards the back of the excavation, up the excavation face and eventually over the top of the Drainage Aggregate to the back of the UWS units near the top of the wall. Overlap Geotextile a minimum of 30 cm (1 foot) and shingled down the face of the excavation in order to prevent fill migration.
2. Place the Underdrainage pipe to ensure gravity flow of water from the [backfill soil](#). Connect drainage collection pipe at a storm sewer catch basin or daylight along slope at an elevation lower than lowest point of pipe within Reinforced Fill mass, every 15 m (50 feet) maximum.
3. Install chimney or blanket drains if other sources of water are discovered during excavation or anticipated.
4. Fill and cover the Underdrainage pipe and trench with Drainage Aggregate and Geotextile fabric.

#### H. DRAINAGE FILL

1. Provide Drainage Fill between the back of wall and Backfill Aggregate.
2. Place a minimum width of 300 mm (1 ft.) and separated from other soils using the specified Geotextile Fabric.
3. Place Drainage Fill behind the UWS facing in maximum lifts of 150 mm (6 inches) and compacted to a minimum density of 95% Standard Proctor.

#### I. BACKFILL AGGREGATE

1. Provide Backfill Aggregate behind UWS and Drainage Fill with a maximum lift thickness of 150 mm (6 inches) and compacted to a minimum density of 95% Standard Proctor Maximum Dry Density (ASTM D698) at a moisture content from 2% below to 2% above optimum.
2. Slope the last lift of Backfill Aggregate away from the UWS facing to rapidly direct runoff away from the UWS at the end of each day's operation. Prevent surface runoff from adjacent areas to enter the UWS construction area.

#### J. GEOSYNTHETIC REINFORCEMENT (for UWS walls over 30 inches tall)

1. Verify type and primary strength direction of the Geosynthetic Reinforcement.
2. Sweep the top of the UWS Units to ensure the UWS Units are clean and free of debris.
3. Cut Geosynthetic Reinforcement in sheets to the length shown in the Construction Documents.

4. Place Geosynthetic Reinforcement sheets horizontally with the primary strength direction perpendicular to the UWS face and adjacent sheets without overlapping and without gaps between them.
  5. Ensure each Geosynthetic Reinforcement layer corresponds with the correct elevations and Drainage Fill is level to prevent voids.
  6. Place the Geosynthetic Reinforcement over the compacted Backfill Aggregate and the UWS Units with the outside edge extending over the shear key of the UWS Unit to within 25 mm (1 in.) of the front facing unit.
  7. Carefully place subsequent UWS Units on top of the lower course to ensure that no pieces of concrete are chipped off and become lodged between courses. Ensure the Geosynthetic Reinforcement is in complete contact with the top and bottom surfaces of the successive UWS courses.
  8. Pull Geosynthetic Reinforcement taut away from UWS Units during Backfill Aggregate placement. Provide Geosynthetic Reinforcement anchoring pins or staples to ensure that there are no wrinkles or slackness prior to Backfill Aggregate placement. Ensure Geosynthetic Reinforcement lays flat when pulled back perpendicular to the back of the UWS.
  9. Prevent construction equipment from operating directly on top of the Geosynthetic Reinforcement until a minimum thickness of 150 mm (6 inches) of Reinforcement Fill has been placed.
  10. Prevent heavy equipment from within 1 meter (3. Ft.) of the back of the UWS Units.
- K. RETAINED FILL
1. Provide compacted Retained Fill behind the Backfill Aggregate or Drainage Fill in maximum lift thickness of 150 mm (6 inches).
- L. FINISHING SRW
1. Finish grading above UWS to direct surface runoff water away. Grade a swale above the UWS sloping away from back of the wall. Establish final grading immediately to ensure and protect the Backfill Aggregate from water infiltration.
  2. Prevent additional structures (fences, handrails, vehicular guardrails, buildings, pools/ponds, etc.) or changes to grading/loading (increased height, slopes, parking areas, changes in proximity to water flow, etc.), other than those shown in the Construction Documents, from being installed.
  3. Prevent landscaping activities within the Reinforcement Fill to ensure:
    - a. The Geosynthetic Reinforcement is not damaged by excavation for the root ball
    - b. The UWS is not subjected to any additional load from plants or trees.
- 3.05 REPAIRING, CLEANING AND CAULKING
- A. Remove and replace coping units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
  - B. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed wall surfaces; wash and scrub clean.
    1. Clean U-Cara Wall Systems in accordance with the manufacturer's written recommendations.
  - C. **Caulking**
    1. **Caulk coping joints.**
- 3.06 PROTECTION
- A. Protect completed work from damage due to subsequent construction activity on the site.
- END OF SECTION