

32-32-23

## Segmental Retaining Wall

For Olde Quarry, Brussels Dimensional, Estate and Lineo Walls

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 Olde Quarry, Estate and Lineo walls 30 inches or less in height that do not require engineering such as seatwalls and planters. A qualified structural engineer is required for any walls over 30 inches in height intending to support loads such as retaining walls. Please refer to Unilock's reference specification for any walls requiring engineering.*

**SECTION 32 32 23****SEGMENTAL RETAINING WALL****PART 1 GENERAL (30 inch specification)****1.01 SUMMARY**

- A. The work covered by this section includes the furnishing of all labor, materials, equipment, inspection and construction of a modular concrete Segmental Retaining Wall ("SRW") including drainage system and geosynthetic reinforcement. The work included in this section consists of, but is not limited, to the following:
1. Excavation and foundation soil preparation.
  2. Furnish and placement of the Leveling Base.
  3. Furnish and placement of the Drainage system.
  4. Furnish and placement of Geotextile Fabric.
  5. Furnish and placement of SRW units.
  6. Furnish and placement of Geosynthetic Reinforcement.
  7. Furnish, placement, and compaction of Backfill and Drainage Aggregates
  8. Furnish final grading.

**1.02 REFERENCES**

- A. ASTM International, latest edition:
- Segmental Retaining Wall Units
1. C 33, Standard Specification for Concrete Aggregates
  2. C140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
  3. C979, Standard Specification for Pigments for Integrally Colored Concrete.
  4. C1372, Standard Specification for Dry-Cast Segmental Retaining Wall Units
- Aggregate Materials
1. C33, Standard Specification for Concrete Aggregates
  2. D448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction
  3. D2940, Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports
- Geotextile Fabric
1. D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity
  2. D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile
- Soils
1. D698, 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. D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- Drainage Pipe
1. D3034, Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe
  2. F667, Standard Specification for Large Diameter Corrugated Polyethylene (PE) Pipe and Fittings

**1.03 SUBMITTALS**

- A. Segmental Retaining Wall:

1. Samples for verification: Three representative full-size samples of SRW. Thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
  2. Accepted samples become the standard of acceptance for the product produced.
  3. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM 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 concrete SRW on projects of similar nature or project size.
- B. Source Limitations:
1. Obtain SRW from one source location with the resources to provide products of consistent quality in appearance and physical properties.
  2. Obtain Drainage Aggregate and Backfill Aggregate from one source.
  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. SRW Contractor Qualifications:
1. Utilize an installer having successfully completed SRW installation similar in design, material, and extent indicated on this project.
- D. Mockups:
1. Install a 5 linear foot x 2 foot tall SRW.
  2. Use this area to determine installation tolerances. 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 &amp; HANDLING

- A. In accordance with Conditions of the Contract and Division 1 Product Requirement Section.
- B. Deliver SRW in manufacturer's original, unopened and undamaged container packaging with identification labels intact.
  - 1. Coordinate delivery and SRW schedule to minimize interference with other construction activities.
  - 2. Unload SRW 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 SRW 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 SRW from the same production run as installed materials.
- C. Manufacture to supply maintenance and reinstatement manuals for SRW units.

**PART 2 PRODUCTS**

## 2.01 SEGMENTAL RETAINING WALL ("SRW") AND COPING

- A. Basis-of-Design Product: SRW modular, solid, dry-cast concrete blocks based on:
  - 1. Unilock:
    - a. Old Quarry
    - b. Estate
    - c. Lineo
  - 2. As manufactured by:
    - Unilock (Add location)
    - Address
    - City, State and Zip
    - Contact: Insert 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. Product requirements:
  - 1. SRW Type 1: Olde Quarry
    - a. Color: Insert product color

- b. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.
    - 1. Random Bundle:
      - a. 15" unit: 38cm x 11.5cm x 23cm (15in x 4-1/2in x 9in)
      - b. 12" unit: 30.5cm x 11.5cm x 23cm (12in x 4-1/2in x 9in)
      - c. 9" unit: 23cm x 11.5cm x 23cm (9in x 4-1/2in x 9in)
    - 2. Corner unit: 30cm x 11.5cm x 23cm (12in x 4-1/2in x 9in)
    - 3. Coping unit: 30.5cm x 7.5cm x 30.5cm (12in x 3in x 12in)

Note: Imperial dimensions are nominal equivalents to the metric dimensions.
  - c. Plastic Insert Tubes: Furnished with Olde Quarry wall
  - d. LEED: HPD 2.1 or latest transparency data
2. **SRW Type 2: Estate**
- a. Color: [Insert product color](#)
  - b. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.
    - 1. 6 Inch Random Bundle:
      - a. Large unit: 38cm x 15cm x 23cm (15in x 6in x 9in)
      - b. Medium unit: 32cm x 15cm x 23cm (12-1/2in x 6in x 9in)
      - c. Small unit: 25cm x 15cm x 23cm (10in x 6in x 9in)
      - d. Corner unit: 32cm x 15cm x 23cm (12-1/2in x 6in x 9in)
    - 2. 3 Inch Random Bundle:
      - a. Large unit: 38cm x 7.5cm x 23cm (15in x 3in x 9in)
      - b. Medium unit: 32cm x 7.5cm x 23cm (12-1/2in x 3in x 9in)
      - c. Small unit: 25cm x 7.5cm x 23cm (10in x 3in x 9in)
      - d. Corner unit: 32cm x 7.5cm x 23cm (12-1/2in x 3in x 9in)
    - 3. Coping unit: 32cm x 7.5cm x 30cm (12-1/2in x 3in x 12in)

Note: Imperial dimensions are nominal equivalents to the metric dimensions.
  - c. Plastic Insert Tubes: Furnished with Estate wall
3. **SRW Type 3: Lineo Wall System**
- a. Color: [Insert product color](#)
  - b. Face Finish: Standard
  - c. Edge: Square, zero-bevel
  - d. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.
    - 1. XL Rectangle: 60cm x 10cm x 20cm (24in x 4in x 8in)
    - 2. Large Rectangle: 50cm x 10cm x 20cm (20in x 4in x 8in)
    - 3. Rectangle: 40cm x 10cm x 20cm (16in x 4in x 8in)
    - 4. Small Rectangle: 30cm x 10cm x 20cm (12in x 4in x 8in)
    - 5. Corner Unit: 40cm x 10cm x 20cm (16in x 4in x 8in)

Note: Imperial dimensions are nominal equivalents to the metric dimensions.
  - e. Wall Spacer Units: Furnished with Lineo wall
  - d. LEED: HPD 2.1 or latest transparency data
- C. Provide SRW meeting the requirements set forth in ASTM C1372.
- D. Provide SRW meeting the physical properties listed below as tested using ASTM C140:
- 1. Dimensional tolerance shall be +/- 3 mm (1/8 in.) 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).
- E. Provide SRW utilizing an integral groove with plastic connection to create:
- 1. Battered wall
  - 2. Vertical wall (flipping ever other course over)
- F. Accept only pigments in concrete pavers conforming to ASTM C 979.  
Note: ACI Report No. 212.3R provides guidance on the use of pigments.

## 2.02 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.

#### 2.03 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**

ASTM D 2940	
Sieve Size	Percent Passing
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.

#### 2.04 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**

ASTM D 2940	
Sieve Size	Percent Passing
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 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**

ASTM No. 8	
Sieve Size	Percent Passing
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

2.06 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.

2.07 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 meeting these requirements include:

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

2.08 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

2.09 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 SRW for compliance with requirements for installation tolerances and other conditions affecting performance for the following items:
  - 1. Verify that subgrade preparation, compacted density and elevations conform to minimum specified requirements.
  - 2. Verify all site services are located outside of SRW 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 SRW alignment.
  - 5. Provide written density test results for soil subgrade, Base Aggregate materials to the Owner, General Contractor and SRW installation subcontractor.
  - 6. Verify that the subgrade soil is free from standing water.
  - 7. Verify the SRW structure or excavation limits are within property boundaries and do not cross into adjacent properties unless approved prior to construction.
  - 8. Verify the SRW drainage system delivers outflow to approved location.
  - 9. Verify the SRW 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 SRW.
  - 2. Verify subgrade Bearing Capacity meets or exceeds values required for area to receive SRW.
  - 3. Identify groundwater conditions and/or other water source prior to SRW 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 SRW 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 SRW finished grade elevations from deviating more than  $\pm 3/8$  in. ( $\pm 10$  mm) for finished elevation of top of wall.
- B. Install SRW units 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:  $\pm 1.0$  over a 10 feet distance,  $\pm$
  - 3. Rotation:
    - a. For vertical walls:  $\pm 0.5$  degrees from plumb
    - b. For battered walls: maximum 2.0 degrees
  - 4. Bulging:  $\pm 0.5$  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 ½ 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 SRW 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 ±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.

E. INSTALLATION OF SRW TYPES 1 AND 2 UNITS FOR BATTERED WALLS

1. Place the SRW bottom row in the middle of the Leveling Base with the reference dimple facing up. Ensure the SRW Units are aligned properly, leveled from side to side and front to back, and in complete contact with the Leveling Base.
2. Align SRW block grooves to form a continuous channel.
3. Sweep the SRW top clean before placing additional courses to ensure that no dirt, concrete, or other foreign materials become lodged between successive lifts.
4. Place plastic connector tubes in SRW block groove.

5. Secure SRW units to successive course with two 10 mm (3/8 inch) beads of Concrete Adhesive positioned 50mm (2 inches) in front and behind the groove of the last course of SRW Units. Offset continuous bead one inch from SRW groove. Do not allow Concrete Adhesive to dry before placing next row of SRW units.
6. Place successive course and offset SRW units to create a running bond pattern with the edge of all units being approximately aligned with the middle of the unit in the course below it. Place cut SRW half units to ensure the vertical line between adjacent SRW units remains within the middle third of the SRW unit below.
7. Provide Drainage and Backfill Aggregate once three courses above grade have been placed. Backfill with additional aggregates after a maximum of three courses of SRW units have been placed above the previous Backfill and Drainage Aggregate level.
8. Verify no gaps are formed between successive lists affection performance and correct before proceeding with additional lists.
9. Ensure SRW Units and Geosynthetic Reinforcement are not damaged during handling and placement.
10. Prevent heavy equipment, for compaction, fill placement or other, within 1 meter (3 ft.) from back of the SRW Units.
11. Sweep the last SRW course clean of all debris. Run one continuous bead of Concrete Adhesive down each side of the SRW groove. Place coping unit with equal overhand on each side of the SRW units. Align face of coping units to each adjacent coping units.

OR

E. INSTALLATION OF SEGMENTAL RETAINING WALL UNITS FOR VERTICAL WALLS

1. Place the SRW bottom row in the middle of the Universal Base Unit with the reference dimple facing up. Ensure the SRW Units are aligned properly, leveled from side to side and front to back, and in complete contact with the Universal Base Units.
2. Align SRW block grooves to form a continuous channel.
3. Sweep the SRW top clean before placing additional courses to ensure that no dirt, concrete, or other foreign materials become lodged between successive lifts.
4. Secure SRW units to successive course with two 10 mm (3/8 inch) beads of Concrete Adhesive positioned 50mm (2 inches) in front and behind the groove of the last course of SRW Units. Offset continuous bead one inch from SRW groove. Do not allow Concrete Adhesive to dry before placing next row of SRW units.
5. Place successive course with reference dimple facing the reference dimple below and offset SRW units to create a running bond pattern with the edge of all units being approximately aligned with the middle of the unit in the course below it. Place cut SRW half units to ensure the vertical line between adjacent SRW units remains within the middle third of the SRW unit below.
6. Provide Drainage and Backfill Aggregate once three courses above grade have been placed. Backfill with additional aggregates after a maximum of three courses of SRW units have been placed above the previous Backfill and Drainage Aggregate level.
7. Verify no gaps are formed between successive lists affection performance and correct before proceeding with additional lists.
8. Ensure SRW Units and Geosynthetic Reinforcement are not damaged during handling and placement.
9. Prevent heavy equipment, for compaction, fill placement or other, within 1 meter (3 ft.) from back of the SRW Units.

AND/OR

E. INSTALLATION OF SRW TYPE 3 UNITS

1. Center the SRW base course on the Universal Base Units (or Cast-in-place Leveling Slab). Align units in a straight and continuous line.
  2. Mix the SRW units being removed from the bundle and place to produce uniform blend of colors. (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 (2) bundles simultaneously, variation in color is dispersed and blended throughout the project).
  3. Exercise care in handling the SRW units to prevent surfaces from contacting backs or edges of other units. Prevent edges from chipping.
  4. Place SRW spacer units on top of each unit prior to placing the successive course. As each wall unit is placed, install vertical spacer units between each block.
  5. Apply three evenly spaced one inch diameter beads of Concrete Adhesive on each unit.
  6. Offset each row 1/2 unit to overlap joints to produce a running bond pattern utilizing a mixture of all unit sizes.
  7. Cut SRW 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.
  8. Remove any cracked or structurally damaged SRW units and replace with new units prior to Concrete Adhesive curing.
- F. DRAINAGE SYSTEM
1. Place the Geotextile Fabric against the back of the first SRW 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 Fill to the back of the SRW Units near the top of the wall. Overlap Geotextile minimum of 300 mm (1 ft.) and shingle down the face of the excavation in order to prevent the migration.
  2. Provide Underdrainage Pipe in accordance with the overall drainage plan for the site. Slope Underdrainage Pipe to ensure gravity flow of water from the Backfill Aggregate. Connect Underdrainage Pipe at a storm sewer catch basin or daylight along slope at an elevation lower than lowest point of pipe within Backfill Aggregate 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.
- G. 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 SRW facing in maximum lifts of 150 mm (6 inches) and compacted to a minimum density of 95% Standard Proctor.
- H. BACKFILL AGGREGATE
1. Provide Backfill Aggregate behind SRW 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 SRW facing to rapidly direct runoff away from the SRW at the end of each day's operation. Prevent surface runoff from adjacent areas to enter the SRW construction area.
- I. GEOSYNTHETIC REINFORCEMENT (for SRW walls over 30 inches tall)
1. Verify type and primary strength direction of the Geosynthetic Reinforcement.
  2. Sweep the top of the SRW Units to ensure the SRW 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 SRW 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 SRW Units with the outside edge extending over the shear key of the SRW Unit to within 25 mm (1 in.) of the front facing unit.
  7. Carefully place subsequent SRW 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 SRW courses.
  8. Pull Geosynthetic Reinforcement taut away from SRW 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 SRW.
  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 SRW Units.
- J. RETAINED FILL
1. Provide compacted Retained Fill behind the Backfill Aggregate or Drainage Fill in maximum lift thickness of 150 mm (6 inches).
- K. SECURE COPING
1. Sweep the last SRW course clean of all debris.
  2. Secure SRW Coping to SRW Units with two 10 mm (3/8 inch) beads of Concrete Adhesive positioned 50mm (2 inches) in front and behind the groove of the last course of SRW Units.
- L. FINISHING SRW
1. Finish grading above SRW to direct surface runoff water away. Grade a swale above the SRW 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 SRW is not subjected to any additional load from plants or trees.
- 3.04 REPAIRING AND CLEANING
- A. Remove and replace SRW Coping Units that are 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 SRW Units; wash and scrub clean.
    1. Clean SRW Units in accordance with the manufacturer's written recommendations.
- 3.05 PROTECTION
- A. Protect completed work from damage due to subsequent construction activity on the site.
- END OF SECTION