

1 The contract unit price for *Segmental Gravity Retaining Walls* does not include the cost for
 2 ditches, fences, handrails, guardrail or barriers associated with block walls as these items will
 3 be paid for elsewhere in the contract.

4 Where it is necessary to provide backfill material behind No. 57 stone from sources other than
 5 excavated areas or borrow sources used in connection with other work in the contract, payment
 6 for furnishing and hauling such backfill material will be paid as extra work in accordance with
 7 Article 104-7. Placing and compacting such backfill material is not considered extra work but
 8 is incidental to the work being performed.

9 Payment will be made under:

Pay Item	Pay Unit
Segmental Gravity Retaining Walls	Square Foot

10 **SECTION 455**
 11 **PRECAST GRAVITY RETAINING WALLS**

12 **455-1 DESCRIPTION**

13 Construct precast gravity retaining walls consisting of precast retaining wall (PRW) units
 14 supported by concrete footings. Provide CIP concrete slope protection as required. Design and
 15 construct precast gravity retaining walls based on actual elevations, wall dimensions and batter
 16 in accordance with the contract and accepted submittals. Define “precast gravity wall” as a
 17 precast gravity retaining wall and “PRW Unit Vendor” as the vendor licensing the precaster.
 18 Define “slope protection” as CIP concrete slope protection.

19 **455-2 MATERIALS**

20 Refer to Division 10.

Item	Section
Geotextiles, Type 2	1056
Joint Materials	1028-1
Portland Cement Concrete	1000
Select Material, Class VI	1016
Precast Retaining Wall Units	1077
Subsurface Drainage Materials	815

21 Provide Type 2 geotextile for separation geotextiles. Use Class A concrete for footings, Class
 22 B concrete for slope protection and Class VI select material for No. 57 stone. Provide PVC
 23 pipes, fittings, outlet pipes and concrete pads for subsurface drainage materials. For PVC pipes
 24 behind precast gravity walls, use pipes with perforations that meet AASHTO M 278.

25 Provide PRW cap and top units that meet the material requirements for PRW units. Use PRW
 26 units from producers approved by the Department and licensed by the PRW Unit Vendor.
 27 Produce PRW units with a final finish that meets Article 1077-11 except for unit faces. Provide
 28 PRW units with a vertical rock like face and a concrete gray color with no tints, dyes or
 29 pigments. Do not begin unit production until sample PRW units of the type, face and color
 30 proposed for the project are approved.

31 Do not mix PRW units from different PRW Unit Vendors on the same precast gravity wall.
 32 Damaged PRW units with excessive discoloration, chips or cracks as determined by the
 33 Engineer will be rejected. Load, transport, unload and store precast gravity wall materials so
 34 materials are kept clean and free of damage.

Section 455

1 455-3 PRECONSTRUCTION REQUIREMENTS

2 (A) Precast Gravity Wall Surveys

3 The Retaining Wall Plans show a plan view, typical sections, details, notes and an elevation or
4 profile view (wall envelope) for each precast gravity wall. Before beginning precast gravity
5 wall design, survey existing ground elevations shown in the plans and other elevations in the
6 vicinity of precast gravity wall locations as needed. For proposed slopes above or below precast
7 gravity walls, survey existing ground elevations to at least 10 feet beyond slope stake points.
8 Based on these elevations, finished grades and actual precast gravity wall dimensions, details
9 and batter, submit revised wall envelopes for acceptance. Use accepted wall envelopes for
10 design.

11 (B) Precast Gravity Wall Designs

12 For precast gravity wall designs, submit design calculations and working drawings at least 30
13 days before the preconstruction meeting. Note name and NCDOT ID number of the PRW unit
14 production facility on the working drawings. Do not begin precast gravity wall construction
15 until a design submittal is accepted.

16 Design precast gravity walls in accordance with the plans and Article 11.11 of the AASHTO
17 LRFD Bridge Design Specifications unless otherwise required. Neglect material above top of
18 footing for stability computations. Design precast gravity walls for seismic if walls are located
19 in seismic zone 2 based on Figure 2-1 of the Structure Design Manual. Design precast gravity
20 walls for the wall batter required by the PRW Unit Vendor and clearances shown in the plans.
21 Do not locate PRW units or footings outside right-of-way or easement limits.

22 When noted in the plans, design precast gravity walls for a live load (traffic) surcharge of 250
23 lb/sf in accordance with Figure C11.5.6-3(a) of the AASHTO LRFD specifications. For steel
24 beam guardrail with 8 foot posts above precast gravity walls, analyze walls for a horizontal load
25 (PH1) of 300 lb/ft of wall in accordance with Figure 3.11.6.3-2(a) of the AASHTO LRFD
26 specifications. For concrete barrier rail above precast gravity walls, analyze walls for a PH1 of
27 500 lb/ft of wall in accordance with Figure 3.11.6.3-2(a).

28 Use 12 inch thick CIP unreinforced concrete footings beneath PRW units that are continuous
29 at steps and extend at least 6 inches in front of and behind bottom row of PRW units. Embed
30 bottom of footings at least 2 feet below bottom of walls shown in the plans.

31 Fill PRW unit core spaces with No. 57 stone and between and behind units with No. 57 stone
32 for a horizontal distance of at least 18 inches so stone is continuous in all directions. For
33 adjacent PRW units with different depths (front to back), it may be necessary to fill behind units
34 with more than 18 inches of No. 57 stone to make stone continuous. Assume a unit weight of
35 100 lb/cf for No. 57 stone.

36 When noted in the plans, locate a 4 inch diameter continuous perforated PVC drain pipe in the
37 No. 57 stone behind bottom row of PRW units. Separation geotextiles are required between
38 No. 57 stone and backfill or natural ground and between stone and overlying fill or pavement
39 section except when concrete pavement, full depth asphalt or cement treated base is placed
40 directly on stone.

41 At the Contractor's option, use PRW cap or top units at top of walls unless there is a back slope
42 or concrete barrier rail above precast gravity walls. For precast gravity walls with back slopes,
43 use top PRW units only and extend top of walls at least 4 inches above where finished grade
44 intersects PRW top units. When concrete barrier rail is required above precast gravity walls,
45 use concrete barrier rail with moment slab as shown in the plans and do not use PRW cap units.
46 When single faced precast concrete barrier is required in front of and against precast gravity
47 walls, fill voids between barrier and wall faces with Class V select material.

48 Submit working drawings and design calculations for acceptance in accordance with Article
49 105-2. Submit working drawings showing plan views, wall profiles with required resistances,
50 typical sections, No. 57 stone and geotextile locations and details of footings, PRW units, etc.

1 If necessary, include details on working drawings for slope protection, concrete barrier rail with
2 moment slab and obstructions extending through walls or interfering with footings, barriers or
3 moment slabs. Submit design calculations for each wall section with different surcharge loads,
4 geometry or material parameters. When designing precast gravity walls with computer
5 software, a hand calculation is required for the tallest wall section. Provide precast gravity wall
6 designs sealed by an engineer licensed in the state of North Carolina.

7 **(C) Preconstruction Meeting**

8 Before starting precast gravity wall construction, hold a preconstruction meeting to discuss the
9 construction and inspection of the precast gravity walls. If this meeting occurs before all precast
10 gravity wall submittals have been accepted, additional preconstruction meetings may be
11 required before beginning construction of precast gravity walls without accepted submittals.
12 The Resident or Bridge Maintenance Engineer, Bridge Construction Engineer, Geotechnical
13 Operations Engineer, Contractor and Precast Gravity Wall Installer Superintendent will attend
14 preconstruction meetings.

15 **455-4 CONSTRUCTION METHODS**

16 Control drainage during construction in the vicinity of precast gravity walls. Direct run off
17 away from precast gravity walls, No. 57 stone and backfill. Contain and maintain stone and
18 backfill and protect material from erosion.

19 Excavate as necessary for precast gravity walls in accordance with the accepted submittals. If
20 applicable and at the Contractor's option, use temporary shoring for wall construction instead
21 of temporary slopes to construct precast gravity walls. Define "temporary shoring for wall
22 construction" as temporary shoring not shown in the plans or required by the Engineer including
23 shoring for OSHA reasons or the Contractor's convenience.

24 Notify the Engineer when foundation excavation is complete. Do not place concrete for
25 footings until excavation depth and foundation material are approved.

26 Construct CIP concrete footings at elevations and with dimensions shown in the accepted
27 submittals and in accordance with Section 420. Cure footings at least 24 hours before placing
28 PRW units.

29 Stack PRW units with no negative wall batter (wall face leaning forward) so the final wall
30 position is as shown in the accepted submittals. Place PRW units with a maximum vertical
31 joint width of 1/2 inch. Stagger PRW units to create a running bond by centering units over
32 joints in the row below as shown in the accepted submittals. Construct precast gravity walls
33 with the following tolerances:

- 34 A. PRW units are level from front to back and between units when checked with a 4 foot long
35 level,
- 36 B. Wall face is within 2 inches of horizontal and vertical alignment shown in the accepted
37 submittals when measured along a 10 foot straightedge unless otherwise approved, and
- 38 C. Wall batter is within 2 degrees of batter required by the PRW Unit Vendor.

39 Overlap adjacent separation geotextiles at least 18 inches at seams and hold geotextiles in place
40 with wire staples or anchor pins as needed. If a drain is required, install wall drainage systems
41 consisting of drains and outlet components as shown in the accepted submittals and in
42 accordance with Section 815.

43 Place No. 57 stone between and behind PRW units in 8 inch to 10 inch thick lifts. Compact
44 stone with hand operated compaction equipment to the satisfaction of the Engineer. Backfill
45 for precast gravity walls behind No. 57 stone in accordance with Article 410-8. Set PRW cap
46 units with a 1/2 inch to 1-1/2 inch overhang as shown in the plans.

47 Pave slopes above and behind precast gravity walls with slope protection as shown in the plans
48 and accepted submittals and in accordance with Article 462-3. Construct slope protection joints

Section 458

1 at a maximum spacing of 10 feet. Make 1/2 inch thick expansion joints that meet Article 420-
2 10 for every third joint and 1/2 inch deep grooved contraction joints that meet Subarticle 825-
3 10(B) for the remaining joints.

4 **455-5 MEASUREMENT AND PAYMENT**

5 *Precast Gravity Retaining Walls* will be measured and paid in square feet. Precast gravity walls
6 will be measured as the square feet of wall face area with the pay height equal to the difference
7 between top of wall and top of footing elevations. Define “top of wall” as top of PRW cap or
8 top units.

9 The contract unit price for *Precast Gravity Retaining Walls* will be full compensation for
10 providing design, submittals, labor, tools, equipment and precast gravity wall materials,
11 excavating, backfilling, hauling and removing excavated materials and supplying footings,
12 PRW units, select material, wall drainage systems, geotextiles, PRW cap and top units, slope
13 protection and any incidentals necessary to construct precast gravity walls.

14 No separate payment will be made for temporary shoring for wall construction. Temporary
15 shoring for wall construction will be incidental to the contract unit price for *Precast Gravity*
16 *Retaining Walls*.

17 The contract unit price for *Precast Gravity Retaining Walls* does not include the cost for ditches,
18 fences, handrails, guardrail or barriers associated with precast gravity walls as these items will
19 be paid for elsewhere in the contract.

20 Where it is necessary to provide backfill material behind No. 57 stone from sources other than
21 excavated areas or borrow sources used in connection with other work in the contract, payment
22 for furnishing and hauling such backfill material will be paid as extra work in accordance with
23 Article 104-7. Placing and compacting such backfill material is not considered extra work but
24 is incidental to the work being performed.

25 Payment will be made under:

Pay Item	Pay Unit
Precast Gravity Retaining Walls	Square Foot

26 **SECTION 458**
27 **WATERPROOFING AND DAMPPROOFING**

28 **458-1 DESCRIPTION**

29 Waterproof or dampproof concrete surfaces in accordance with these specifications for the
30 particular method of waterproofing or dampproofing called for in the plans. Furnish and apply
31 all asphalt, tar, fabric, asphalt plank and any other materials.

32 **458-2 MATERIALS**

33 Refer to Division 10.

Item	Section
Asphalt Binder	1020-7(B)
Asphalt Primer	1020-7(A)
Tar	1020-7(C)
Woven Cotton Fabric	1020-7(D)

34 **458-3 METHOD A WATERPROOFING**

35 **(A) General**

36 Method A waterproofing consists of one coat of asphalt primer, and 3 mop coats of hot
37 asphalt cement with 2 layers of cotton fabric alternating between the mop coats.