

MURPHEY CANDLER PARK DAM

MAINTENANCE

CITY OF BROOKHAVEN



JULY 28, 2021

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MURPHEY CANDLER PARK DAM

MAINTENANCE

CITY OF BROOKHAVEN GA
 4362 PEACHTREE ROAD NE
 BROOKHAVEN, GA 30319

SEAL

KEY PLAN

SCALE

NO.	DESCRIPTION	DATE

REVISIONS

DRAWN BY	_____	HD
APPROVED BY	_____	SC
CHECKED BY	_____	SC
DATE	_____	07-28-2021

TITLE

COVER

PROJECT NO. 50103407

G-001

SHEET NO.

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REPLACE MISSING ANIMAL GUARDS ON THREE DRAINS (SEE PICTURE 1)

REMOVE ALL TREES WITHIN 3 FEET OF SPILLWAY WALLS (BOTH SIDES OF SPILLWAY)



PICTURE 1



2835 Brandywine Road
Suite 100
Atlanta, GA 30341-4015
678.530.0022

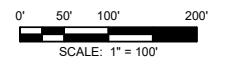
MURPHEY CANDLER PARK DAM
MAINTENANCE

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4362 PEACHTREE ROAD NE
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MAINTENANCE
(1)

PROJECT NO. 50103407

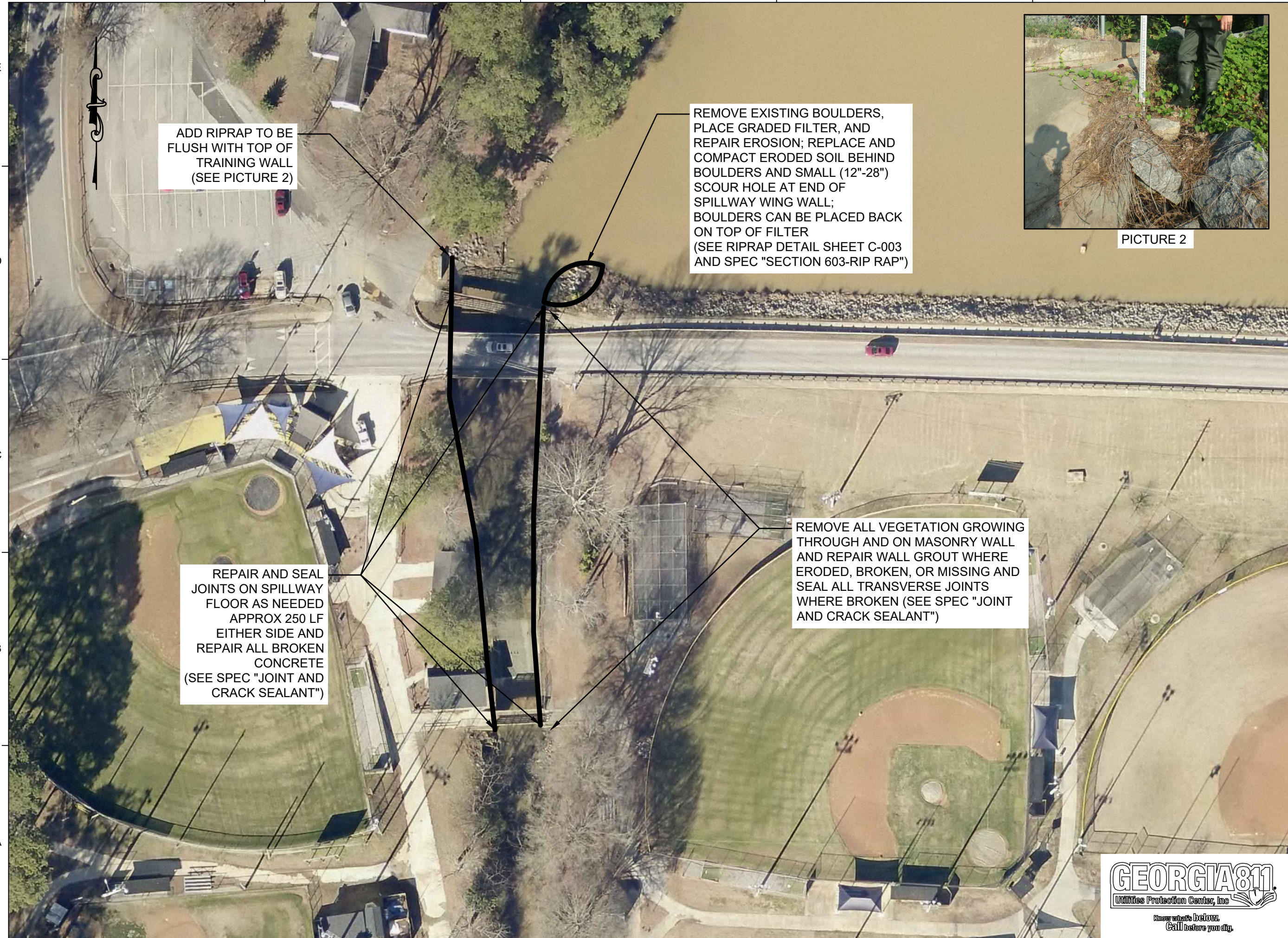
C-001

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ADD RIPRAP TO BE FLUSH WITH TOP OF TRAINING WALL (SEE PICTURE 2)

REMOVE EXISTING BOULDERS, PLACE GRADED FILTER, AND REPAIR EROSION; REPLACE AND COMPACT ERODED SOIL BEHIND BOULDERS AND SMALL (12"-28") SCOUR HOLE AT END OF SPILLWAY WING WALL; BOULDERS CAN BE PLACED BACK ON TOP OF FILTER (SEE RIPRAP DETAIL SHEET C-003 AND SPEC "SECTION 603-RIP RAP")

REPAIR AND SEAL JOINTS ON SPILLWAY FLOOR AS NEEDED APPROX 250 LF EITHER SIDE AND REPAIR ALL BROKEN CONCRETE (SEE SPEC "JOINT AND CRACK SEALANT")

REMOVE ALL VEGETATION GROWING THROUGH AND ON MASONRY WALL AND REPAIR WALL GROUT WHERE ERODED, BROKEN, OR MISSING AND SEAL ALL TRANSVERSE JOINTS WHERE BROKEN (SEE SPEC "JOINT AND CRACK SEALANT")



PICTURE 2



2835 Brandywine Road
Suite 100
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678.530.0022

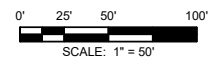
MURPHEY CANDLER PARK DAM
MAINTENANCE

CITY OF BROOKHAVEN GA
4362 PEACHTREE ROAD NE
BROOKHAVEN, GA 30319

SEAL

KEY PLAN

SCALE



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CHECKED BY	_____	SC
DATE	_____	07-28-2021

MAINTENANCE
(2)

PROJECT NO. 50103407

C-002

SHEET NO.

GEORGIA811
Utilities Protection Center, Inc.
Know what's below.
Call before you dig.

**MURPHEY CANDLER PARK DAM
 MAINTENANCE**

CITY OF BROOKHAVEN GA
 4362 PEACHTREE ROAD NE
 BROOKHAVEN, GA 30319

SEAL

KEY PLAN

SCALE

NO.	DESCRIPTION	DATE

REVISIONS	
DRAWN BY	HD
APPROVED BY	SC
CHECKED BY	SC
DATE	07-28-2021

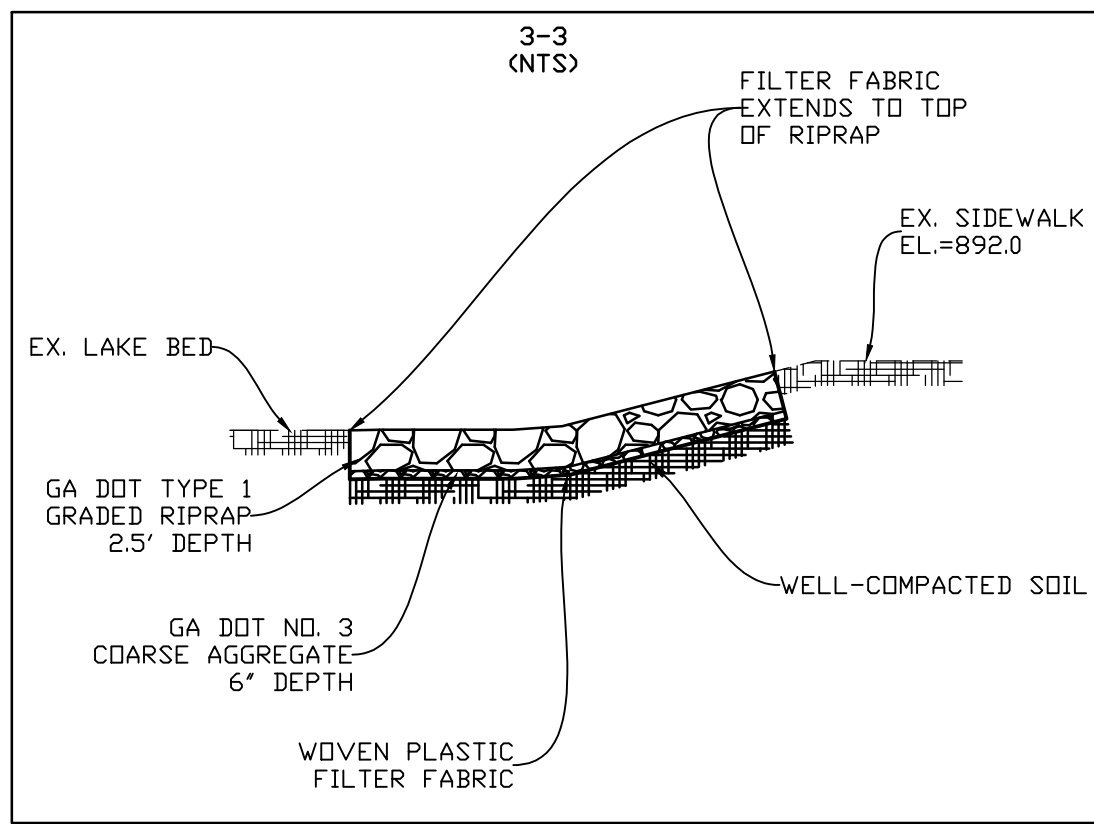
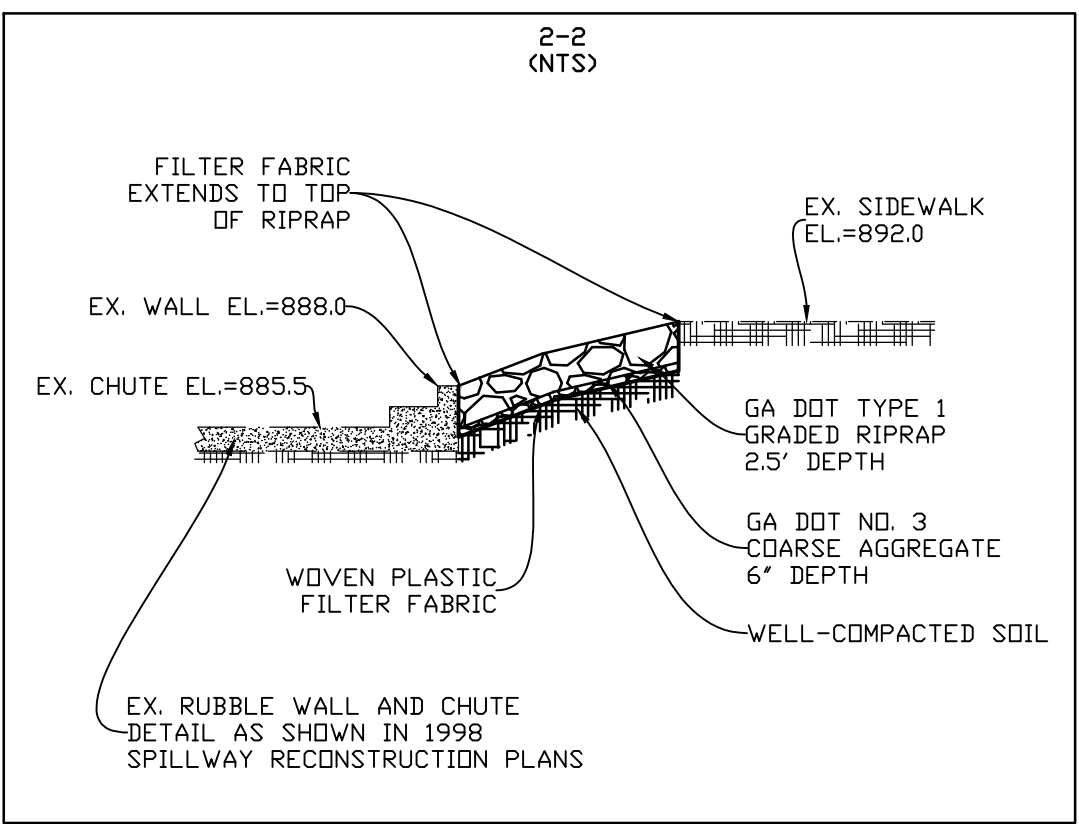
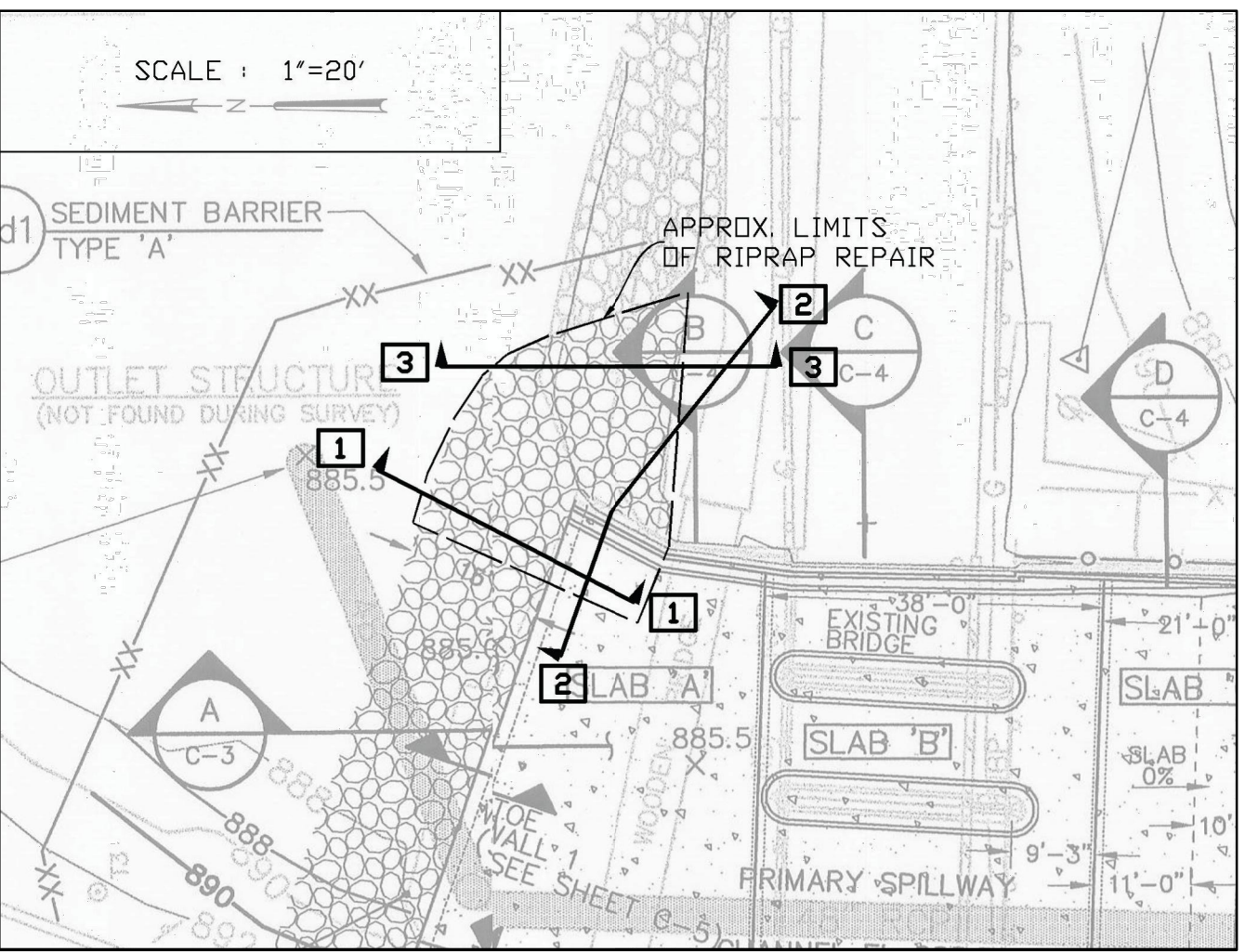
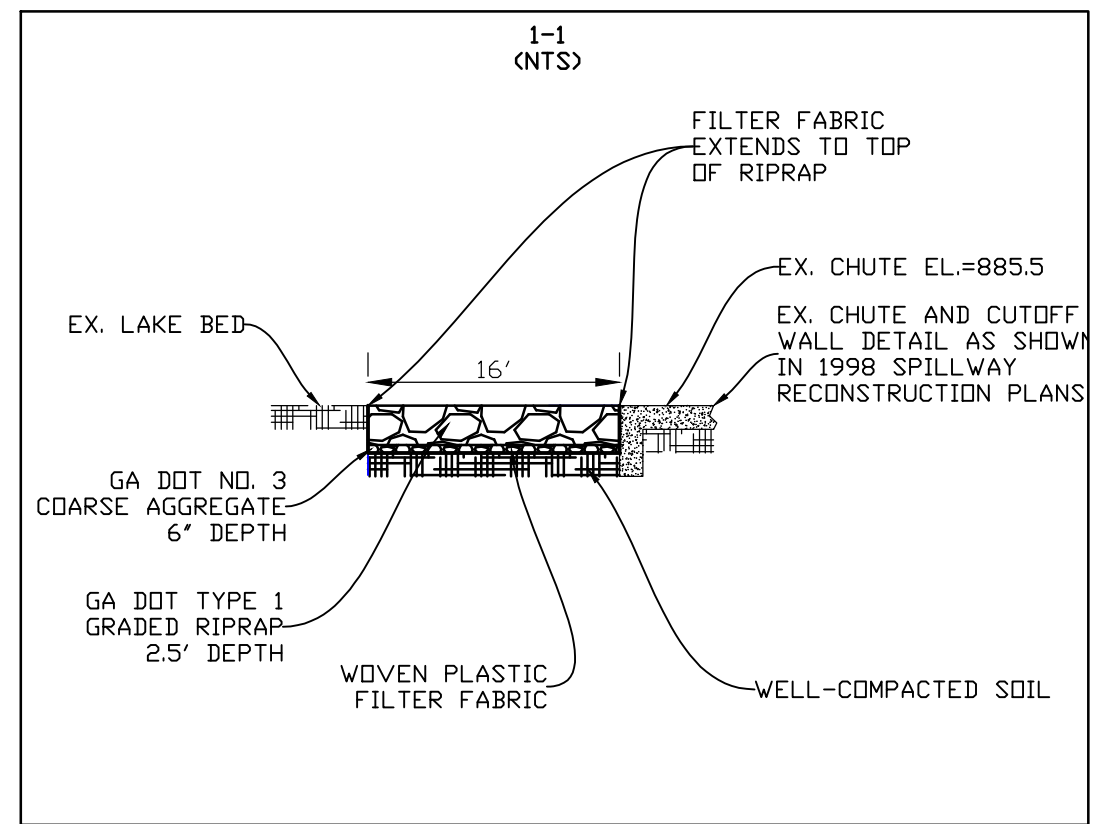
TITLE

**RIPRAP
 DETAIL**

PROJECT NO. 50103407

C-003

SHEET NO.



ALL ELEVATIONS ARE APPROXIMATE. CHUTE AND CUTOFF WALL DATA TAKEN FROM 1998 SPILLWAY RECONSTRUCTION PLANS. RUBBLE WALL AND SIDEWALK DATA ESTIMATED FROM GIS 2' CONTOURS.

RIPRAP: GA DOT SS603 & SS805
 COARSE AGGREGATE: GA DOT SS800
 FILTER FABRIC: GA DOT SS881



Know what's below.
 Call before you dig.

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Section 603—Rip Rap

603.1 General Description

This work includes placing protective coverings of sand-cement bag rip rap or stone rip rap.

When required, this work includes placing crushed stone filter material or plastic filter fabric beneath stone rip rap on:

- Fill slopes
- Cut slopes
- End rolls
- Shoulders
- Ditches
- Stream banks
- Channel banks
- Other locations

603.1.01 Definitions

General Provisions 101 through 150.

603.1.02 Related References

A. Standard Specifications

[Section 800—Coarse Aggregate](#)

[Section 801—Fine Aggregate](#)

[Section 805—Rip Rap and Curbing Stone](#)

[Section 815—Graded Aggregate](#)

[Section 830—Portland Cement](#)

[Section 832—Curing Agents](#)

[Section 880—Water](#)

[Section 881—Fabrics](#)

B. Referenced Documents

AASHTO T 134

[QPL 28](#)

603.1.03 Submittals

General Provisions 101 through 150.

603.2 Materials

Ensure that the materials meet the requirements of the following Specifications:

Material	Specification
Portland cement	830.2.01
Rip Rap (Stone)	805.2.01

Section 603—Rip Rap

Material	Specification
Membrane Curing Compound	832.2.03
Stone Filter Blanket	815.2.01 or 800.2.01 (Size No. 467*)
Fine Aggregate for Sand Cement Rip Rap	801.2.03
Water	880.2.01
Woven Plastic Filter Fabric	881.2.05
*Except that up to 10% is allowed to pass the No. 4 (4.75 mm) sieve.	

A. Bags for Sand-Cement Bag Rip Rap

Use cotton, burlap, or fiber reinforced paper bags that can contain the sand-cement mixture without leaking during handling and placing. Do not use bags that previously held sugar or other material that will adversely affect the sand-cement mixture.

Ensure that the capacity is at least 0.75 ft³ (0.02 m³) but not greater than 2 ft³ (0.5 m³).

B. Stone Dumped Rip Rap

Stone dumped rip rap is designated on the Plans as Type 1 or Type 3 as defined in [Subsection 805.2.01](#).

603.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

603.3 Construction Requirements

603.3.01 Personnel

General Provisions 101 through 150.

603.3.02 Equipment

General Provisions 101 through 150.

603.3.03 Preparation

General Provisions 101 through 150.

603.3.04 Fabrication

General Provisions 101 through 150.

603.3.05 Construction

Construct this Work according to the following requirements:

A. Preparing the Foundations

Prepare the ground surface where the rip rap will be placed to conform with the correct lines and grades before beginning the placement.

1. When filling depressions, compact the new material with hand or mechanical tampers.
Dispose of excess material by spreading it neatly within the right-of-way as an incidental part of the work.
2. Unless otherwise shown or provided below, begin placing the rip rap in a toe ditch constructed in original ground around the toe of the fill or the cut slope.

Section 603—Rip Rap

Ensure that the toe ditch is 2 ft (600 mm) deep in original ground and the side next to the fill or cut has the same slope.

3. After placing the rip rap, backfill the toe ditch and spread the excess dirt neatly within the right-of-way as an incidental part of the work.
4. When beginning rip rap in water or below normal water level, substitute an apron of rip rap for the toe ditch. Ensure that the width and thickness of this apron is as shown on the Plans or determined by the Engineer.

B. Placing Stone Rip Rap

Place rip rap to the limits shown on the Plans or as directed by the Engineer. Place and classify rip rap as follows:

1. Stone Plain Rip Rap

Dump and handle stone plain rip rap into place to form a compact layer to the design thickness.

Ensure that the thickness tolerance for the course is plus 12 in (300 mm) with no under-tolerance. If the Plans do not show a thickness, place stone rip rap to at least 12 in (300 mm) thick, but no greater than 2 ft (600 mm) thick.

2. Stone Dumped Rip Rap

Dump stone dumped rip rap into place to form a uniform surface as thick as specified in the Plans.

- a. Ensure that the thickness tolerance for the course is minus 6 in (150 mm) and plus 12 in (300 mm). If the Plans or Proposal do not specify a thickness, place the course to at least 2 ft (600 mm) thick.
- b. Recycled concrete that meets the requirements of [Subsection 805.2.01](#) may be used instead of stone when shown on the Plans or approved by the Engineer.

Use recycled concrete only when materials do not contain steel after processing.

NOTE: Do not use recycled concrete in aesthetically sensitive areas.

3. Stone Grouted Rip Rap

Place stone grouted rip rap according to specifications for stone plain rip rap and these guidelines:

- a. Prevent earth from filling the spaces between the stones.
- b. After placing the stone, fill the spaces between them with 1:3 grout composed of Portland cement and sand mixed thoroughly with enough water to make a thick, creamy consistency.
- c. Place the grout beginning at the toe. Finish it by sweeping with a stiff bristle broom.
- d. After grouting, cover the rip rap and keep it wet for 5 days, or cover and keep wet for 24 hours and then coat with white pigmented membrane curing compound.

C. Placing Filter

Place woven plastic filter fabric under all rip rap. Follow these requirements for placing the filter fabric:

1. Prepare the surface to receive the fabric until it is smooth and free from obstructions, depressions, and debris.
2. Place the fabric with the long dimension running up the slope. Minimize the number of overlaps.
3. Place the strips to provide a width of at least 1 ft (300 mm) of overlap for each joint.
4. Anchor the filter fabric in place with securing pins of the type recommended by the fabric manufacturer. Place the pins on or within 3 in (75 mm) of the centerline of the overlap.
5. Place the fabric so that the upstream strip will overlap the downstream strip.
6. Loosely place the fabric to prevent stretching and tearing during stone placement.
Do not drop the stones more than 3 ft (1 m) during construction.
7. Always protect the fabric during construction from clogging due to clay, silts, chemicals, or other contaminants.

Section 603—Rip Rap

8. Remove contaminated fabric or fabric damaged during installation or rip rap placement. Replace with uncontaminated or undamaged fabric at no expense to the Department.

D. Placing Sand-Cement Bag Rip Rap

Place rip rap to the limits shown on the Plans or as directed by the Engineer.

1. Proportioning Materials

Mix sand and Portland cement at the maximum ratio of 5:1 by weight.

- a. Obtain a minimum compressive strength of 500 psi (3 MPa) in 7 days.
- b. For sand-cement bag rip rap, use enough water to make up the optimum moisture content of the aggregate and cement as determined by AASHTO T 134.
- c. When sand-cement rip rap is to be prebagged, mix the sand cement dry. After placing each course, wet the bags until the bags are wet enough for proper cement hydration.

2. Placement

Before placing sand-cement bag rip rap, fill the bags full, but allow room to tie the bags.

- a. Place the bagged rip rap by hand with the tied ends facing the same direction. Produce close, broken joints.
- b. Place header courses when directed by the Engineer or required by the Plans.
- c. After placing the bags, ram or pack them against one another to produce the required thickness and form a consolidated mass.
- d. Do not allow the top of each bag to vary more than 3 in (75 mm) above or below the required plane.

E. Placing Stone Blanket Protection

Ensure that the stone blanket protection meets the materials Specifications for stone filter blanket as specified in [Subsection 603.2](#), “Materials,” except stone size No. 357 will be allowed instead of size No. 467.

Place stone blanket protection to the limits shown on the Plans, or as directed by the Engineer.

Uniformly place this material to the thickness shown on the Plans and to a thickness tolerance of 0.5 in (\pm 15 mm).

Do not use stone blanket protection on slopes steeper than two horizontal to one vertical or in areas highly susceptible to erosion. Do not use plastic filter fabrics with stone blanket protection.

603.3.06 Quality Acceptance

General Provisions 101 through 150.

603.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

603.4 Measurement

This work is measured for payment in square yards (meters) of accepted material of the specified thickness. Area measurements are made parallel to the surface on which the material is placed. Plastic filter fabric will be measured as the area of rip rap placed and accepted. No separate measurement will be made for fabric overlap joints, seams, or vertical sections at toe of slopes. No separate measurement is made for grout or cushioning sand.

Plan dimensions are figured by the use of filled bags 12 by 18 by 6 in. (300 by 450 by 150 mm) thick.

When filled bags are less than Plan dimensions or are of varying lengths or width, Plan square yards (meters) will be used to determine pay quantities, if overall dimensions are equal to or greater than those shown on the Plans.

603.4.01 Limits

General Provisions 101 through 150.

Section 603—Rip Rap

603.5 Payment

This work will be paid for at the Contract Price per square yard (meter) of material complete in place.

Payment will be made under:

Item No. 603	Stone plain rip rap ____ in (mm) thick	Per square yard (meter)
Item No. 603	Stone dumped rip rap (<u>type</u>) ____ in (mm) thick	Per square yard (meter)
Item No. 603	Stone grouted rip rap (<u>thick</u>)	Per square yard (meter)
Item No. 603	Filter blanket	Per square yard (meter)
Item No. 603	Sand-cement bag rip rap, ____ in (mm) thick	Per square yard (meter)
Item No. 603	Stone blanket protection, ____ in (mm)	Per square yard (meter)
Item No. 603	Plastic filter fabric	Per square yard (meter)

603.5.01 Adjustments

General Provisions 101 through 150.

Section 800—Coarse Aggregate

800.1 General Description

This section includes requirements for coarse aggregate. All aggregate shall be the specified type, class, and grade, and shall meet the requirements for the intended use.

800.1.01 Related References

A. Standard Specifications

[Section 424—Bituminous Surface Treatment](#)

B. Referenced Documents

AASHTO	ASTM	
T 11	C 277	C 295
T 27	C 289	C 586
T 96	C 294	E 30
T 104		G 23

[GDT 104](#)

[GDT 129](#)

[GDT 133](#)

[QPL 2](#)

800.2 Materials

800.2.01 Coarse Aggregate

A. Requirements

The Contractor shall use the type, group, class, and grade of coarse aggregate specified. For coarse aggregate sources, see [QPL 2](#).

1. Coarse Aggregate Types

Type	Characteristics
Crushed stone	Sound, durable rock particles.
Gravel	Sound, durable rock without damaging coatings.
Air-cooled blast furnace slag	Sound, durable particles with uniform density and quality, or other slags that have a good service record. Dry slag shall weigh at least 70 lb/ft ³ (1120 kg/m ³) compacted and shall contain less than 30% glassy particles by weight. Do not use slag as aggregate for Portland cement concrete.
Synthetic aggregate	Sound, durable, expanded clay, shale, or other manufactured product.

2. Coarse Aggregate Groups

- a. Group I: Limestone, dolomite, marble, or any combination thereof. Ensure Group I aggregates meet the abrasion requirement for Class A stone when used in Portland cement concrete of any type or class.
- b. Group II: Slag, gravel, granitic and gneissic rocks, quartzite, synthetic aggregate, or any combination thereof.

3. Classes

Aggregates are classified by physical properties that determine how they are used.

- a. Do not blend aggregates that meet abrasion requirements with aggregates that do not meet requirements.
- b. “Class A” and “Class B” aggregate used in Portland cement concrete, asphaltic concrete, and bituminous surface treatment shall meet these limits:

Section 800—Coarse Aggregate

Percent Wear AASHTO T 96 (“B” Grading)		
	Class A	Class B
Group I Aggregates	0-40	41-55
Group II Aggregates	0-50	51-60

- c. “Class B” aggregates used in all applications other than Portland cement concrete, asphaltic concrete, or bituminous surface treatment shall meet these limits:

Percent Wear AASHTO T 96 (“B” Grading)	
	Class B
Group I Aggregates	41-55
Group II Aggregates	51-65

4. Soundness

Test coarse aggregate used in Portland cement concrete, bituminous surfaces, bituminous bases, aggregate bases, or surface treatment with five alternations of the magnesium sulfate soundness test.

- a. Use aggregate with a weight loss of less than 15 percent.
- b. The 15 percent soundness loss for a Class “CS” concrete is waived if it has a 5-year service record.
- c. If the material meets all the requirements except for the 15 percent soundness requirement, the material may be used in Zones 3 and 4 (see [Subsection 424.3.05](#), “Construction Requirements”) under the following conditions:
 - 1) The aggregate in bituminous courses and in all types and classes of Portland cement concrete construction, except as stated in Group I, has a satisfactory five-year service record under similar service and exposure.
 - 2) The Engineer’s investigation shows that it equals or exceeds the quality of approved aggregate (in cases where the material’s uniformity changes at the source, or does not have a five-year service record).

5. Grades

Use coarse aggregate that is well graded within the limits and sizes specified in [Table 800.1](#).

6. Detrimental Substances

- a. Detrimental substances include shale, weathered or decomposed rock, friable particles, or any substance that may be detrimental for the use intended..
- b. Do not use any aggregate that can cause a deleterious reaction.
- c. Do not use aggregates that contain Chrysotile (defined as fibrous serpentinite) as a temporary or permanent unbound surfacing for roads, nor as stabilizer for soil used as subgrade, base, or surface course.
- d. Detrimental substances shall not exceed the following limits:

1) For Portland Cement Concrete:

Substance	Max % Allowed
Mica schist—Materials defined in ASTM C 294 as phyllite or schist. Use GDT 104 to analyze these materials.	5
Materials that pass the No. 200 (75 µm) sieve.	1.5
Flat and elongated pieces (with lengths more than five times the average thickness).	10
Sulphur content computed as sulfide sulphur (for bridge-type structures)—If the sulphur content exceeds 0.01%, do not use the aggregate unless it passes a petrographic analysis and a weathering test equivalent to 6 months or more of exposure.	0.01
Other local detrimental substances. (Any Combination)	2.0
NOTE: Do not use aggregate in Portland Cement concrete that is capable of producing a deleterious reaction when combined with Portland Cement.	

2) For Asphaltic Concrete:

Section 800—Coarse Aggregate

Substance	Max. % Allowed
Mica schist—Materials defined in ASTM C 294 as phyllite or schist. Use GDT 104 to analyze these materials. (Use this requirement for Interstate Construction only.)	10
Flat or elongated particles (with lengths more than five times the average thickness).	10
Glassy particles (slag).	30
Other local detrimental substances. (Any combination)	2.0

3) For Bituminous Surface Treatment:

Substance	Max. % Allowed
Mica schist—Materials defined in ASTM C 294 as phyllite or schist. Use GDT 104 to analyze these materials.	10
Material finer than No. 200 (75 µm) sieve.	
#5 Stone	0.5
#6 Stone	0.7
#7 Stone	0.7
#89 Stone	1.0
Flat and elongated particles (with lengths more than five times the average thickness).	10
Glassy particles (slag).	30
Other local detrimental substances. (Any combination)	2

- e. Ensure that gravel used in asphaltic concrete and bituminous surface treatment meets the following additional requirements:
- Consists of siliceous particles.
 - A minimum of 85%, by count, of the material retained on the No. 4 (4.75 mm) sieve has one or more fractured faces.
 - The fracture is for the approximate average diameter or thickness of the particle.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test as follows:

Test	Method
Material that passes the No. 200 (75 µm) sieve	AASHTO T 11
Sulphur content	ASTM E 30, Leco method
Weathering	ASTM G 23
Petrographic analysis	ASTM C 295
Soundness (magnesium sulfate)	AASHTO T 104
Percent wear	AASHTO T 96
Aggregate gradation	AASHTO T 27
Reactivity	ASTM C 227, C 289, and C 586
Schist or phyllite	GDT 104
Flat and elongated particles	GDT 129
Friable Particles	GDT 133

Section 800—Coarse Aggregate

D. Materials Warranty

General Provisions 101 through 150.

TABLE 800.1 - SIZES OF COARSE AGGREGATES

SIZE NO	NOMINAL SIZE SQUARE OPENINGS		AMOUNTS FINER THAN EACH LABORATORY SIEVE (SQUARE OPENINGS). %, BY WEIGHT										
	(1)	mm	2 ½"	2"	1 ½"	1"	¾"	½"	3/8"	No. 4	No. 8	No- 16	No. 50
			63 mm	50 mm	37.5mm	25 mm	19 mm	12.5 mm	9.5 mm	4.75 mm	2.36mm	1.18 mm	300 μm
3	2-1	50 - 25	100	90-100	35-70	00-15	-----	00-5	----	-----	-----	-----	-----
357	2-No. 4	50 - 4.75	100	95-100	-----	35-70	-----	10-30	----	00-5	-----	-----	-----
4	1 ½ -3/4	37.5 - 19	-----	100	90-100	20-55	00-15	-----	00-5	-----	-----	-----	-----
467	1 ½- No. 4	37.5 - 4.75	-----	100	95-100	-----	35-70	-----	10-30	00-5	-----	-----	-----
5	1-1/2	25 – 12.5	-----	-----	100	90-100	20-55	00-10	00-5	-----	-----	-----	-----
56	1-3/8	25 – 9.5	-----	-----	100	90-100	40-75	15-35	00-15	00-5	-----	-----	-----
57	1-No. 4	25 – 4.75	-----	-----	100	95-100	-----	25-60	-----	00-10	00-5	-----	-----
6	¾-3/8	19 – 9.5	-----	-----	-----	100	90-100	20-55	00-15	00-5	-----	-----	-----
67	¾-No. 4	19 – 4.75	-----	-----	-----	100	90-100	-----	20-55	00-10	00-5	-----	-----
68	¾-No. 8	19 –2.36	-----	-----	-----	100	90-100	-----	30-65	05-25	00-10	0-5	-----
7	½-No. 4	12.5 – 4.75	-----	-----	-----	-----	100	90-100	40-70	00-15	00-5	-----	-----
78	½-No. 8	12.5 – 2.36	-----	-----	-----	-----	100	90-100	40-75	05-25	00-10	0-5	-----
8	3/8-No. 8	9.5 – 2.36	-----	-----	-----	-----	-----	100	85-100	10-40	0-10	0-5	-----
89	3/8-No. 16	9.5 – 1.18	-----	-----	-----	-----	-----	100	90-100	20-55	0-15	0-10	0-5
9	No. 4-No. 16	4.75 – 1.18	-----	-----	-----	-----	-----	-----	100	85-100	10-40	0-10	0-5

(1) In inches, except where otherwise indicated. Numbered sieves are those of the United States Standard Sieve Series.

Section 805—Rip Rap and Curbing Stone

805.1 General Description

This section includes the requirements for rip rap and curbing stone. Construction and material will be covered under the Special Provisions.

805.1.01 Related References

A. Standard Specifications

General Provisions 101 through 150.

B. Referenced Documents

AASHTO T 96

AASHTO T 104

ASTM C 295

[GDT 64](#)

805.2 Materials

805.2.01 Rip Rap

A. Requirements

1. Aggregate Quality

All rip rap stone shall be made of sound, durable rock pieces that meet these requirements:

Aggregate Quality	Maximum Percent
Abrasion loss "B" grading	65
Soundness loss	15
Flat and slabby pieces (length five times more than the average thickness)	5
Weathered and/or decomposed pieces and shale	5

2. Gradation for Stone-Dumped rip rap Type 1 and Type 3:

Severe Drainage Conditions or Moderate Wave Action (Type 1)*		
Size By Volume	Approx. Weight	Percent Smaller Than
4.2 ft ³ (0.12 m ³)	700 lbs (320 kg)	100%
1.8 ft ³ (0.05 m ³)	300 lbs (135 kg)	50% - 90%
0.8 ft ³ (0.02 m ³)	125 lbs (55 kg)	20% - 65%
*Between 0% and 15% of the Type 1 rip rap shall pass a 4 in (100 mm) square opening sieve.		

General Use Normal Drainage Conditions (Type 3)*		
Size By Volume	Approx. Weight	Percent Smaller Than
1.0 ft ³ (0.03 m ³)	165 lbs (75 kg)	100%
0.1 ft ³ (0.003 m ³)	15 lbs (7 kg)	10% - 65%
*Between 0% and 15% of the Type 3 rip rap shall pass a 2 in (50 mm) square opening sieve.		

3. Stone for Plain Rip Rap

The stones shall be clean and free of rock dust and fines.

- a. Process the stone so that the largest pieces have a volume of 2 ft³ (0.06 m³) or less.

Section 805—Rip Rap and Curbing Stone

- b. Ten percent or less of the total rip rap weight can consist of spalls that pass a 5 in (125 mm) sieve.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test as follows:

Test	Method
Percent wear	AASHTO T 96
Petrographic analysis	ASTM C 295
Soundness (magnesium sulfate)	AASHTO T 104

D. Materials Warranty

General Provisions 101 through 150.

805.2.02 Curbing Stone

A. Requirements

1. Type 1:

Provide Type 1 curb that meets these requirements:

- a. Curb thickness and height as shown on the Plans
- b. Cut in lengths of not less than 5 ft (1.5 m) nor more than 10 ft (3 m)
- c. Tops dressed to an even, smooth surface for the full length
- d. Have straight, even edges
- e. Top sloped $\frac{1}{4}$ in (6 mm) from back to front
- f. Have squared ends to permit joints to be constructed not more than $\frac{1}{2}$ in (13 mm) wide for the full depth of the curb.
- g. Backface hand dressed at least 4 in (100 mm) below that part of the back that will be exposed
- h. Front face hand dressed to a depth of 1 in (25 mm) below the indicated elevation of the base course, pavement or gutter
- i. Have ends of circular curb sections cut along radial lines to permit joints to be constructed not more than $\frac{1}{2}$ in (13 mm) wide
- j. Circular curb conforms accurately to the required radius
- k. Dressed surfaces do not contain projections or depressions more than $\frac{3}{8}$ in (10 mm) from the plane surface of the curb

2. Type 2:

Provide Type 2 curb that meets these requirements:

- a. Dimensions shall be 5 in (125 mm) thick, 17 in (425 mm) deep, and 5 ft (1.5 m) long, unless otherwise specified.
- b. Front face to have a top margin draught with a smooth face 10 in (250 mm) deep
- c. Have a smooth face (Note: A quarry face may be considered a smooth face if free from holes and all bumps exceeding allowed tolerances are pointed level)
- d. Tops of curbs present even, smooth faces for the full length
- e. Have squared joints that when abutted with adjacent sections, present no crack or joint exceeding $\frac{1}{2}$ in (13 mm) in width
- f. Have ends of circular curb sections cut along radial lines to permit joints to be constructed not more than $\frac{1}{2}$ in (13 mm) wide
- g. Circular curb conforms accurately to the required radius

Section 805—Rip Rap and Curbing Stone

h. The allowable tolerances for Type 2 Curb dimensions are as follows:

Measurement Item	Dimension & Tolerance
Thickness	5 ¼ in (131 mm) +/- ¼ in (6mm)
Depth	17 in (425 mm) +/- 1 in (25 mm)
Top Surface	¼ in (6 mm) in 5 ft (1.5 m)
Side Surface	½ in (13 mm) in 5 ft (1.5 m)

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test for Percent Wear according to AASHTO T 96

D. Materials Warranty

General Provisions 101 through 150.

Section 881—Fabrics

881.1 General Description

This section includes the requirements for the following fabrics:

- Plain cotton duck
- Rubber-impregnated cotton duck
- Burlap and cotton bags
- Plastic filter fabric
- Pavement reinforcement fabric
- Silt fence filter fabric

881.1.01 Related References

A. Standard Specifications

[Section 106—Materials Certification](#)

B. Referenced Documents

Federal Specification CCC-C 419 Type III

ASTM D 36

ASTM D 146

ASTM D 412

ASTM D 1777

ASTM D 3786

ASTM D 4355

ASTM D 4632, GRAB

ASTM D 4751

ASTM D 4833

[GDT 87](#)

[GDT 88](#)

[GDT 95](#)

[QPL 28](#)

[QPL 36](#)

[QPL 40](#)

[QPL 47](#)

881.2 Materials

881.2.01 Plain Cotton Duck

A. Requirements

1. Use plain cotton duck that meets the requirements of Federal Specification CCC-C 419 Type III.

Section 881—Fabrics

2. Ensure that the duck weighs at least 8 oz./yd² (270 g/m²).

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

General Provisions 101 through 150.

D. Materials Warranty

General Provisions 101 through 150.

881.2.02 Rubber-Impregnated Cotton Duck

A. Requirements

1. Use preformed rubber-impregnated fabric pads made of multiple layers of 8 oz (270 g) cotton duck, impregnated and bound with high quality natural rubber, or made of equivalent materials compressed into resilient pads of uniform thickness.
2. Use enough plies to reach the specified thickness after compression and vulcanizing.
3. Ensure that the finished pad withstands compression loads of not less than 10,000 psi (70 MPa) when applied perpendicular to the plane of the laminations. Ensure that the pad does not extrude or harmfully reduce in thickness.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

General Provisions 101 through 150.

D. Materials Warranty

General Provisions 101 through 150.

881.2.03 Burlap Bags

A. Requirements

1. Use burlap bags made of at least 95 percent jute and manila fibers.
2. Use burlap that weighs 8 to 18 oz/10 ft² (250 to 550 g/m²).
3. Use bags with a capacity of 1 to 2 ft³ (0.03 to 0.06 m³).

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

General Provisions 101 through 150.

D. Materials Warranty

General Provisions 101 through 150.

881.2.04 Cotton Bags

A. Requirements

1. Use cotton bags with Osnaburg 40 x 26 thread count and a nominal fabric weight of 6.8 oz/yd² (230 g/m²).
2. Use bags that have 1/2 in (13 mm) sewn seams with at least 1 stitch per 1/5 in (5 mm).

Section 881—Fabrics

- Use 4 or 5 ply, 12 cotton yarn or equivalent for the stitches.
- Ensure that seam efficiency is at least 80 percent. Ensure that the inside measurements tolerance is $\pm 1/2$ in (13 mm).

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

General Provisions 101 through 150.

D. Materials Warranty

General Provisions 101 through 150.

881.2.05 Plastic Filter Fabric

A. Requirements

- Use pervious sheets of plastic yarn made from a long-chain synthetic polymer. Use polymer composes of at least 85 percent by weight of propylene, ethylene, amide, ester, or vinylidene chloride.
Use a sheet of plastic yarn that contains stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultra-violet and/or heat exposure.
- Ensure that the fabric is finished so that the filaments will retain their relative position with respect to each other.
- Use fabric without defects, rips, holes, or flaws.
- Use fabric that meets the following physical requirements for woven and non-woven fabric:

Woven Fabrics	
Tensile strength (any direction)	200 lbs (890 N) minimum
Bursting strength	500 psi (3.5 MPa) minimum
Elongation before breaking	10% to 35%
Percent open area	4.0% to 6.5%
Non-woven Fabrics	
Puncture resistance	30 lbs (135 N) minimum
Grab tensile strength	65 lbs (290 N) minimum
Grab elongation	40% minimum
Flow rate [H from 3 to 1 in (75 to 25 mm)]	50 gal/min/ ft ² (34 liters/second/m ²) (minimum) to 350 gal/ min/ft ² (240 liters/second/m ²) (maximum)

- Seams
 - Get approval on the seams from the Engineer before use on a Project.
 - Use fabric that is sewn with thread of the same chemical requirements as the fabric, or use fabric bound with cement or heat. Either have the fabric bound or sewn at the point of manufacture or at a location approved by the Engineer.
 - Seam Uses: You may use one seam in edge drain and underdrain applications.

Section 881—Fabrics

You may bond or sew fabric together to form sections at least 6 ft (1.8 m) wide for use under rip rap or behind retaining walls.

6. Fabric Use

- a. Use woven fabrics beneath rip rap when dropping stone from 3 ft (1 m) or less.
- b. You may use woven fabrics that meet the flow rate for edge drains.
- c. Use non-woven fabrics to line edge drains, underdrains, or behind retaining walls, where specified.
- d. Do not use non-woven fabrics for filter beneath rip rap.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test according to the following:

Test	Method
Puncture resistance	ASTM D 4833
Tensile strength, elongation, grab strength	ASTM D 4632
Bursting strength	ASTM D 3786
Percent open area	GDT 88
Flow rate	GDT 87

1. See [QPL 28](#) for acceptable woven and non-woven fabrics that meet the requirements of this Specification. See [QPL 47](#) for acceptable Geocomposite wall drains.
2. The Department will reject any fabrics that meet this Specification but fail to perform in actual use.

D. Materials Care and Warranty

Wrap fabric in burlap or similar heavy duty protection during shipment and storage to protect it from mud, dirt, dust, and debris.

881.2.06 Pavement Reinforcement Fabric

A. Requirements

Type I and Type II Pavement Reinforcement Fabric

1. Use pavement reinforcement fabric that has the following properties:
 - Is non-woven, heat-resistant material composed of polypropylene or polyester fibers
 - Can be saturated with asphalt cement
 - Can be placed smooth with mechanical devices and be without wrinkles
 - Can withstand the heat of asphaltic concrete mixes during paving operations
 - Can withstand normal field handling and construction operations without damage

For a list of sources, see [QPL 40](#).

- Meets the following physical requirements. The bid item or Plans will indicate which type of fabric is required for a Project.

	Type I	Type II
Tensile strength, minimum	90 lbs (400 N)	125 lbs (555 N)

Section 881—Fabrics

Elongation at break	40% min., 100% max.	40% min., 100% max.
Asphalt retention, minimum	0.18 gal/yd ² (0.8 L/m ²)	0.28 gal/yd ² (1.3 L/m ²)

2. Submit a certificate from the manufacturer that shows the physical properties of the material used and how it meets this Specification. Submit the certificate according to [Subsection 106.05, “Materials Certification.”](#)
3. Demonstrate to the Department that fabric meeting the physical properties requirements of this Specification has been used successfully in installations with similar environmental and Project conditions.

High Strength Pavement Reinforcement Fabric

1. Use pavement reinforcement fabric that has the following properties:
 - Is a flexible, water-resistant, high-density asphaltic membrane laminated between two layers of high strength, heat resistant polypropylene or polyester fabric.
 - Can be placed smooth with mechanical devices and be without wrinkles.
 - Can withstand the heat of asphaltic concrete mixes during paving operations.
 - Can withstand normal field handling and construction operations without damage.
 - May have a self-adhesive backing adhered to a film release liner.

For a list of sources, see [QPL 40](#).

- Meets the following physical requirements. The bid item or Plans will indicate which type of fabric is required for a Project.

Width, minimum	18 in (450 mm)
Tensile strength, minimum	1,800 lbs/in ² (12 MPa)
Elongation	20% to 50%
Softening Point (Asphaltic membrane), minimum	190 °F (87 °C)
Caliper	0.135 inch (3.43 mm) 95% retained after loading
Pliability (Cold Flex) 2" (50 mm) X 5" (125 mm) specimen, condition specimen at 0 °F (-18 °C) for 1 hour, 180° bend on 2" (50 mm) mandrel	No Separation

2. Submit a certificate from the manufacturer that shows the physical properties of the material used and how it meets this Specification. Submit the certificate according to [Subsection 106.05, “Materials Certification.”](#)
3. Demonstrate to the Department that fabric meeting the physical properties requirements of this Specification has been used successfully in installations with similar environmental and Project conditions.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Type I and Type II Pavement Reinforcement Fabric

Section 881—Fabrics

Test according to the following:

Test	Method
Tensile strength	ASTM D 4632 Grab
Elongation	ASTM D 4632 Grab
Asphalt retention	GDT 95

High Strength Pavement Reinforcement Fabric

Test according to the following:

Test	Method
Tensile strength	ASTM D 412
Elongation	ASTM D 412
Softening Point	ASTM D 36
Caliper	ASTM D 1777
Pliability (Cold Flex)	ASTM D 146

D. Materials Warranty

General Provisions 101 through 150.

881.2.07 Silt Fence Filter Fabric

A. Requirements

1. Use approved silt fence from [QPL 36](#).
 - a. Type “A” and “B” Fences: Use either woven or nonwoven filter fabric for Type “A” and “B” fences. If using woven fabric, the fabric may have slit tape yarns in one direction (warp or fill) only.
 - b. Type “C” Fences: Use non-calendered woven fabric constructed with monofilament yarns only.

NOTE: Approved fabrics must consistently exceed the minimum requirements of this Specification as verified by the Office of Materials and Research. If a fabric is removed from the Qualified Products List, do not use it in the work until the Department has reestablished the product’s acceptability.

2. Ensure that silt fence filter fabrics have the following characteristics:
 - Has strong rot-proof synthetic fibers formed into either a woven or non-woven fabric
 - Has no treatment or coating that might significantly alter its physical properties after installation
 - Contains stabilizers and/or inhibitors to make the filaments resistant to deterioration resulting from exposure to sunlight or heat
 - Makes a pervious sheet of synthetic fibers oriented into a stable network so that the fibers retain their relative position with respect to each other under normal handling, installation, and service conditions
 - Has finished fabric edges to prevent the outer yarn from pulling away from the fabric
 - Has no defects or flaws that would significantly affect its physical and/or filtering properties
 - Meets the following physical or dimensional requirements:

Type Fence	A	B	C

Section 881—Fabrics

Minimum tensile strength, pounds (newtons) (1)	Warp – 120 (530) Fill – 100 (445)	Warp – 120 (530) Fill – 100 (445)	Warp– 260 (1155) Fill – 180 (800)
Elongation (% Max.)	40	40	40
Apparent opening size (max. sieve size)	No. 30 (600 um)	No. 30 (600 um)	No. 30 (600 um)
Flow rate, gal/ min./ft ² (L/min./m ²)	25 (1015)	25 (1015)	70 (2850)
Ultraviolet stability (2)	80	80	80
Bursting strength, psi (kPa)	175 (1200)	175 (1200)	175 (1200)
Minimum fabric width	36 in (900 mm)	22 in (550 mm)	36 in (900 mm)
1. Minimum roll average of five specimens. 2. Percent of required initial minimum tensile strength.			

B. Fabrication

The fabric may be manufactured with pockets for posts, hems with cord, or with posts pre-attached using staples or button head nails.

Ensure that the fabric has the manufacturer’s mark, either with an approved color mark yarn in the fabric or the manufacturer’s name and product trade name labeled on the fabric at a minimum of 100 ft (30 m) intervals.

C. Acceptance

Test according to the following:

Test	Method
Tensile strength	ASTM D 4632
Elongation	ASTM D 4632
Apparent opening size	ASTM D 4751
Flow Rate	GDT 87
Ultraviolet stability	ASTM D 4632 (after 300 hours weathering according to ASTM D 4355)
Bursting strength	ASTM D 3786, Diaphragm Bursting Strength Tester

D. Materials Care and Warranty

Wrap fabric in a heavy-duty protective covering during shipment and storage to protect it from mud, dirt, dust and debris.

Do not expose fabric to temperatures greater than 140 °F (60 °C).

881.2.08 Filter Fabric for Embankment Stabilization

See Special Provision.

JOINT AND CRACK SEALANT

PART 1 - GENERAL

1.1 SUMMARY

1. Furnish all materials, labor, tools, equipment and services necessary for the preparation of the substrate and the application of a joint and crack sealant as indicated by the drawings and specifications.
2. This section specifies components of a concrete repair and protection system that shall be provided by a single manufacturer.

1.2 SUBMITTALS

1. Submittals for any proposed material substitutions shall include written verification that the proposed substitute meets or exceeds all the performance criteria specified in this section. If the proposed substitute does not meet or exceed all the performance criteria specified in this section, submit the respective performance criteria of the proposed substitute, project references demonstrating a proven record of performance, compatibility documentation with entire concrete repair and protection system, and the cost savings to the owner.
2. Submit warranty upon acceptance of work.

1.3 QUALITY ASSURANCE

1. The contractor shall be experienced in concrete repair and protection. This shall be demonstrated by providing five successful concrete repair and protection project references.
2. The manufacturer shall be experienced in concrete repair and protection. This shall be demonstrated by providing proof of producing concrete repair and protection products for a minimum of ten years. Manufacturers that do not comply with the ISO 9001 quality standard in the development, manufacturing, and sale of their products shall not be acceptable.
3. The contractor shall schedule a site meeting with a representative of the product prior to commencement of work.
4. Deliver products in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Store and condition the product in full compliance with the manufacturer's recommendations.

5. The contractor shall supply a complete warranty for workmanship for one year commencing with the date of acceptance of work. The manufacturer shall supply a complete warranty for materials for five years commencing with the date of acceptance of work.

PART 2 - PRODUCTS

2.1 SEALANTS TO BE APPLIED TO JOINTS AND CRACKS

1. The product shall be a two-component, non-sag for vertical and self-leveling for horizontal, polyurethane-based, elastomeric sealant.
2. Any primers, as required, recommended by the manufacturer of the specified product, approved by the engineer.
3. Backer Rod: Closed-cell, dense, polyethylene, extruded rod.
4. Specified product: Sikaflex 2c NS/SL, as manufactured by Sika Corporation, Lyndhurst, New Jersey. The specified product has been selected to establish a minimum standard of quality that will be accepted. The listing of the product is not intended to limit competition, but to establish the standard of quality. Proposed substitutions may be submitted, and shall conform to the standard of quality, as established in these specifications.

2.2 PERFORMANCE CRITERIA

1. Pot life: 3-4 hours.
2. Initial cure (tack-free time): 6-8 hours.
3. Final cure: 3 days, maximum.
4. Tensile Strength (ASTM D-412) at 14 days: > 125 psi.
5. Shore A Hardness (ASTM D-2240): 35 - 45.
6. Movement capability: + or - 50% of average joint width.
7. Adhesion in peel to concrete (TT-S-00227E): > 20 lb.
8. Tear strength (ASTM D-624): > 75 lb./in.
9. The product must be able to perform in total water immersion.

10. The product must be ANSI/NSF Standard 61 approved for potable water contact.
11. Service range: -40°F to 170°F.

PART 3 - EXECUTION

3.1 PREPARATION

1. Joint and crack walls must be sound, clean, dry, frost-free, and free of oil and grease. Remove all traces of the old sealant, dust, laitance, grease, oils, curing compounds, and foreign matter by mechanical means. Blow joint free of dust using a compressed air line equipped with an oil trap.

3.2 APPLICATION

1. Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature is 40°F (5°C) and rising.
2. Prime all substrates as required based upon the recommendations of the manufacturer of the specified product, when field testing indicates need, and when the joints will be subject to immersion after cure, as approved by the Engineer.
3. Install bond breaker tape or backer rod to prevent bond at base of joint or crack and to set depth of sealant between 3/8 to 1/2 inch. Minimum width of joint or crack is 1/4 inch, and maximum width is 2 inches. A 2:1 width to depth ratio is the best design.
4. Place nozzle of sealant gun into bottom of the joint or crack and fill completely. Keep the tip of the nozzle in the sealant and continue with a steady flow of sealant preceding the nozzle to avoid air entrapment. Avoid overlapping of sealant to eliminate entrapment of air. Tool as necessary to properly fill the joint or crack.
5. Adhere to all procedures, limitations and cautions for the product in the manufacturer's current printed literature.

3.3 CLEANING

1. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.