SEE SHEET IL1FOR INDEX OF SHEETS

	BRIDGES TO BE CONSTRUCTED			
BRIDGE NO.	ROAD NO.	LENGTH	STA. TO STA.	LOCATION
1/2A	I-385 SB	201.85'	374+34.76 TO 376+36.61	GARLINGTON RD. & GE RAILROAD OVERPASS
2B	I-385 NB	201.50'	374+96.79 TO 376+98.29	GARLINGTON RD. & GE RAILROAD OVERPASS
3	I-385 NB CD	201.50'	376+37.60 TO 378+39.10	GARLINGTON RD. & GE RAILROAD OVERPASS
4	RAMP 8	148.17'	57+85.53 TO 59+33.70	I-385 NB CD OVERPASS
5	RAMP 1A	1522.83'	72+79.42 TO 88+02.25	I-385 & I-85 OVERPASS
6	RAMP 4B	1962.83'	390+18.50 TO 409+81.33	I-385 & I-85 OVERPASS
7	RAMP 2B	475.00'	34+16.95 TO 38+91.95	I-85 OVERPASS
8	RAMP 3A	254.85'	297+81.45 TO 300+36.30	I-85 OVERPASS
9	RAMP 2A	368.84'	71+70.81 TO 75+39.65	I-85 OVERPASS
10	RAMP 1B	220.05'	69+11.35 TO 71+31.40	RAMP 4B OVERPASS
12	I-385	497.17'	395+34.84 TO 400+32.01	I-85 OVERPASS
BRIDGE PLANS BOUND UNDER SEPARATE COVER				

South Carolina Department of Transportation

PROPOSED PLANS FOR GREENVILLE COUNTY

PROJECT ID 0038111 - R02

INTERSTATE 85 / 385 INTERCHANGE

FROM: 0.20 MILES SOUTH OF S-326
TO: ROAD S-492

PROJECT ID 0038111-R02
INTERSTATE 385
447+60.00 END

PROJECT ID 0038111-R02
INTERSTATE 385
303+89.49 BEGIN

PROJECT ID 0038111-R02
INTERSTATE 85
203+00.00 BEGIN

PROJECT ID 0038111-R02
INTERSTATE 85
STA. 435+00.00 END

GREENVILLE COUNTY MAP

LAYOUT
(NOT TO SCALE)

	I-85	I-385	RAMPS	CD's	TOTAL
NET LENGTH OF ROADWAY	4.394 MILES	2.551 MILES	9.035 MILES	2.867 MILES	18.757 MILES
NET LENGTH OF BRIDGES	- MILES	0.171 MILES	0.938 MILES	0.038 MILES	1.147 MILES
NET LENGTH OF PROJECT	4.394 MILES	2.722 MILES	9.973 MILES	2.905 MILES	19.993 MILES
LENGTH OF EXCEPTIONS	- MILES	- MILES	- MILES	- MILES	- MILES
GROSS LENGTH OF PROJECT	4.394 MILES	2.722 MILES	9.973 MILES	2.905 MILES	19.993 MILES

EQUALITIES IN STATIONING

NONE

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF LETTING.

RELEASE FOR CONSTRUCTION PLANS

CONTRACT ID 5384210

SHEET NO.	TOTAL SHEETS
1	1918

Hydraulic Design Reference for these plans in the:

2009

Edition of SCDOT'S "Requirements for Hydraulic Design Studies"

Design Reference for these plans is the:

2001

AASHTO "A Policy on Geometric Design of Highways and Streets"

UNLESS OTHERWISE NOTED ON TYPICAL SECTION

6	1/9/18	SHEET TOTAL REVISED	B.G.N.
7	5/3/18	SHEET TOTAL REVISED	B.G.N.

NPDES PERMIT INFORMATION

Disturbed Area = 160.5 Acre(s)

Permitted Area = 349.7 Acre(s)

Approximate Location of Roadway is

Begin
Latitude 34° 50' 20' N
Longitude 82° 17' 26' W

End
Latitude 34° 50' 02' N
Longitude 82° 17' 27' W

Hydraulic and NPDES Design provided by:

CECS, Inc.

Designs may be obtained from the SCDOT Regional Production Group

SCDOT REVIEW	RIGHT-OF-WAY INITIAL	RIGHT-OF-WAY DATE	CONSTRUCTION INITIAL	CONSTRUCTION DATE
PRECONSTRUCTION SUPPORT - ROAD				
PRECONSTRUCTION SUPPORT - STRUCTURES				
RPG - DESIGN MANAGER				
RPG - PROGRAM MANAGER				

THE INITIALS ABOVE DO NOT RELIEVE THE ENGINEER OF RECORD OF THE RESPONSIBILITY TO DESIGN THIS PROJECT IN ACCORDANCE WITH ALL APPLICABLE CRITERIA.

ENVIRONMENTAL PERMIT INFORMATION

USACE PERMIT	X YES	NO
NEPA DOCUMENT	X YES	NO
401 CERTIFICATION	X YES	NO
OCRM CAP	YES	X NO
NAVIGABLE WATERS	SC USCG USACE	X N/A

3 DAYS BEFORE DIGGING IN SOUTH CAROLINA

CALL 811

SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

RAILROAD INVOLVEMENT?
(YES) / NO

TRAFFIC DATA

	I-85	I-385
2015 ADT	118,200	106,500
2035 ADT	174,700	171,400
TRUCKS	18 %	18 %

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	1/27/16	SHEET TOTAL REVISED	D.R.R.	B.G.N.
2	5/02/16	SHEET TOTAL REVISED	D.R.R.	B.G.N.
3	5/12/16	SHEET TOTAL REVISED	D.R.R.	B.G.N.
4	6/17/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
5	7/8/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
6	8/9/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
7	8/18/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
8	9/12/16	BRIDGE LENGTHS 1/2A, 2B, 3, SHT. TTL RVSD	D.R.R.	
9	9/28/16	SHEET TOTAL REVISED	B.G.N.	
10	10/21/16	SHEET TOTAL REVISED	B.G.N.	
11	10/28/16	SHEET TOTAL REVISED	B.G.N.	
12	1/12/17	SHEET TOTAL REVISED	B.G.N.	
13	2/2/17	SHEET TOTAL REVISED	B.G.N.	
14	3/16/17	SHEET TOTAL REVISED	B.G.N.	
15	12/18/17	SHEET TOTAL REVISED	B.G.N.	

For Right Of Way Acquisition:

Consultant Engineer of Record — Date

Regional Production Engineer — Date

CONSULTING ENGINEERING FIRM

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.
2000 PARK STREET
SUITE 201
COLUMBIA, S.C. 29201

ENGINEER OF RECORD

SOUTH CAROLINA — CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA — REGISTERED PROFESSIONAL ENGINEER — Faisal Hanna Rady — No. 31591 — FAISAL HANNA RADY

6/7/2018 12:48:12 PM EDT

FOR CONSTRUCTION: _____ DATE

S:\Proj\20II\4II1A\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\Sht_01_Title_I-85.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	3

SCDOT

TYPICAL SECTION OF IMPROVEMENT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
COLUMBIA, S.C.

FOR PGL AND BASELINE LOCATIONS SEE PLAN VIEW AND CROSS SECTIONS

⊗ NOTE:
THIS SLOPE MAY BE VARIED WHEN A DEEPER DITCH IS NECESSARY FOR DRAINAGE PURPOSES, USING A MINIMUM SLOPE OF 12:1 AND A MAXIMUM SLOPE OF 4:1. WHERE A DEEPER DITCH THAN PROVIDED BY A 4:1 IS NECESSARY, THE DITCH SHALL BE PLACED FARTHER FROM THE ℄ CONTINUING THE 4:1 SLOPE TO PROVIDE FOR THE NECESSARY DEPTH. SEE PROFILE FOR THE SPECIAL DITCH GRADES.

* < 5.0' USE 6:1 SLOPE
5.0' - 10.0' USE 4:1 SLOPE
> 10.0' USE 2:1 SLOPE
(USE 4:1 MAX. SLOPE IN INTERCHANGE AREAS WHERE POSSIBLE)

** ADD 3.5' WHERE GUARDRAIL IS ERECTED EXCEPT IN AREAS WITH ADDITIONAL LENGTH POSTS

*** MILLED-IN RUMBLE STRIPS (TYPICAL).

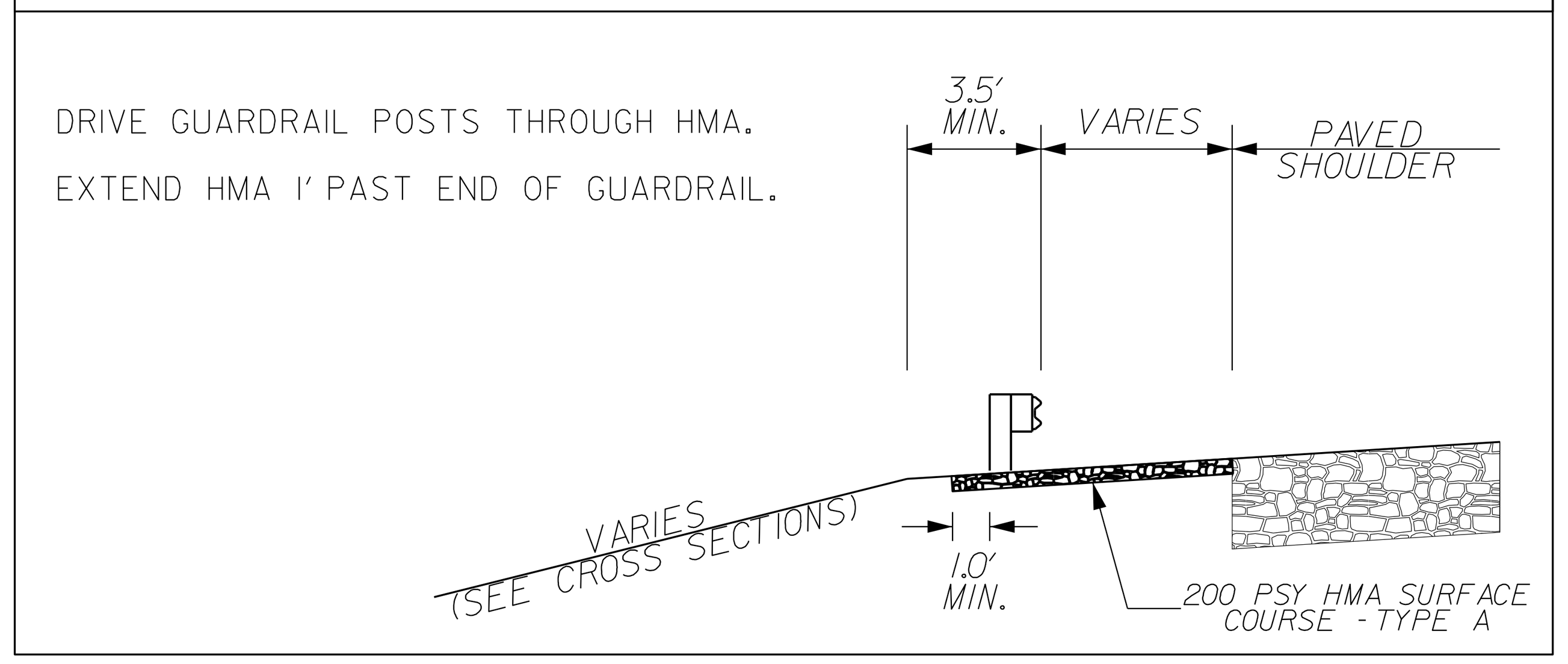
**** IN AREAS WITH OGFC MILL 3" UNIFORM WITH AN ADDITIONAL 1" VARIABLE FOR CROSS SLOPE CORRECTION IN AREAS WITHOUT OGFC MILL MAXIMUM 2"

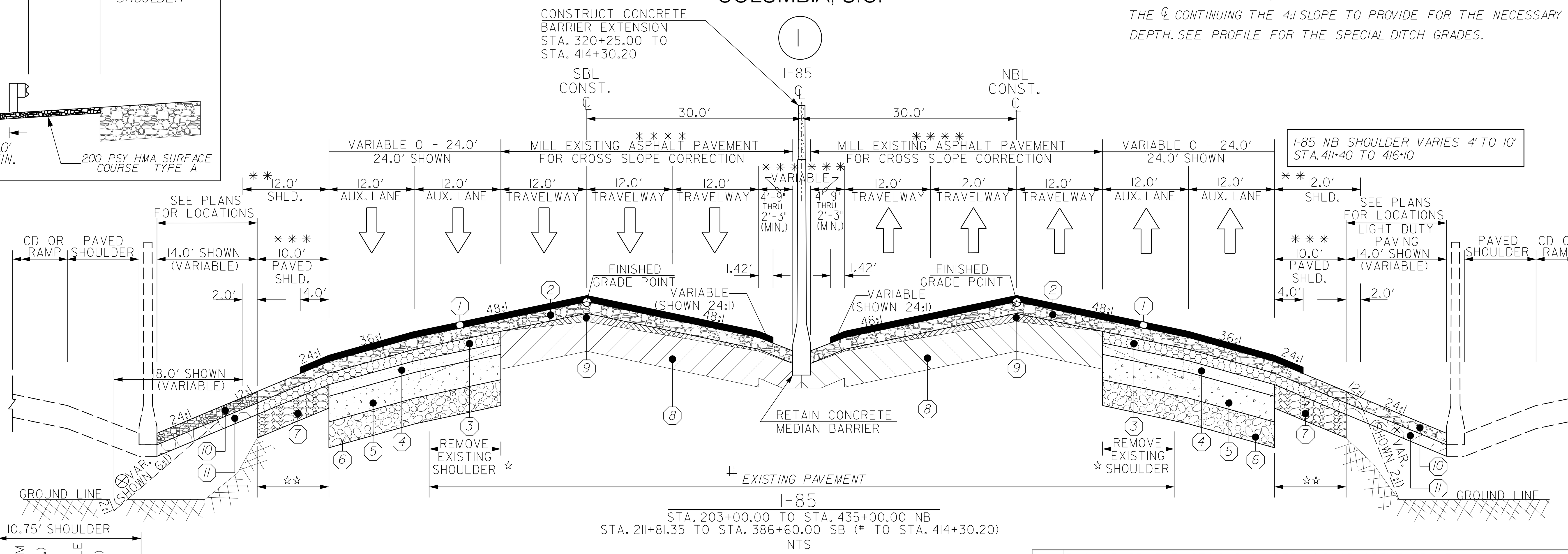
\# STA. 211+81.35 TO STA. 317+18.68 SB. MICRO MILL EXISTING OPEN GRADED FRICTION COURSE AND REPLACE WITH 140 PSY OPEN GRADED FRICTION COURSE. OMIT (2) AND (9)
STA. 386+60.00 TO 414+30.20 SB, MILL 3-INCHES IN AREAS WTIH OGFC AND 2-INCHES IN AREAS WITHOUT OGFC, CORRECT CROSS SLOPE OF EXISTING PAVEMENT, AND PLACE (2) AND 140 PSY OGFC.

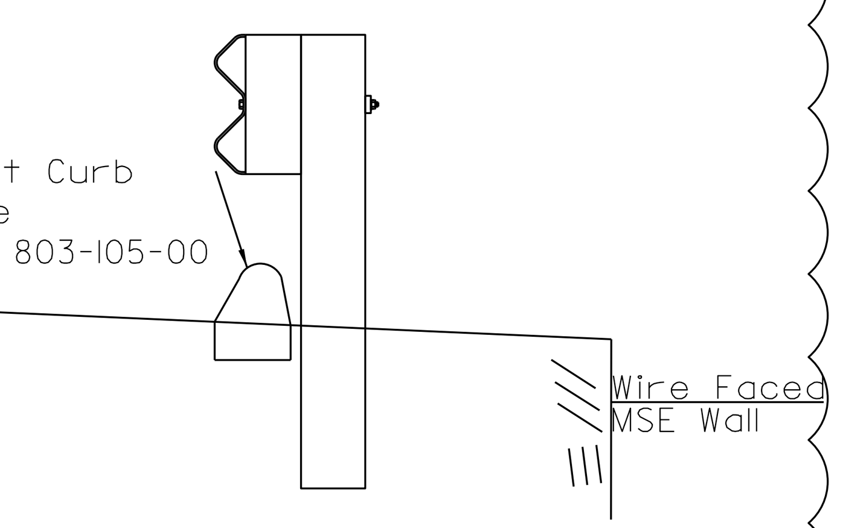
☆ RETAIN EXISTING SHOULDERS
NORTHBOUND:
STA. 251+13.43 TO STA. 294+06.00
STA. 302+87.21 TO STA. 332+96.95
SOUTHBOUND:
STA. 273+75.83 TO STA. 335+60.80

☆☆ FULL DEPTH SHOULDERS (revision 2)
NB STA. 394+38.80 TO STA. 414+00.00
SB STA. 375+00.00 TO STA. 407+00.00
SEE SHEETS 18 & 19 FOR EXTENDED FULL DEPTH SHOULDERS REQUIREMENT
OMIT (7) AND USE (4) (5) AND (6)

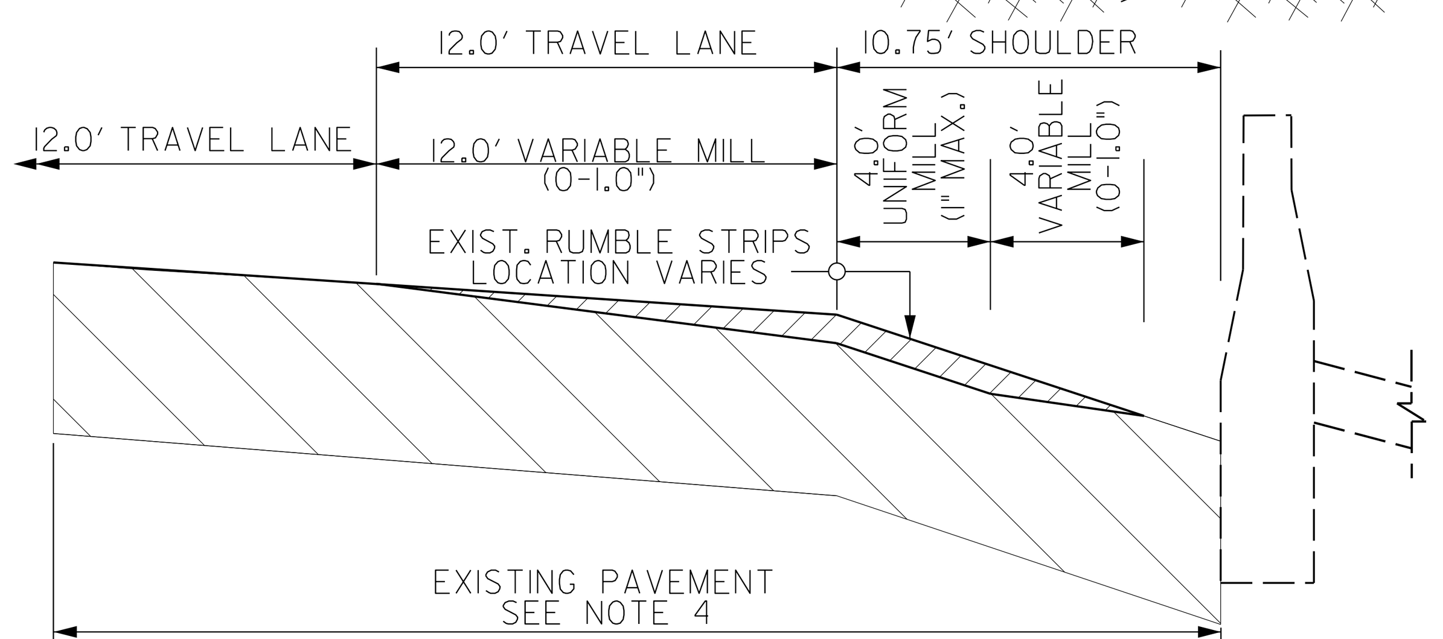
MOW STRIP DETAIL TO BE USED FOR ALL NEW AND REPLACEMENT GUARDRAIL





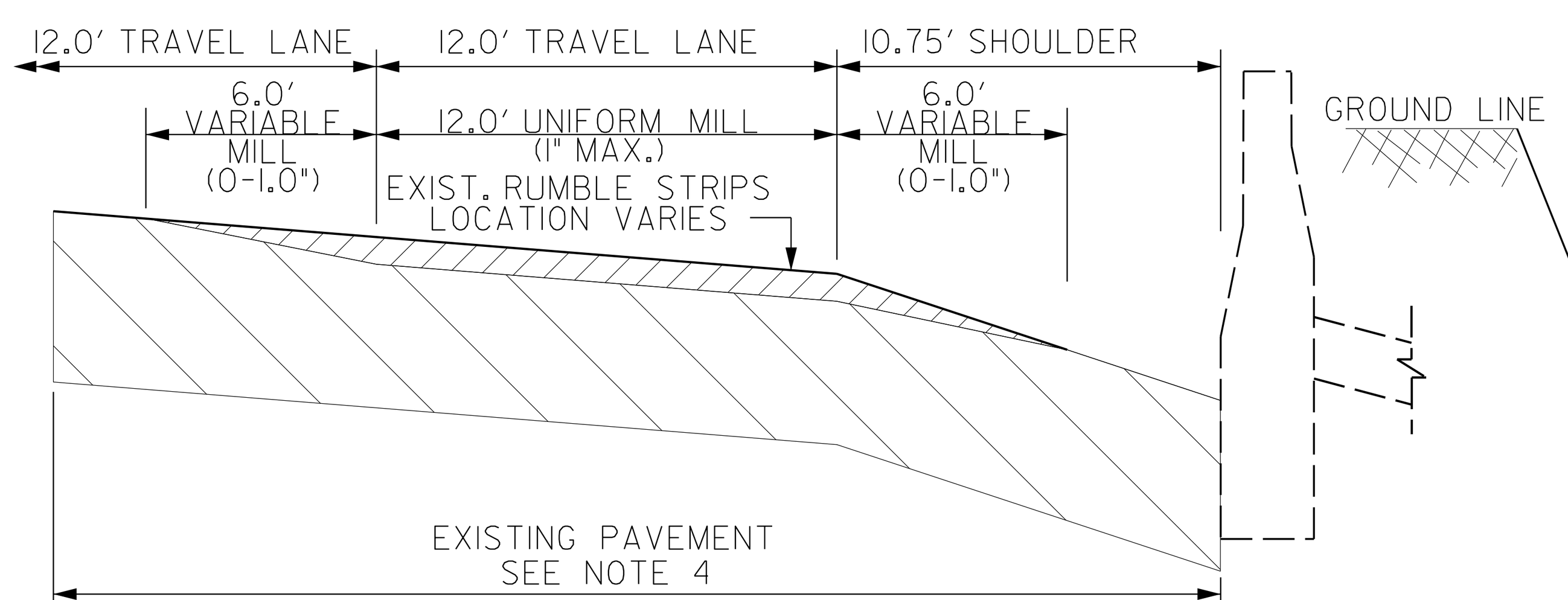


ASPHALT CURB UNDER GUARDRAIL
STA. 413+00.00 TO STA. 415+00.00 NB
NTS

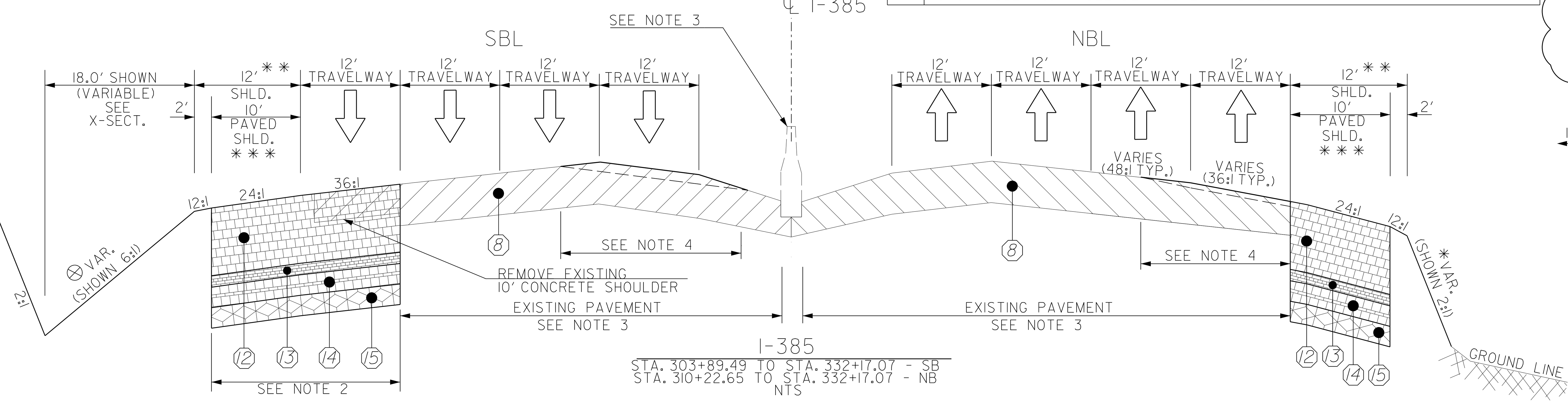


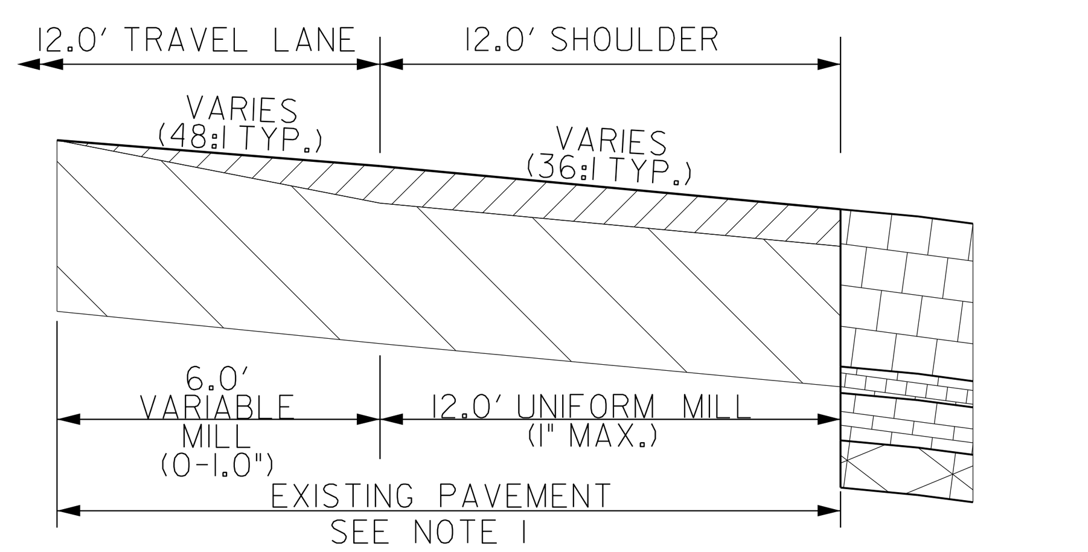
DETAIL 2A

1	DIAMOND GRIND EXISTING SHOULDER AND ADJACENT TRAVEL LANE NORTHBOUND FROM STA. 310+22.65 TO STA. 332+17.07 (SEE DETAIL 1)
2	REMOVE AND REPLACE EXISTING SHOULDER WITH NEW TRAVEL LANE AND NEW SHOULDER SOUTHBOUND FROM STA. 303+89.49 TO STA. 332+17.07
3	EXISTING CONCRETE PAVEMENT AND BARRIER TO BE RETAINED STA. 303+89.49 TO STA. 322+17.07
4	REMOVE EXISTING RUMBLE STRIP SOUTHBOUND FROM APPROX. STA. 224+50 TO STA. 332+17.07 (SEE DETAILS 2A AND 2B)



DETAIL 2B





DETAIL 1

LEGEND

1. OPEN-GRADED FRICTION COURSE (140 PSY)
2. HOT MIX ASPHALT SURFACE COURSE - TYPE A (200 PSY)
3. HOT MIX ASPHALT INTERMEDIATE COURSE - TYPE B (200 PSY)
4. HOT MIX ASPHALT BASE COURSE - TYPE A (300 PSY)
5. CEMENT STAB. AGGR. BASE CR. (10" UNIF.)
6. CEMENT MODIFIED SUBBASE (8" UNIFORM)
7. CEMENT STAB. AGGR. BASE CR. (9" UNIF.)
8. RETAIN EXISTING PAVEMENT
9. STRENGTHENING AND LEVELING: (≤ 2") ASPH. SURF. COURSE TYPE E; (> 2") ASPH. SURF. COURSE TYPE B
10. HOT MIX ASPHALT SURFACE COURSE - TYPE D (150 PSY)
11. GRADED AGGREGATE BASE COURSE (6" UNIFORM)
12. PLAIN JOINT CONCRETE PAVEMENT (13" UNIFORM)
13. FABRIC INTERLAYER
14. CEMENT STAB. AGGR. BASE CR. (6" UNIF.)
15. CEMENT MODIFIED SUBBASE (6" UNIFORM)
16. MILLING OF EXISTING PAVEMENT (0" - 3")

DESIGN SPEED			
MPH	FROM STA.	TO STA.	
65	203+00.00	435+00.00	I-85
65	303+89.49	332+17.07	I-385
EXCEPTIONS TO DESIGN SPEED			

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	03/08/16	MODIFIED "☆" NOTE	D.R.R.	B.G.N.
2	07/22/16	ADD ASPHALT CURB DET. & EXT. SHLDR NOTE	D.R.R.	B.G.N.
3	06/02/17	ADDED MOW STRIP DETAIL	B.G.N.	R.L.K.
4	5/3/18	REVISED I-85 SB END STA., ADDED I-85 NB REDUCED SHOULDER NOTE	B.G.N.	P.H.R.

DRAWN BY: A.W.F. DATE: 6/10/15
REVIEWED BY: B.A.H. DATE: 09/04/15
APPROVED BY: B.G.N. DATE: 09/20/15

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD No. 13591
6/7/2018 12:48:11 PM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

I-85 / I-385 INTERCHANGE

TYPICAL SECTION

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	3E

GEOTECHNICAL NOTES

MAIN INTERCHANGE

The following notes apply to borrow materials:

Provide borrow materials meeting the following minimum requirements:

- **A sandy material (35% or less passing 0.075 mm) with a minimum total soil unit weight, γ of 110 pcf, with a maximum dry density exceeding 100 pcf.**
- **Minimum friction angle, φ, of 30°and cohesion, c, of 50 psf for embankment fill.**
- **No. 57 Stone backfill for Mechanically Stabilized Earth Walls**

Walls 32 and 36 will require an embankment fill with a minimum friction angle, φ, of 32°and cohesion, c, of 50 psf. This requirement is between alignment Ramp 4, Stations 50+50 and 52+50.

In addition, determine the moisture-density relationship and classification of the material. Test and submit the classification, moisture-density relationship, and soil strength parameters of the material to the Engineer for acceptance. An AASHTO certified laboratory is required to perform the testing. Contact the RPG Geotechnical Engineer for a list of locally available AASHTO certified laboratories. The Department may perform independent testing to assure quality.

Determine the friction angle and cohesion using either direct shear testing or consolidated-undrained triaxial shear testing with pore pressure measurements. Direct Shear testing shall only be performed on soils with a fines content of less than 25 percent. Classification testing includes grain-size distribution with wash #200 sieve, moisture plasticity testing and natural moisture content. Use the Standard Proctor test to determine the moisture-density relationship. Remold all samples used in shear strength testing to 95 percent of the Standard Proctor density. Conduct shear strength testing at the initial selection of the borrow pit, any subsequent changes in borrow pits, and for every 10,000 cy of materials placed. Perform classification testing for every 50,000 cy of materials placed, including the material used for the shear strength testing. Additional shear testing may be required if, in the opinion of the RCE, the materials being placed are different from those originally tested.

If these minimum criteria cannot be met, provide the soil parameters for the intended borrow excavation material for the project site to the Engineer for review and acceptance. After acceptable borrow material is obtained, compact the fill to the required finish grade line using the compactive effort indicated in the Standard Specifications for Highway Construction, Section 205 (Embankment Construction).

The following notes apply to muck excavation:

Any areas identified on the plans and any additional areas that are discovered to deflect or settle may require corrective action as directed by the RCE. This may include undercutting, placing No. 57 stone aggregate that is separated from other borrow materials by a geotextile for separation of sub-grade and sub-base, and/or additional compactive effort to the approval of the RCE.

In areas that require mucking or undercutting, borrow material soil may be placed as a bridge lift as long as the grade on which the material is being placed is at least 2 feet above ground water level. In the event that groundwater does not allow backfilling with a borrow material soil, use a No. 57 stone as the bridge lift material. Borrow material bridge lifts may not exceed a 2-foot thickness. The depth at which mucking or undercutting is required is dependent upon encountering a suitable bearing material within the excavation or if a predetermined elevation or depth is required. In most cases, do not undercut more than 3 to 5 feet. The RCE will determine the final mucking or undercutting thickness, unless otherwise specified in the project plans and/or specifications. If a suitable bearing soil is not encountered within this depth range, place a P1 biaxial geogrid with an aperture size of less than or equal to 1 inch and in accordance with the project special previsions beneath a 2-foot thick bridge lift of No. 57 stone. If additional compacted borrow material soil is needed to reach grade, place a geotextile for separation of sub-grade and sub-base between the No. 57 stone and the overlying compacted soil. A bridge lift consisting of borrow material soil may not be placed within 3 feet of the base of the pavement section. Place only compacted borrow material soil or No. 57 stone within this zone. Reference the Standard Specifications for Highway Construction, Earthwork Section, Division 200.

The following notes apply for settlement and displacement monitoring:

The contractor shall establish a monitoring program consisting of settlement instruments. The settlement monitoring program must include establishing settlement monitoring instruments on the subgrade soils prior to fill placement, and at design pavement subgrade elevation. Settlement monitoring instruments are required at a spacing of every 100 feet along MSE Walls and every 500 feet along embankments with new fill thicknesses exceeding 20 feet. Instruments shall be established at the centerline of road and edge of pavement. Settlement monitoring shall continue until three consecutive measurements demonstrate the rate of settlement is less than 0.1 inches per year. No more than one measurement shall be obtained on a single day.

A minimum of 2 measurements shall be obtained on monuments prior to fill placement, and instruments shall be measured weekly during fill placement. Instrumentation measurements shall be provided to the Geotechnical Engineer within 24 hours of measurements for interpretation. Interpreted results shall be provided to the RCE.

The following notes apply to slope construction:

Where the new fill meets the existing slope, the existing slope shall be benched to limit the potential for a preferential failure surface and to allow compaction at the interface. Benches shall have a minimum horizontal length of 8 feet and a vertical rise of no more than 3 feet. Fill slopes of 2H:1V or steeper shall be overbuilt (i.e. fill should temporarily extend beyond the final slope face) to allow compaction at the slope face. After compaction is complete, the slope may be regraded to the final inclination.

Should seeps or thick lenses of highly plastic soils be observed in the planned fill and cut slopes that are steeper than 2H:1V, ECS must be contacted to determine if the steeper slopes may be constructed as planned or if slope flattening or reinforcing is required. Similarly, if soft or wet ground conditions are observed at the base of planned fill embankments, the QA representative must determine the limits of undercutting required or required in-situ treatment.

I-85 STA. 375+00 TO PELHAM RAMP

The following notes apply to borrow materials:

Provide borrow materials meeting the following minimum requirements:

- **A sandy material (35% or less passing 0.075 mm) with a minimum total soil unit weight, γ of 110 pcf, with a maximum dry density exceeding 100 pcf.**
- **Minimum friction angle, φ, of 30° and cohesion, c, of 50 psf for embankment fill, alternatively embankment fill may consist of a minimum friction angle (φ) of 34° with zero cohesion.**
- **No. 57 Stone backfill for Mechanically Stabilized Earth Walls**

In addition, determine the moisture-density relationship and classification of the material. Test and submit the classification, moisture-density relationship, and soil strength parameters of the material to the Engineer for acceptance. An AASHTO certified laboratory is required to perform the testing. Contact the RPG Geotechnical Engineer for a list of locally available AASHTO certified laboratories. The Department may perform independent testing to assure quality.

Determine the friction angle and cohesion using either direct shear testing or consolidated-undrained triaxial shear testing with pore pressure measurements. Direct Shear testing shall only be performed on soils with a fines content of less than 25 percent. Classification testing includes grain-size distribution with wash #200 sieve, moisture plasticity testing and natural moisture content. Use the Standard Proctor test to determine the moisture-density relationship. Remold all samples used in shear strength testing to 95 percent of the Standard Proctor density. Conduct shear strength testing at the initial selection of the borrow pit, any subsequent changes in borrow pits, and for every 10,000 cy of materials placed. Perform classification testing for every 50,000 cy of materials placed, including the material used for the shear strength testing. Additional shear testing may be required if, in the opinion of the RCE, the materials being placed are different from those originally tested.

If these minimum criteria cannot be met, provide the soil parameters for the intended borrow excavation material for the project site to the Engineer for review and acceptance. After acceptable borrow material is obtained, compact the fill to the required finish grade line using the compactive effort indicated in the Standard Specifications for Highway Construction, Section 205 (Embankment Construction).

The following notes apply to muck excavation:

Any areas identified on the plans and any additional areas that are discovered to deflect or settle may require corrective action as directed by the RCE. This may include undercutting; placing No. 57 stone aggregate that is separated from other borrow materials by a geotextile for separation of sub-grade and sub-base, and/or additional compactive effort to the approval of the RCE.

In areas that require mucking or undercutting, borrow material soil may be placed as a bridge lift as long as the grade on which the material is being placed is at least 2 feet above ground water level. In the event that groundwater does not allow backfilling with a borrow material soil, use a No. 57 stone as the bridge lift material. Borrow material bridge lifts may not exceed a 2-foot thickness. The depth at which mucking or undercutting is required is dependent upon encountering a suitable bearing material within the excavation or if a predetermined elevation or depth is required. In most cases, do not undercut more than 3 to 5 feet. The RCE will determine the final mucking or undercutting thickness, unless otherwise specified in the project plans and/or specifications. If a suitable bearing soil is not encountered within this depth range, place a P1 biaxial geogrid with an aperture size of less than or equal to 1 inch and in accordance with the project special provisions beneath a 2-foot thick bridge lift of No. 57 stone. If additional compacted borrow material soil is needed to reach grade, place a geotextile for separation of sub-grade and sub-base between the No. 57 stone and the overlying compacted soil. A bridge lift consisting of borrow material soil may not be placed within 3 feet of the base of the pavement section. Place only compacted borrow material soil or No. 57 stone within this zone. Reference the Standard Specifications for Highway Construction, Earthwork Section, Division 200.

The following notes apply for MSE Wall Subgrades:

Prior to construction of the leveling pad and MSE fill, the RCE shall verify that the retaining wall is founded on subgrade materials possessing the minimum allowable bearing capacity noted on wall plan and elevation sheets. If the RCE determines that the subgrade is unacceptable for placement of MSE fill, the contractor shall undercut the subgrade to the limits directed by the RCE. Unacceptable subgrade materials include, but are not limited to, all high plasticity clays and elastic silts (CH, MH), low plasticity clays and silts (CL, ML) with an unconfined compressive strength less than 2,000 psf, and deleterious debris. Replacement of undercut material will be with Backfill Material, meeting requirements outlined in the SCDOT Standard Specifications for Highway Construction.

The foundation area for the MSE walls might have scattered pockets of soft soils that might be present at the surface or just below the surface for the base of the MSE fill. These soft pockets are only expected to extend a few feet below the base of the MSE fill. The quality assurance representative shall proofroll the subgrade in this area and/or conduct dynamic cone tests at regular intervals to determine that the subgrade meets the requirements of the paragraph above.

There are several locations along the roadway alignment where proposed drainage structures are situated in front of (i.e. parallel) MSE walls, or where new and existing draining structures pass beneath the MSE walls. Where new pipes are parallel to the proposed wall, the pipe should be installed prior to the proposed wall or the wall design should account for the temporary reduction in passive resistance. Where pipes pass beneath walls, the pipes should be designed to account for the increased loading associated with the wall backfill. We recommend the top of each pipe be situated a minimum of 1 foot below the bottom of retaining.

The following notes apply for settlement and displacement monitoring:

The contractor shall establish a monitoring program consisting of settlement instruments. The settlement monitoring program must include establishing settlement monitoring instruments on the subgrade soils prior to fill placement, and at design pavement subgrade elevation. Settlement monitoring instruments are required at a spacing of every 100 feet along MSE Walls and every 500 feet along embankments with new fill thicknesses exceeding 20 feet. Instruments shall be established at the centerline of road and edge of pavement. Settlement monitoring shall continue until three consecutive measurements demonstrate the rate of settlement is less than 0.1 inches per year. No more than one measurement shall be obtained on a single day.

A minimum of 2 measurements shall be obtained on monuments prior to fill placement, and instruments shall be measured weekly during fill placement. Instrumentation measurements shall be provided to the Geotechnical Engineer within 24 hours of measurements for interpretation. Interpreted results shall be provided to the RCE.

The following notes apply to slope construction:

Where the new fill meets the existing slope, the existing slope shall be benched to limit the potential for a preferential failure surface and to allow compaction at the interface. Benches shall have a minimum horizontal length of 8 feet and a vertical rise of no more than 3 feet. Fill slopes of 2H:1V or steeper shall be overbuilt (i.e. fill should temporarily extend beyond the final slope face) to allow compaction at the slope face. After compaction is complete, the slope may be regraded to the final inclination.

Should seeps or thick lenses of highly plastic soils be observed in the planned fill and cut slopes that are steeper than 2H:1V, ECS must be contacted to determine if the steeper slopes may be constructed as planned or if slope flattening or reinforcing is required. Similarly, if soft or wet ground conditions are observed at the base of planned fill embankments, the QA representative must determine the limits of undercutting required or required in-situ treatment.

The following Plan Notes apply to Mechanically Stabilized Earth walls:

Reinforced Backfill (Granular Fill or stone.)

Internal Friction Angle (deg) = 36
Total Unit Weight = 120 pcf
Surcharge Dead Load for Pavement Overlay = 140 psf
Active Earth Pressure Coefficient = 0.26

Retained Backfill

Internal Friction Angle (deg) = 30
Total Unit Weight = 117 pcf
Active Earth Pressure Coefficient = 0.33

Wall 17 I-85 Station
Foundation Soils
Total Internal Friction Angle (deg) = 26
Total Cohesion = 0 psf
Effective Internal Friction Angle (deg) = 26
Effective Cohesion = 0 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
0 < H ≤ 7.5	14.5 ft	2,000	3,100

Wall 18 I-85 Station 413+00 to 415+00
Foundation Soils
Total Internal Friction Angle (deg) = 0
Total Cohesion = 1000 psf
Effective Internal Friction Angle (deg) = 26
Effective Cohesion = 100 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
3 < H ≤ 7	12.5 ft	5,400	8,400

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	07/22/16	ADDED I-85 (ROCKY CREEK AREA GEOTECH. NOTES (ST. 375+00 - PELHAM)	D.R.R.	P.H.R.					
2	5/3/18	REVISED WALL 18, REMOVED WALL 55	B.G.N.	P.H.R.					

DRAWN BY : A.W.F
DATE : 6/10/15

REVIEWED BY : B.A.H.
DATE : 09/04/15

APPROVED BY : B.G.N.
DATE : 09/20/15

FLATIRON
ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — No. 13596

Paul Hanna Raad

6/7/2018 12:43:42 PM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

GEOTECHNICAL NOTES

S:\Proj\2011\4711A\Design\Project PIN Number\Roadway\Dgn\Typicals\Interchange\Sht03E_Geotech_Notes.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	18

CONTRACTOR TO REPLACE EXISTING GUARDRAIL (WITH ASSOCIATED PAVING UNDER GUARDRAIL) WITHIN THE PROJECT LIMITS.

CONSTRUCT CONCRETE BARRIER AT SIGN SUPPORT
SEE STANDARD DRAWINGS 805-801-00 & 805-804-00

LIGHT DUTY PAVING

PAVED SHOULDER

PAVEMENT REMOVAL

ALIGNMENT CONTROL CAN BE FOUND ON REFERENCE DATA SHEETS 5B TO 5K

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	7/22/16	ADDED WALL 55 & REV. WALL 17	D.R.R.	B.G.N.
2	5/3/18	REVISED STA. 386+60 TO 425+00	B.G.N.	P.H.R.

DRAWN BY: A.W.F DATE: 6/10/15
REVIEWED BY: B.A.H. DATE: 09/04/15
APPROVED BY: B.G.N. DATE: 09/20/15

FLATIRON · ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 — SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 13591

6/7/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
SCDOT

I-85 / I-385 INTERCHANGE

PLAN SHEET
STA. 373+00.00 TO STA. 388+00.00

S:\Proj\2014\47HA\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\Sht_18.dgn 5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	19

ALIGNMENT CONTROL CAN BE FOUND ON REFERENCE DATA SHEETS 5B TO 5K

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED STA. 386+60 TO 425+00	B.G.N.	P.H.R.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F
DATE : 6/10/15

REVIEWED BY : B.A.H.
DATE : 09/04/15

APPROVED BY : B.G.N.
DATE : 09/20/15

FLATIRON ZACHRY
CE CS
CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION
6/7/2018 12:03:27 PM EDT

SOUTH CAROLINA PROFESSIONAL ENGINEER Paul Hanna Road 27820 PAUL HANNA ROAD

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

PLAN SHEET
STA. 388+00.00 TO STA. 403+00.00

S:\Proj\2011471\IA\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\Sht-19.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	20

ALIGNMENT CONTROL CAN BE FOUND ON REFERENCE DATA SHEETS 5B TO 5K

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
⚠	5/3/18	REVISED STA. 386+60 TO 425+00	B.G.N.	P.H.R.					

DRAWN BY : A.W.F DATE : 6/10/15
REVIEWED BY : B.A.H. DATE : 09/04/15
APPROVED BY : B.G.N. DATE : 09/20/15

FLATIRON / ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD No. 13591
DocuSigned by: Paul Hanna Raad 900785469FEB450...
6/7/2018 12:43:42 PM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
SCDOT

I-85 / I-385 INTERCHANGE

PLAN SHEET
STA. 403+00.00 TO STA. 418+00.00

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5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	21

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED STA. 386+60 TO 425+00	B.G.N.	P.H.R.

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F
DATE : 6/10/15

REVIEWED BY : B.A.H.
DATE : 09/04/15

APPROVED BY : B.G.N.
DATE : 09/20/15

FLATIRON ZACHRY
CES
CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION
SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 15578 PAUL HANNA RAAD
6/7/2018 12:43:47 PM EDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

PLAN SHEET
STA. 418+00.00 TO STA. 433+00.00

S:\Proj\2011\47IIA\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\Sht_21.dgn
5/30/2018

STATE	COUNTY	PROJECT ID	ROAD/ROUTE NO.	SHEET NO.
SC	GREENVILLE	0038III - R02	I-385 I-85	47

REVISIONS				
NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED END OF SB PROFILE	B.G.N.	P.H.R.

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — No. 19658 — PAUL HANNA RAO

6/7/2018 12:43:42 PM EDT

I–85 NB

VPI (373+35.00)
El 900.18

(-) 2.155%

(-) 1.782%

K = 538
195.00' V.C.

VPC (+32.50) 898.08

VPT (+32.50) 898.08

K = 523
195.00' V.C.

VPT (+32.50) 900.17

VPI (375+30.00)
El 895.97

VPT (+27.50) 894.23

VPC (+30.00) 894.18

(-) 1.792%

K = 2425
200.00' V.C.

VPI (377+30.00)
El 892.39

VPT (+30.00) 890.68

FINISHED GRADE

(-) 1.710%

EXISTING GROUND

VPC (+05.00) 882.56

K = 400
200.00' V.C.

VPI (384+05.00)
El 880.85

VPT (+05.00) 879.64

(-) 1.210%

VPC (+30.00) 878.12

K = 222
200.00' V.C.

(-) 0.310%

VPI (387+30.00)
El 876.91

	373+00	374+00	375+00	376+00	377+00	378+00	379+00	380+00	381+00	382+00	383+00	384+00	385+00	386+00	387+00	388+00
FINISHED GRADE		900.76	900.28	899.79	899.28	898.77	898.24	897.70	897.18	896.66	896.16	895.67	895.19	894.73	894.27	893.82	893.38	892.94	892.50	892.06	891.63	891.19	890.76	890.34	889.91	889.48	889.05	888.63	888.20	887.77	887.34	886.92	886.49	886.06	885.63	885.21	884.78	884.35	883.92	883.50	883.07	882.64	882.22	881.81	881.42	881.05	880.68	880.34	880.01	879.70	879.39	879.09	878.79	878.49	878.18	877.89	877.63	877.39	877.18	877.00	876.84	876.72
EXISTING GROUND		900.59	900.09	899.56	899.06	898.51	898.02	897.56	897.10	896.64	896.19	895.75	895.29	894.86	894.41	893.92	893.45	892.98	892.50	892.01	891.52	891.08	890.66	890.22	889.78	889.31	888.89	888.48	888.06	887.66	887.25	886.85	886.41	885.94	885.49	885.03	884.60	884.17	883.72	883.31	882.86	882.40	881.97	881.54	881.14	880.79	880.46	880.12	879.76	879.43	879.13	878.89	878.59	878.32	878.04	877.72	877.46	877.19	876.96	876.77	876.66	876.54

I–85 SB

VPI (373+50.00)
El 901.88

(-) 1.236%

K = 427
200.00' V.C.

VPT (+50.00) 900.17

VPC (+50.00) 900.17

(-) 1.705%

VPI (375+50.00)
El 898.47

K = 1849
200.00' V.C.

VPT (+50.00) 896.65

(-) 1.813%

VPC (+00.00) 893.93

K = 1946
200.00' V.C.

VPI (379+00.00)
El 892.12

VPT (+00.00) 890.41

(-) 1.711%

VPC (+50.00) 889.55

K = 1069
200.00' V.C.

VPI (381+50.00)
El 887.84

VPT (+50.00) 885.94

VPC (+60.00) 885.75

K = 254
200.00' V.C.

(-) 1.898%

EXISTING GROUND

VPI (383+60.00)
El 883.86

VPT (+60.00) 882.75

VPC (+60.00) 882.75

K = 21155
200.00' V.C.

FINISHED GRADE

(-) 1.109%

(-) 1.100%

VPT (+60.00) 880.54

END CONSTRUCTION
STA. 386+60.00
I-85 SB WIDENING

10'
50'

	373+00	374+00	375+00	376+00	377+00	378+00	379+00	380+00	381+00	382+00	383+00	384+00	385+00	386+00	387+00	388+00
FINISHED GRADE		902.47	902.12	901.76	901.38	900.99	900.59	900.17	899.74	899.31	898.88	898.44	898.00	897.55	897.10	896.65	896.20	895.75	895.29	894.84	894.39	893.93	893.48	893.03	892.59	892.14	891.71	891.27	890.84	890.41	889.98	889.55	889.12	888.69	888.24	887.80	887.34	886.88	886.42	885.94	885.47	885.03	884.60	884.21	883.83	883.48	883.16	882.86	882.58	882.30	882.03	881.75	881.48	881.20	880.92	880.65	880.27	880.00	879.75	879.50	879.34	879.27
EXISTING GROUND		902.12	901.79	901.48	901.13	900.76	900.43	900.06	899.70	899.31	898.90	898.47	898.04	897.59	897.14	896.69	896.22	895.76	895.32	894.85	894.41	893.98	893.54	893.09	892.64	892.19	891.74	891.25	890.83	890.39	889.97	889.58	889.16	888.71	888.26	887.82	887.36	886.90	886.43	885.93	885.44	884.96	884.53	884.14	883.77	883.44	883.11	882.79	882.48	882.21	881.96	881.64	881.37	881.11	880.86	880.57	880.27	880.00	879.75	879.50	879.34	879.27

STATE	COUNTY	PROJECT ID	ROAD/ROUTE NO.	SHEET NO.
SC	GREENVILLE	0038III - R02	I-385 I-85	48

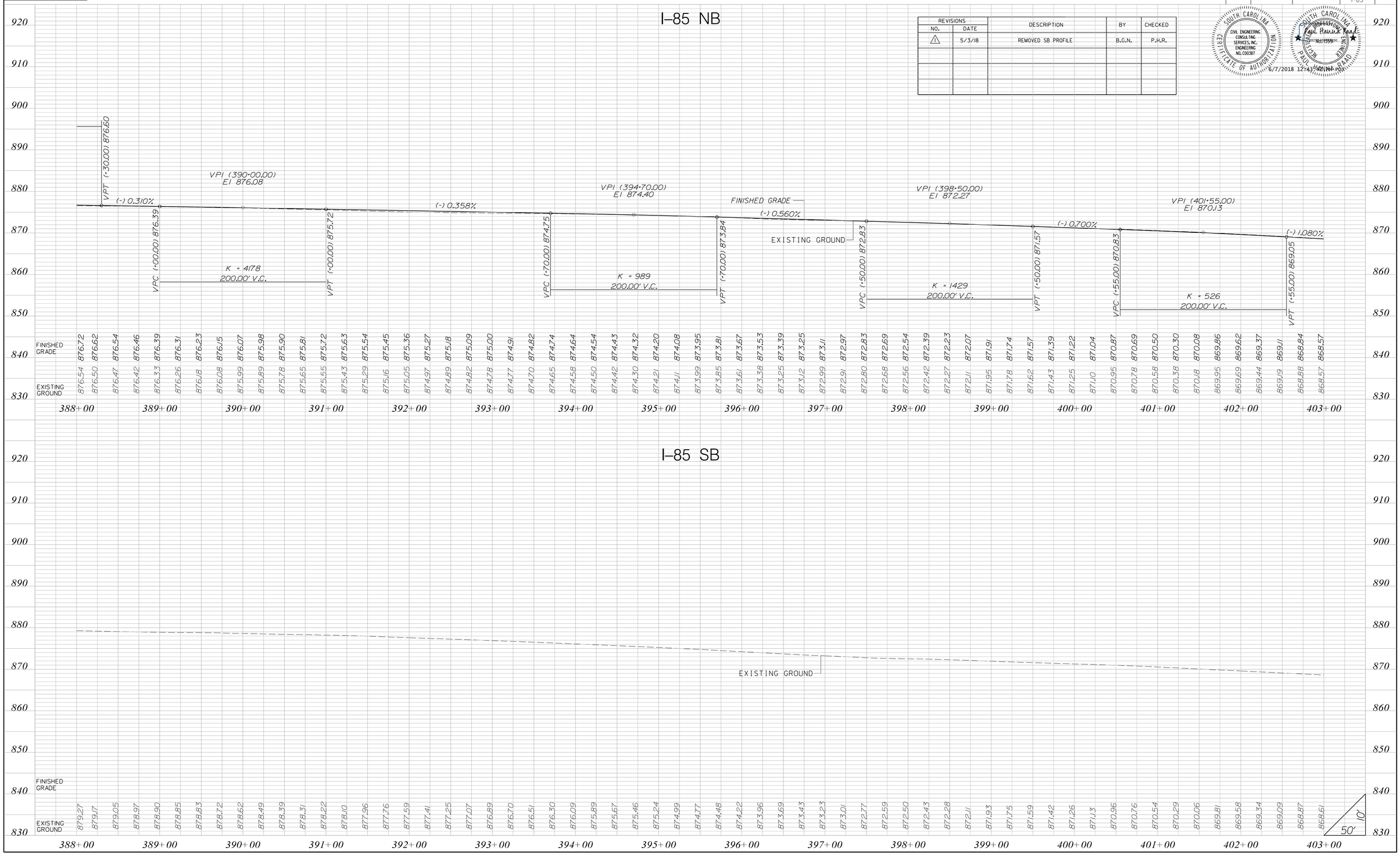
I–85 NB

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REMOVED SB PROFILE	B.G.N.	P.H.R.

CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 — CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA — PAUL HAMM — No. 31559 — REGISTERED PROFESSIONAL ENGINEER

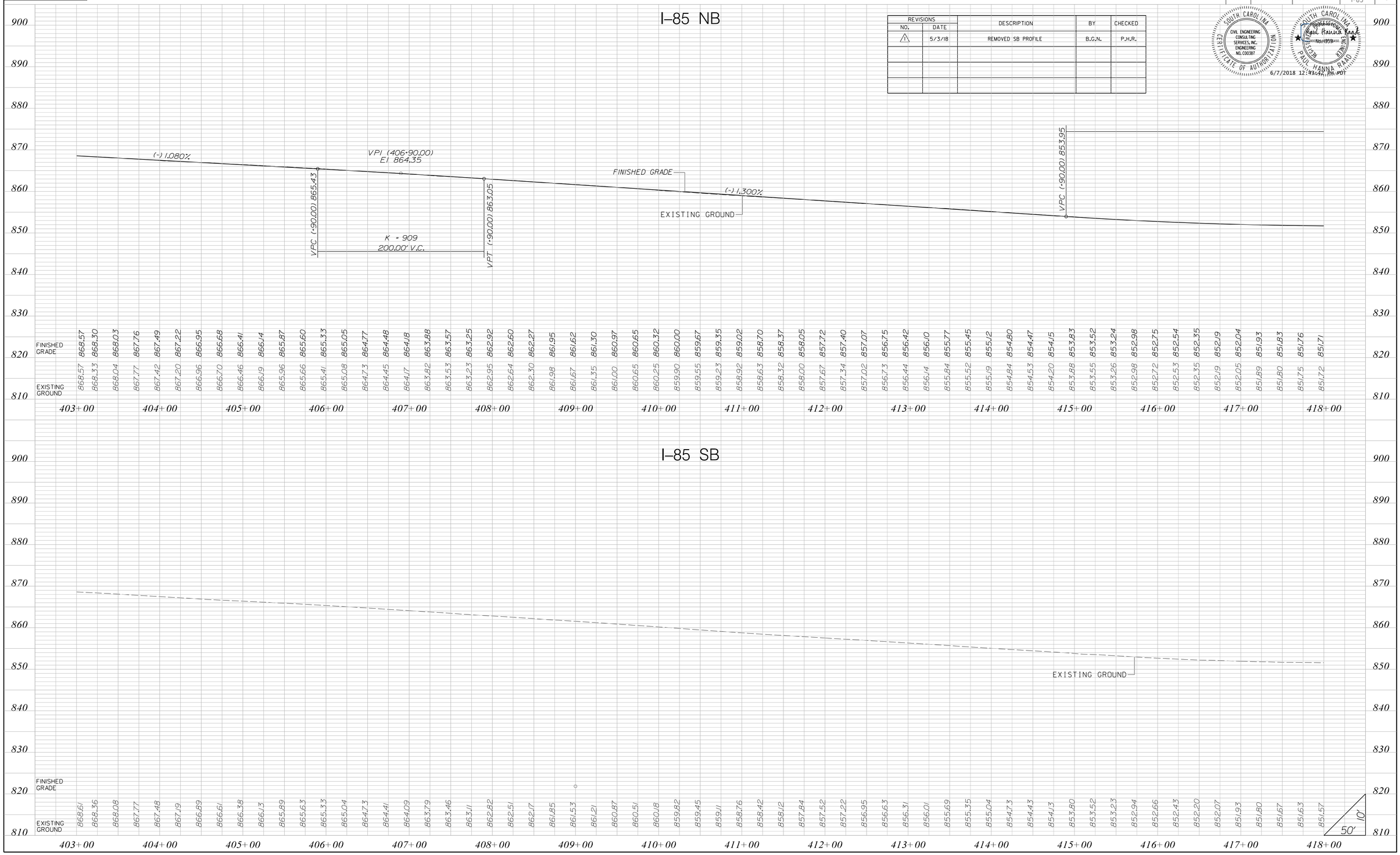
8/7/2018 12:43:42 PM



STATE	COUNTY	PROJECT ID	ROAD/ROUTE NO.	SHEET NO.
SC	GREENVILLE	0038III - R02	I-385 I-85	49

I–85 NB

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REMOVED SB PROFILE	B.G.N.	P.H.R.



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	D13

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	07/22/16	DESIGN NORTH OF STA. 376+00	DKA	BGN					
2	04/25/18	REVISED DRAINAGE, CONST. LIMITS	DKA	BGN					

DRAWN BY : R.A.R. DATE : 08/28/15
REVIEWED BY : D.K.A. DATE : 09/18/15
APPROVED BY : B.G.N. DATE : 09/20/15

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA PROFESSIONAL ENGINEER — DONALD ... AULD — No. 30706

6/6/2018 10:56:07 AM EDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

DRAINAGE PLAN SHEET

STA. 373+00.00 TO STA. 388+00.00

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5/23/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	D14

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	04/25/18	REVISED DRAINAGE, CONST. LIMITS	DKA	BGN					

DRAWN BY : R.A.R. DATE : 08/28/15
REVIEWED BY : D.K.A. DATE : 09/18/15
APPROVED BY : B.G.N. DATE : 09/20/15

FLATIRON / ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 30786 DONALD KRISTIAN AULD
6/6/2018 10:53:07 AM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

DRAINAGE PLAN SHEET
STA. 388+00.00 TO STA. 403+00.00

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5/23/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	D15

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
△	04/25/18	REVISED DRAINAGE, CONST. LIMITS	DKA	BGN					

DRAWN BY : R.A.R. DATE : 08/28/15
REVIEWED BY : D.K.A. DATE : 09/18/15
APPROVED BY : B.G.N. DATE : 09/20/15

FLATIRON
ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA PROFESSIONAL ENGINEER DONALD K. AULD

6/6/2018 10:15 AM

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

DRAINAGE PLAN SHEET
STA. 403+00.00 TO STA. 418+00.00

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5/23/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	D16

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	04/25/18	REVISED DRAINAGE, CONST. LIMITS	DKA	BGN					

DRAWN BY : R.A.R.
DATE : 08/28/15

REVIEWED BY : D.K.A.
DATE : 09/18/15

APPROVED BY : B.G.N.
DATE : 09/20/15

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 30706 DONALD KRISHJEN AULD

DocuSigned by: Donald Krishjen Auld 7091F229B1BD473...

6/6/2018 10:56:07 AM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT South Carolina Department of Transportation

I-85 / I-385 INTERCHANGE

DRAINAGE PLAN SHEET
STA. 418+00.00 TO STA. 433+00.00

STORM SEWER DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	D33

	GEOMETRY			UPSTREAM						DOWNSTREAM						
	PIPE			NODE						NODE						
ID	DIA. AND MATERIAL	NO. OF BARRELS	LENGTH (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	SPT "N"
NP-R10	18" SM. WALL PIPE	1	8	DN-R30	DUMMY JOINT	I85	381+45.66	82	879.93	DN-R29	DUMMY JOINT	I85	381+45.80	74	879.84	
NP-R12	18" SM. WALL PIPE	1	12	DN-R28	DUMMY JOINT	I85	381+46.00	-79	877.84	OP-R102	OP	I85	381+45.85	-91	877.68	
NP-R15	18" SM. WALL PIPE	1	16	DN-R31	DUMMY JOINT	I85	385+95.86	-79	873.06	OP-R103	OP	I85	385+95.83	-95	872.67	
NP-R2	18" SM. WALL PIPE	1	18	J-R13N	JB	I85	388+45.95	78	869.38	OP-R100	OP	I85	388+45.65	98	869.28	
NP-R29	24" SM. WALL PIPE	1	27	CB-R29	DI TYPE 112	PELHAM_RAMP	55+00.00	-33	868.45	MH-R29	CONVERT EXIST. BOX TO MH	I85	432+94.00	69	868.04	

	GEOMETRY			UPSTREAM						DOWNSTREAM						
	PIPE			NODE						NODE						
ID	DIA. AND MATERIAL	NO. OF BARRELS	LENGTH (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	SPT "N"

	GEOMETRY			UPSTREAM						DOWNSTREAM						
	PIPE			NODE						NODE						
ID	DIA. AND MATERIAL	NO. OF BARRELS	LENGTH (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	SPT "N"

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	04/20/17	NP-R1,NP-R11,NP-R13,NP-R14,NP-R23,NP-R24, NP-R25,NP-R3,NP-R32,NP-R33,NP-R35, NP-R36,NP-R37 AND ASSOCIATED STRUCTURES DELETED.	D.K.A.	B.G.N.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER DONALD KRISHJEN ABLO No. 38706

6/6/2018 10:56:07 AM PDT

I–85

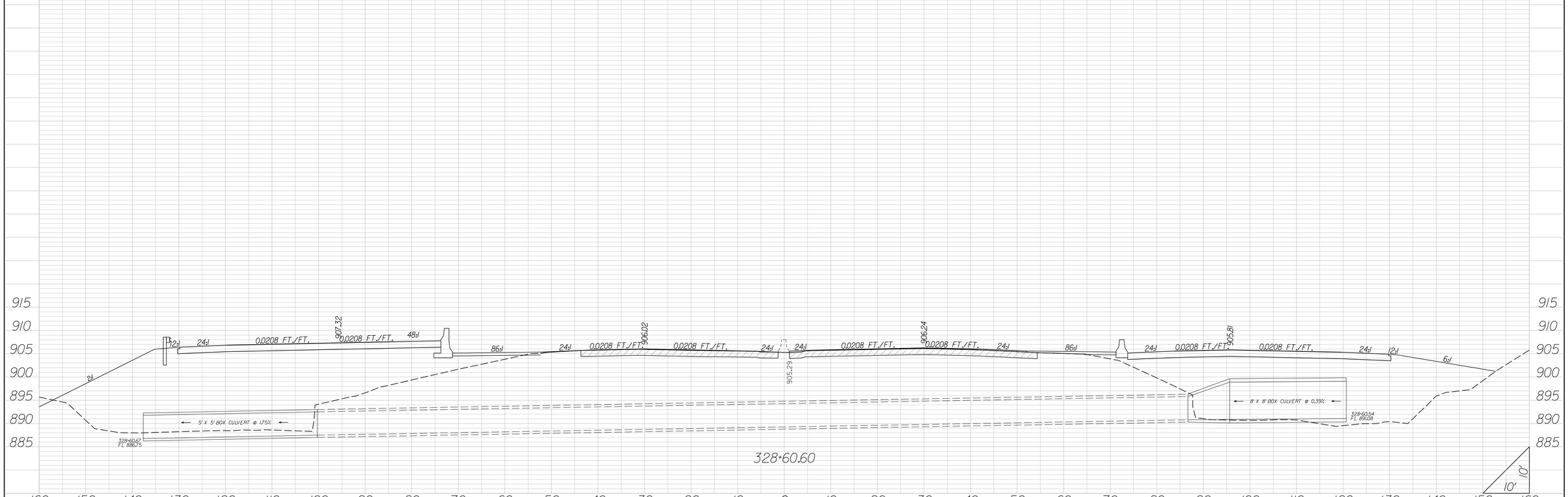
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	DRAIN XI

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION
CIVIL ENGINEERING CONSULTING SERVICES, INC.
ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER
Paul Hanna Raad
No. 19597
PAUL HANNA RAAD

6/7/2018 12:43:42 PM PDT

1	7/22/16	ADDED NP-R32
2	5/3/18	REMOVED X-LINE STA. 421+61



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FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	EC8

EROSION CONTROL DATA SHEET

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH STATION	OUTFALL DITCH SIDE	NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS
I-85	385+05	LT	ROCKY CREEK	ENOREE RIVER
I-85	386+53	LT	ROCKY CREEK	ENOREE RIVER
I-85	387+61	RT	ROCKY CREEK	ENOREE RIVER
I-85	389+05	LT	ROCKY CREEK	ENOREE RIVER
I-85	413+26	LT	ROCKY CREEK	ENOREE RIVER
I-85	418+24	RT	ROCKY CREEK	ENOREE RIVER
I-85	423+25	RT	ROCKY CREEK	ENOREE RIVER
I-85	427+99	RT	ROCKY CREEK	ENOREE RIVER
PEL. RA.*	53+31	RT	ROCKY CREEK	ENOREE RIVER
PEL. RA.*	54+67	RT	ROCKY CREEK	ENOREE RIVER
			*PELHAM_RAMP	

ROAD / ROUTE	OUTFALL DITCH STATION	OUTFALL DITCH SIDE	NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS

SOIL TYPES

ROAD / ROUTE	STATION	TO STATION	SOIL PARTICLE SIZE (COARSE / FINE)	ZONE
I-85	BEG.	413+22	FINE	PIEDMONT
I-85	413+22	426+17	COARSE	PIEDMONT
I-85	426+17	END	FINE	PIEDMONT
PEL. RA. *	BEG.	END	FINE	PIEDMONT
*PELHAM	RAMP			

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION	TO STATION	SIDE	DEPTH OF BLANKET (FT)	SLOPES x : 1 FRONT	SLOPES x : 1 BACK	DITCH BOTTOM WIDTH (FT)	MSY
							TOTALS	

SEE SHTS. EC9 FOR TEMPORARY EROSION CONTROL BLANKET

SEDIMENT DAM

* NOTE BASIN INCISEMENT TO BE CONSTRUCTED WITH VERTICAL SIDE SLOPES TO DEPTH SHOWN IN "DEPTH OF BASIN".

ROAD / ROUTE	NO	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF BASIN	WIDTH OF BASIN	DEPTH OF BASIN	SIDE SLOPE OF BASIN	SPILLWAY WIDTH	SPILLWAY DEPTH	TOTAL HEIGHT TO SPILLWAY	SEDIMENT STORAGE VOLUME	RUNOFF STORAGE VOLUME	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH
I-85	RC1	381+40	RT	UNDRAINED	118	25	1	6:1/2:1	2	1.9	2.9	109	135			
I-85	RC2	386+24	RT	UNDRAINED	112	40	2.5	6:1/2:1	10	2	4.5	414	199			
I-85	RC3	395+00	RT	UNDRAINED	100	10	2	6:1/2:1	3	3.5	5.5	74	156			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION	TO STATION	SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
I-85	387+14	388+92	LT	20	150	60	
I-85	376+00	383+50	RT	10	150	60	
I-85	383+50	384+00	RT	10	100	20	
I-85	384+00	385+50	RT	10	150	20	
I-85	385+50	386+50	RT	10	100	20	
I-85	388+50	389+50	RT	10	75	30	
I-85	389+50	391+50	RT	10	150	30	
I-85	391+50	395+00	RT	10	100	50	
I-85	395+00	397+00	RT	10	25	90	
I-85	401+00	409+00	RT	10	150	70	
PELHAM	54+00	55+00	LT	10	150	20	
PELHAM	61+00	61+25	LT	10	25	20	
PELHAM	55+00	61+25	RT	10	50	140	
					GRAND TOTAL	630	

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION	TO STATION	SIDE	DEPTH OF MAT (FT)	SLOPES x : 1 FRONT	SLOPES x : 1 BACK	DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
I-85	381+50	387+00	RT	3	6	2	0	1	1.525	0.000	0.000
I-85	415+00	418+00	RT	2	1	0	0	3	0.000	0.000	0.094
I-85	423+00	426+00	RT	5	1.5	0	0	2	0.000	0.300	0.000
PELHAM	55+00	61+25	RT	2	6	2	0	1	1.155	0.000	0.000
								TOTALS	2.681	0.300	0.094

△1 04/25/18 ADJUSTED EROSION CONTROL ITEMS TO REFLECT REVISED CONST. LIMITS

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 30706 DONALD KRISHJEN AULD

DocuSigned by: Donald Krishjen Auld

6/6/2018 10:56:07 AM PDT

EROSION CONTROL DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	EC9

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	SLOPES		DITCH BOTTOM WIDTH (FT)	MSY
					x : 1			
					FRONT	BACK		
I-85	375+00	375+50	LT	10	4	0	0	0.229
I-85	375+50	375+25	LT	10	2	0	0	0.062
I-85	377+00	379+50	LT	6	2	0	0	0.373
I-85	381+50	386+00	LT	8	2	0	0	0.894
I-85	386+50	387+00	LT	14	2	0	0	0.174
I-85	387+50	388+50	LT	6	2	2	10	0.409
I-85	376+50	376+50	RT	12	0	2	0	0.000
I-85	377+00	380+50	RT	20	0	2	0	1.739
I-85	381+00	381+50	RT	15	0	2	0	0.186
I-85	381+50	382+00	RT	9	0	2	0	0.112
I-85	384+50	385+50	RT	6	0	2	0	0.149
I-85	388+50	389+00	RT	8	6	2	0	0.370
I-85	389+00	389+50	RT	18	0	2	0	0.224
I-85	389+50	390+00	RT	21	0	2	0	0.261
I-85	390+00	391+50	RT	31	0	2	0	1.155
I-85	391+50	392+50	RT	25	0	2	0	0.621
I-85	392+50	394+00	RT	20	0	2	0	0.745
I-85	393+50	396+00	RT	8	6	0	0	1.352
I-85	394+00	396+00	RT	8	0	2	0	0.398
I-85	397+00	398+00	RT	8	2	0	0	0.199
I-85	398+00	401+00	RT	8	4	0	0	1.099
I-85	402+00	403+00	RT	10	0	2	0	0.248
I-85	403+00	405+00	RT	20	0	2	0	0.994
I-85	405+00	408+00	RT	25	0	2	0	1.863
I-85	408+00	409+00	RT	10	0	2	0	0.248
I-85	424+00	426+00	RT	5	1.5	0	0	0.200
I-85	426+00	427+50	RT	8	4	0	0	0.550

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	SLOPES		DITCH BOTTOM WIDTH (FT)	MSY
					x : 1			
					FRONT	BACK		

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	SLOPES		DITCH BOTTOM WIDTH (FT)	MSY
					x : 1			
					FRONT	BACK		

04/25/18 ADJUSTED EROSION CONTROL ITEMS TO REFLECT REVISED CONST. LIMITS

SEE SHEET IL1FOR INDEX OF SHEETS

	BRIDGES TO BE CONSTRUCTED			
BRIDGE NO.	ROAD NO.	LENGTH	STA. TO STA.	LOCATION
1/2A	I-385 SB	201.85'	374+34.76 TO 376+36.61	GARLINGTON RD. & GE RAILROAD OVERPASS
2B	I-385 NB	201.50'	374+96.79 TO 376+98.29	GARLINGTON RD. & GE RAILROAD OVERPASS
3	I-385 NB CD	201.50'	376+37.60 TO 378+39.10	GARLINGTON RD. & GE RAILROAD OVERPASS
4	RAMP 8	148.17'	57+85.53 TO 59+33.70	I-385 NB CD OVERPASS
5	RAMP 1A	1522.83'	72+79.42 TO 88+02.25	I-385 & I-85 OVERPASS
6	RAMP 4B	1962.83'	390+18.50 TO 409+81.33	I-385 & I-85 OVERPASS
7	RAMP 2B	475.00'	34+16.95 TO 38+91.95	I-85 OVERPASS
8	RAMP 3A	254.85'	297+81.45 TO 300+36.30	I-85 OVERPASS
9	RAMP 2A	368.84'	71+70.81 TO 75+39.65	I-85 OVERPASS
10	RAMP 1B	220.05'	69+11.35 TO 71+31.40	RAMP 4B OVERPASS
12	I-385	497.17'	395+34.84 TO 400+32.01	I-85 OVERPASS
BRIDGE PLANS BOUND UNDER SEPARATE COVER				

South Carolina Department of Transportation

PROPOSED PLANS FOR GREENVILLE COUNTY

PROJECT ID 0038111 - R02

INTERSTATE 85 / 385 INTERCHANGE

FROM: 0.20 MILES SOUTH OF S-326
TO: ROAD S-492

PROJECT ID 0038111-R02
INTERSTATE 385
447+60.00 END

PROJECT ID 0038111-R02
INTERSTATE 385
303+89.49 BEGIN

PROJECT ID 0038111-R02
INTERSTATE 85
203+00.00 BEGIN

PROJECT ID 0038111-R02
INTERSTATE 85
STA. 435+00.00 END

GREENVILLE COUNTY MAP

LAYOUT
(NOT TO SCALE)

	I-85	I-385	RAMPS	CD's	TOTAL
NET LENGTH OF ROADWAY	4.394 MILES	2.551 MILES	9.035 MILES	2.867 MILES	18.757 MILES
NET LENGTH OF BRIDGES	- MILES	0.171 MILES	0.938 MILES	0.038 MILES	1.147 MILES
NET LENGTH OF PROJECT	4.394 MILES	2.722 MILES	9.973 MILES	2.905 MILES	19.993 MILES
LENGTH OF EXCEPTIONS	- MILES	- MILES	- MILES	- MILES	- MILES
GROSS LENGTH OF PROJECT	4.394 MILES	2.722 MILES	9.973 MILES	2.905 MILES	19.993 MILES

EQUALITIES IN STATIONING

NONE

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF LETTING.

RELEASE FOR CONSTRUCTION PLANS

CONTRACT ID 5384210

SHEET NO.	TOTAL SHEETS
1	1918

Hydraulic Design Reference for these plans in the:

2009

Edition of SCDOT'S "Requirements for Hydraulic Design Studies"

Design Reference for these plans is the:

2001

AASHTO "A Policy on Geometric Design of Highways and Streets"

UNLESS OTHERWISE NOTED ON TYPICAL SECTION

6	1/9/18	SHEET TOTAL REVISED	B.G.N.
7	5/3/18	SHEET TOTAL REVISED	B.G.N.

NPDES PERMIT INFORMATION

Disturbed Area = 160.5 Acre(s)

Permitted Area = 349.7 Acre(s)

Approximate Location of Roadway is

Begin
Latitude 34° 50' 20' N
Longitude 82° 17' 26' W

End
Latitude 34° 50' 02' N
Longitude 82° 17' 27' W

Hydraulic and NPDES Design provided by:

CECS, Inc.

Designs may be obtained from the SCDOT Regional Production Group

SCDOT REVIEW	RIGHT-OF-WAY INITIAL	RIGHT-OF-WAY DATE	CONSTRUCTION INITIAL	CONSTRUCTION DATE
PRECONSTRUCTION SUPPORT - ROAD				
PRECONSTRUCTION SUPPORT - STRUCTURES				
RPG - DESIGN MANAGER				
RPG - PROGRAM MANAGER				

THE INITIALS ABOVE DO NOT RELIEVE THE ENGINEER OF RECORD OF THE RESPONSIBILITY TO DESIGN THIS PROJECT IN ACCORDANCE WITH ALL APPLICABLE CRITERIA.

ENVIRONMENTAL PERMIT INFORMATION

USACE PERMIT	X YES	NO
NEPA DOCUMENT	X YES	NO
401 CERTIFICATION	X YES	NO
OCRM CAP	YES	X NO
NAVIGABLE WATERS	SC USCG USACE	X N/A

3 DAYS BEFORE DIGGING IN SOUTH CAROLINA

CALL 811

SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

RAILROAD INVOLVEMENT?
(YES) / NO

TRAFFIC DATA

	I-85	I-385
2015 ADT	118,200	106,500
2035 ADT	174,700	171,400
TRUCKS	18 %	18 %

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	1/27/16	SHEET TOTAL REVISED	D.R.R.	B.G.N.
2	5/02/16	SHEET TOTAL REVISED	D.R.R.	B.G.N.
3	5/12/16	SHEET TOTAL REVISED	D.R.R.	B.G.N.
4	6/17/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
5	7/8/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
6	8/9/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
7	8/18/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
8	9/12/16	BRIDGE LENGTHS 1/2A, 2B, 3, SHT. TTL RVSD	D.R.R.	
9	9/28/16	SHEET TOTAL REVISED	B.G.N.	
10	10/21/16	SHEET TOTAL REVISED	B.G.N.	
11	10/28/16	SHEET TOTAL REVISED	B.G.N.	
12	1/12/17	SHEET TOTAL REVISED	B.G.N.	
13	2/2/17	SHEET TOTAL REVISED	B.G.N.	
14	3/16/17	SHEET TOTAL REVISED	B.G.N.	
15	12/18/17	SHEET TOTAL REVISED	B.G.N.	

For Right Of Way Acquisition:

Consultant Engineer of Record — Date

Regional Production Engineer — Date

CONSULTING ENGINEERING FIRM

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.
2000 PARK STREET
SUITE 201
COLUMBIA, S.C. 29201

ENGINEER OF RECORD

SOUTH CAROLINA — CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA — REGISTERED PROFESSIONAL ENGINEER — Faisal Hanna Rady — No. 31591 — FAISAL HANNA RADY

6/7/2018 12:48:12 PM EDT

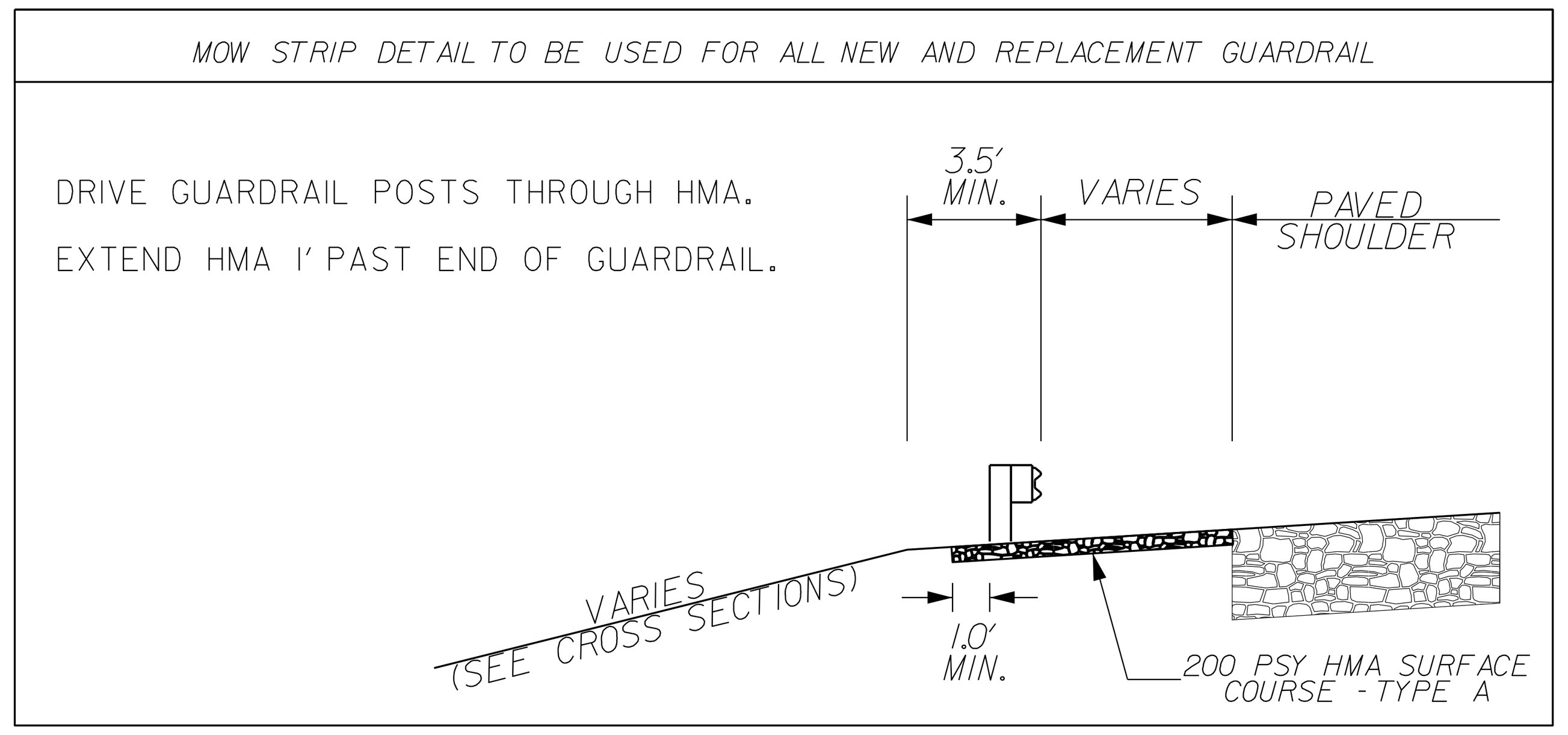
FOR CONSTRUCTION: _____ DATE

S:\Proj\20II\4II1A\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\Sht_01_Title_I-85.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	003811 - R02	I-85 / I-385	3

SCDOT

TYPICAL SECTION OF IMPROVEMENT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
COLUMBIA, S.C.



FOR PGL AND BASELINE LOCATIONS SEE PLAN VIEW AND CROSS SECTIONS

⊗ NOTE:
THIS SLOPE MAY BE VARIED WHEN A DEEPER DITCH IS NECESSARY FOR DRAINAGE PURPOSES,USING A MINIMUM SLOPE OF 12:1 AND A MAXIMUM SLOPE OF 4:1. WHERE A DEEPER DITCH THAN PROVIDED BY A 4:1 IS NECESSARY, THE DITCH SHALL BE PLACED FARTHER FROM THE ℄ CONTINUING THE 4:1 SLOPE TO PROVIDE FOR THE NECESSARY DEPTH. SEE PROFILE FOR THE SPECIAL DITCH GRADES.

* < 5.0' USE 6:1 SLOPE
5.0' - 10.0' USE 4:1 SLOPE
> 10.0' USE 2:1 SLOPE
(USE 4:1 MAX. SLOPE IN INTERCHANGE AREAS WHERE POSSIBLE)

** ADD 3.5' WHERE GUARDRAIL IS ERECTED EXCEPT IN AREAS WITH ADDITIONAL LENGTH POSTS

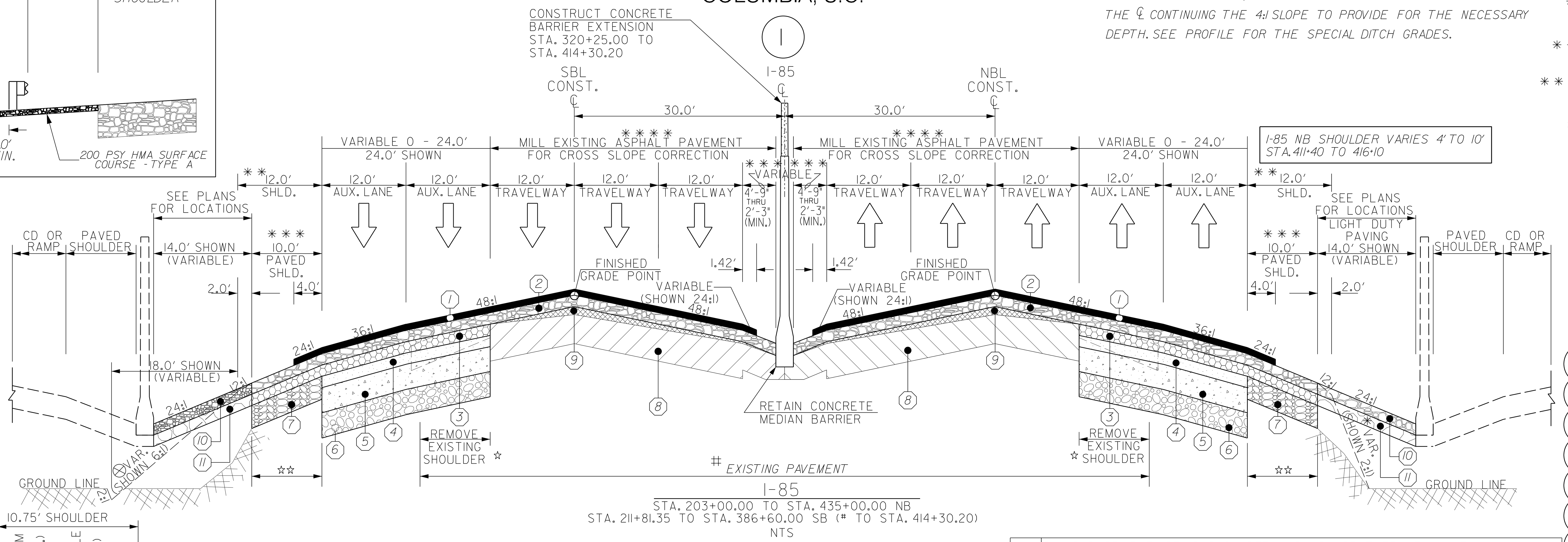
*** MILLED-IN RUMBLE STRIPS (TYPICAL).

**** IN AREAS WITH OGFC MILL 3" UNIFORM WITH AN ADDITIONAL 1" VARIABLE FOR CROSS SLOPE CORRECTION IN AREAS WITHOUT OGFC MILL MAXIMUM 2"

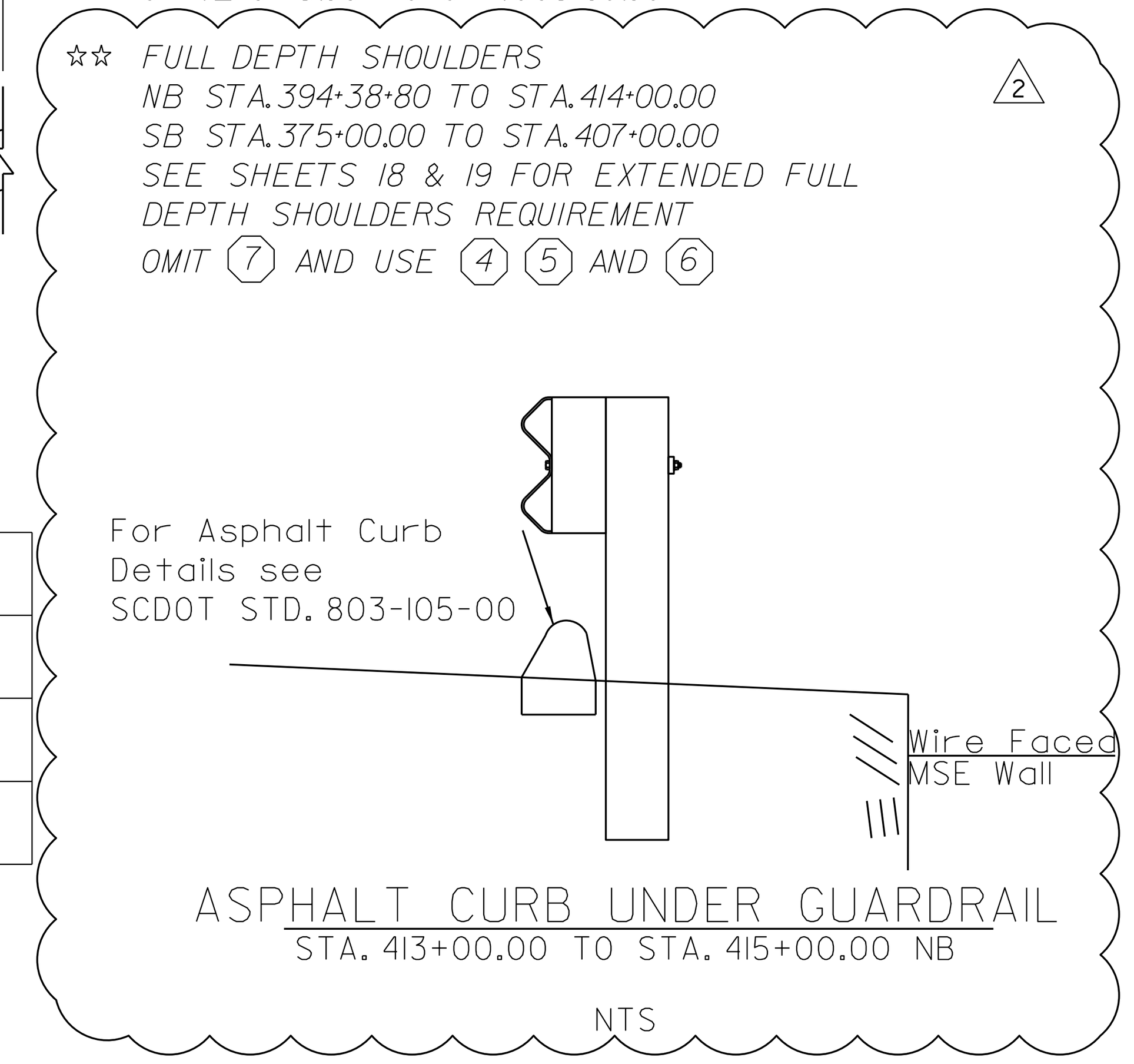
\# STA.211+81.35 TO STA.317+18.68 SB.
MICRO MILL EXISTING OPEN GRADED FRICTION COURSE AND REPLACE WITH 140 PSY OPEN GRADED FRICTION COURSE. OMIT (2) AND (9)
STA.386+60.00 TO 414+30.20 SB, MILL 3-INCHES IN AREAS WTIH OGFC AND 2-INCHES IN AREAS WITHOUT OGFC. CORRECT CROSS SLOPE OF EXISTING PAVEMENT, AND PLACE (2) AND 140 PSY OGFC.

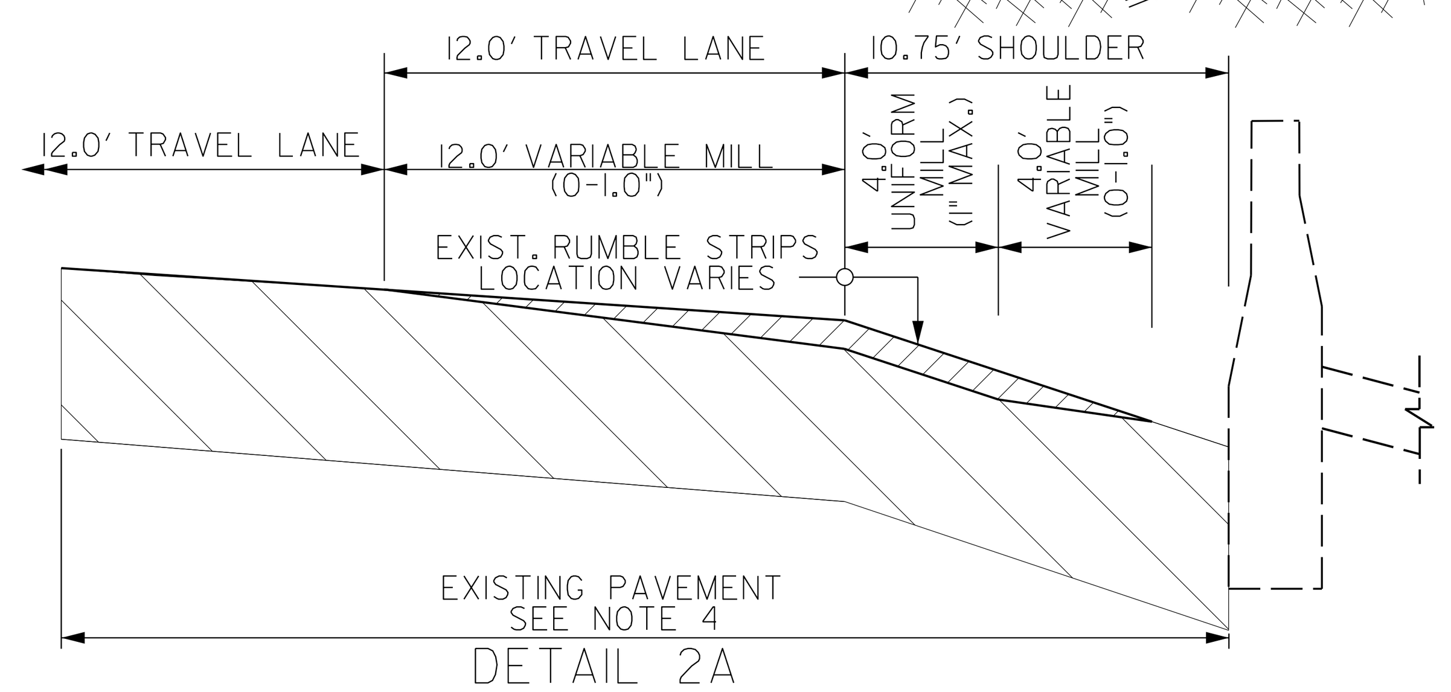
☆ RETAIN EXISTING SHOULDERS
NORTHBOUND:
STA.251+13.43 TO STA.294+06.00
STA.302+87.21 TO STA.332+96.95
SOUTHBOUND:
STA.273+75.83 TO STA.335+60.80

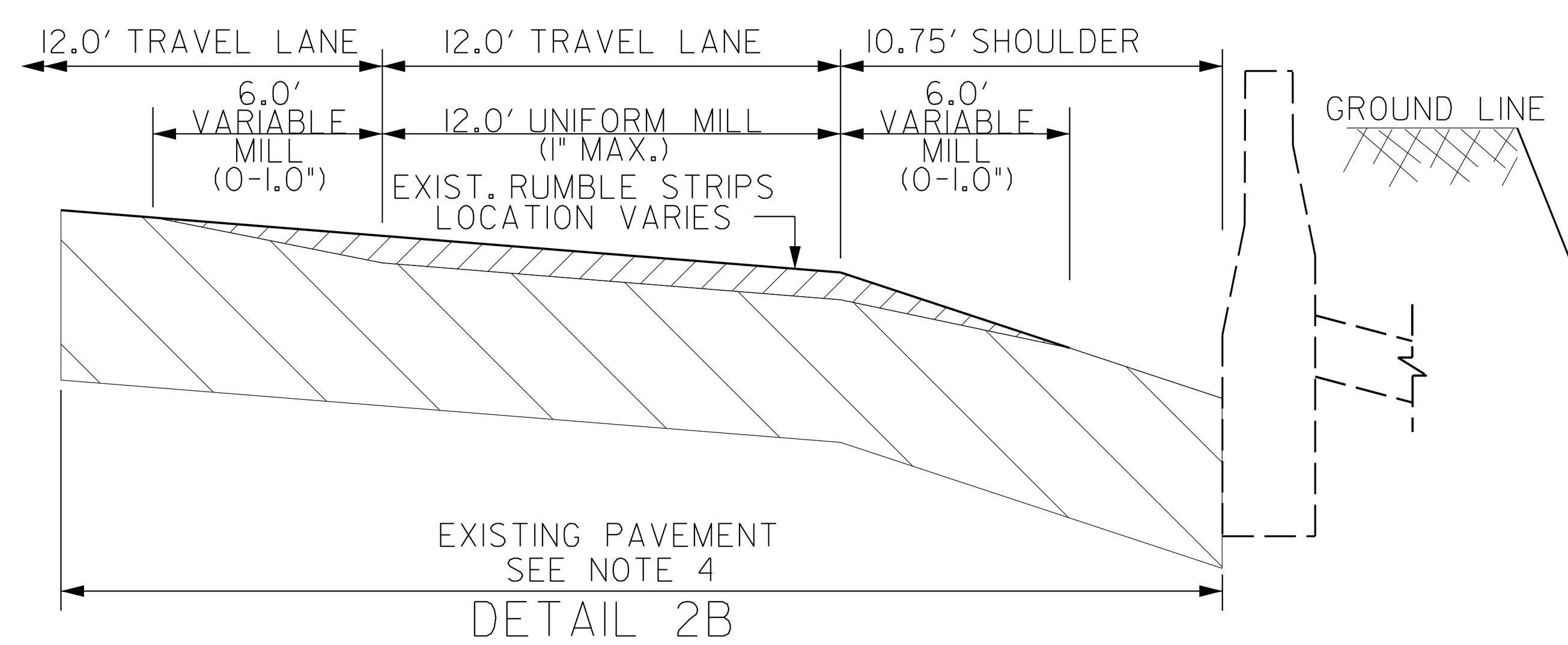
☆☆ FULL DEPTH SHOULDERS
NB STA.394+38.80 TO STA.414+00.00
SB STA.375+00.00 TO STA.407+00.00
SEE SHEETS 18 & 19 FOR EXTENDED FULL DEPTH SHOULDERS REQUIREMENT
OMIT (7) AND USE (4) (5) AND (6)

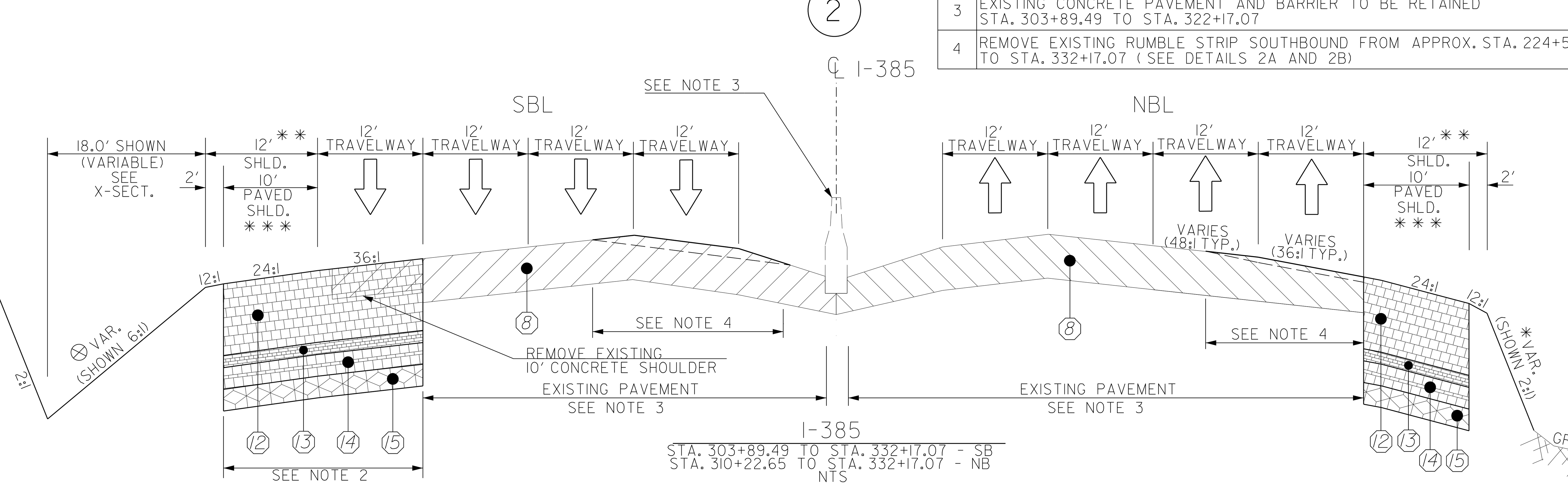


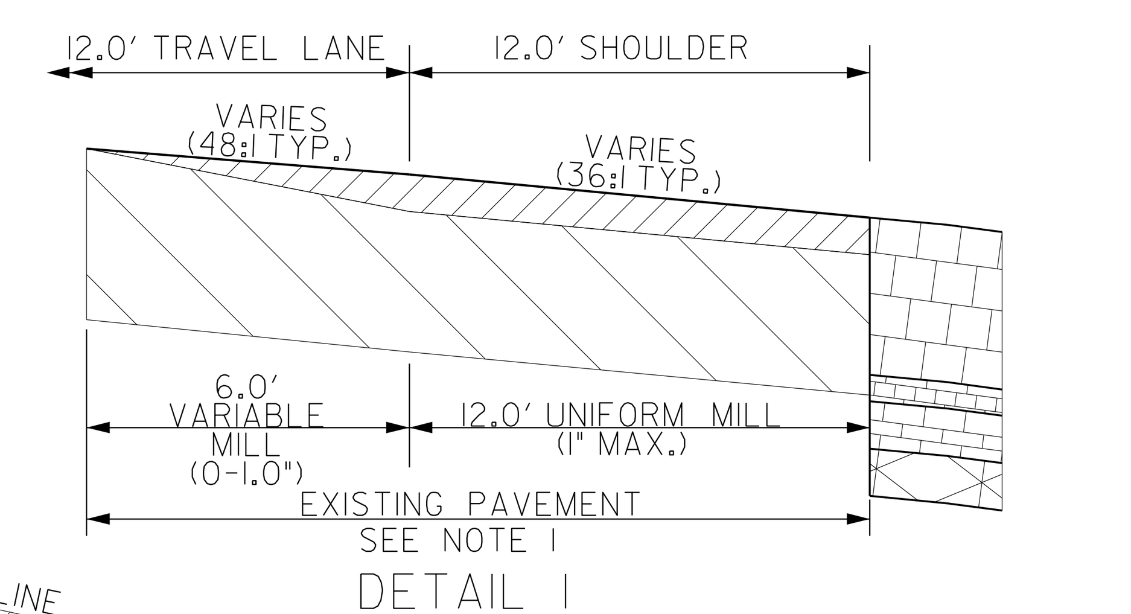
1	DIAMOND GRIND EXISTING SHOULDER AND ADJACENT TRAVEL LANE NORTHBOUND FROM STA. 310+22.65 TO STA. 332+17.07 (SEE DETAIL 1)
2	REMOVE AND REPLACE EXISTING SHOULDER WITH NEW TRAVEL LANE AND NEW SHOULDER SOUTHBOUND FROM STA. 303+89.49 TO STA. 332+17.07
3	EXISTING CONCRETE PAVEMENT AND BARRIER TO BE RETAINED STA. 303+89.49 TO STA. 322+17.07
4	REMOVE EXISTING RUMBLE STRIP SOUTHBOUND FROM APPROX. STA. 224+50 TO STA. 332+17.07 (SEE DETAILS 2A AND 2B)











LEGEND

1. OPEN-GRADED FRICTION COURSE (140 PSY)
2. HOT MIX ASPHALT SURFACE COURSE - TYPE A (200 PSY)
3. HOT MIX ASPHALT INTERMEDIATE COURSE - TYPE B (200 PSY)
4. HOT MIX ASPHALT BASE COURSE - TYPE A (300 PSY)
5. CEMENT STAB.AGGR.BASE CR. (10" UNIF.)
6. CEMENT MODIFIED SUBBASE (8" UNIFORM)
7. CEMENT STAB.AGGR.BASE CR. (9" UNIF.)
8. RETAIN EXISTING PAVEMENT
9. STRENGTHENING AND LEVELING: (≤ 2") ASPH.SURF.COURSE TYPE E; (> 2") ASPH.SURF.COURSE TYPE B
10. HOT MIX ASPHALT SURFACE COURSE - TYPE D (150 PSY)
11. GRADED AGGREGATE BASE COURSE (6" UNIFORM)
12. PLAIN JOINT CONCRETE PAVEMENT (13" UNIFORM)
13. FABRIC INTERLAYER
14. CEMENT STAB.AGGR.BASE CR. (6" UNIF.)
15. CEMENT MODIFIED SUBBASE (6" UNIFORM)
16. MILLING OF EXISTING PAVEMENT (0" - 3")

DESIGN SPEED			
MPH	FROM STA.	TO STA.	
65	203+00.00	435+00.00	I-85
65	303+89.49	332+17.07	I-385
EXCEPTIONS TO DESIGN SPEED			

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	03/08/16	MODIFIED "☆" NOTE	D.R.R.	B.G.N.
2	07/22/16	ADD ASPHALT CURB DET. & EXT. SHLDR NOTE	D.R.R.	B.G.N.
3	06/02/17	ADDED MOW STRIP DETAIL	B.G.N.	R.L.K.
4	5/3/18	REVISED I-85 SB END STA., ADDED I-85 NB REDUCED SHOULDER NOTE	B.G.N.	P.H.R.

DRAWN BY : A.W.F DATE : 6/10/15
REVIEWED BY : B.A.H. DATE : 09/04/15
APPROVED BY : B.G.N. DATE : 09/20/15

FLATIRON | ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD No. 13591
6/7/2018 12:43 PM

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION — SCDOT

I-85 / I-385 INTERCHANGE

TYPICAL SECTION

S:\Proj\2011\47IIA\Design\Project PIN Number\Roadway\Dgn\Typicals\Interchange\Sht03_Typical_I-85_WO.dgn
6/1/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	3E

GEOTECHNICAL NOTES

MAIN INTERCHANGE

The following notes apply to borrow materials:

Provide borrow materials meeting the following minimum requirements:
- **A sandy material (35% or less passing 0.075 mm) with a minimum total soil unit weight, γ_of 110 pcf, with a maximum dry density exceeding 100 pcf.**
- **Minimum friction angle, φ, of 30°and cohesion, c, of 50 psf for embankment fill.**
- **No. 57 Stone backfill for Mechanically Stabilized Earth Walls**

Walls 32 and 36 will require an embankment fill with a minimum friction angle, φ, of 32°and cohesion, c, of 50 psf. This requirement is between alignment Ramp 4, Stations 50+50 and 52+50.

In addition, determine the moisture-density relationship and classification of the material. Test and submit the classification, moisture-density relationship, and soil strength parameters of the material to the Engineer for acceptance. An AASHTO certified laboratory is required to perform the testing. Contact the RPG Geotechnical Engineer for a list of locally available AASHTO certified laboratories. The Department may perform independent testing to assure quality.

Determine the friction angle and cohesion using either direct shear testing or consolidated-undrained triaxial shear testing with pore pressure measurements. Direct Shear testing shall only be performed on soils with a fines content of less than 25 percent. Classification testing includes grain-size distribution with wash #200 sieve, moisture plasticity testing and natural moisture content. Use the Standard Proctor test to determine the moisture-density relationship. Remold all samples used in shear strength testing to 95 percent of the Standard Proctor density. Conduct shear strength testing at the initial selection of the borrow pit, any subsequent changes in borrow pits, and for every 10,000 cy of materials placed. Perform classification testing for every 50,000 cy of materials placed, including the material used for the shear strength testing. Additional shear testing may be required if, in the opinion of the RCE, the materials being placed are different from those originally tested.

If these minimum criteria cannot be met, provide the soil parameters for the intended borrow excavation material for the project site to the Engineer for review and acceptance. After acceptable borrow material is obtained, compact the fill to the required finish grade line using the compactive effort indicated in the Standard Specifications for Highway Construction, Section 205 (Embankment Construction).

The following notes apply to muck excavation:

Any areas identified on the plans and any additional areas that are discovered to deflect or settle may require corrective action as directed by the RCE. This may include undercutting, placing No. 57 stone aggregate that is separated from other borrow materials by a geotextile for separation of sub-grade and sub-base, and/or additional compactive effort to the approval of the RCE.

In areas that require mucking or undercutting, borrow material soil may be placed as a bridge lift as long as the grade on which the material is being placed is at least 2 feet above ground water level. In the event that groundwater does not allow backfilling with a borrow material soil, use a No. 57 stone as the bridge lift material. Borrow material bridge lifts may not exceed a 2-foot thickness. The depth at which mucking or undercutting is required is dependent upon encountering a suitable bearing material within the excavation or if a predetermined elevation or depth is required. In most cases, do not undercut more than 3 to 5 feet. The RCE will determine the final mucking or undercutting thickness, unless otherwise specified in the project plans and/or specifications. If a suitable bearing soil is not encountered within this depth range, place a P1 biaxial geogrid with an aperture size of less than or equal to 1 inch and in accordance with the project special previsions beneath a 2-foot thick bridge lift of No. 57 stone. If additional compacted borrow material soil is needed to reach grade, place a geotextile for separation of sub-grade and sub-base between the No. 57 stone and the overlying compacted soil. A bridge lift consisting of borrow material soil may not be placed within 3 feet of the base of the pavement section. Place only compacted borrow material soil or No. 57 stone within this zone. Reference the Standard Specifications for Highway Construction, Earthwork Section, Division 200.

The following notes apply for settlement and displacement monitoring:

The contractor shall establish a monitoring program consisting of settlement instruments. The settlement monitoring program must include establishing settlement monitoring instruments on the subgrade soils prior to fill placement, and at design pavement subgrade elevation. Settlement monitoring instruments are required at a spacing of every 100 feet along MSE Walls and every 500 feet along embankments with new fill thicknesses exceeding 20 feet. Instruments shall be established at the centerline of road and edge of pavement. Settlement monitoring shall continue until three consecutive measurements demonstrate the rate of settlement is less than 0.1 inches per year. No more than one measurement shall be obtained on a single day.

A minimum of 2 measurements shall be obtained on monuments prior to fill placement, and instruments shall be measured weekly during fill placement. Instrumentation measurements shall be provided to the Geotechnical Engineer within 24 hours of measurements for interpretation. Interpreted results shall be provided to the RCE.

The following notes apply to slope construction:

Where the new fill meets the existing slope, the existing slope shall be benched to limit the potential for a preferential failure surface and to allow compaction at the interface. Benches shall have a minimum horizontal length of 8 feet and a vertical rise of no more than 3 feet. Fill slopes of 2H:1V or steeper shall be overbuilt (i.e. fill should temporarily extend beyond the final slope face) to allow compaction at the slope face. After compaction is complete, the slope may be regraded to the final inclination.

Should seeps or thick lenses of highly plastic soils be observed in the planned fill and cut slopes that are steeper than 2H:1V, ECS must be contacted to determine if the steeper slopes may be constructed as planned or if slope flattening or reinforcing is required. Similarly, if soft or wet ground conditions are observed at the base of planned fill embankments, the QA representative must determine the limits of undercutting required or required in-situ treatment.

I-85 STA. 375+00 TO PELHAM RAMP

The following notes apply to borrow materials:

Provide borrow materials meeting the following minimum requirements:
- **A sandy material (35% or less passing 0.075 mm) with a minimum total soil unit weight, γ_of 110 pcf, with a maximum dry density exceeding 100 pcf.**
- **Minimum friction angle, φ, of 30° and cohesion, c, of 50 psf for embankment fill, alternatively embankment fill may consist of a minimum friction angle (φ) of 34° with zero cohesion.**
- **No. 57 Stone backfill for Mechanically Stabilized Earth Walls**

In addition, determine the moisture-density relationship and classification of the material. Test and submit the classification, moisture-density relationship, and soil strength parameters of the material to the Engineer for acceptance. An AASHTO certified laboratory is required to perform the testing. Contact the RPG Geotechnical Engineer for a list of locally available AASHTO certified laboratories. The Department may perform independent testing to assure quality.

Determine the friction angle and cohesion using either direct shear testing or consolidated-undrained triaxial shear testing with pore pressure measurements. Direct Shear testing shall only be performed on soils with a fines content of less than 25 percent. Classification testing includes grain-size distribution with wash #200 sieve, moisture plasticity testing and natural moisture content. Use the Standard Proctor test to determine the moisture-density relationship. Remold all samples used in shear strength testing to 95 percent of the Standard Proctor density. Conduct shear strength testing at the initial selection of the borrow pit, any subsequent changes in borrow pits, and for every 10,000 cy of materials placed. Perform classification testing for every 50,000 cy of materials placed, including the material used for the shear strength testing. Additional shear testing may be required if, in the opinion of the RCE, the materials being placed are different from those originally tested.

If these minimum criteria cannot be met, provide the soil parameters for the intended borrow excavation material for the project site to the Engineer for review and acceptance. After acceptable borrow material is obtained, compact the fill to the required finish grade line using the compactive effort indicated in the Standard Specifications for Highway Construction, Section 205 (Embankment Construction).

The following notes apply to muck excavation:

Any areas identified on the plans and any additional areas that are discovered to deflect or settle may require corrective action as directed by the RCE. This may include undercutting; placing No. 57 stone aggregate that is separated from other borrow materials by a geotextile for separation of sub-grade and sub-base, and/or additional compactive effort to the approval of the RCE.

In areas that require mucking or undercutting, borrow material soil may be placed as a bridge lift as long as the grade on which the material is being placed is at least 2 feet above ground water level. In the event that groundwater does not allow backfilling with a borrow material soil, use a No. 57 stone as the bridge lift material. Borrow material bridge lifts may not exceed a 2-foot thickness. The depth at which mucking or undercutting is required is dependent upon encountering a suitable bearing material within the excavation or if a predetermined elevation or depth is required. In most cases, do not undercut more than 3 to 5 feet. The RCE will determine the final mucking or undercutting thickness, unless otherwise specified in the project plans and/or specifications. If a suitable bearing soil is not encountered within this depth range, place a P1 biaxial geogrid with an aperture size of less than or equal to 1 inch and in accordance with the project special provisions beneath a 2-foot thick bridge lift of No. 57 stone. If additional compacted borrow material soil is needed to reach grade, place a geotextile for separation of sub-grade and sub-base between the No. 57 stone and the overlying compacted soil. A bridge lift consisting of borrow material soil may not be placed within 3 feet of the base of the pavement section. Place only compacted borrow material soil or No. 57 stone within this zone. Reference the Standard Specifications for Highway Construction, Earthwork Section, Division 200.

The following notes apply for MSE Wall Subgrades:

Prior to construction of the leveling pad and MSE fill, the RCE shall verify that the retaining wall is founded on subgrade materials possessing the minimum allowable bearing capacity noted on wall plan and elevation sheets. If the RCE determines that the subgrade is unacceptable for placement of MSE fill, the contractor shall undercut the subgrade to the limits directed by the RCE. Unacceptable subgrade materials include, but are not limited to, all high plasticity clays and elastic silts (CH, MH), low plasticity clays and silts (CL, ML) with an unconfined compressive strength less than 2,000 psf, and deleterious debris. Replacement of undercut material will be with Backfill Material, meeting requirements outlined in the SCDOT Standard Specifications for Highway Construction.

The foundation area for the MSE walls might have scattered pockets of soft soils that might be present at the surface or just below the surface for the base of the MSE fill. These soft pockets are only expected to extend a few feet below the base of the MSE fill. The quality assurance representative shall proofroll the subgrade in this area and/or conduct dynamic cone tests at regular intervals to determine that the subgrade meets the requirements of the paragraph above.

There are several locations along the roadway alignment where proposed drainage structures are situated in front of (i.e. parallel) MSE walls, or where new and existing draining structures pass beneath the MSE walls. Where new pipes are parallel to the proposed wall, the pipe should be installed prior to the proposed wall or the wall design should account for the temporary reduction in passive resistance. Where pipes pass beneath walls, the pipes should be designed to account for the increased loading associated with the wall backfill. We recommend the top of each pipe be situated a minimum of 1 foot below the bottom of retaining.

The following notes apply for settlement and displacement monitoring:

The contractor shall establish a monitoring program consisting of settlement instruments. The settlement monitoring program must include establishing settlement monitoring instruments on the subgrade soils prior to fill placement, and at design pavement subgrade elevation. Settlement monitoring instruments are required at a spacing of every 100 feet along MSE Walls and every 500 feet along embankments with new fill thicknesses exceeding 20 feet. Instruments shall be established at the centerline of road and edge of pavement. Settlement monitoring shall continue until three consecutive measurements demonstrate the rate of settlement is less than 0.1 inches per year. No more than one measurement shall be obtained on a single day.

A minimum of 2 measurements shall be obtained on monuments prior to fill placement, and instruments shall be measured weekly during fill placement. Instrumentation measurements shall be provided to the Geotechnical Engineer within 24 hours of measurements for interpretation. Interpreted results shall be provided to the RCE.

The following notes apply to slope construction:

Where the new fill meets the existing slope, the existing slope shall be benched to limit the potential for a preferential failure surface and to allow compaction at the interface. Benches shall have a minimum horizontal length of 8 feet and a vertical rise of no more than 3 feet. Fill slopes of 2H:1V or steeper shall be overbuilt (i.e. fill should temporarily extend beyond the final slope face) to allow compaction at the slope face. After compaction is complete, the slope may be regraded to the final inclination.

Should seeps or thick lenses of highly plastic soils be observed in the planned fill and cut slopes that are steeper than 2H:1V, ECS must be contacted to determine if the steeper slopes may be constructed as planned or if slope flattening or reinforcing is required. Similarly, if soft or wet ground conditions are observed at the base of planned fill embankments, the QA representative must determine the limits of undercutting required or required in-situ treatment.

The following Plan Notes apply to Mechanically Stabilized Earth walls:

Reinforced Backfill (Granular Fill or stone.)

Internal Friction Angle (deg) = 36
Total Unit Weight = 120 pcf
Surcharge Dead Load for Pavement Overlay = 140 psf
Active Earth Pressure Coefficient = 0.26

Retained Backfill

Internal Friction Angle (deg) = 30
Total Unit Weight = 117 pcf
Active Earth Pressure Coefficient = 0.33

Wall 17 I-85 Station
Foundation Soils
Total Internal Friction Angle (deg) = 26
Total Cohesion = 0 psf
Effective Internal Friction Angle (deg) = 26
Effective Cohesion = 0 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
0 < H ≤ 7.5	14.5 ft	2,000	3,100

Wall 18 I-85 Station 413+00 to 415+00
Foundation Soils
Total Internal Friction Angle (deg) = 0
Total Cohesion = 1000 psf
Effective Internal Friction Angle (deg) = 26
Effective Cohesion = 100 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
3 < H ≤ 7	12.5 ft	5,400	8,400

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	07/22/16	ADDED I-85 (ROCKY CREEK AREA GEOTECH. NOTES (ST. 375+00 - PELHAM)	D.R.R.	P.H.R.					
2	5/3/18	REVISED WALL 18, REMOVED WALL 55	B.G.N.	P.H.R.					

DRAWN BY : A.W.F DATE : 6/10/15
REVIEWED BY : B.A.H. DATE : 09/04/15
APPROVED BY : B.G.N. DATE : 09/20/15

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 13591

6/7/2018 12:43:42 PM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

GEOTECHNICAL NOTES

S:\Proj\2011\4711A\Design\Project PIN Number\Roadway\Dgn\Typicals\Interchange\Sht03E_Geotech_Notes.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	18

SEE SHEET 17 FOR GUARDRAIL NOTE
PRESENT 40' R/W 23.412 M.E.A.
WHISPERING HOLLOW RD.
MUDDY FORD ROAD
+42.54
+92.50
PRESENT 150' R/W 23.412 M.E.A.
BEGIN WALL 17 w/ MOMENT SLAB BARRIER STA. +73.80 68.6875' LT.
END WALL 17 W/ MOMENT SLAB BARRIER STA. +66.59 68.6875' LT.
+00.00 54.00
WALL 17
MOMENT SLAB BARRIER
ERECT 987.5 LF STEEL BEAM GUARDRAIL
CONSTRUCT THRIE BEAM BRIDGE CONNECTOR
END CONSTRUCTION
STA. 386+60.00 I-85 SB WIDENING
REPLACE OGFC AND CORRECT CROSS SLOPE
TO STA. 414+30.20
(SEE SHEET 3)
+60.00 54.00
STA. 386+78 END EXISTING GUARDRAIL REMOVAL
CONSTRUCT END ANCHOR TYPE B
10' PAVED SHOULDER
300' TAPER
INTERSTATE 85 SB
INTERSTATE 85 NB
CUR I85-3
℄ I-85
375
380
385
PAVED SHOULDER
12'
MATCH LINE STA. 373+00.00
SEE SHEET 17
MATCH LINE STA. 388+00.00
SEE SHEET 19
SEE SHEET 17 FOR GUARDRAIL NOTE
+88.06
+71.72
PRESENT 75' R/W 23.412 M.E.A.
ERECT 400 LF STEEL BEAM GUARDRAIL
CONSTRUCT END TERMINAL (TYPE T)
CONSTRUCT END ANCHOR (TYPE B)
53
55
56
57
58
59
60
61
62

CONTRACTOR TO REPLACE EXISTING GUARDRAIL (WITH ASSOCIATED PAVING UNDER GUARDRAIL) WITHIN THE PROJECT LIMITS.

CONSTRUCT CONCRETE BARRIER AT SIGN SUPPORT SEE STANDARD DRAWINGS 805-801-00 & 805-804-00

LIGHT DUTY PAVING

PAVED SHOULDER

PAVEMENT REMOVAL

ALIGNMENT CONTROL CAN BE FOUND ON REFERENCE DATA SHEETS 5B TO 5K

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	7/22/16	ADDED WALL 55 & REV. WALL 17	D.R.R.	B.G.N.
2	5/3/18	REVISED STA. 386+60 TO 425+00	B.G.N.	P.H.R.

DRAWN BY : A.W.F DATE : 6/10/15
REVIEWED BY : B.A.H. DATE : 09/04/15
APPROVED BY : B.G.N. DATE : 09/20/15

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

6/7/2018 12:03:32 PM

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

PLAN SHEET
STA. 373+00.00 TO STA. 388+00.00

S:\Proj\2014718\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\Sht_18.dgn 5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	19

ALIGNMENT CONTROL CAN BE FOUND ON REFERENCE DATA SHEETS 5B TO 5K

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED STA. 386+60 TO 425+00	B.G.N.	P.H.R.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F
DATE : 6/10/15

REVIEWED BY : B.A.H.
DATE : 09/04/15

APPROVED BY : B.G.N.
DATE : 09/20/15

FLATIRON ZACHRY
CE CS
CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION
6/7/2018 12:03:27 PM EDT

SOUTH CAROLINA PROFESSIONAL ENGINEER Paul Hanna Road 27820 PAUL HANNA ROAD

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

PLAN SHEET
STA. 388+00.00 TO STA. 403+00.00

S:\Proj\2011471\IA\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\Sht-19.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	20

ALIGNMENT CONTROL CAN BE FOUND ON REFERENCE DATA SHEETS 5B TO 5K

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
△	5/3/18	REVISED STA. 386+60 TO 425+00	B.G.N.	P.H.R.					

DRAWN BY : A.W.F — DATE : 6/10/15
REVIEWED BY : B.A.H. — DATE : 09/04/15
APPROVED BY : B.G.N. — DATE : 09/20/15

FLATIRON — ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — NO. 13591
6/7/2018 12:47:48 PM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION — SCDOT

I-85 / I-385 INTERCHANGE

PLAN SHEET
STA. 403+00.00 TO STA. 418+00.00

S:\Proj\2014\7114\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\Sht_20.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	21

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED STA. 386+60 TO 425+00	B.G.N.	P.H.R.

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F
DATE : 6/10/15

REVIEWED BY : B.A.H.
DATE : 09/04/15

APPROVED BY : B.G.N.
DATE : 09/20/15

FLATIRON ZACHRY
CES
CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION
SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 15578 PAUL HANNA RAAD
6/7/2018 12:43:47 PM EDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

PLAN SHEET
STA. 418+00.00 TO STA. 433+00.00

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5/30/2018

STATE	COUNTY	PROJECT ID	ROAD/ROUTE NO.	SHEET NO.
SC	GREENVILLE	0038III - R02	I-385 I-85	47

REVISIONS				
NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED END OF SB PROFILE	B.G.N.	P.H.R.

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — No. 19658 — PAUL HANNA RAO

6/7/2018 12:43:42 PM EDT

I–85 NB

VPI (373+35.00)
El 900.18

(-) 2.155%

(-) 1.782%

K = 538
195.00' V.C.

VPC (+32.50) 898.08

VPT (+32.50) 898.08

K = 523
195.00' V.C.

VPT (+32.50) 900.17

VPI (375+30.00)
El 895.97

VPT (+27.50) 894.23

VPC (+30.00) 894.18

(-) 1.792%

K = 2425
200.00' V.C.

VPI (377+30.00)
El 892.39

VPT (+30.00) 890.68

FINISHED GRADE

(-) 1.710%

EXISTING GROUND

VPC (+05.00) 882.56

K = 400
200.00' V.C.

VPI (384+05.00)
El 880.85

VPT (+05.00) 879.64

(-) 1.210%

VPC (+30.00) 878.12

K = 222
200.00' V.C.

(-) 0.310%

VPI (387+30.00)
El 876.91

	373+00	374+00	375+00	376+00	377+00	378+00	379+00	380+00	381+00	382+00	383+00	384+00	385+00	386+00	387+00	388+00
FINISHED GRADE		900.76	900.28	899.79	899.28	898.77	898.24	897.70	897.18	896.66	896.16	895.67	895.19	894.73	894.27	893.82	893.38	892.94	892.50	892.06	891.63	891.19	890.76	890.34	889.91	889.48	889.05	888.63	888.20	887.77	887.34	886.92	886.49	886.06	885.63	885.21	884.78	884.35	883.92	883.50	883.07	882.64	882.22	881.81	881.42	881.05	880.68	880.34	880.01	879.70	879.39	879.09	878.79	878.49	878.18	877.89	877.63	877.39	877.18	877.00	876.84	876.72
EXISTING GROUND		900.59	900.09	899.56	899.06	898.51	898.02	897.56	897.10	896.64	896.19	895.75	895.29	894.86	894.41	893.92	893.45	892.98	892.50	892.01	891.52	891.08	890.66	890.22	889.78	889.31	888.89	888.48	888.06	887.66	887.25	886.85	886.41	885.94	885.49	885.03	884.60	884.17	883.72	883.31	882.86	882.40	881.97	881.54	881.14	880.79	880.46	880.12	879.76	879.43	879.13	878.89	878.59	878.32	878.04	877.72	877.46	877.19	876.96	876.77	876.66	876.54

I–85 SB

VPI (373+50.00)
El 901.88

(-) 1.236%

K = 427
200.00' V.C.

VPT (+50.00) 900.17

VPC (+50.00) 900.17

(-) 1.705%

VPI (375+50.00)
El 898.47

K = 1849
200.00' V.C.

VPT (+50.00) 896.65

(-) 1.813%

VPC (+00.00) 893.93

K = 1946
200.00' V.C.

VPI (379+00.00)
El 892.12

VPT (+00.00) 890.41

(-) 1.711%

VPC (+50.00) 889.55

K = 1069
200.00' V.C.

VPI (381+50.00)
El 887.84

VPT (+50.00) 885.94

VPC (+60.00) 885.75

K = 254
200.00' V.C.

(-) 1.898%

EXISTING GROUND

VPI (383+60.00)
El 883.86

VPT (+60.00) 882.75

VPC (+60.00) 882.75

K = 21155
200.00' V.C.

FINISHED GRADE

(-) 1.109%

(-) 1.100%

VPT (+60.00) 880.54

END CONSTRUCTION
STA. 386+60.00
I-85 SB WIDENING

10'
50'

	373+00	374+00	375+00	376+00	377+00	378+00	379+00	380+00	381+00	382+00	383+00	384+00	385+00	386+00	387+00	388+00
FINISHED GRADE		902.47	902.12	901.76	901.38	900.99	900.59	900.17	899.74	899.31	898.88	898.44	898.00	897.55	897.10	896.65	896.20	895.75	895.29	894.84	894.39	893.93	893.48	893.03	892.59	892.14	891.71	891.27	890.84	890.41	889.98	889.55	889.12	888.69	888.24	887.80	887.34	886.88	886.42	885.94	885.47	885.03	884.60	884.21	883.83	883.48	883.16	882.86	882.58	882.30	882.03	881.75	881.48	881.20	880.92	880.65	880.27	880.00	879.75	879.50	879.34	879.27
EXISTING GROUND		902.12	901.79	901.48	901.13	900.76	900.43	900.06	899.70	899.31	898.90	898.47	898.04	897.59	897.14	896.69	896.22	895.76	895.32	894.85	894.41	893.98	893.54	893.09	892.64	892.19	891.74	891.25	890.83	890.39	889.97	889.58	889.16	888.71	888.26	887.82	887.36	886.90	886.43	885.93	885.44	884.96	884.53	884.14	883.77	883.44	883.11	882.79	882.48	882.21	881.96	881.64	881.37	881.11	880.86	880.57	880.27	880.00	879.75	879.50	879.34	879.27

STATE	COUNTY	PROJECT ID	ROAD/ROUTE NO.	SHEET NO.
SC	GREENVILLE	0038III - R02	I-385 I-85	48

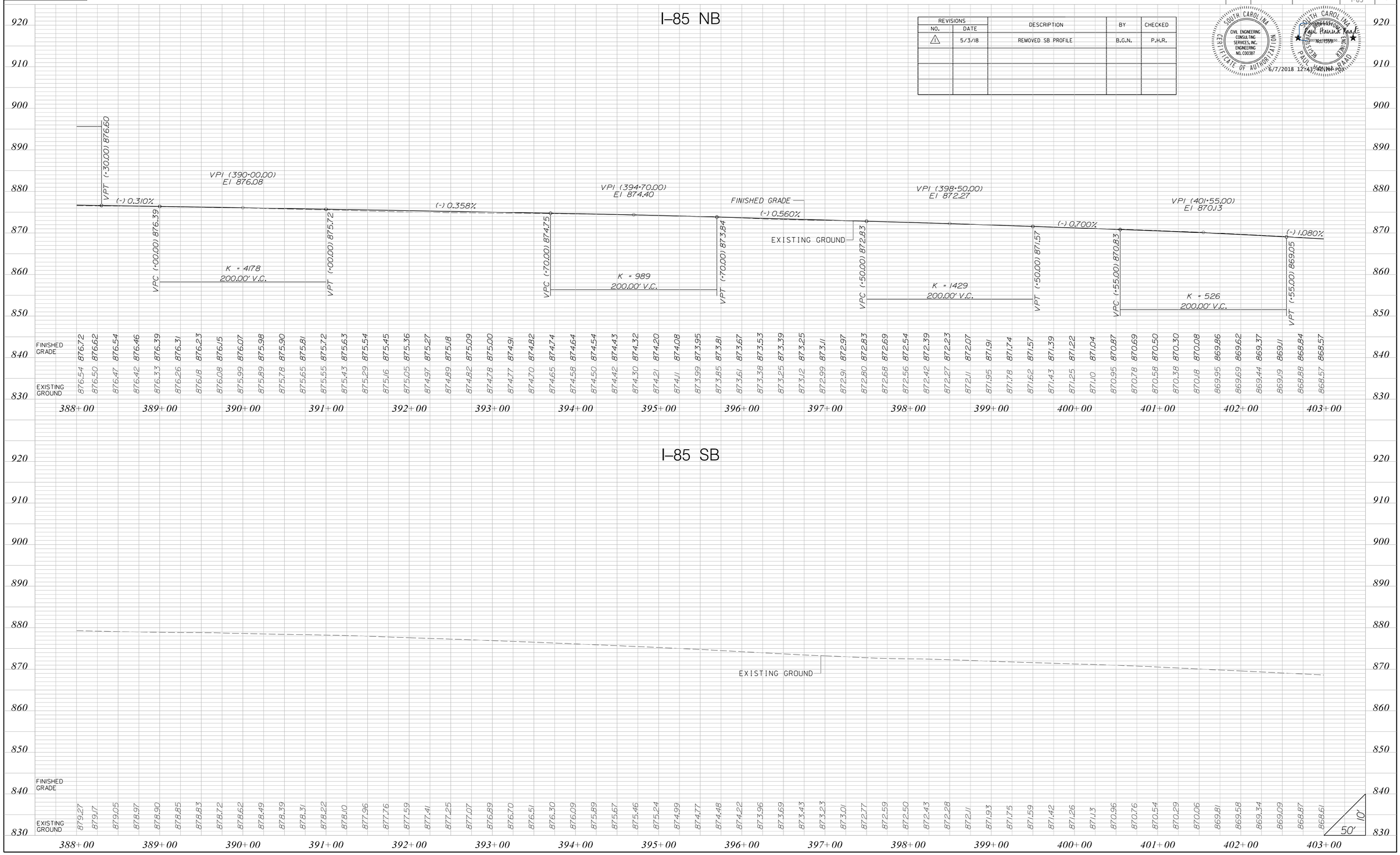
I–85 NB

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REMOVED SB PROFILE	B.G.N.	P.H.R.

CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 — CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA — PAUL HAMM — No. 31559 — REGISTERED PROFESSIONAL ENGINEER

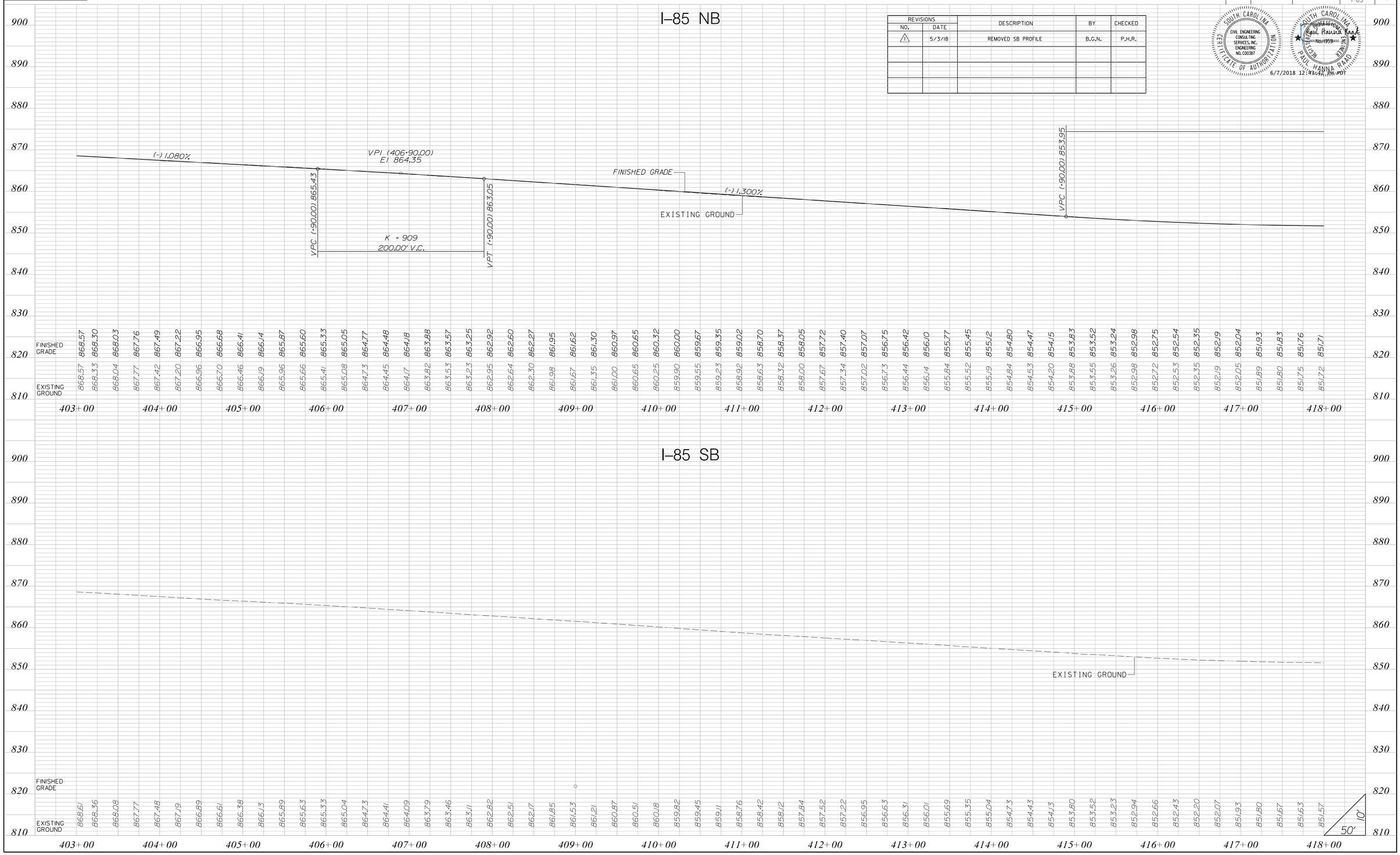
8/7/2018 12:43:42 PM



STATE	COUNTY	PROJECT ID	ROAD/ROUTE NO.	SHEET NO.
SC	GREENVILLE	0038III - R02	I-385 I-85	49

I–85 NB

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REMOVED SB PROFILE	B.G.N.	P.H.R.



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	D13

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	07/22/16	DESIGN NORTH OF STA. 376+00	DKA	BGN					
2	04/25/18	REVISED DRAINAGE, CONST. LIMITS	DKA	BGN					

DRAWN BY : R.A.R.
DATE : 08/28/15

REVIEWED BY : D.K.A.
DATE : 09/18/15

APPROVED BY : B.G.N.
DATE : 09/20/15

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

6/6/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

DRAINAGE PLAN SHEET
STA. 373+00.00 TO STA. 388+00.00

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	D14

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
⚠	04/25/18	REVISED DRAINAGE, CONST. LIMITS	DKA	BGN					

DRAWN BY : R.A.R.
DATE : 08/28/15

REVIEWED BY : D.K.A.
DATE : 09/18/15

APPROVED BY : B.G.N.
DATE : 09/20/15

FLATIRON
ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION
CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA PROFESSIONAL ENGINEER
DONALD KRISTIAN AULD
No. 30786
6/6/2018 10:58:07 AM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

DRAINAGE PLAN SHEET

STA. 388+00.00 TO STA. 403+00.00

S:\Proj\2011.47HA\Design\Project PIN Number\Drainage\DR Plan Sheets\Interchange\D_14.dgn
5/23/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	D15

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	04/25/18	REVISED DRAINAGE, CONST. LIMITS	DKA	BGN					

DRAWN BY : R.A.R.
DATE : 08/28/15

REVIEWED BY : D.K.A.
DATE : 09/18/15

APPROVED BY : B.G.N.
DATE : 09/20/15

FLATIRON
ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION
CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER
6/6/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
SCDOT

I-85 / I-385 INTERCHANGE

DRAINAGE PLAN SHEET
STA. 403+00.00 TO STA. 418+00.00

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	D16

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	04/25/18	REVISED DRAINAGE, CONST. LIMITS	DKA	BGN

DRAWN BY : R.A.R. DATE : 08/28/15
REVIEWED BY : D.K.A. DATE : 09/18/15
APPROVED BY : B.G.N. DATE : 09/20/15

FLATIRON
ZACHRY
CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION
SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 30706 DONALD KRISHEN AULD
6/6/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
SCDOT

I-85 / I-385 INTERCHANGE

DRAINAGE PLAN SHEET
STA. 418+00.00 TO STA. 433+00.00

S:\Proj\2011\4718\Design\Project PIN Number\Drainage\DR Plan Sheets\Interchange\D16.dgn
5/23/2018

STORM SEWER DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	D33

	GEOMETRY			UPSTREAM						DOWNSTREAM						
	PIPE			NODE						NODE						
ID	DIA. AND MATERIAL	NO. OF BARRELS	LENGTH (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	SPT "N"
NP-R10	18" SM. WALL PIPE	1	8	DN-R30	DUMMY JOINT	I85	381+45.66	82	879.93	DN-R29	DUMMY JOINT	I85	381+45.80	74	879.84	
NP-R12	18" SM. WALL PIPE	1	12	DN-R28	DUMMY JOINT	I85	381+46.00	-79	877.84	OP-R102	OP	I85	381+45.85	-91	877.68	
NP-R15	18" SM. WALL PIPE	1	16	DN-R31	DUMMY JOINT	I85	385+95.86	-79	873.06	OP-R103	OP	I85	385+95.83	-95	872.67	
NP-R2	18" SM. WALL PIPE	1	18	J-R13N	JB	I85	388+45.95	78	869.38	OP-R100	OP	I85	388+45.65	98	869.28	
NP-R29	24" SM. WALL PIPE	1	27	CB-R29	DI TYPE 112	PELHAM_RAMP	55+00.00	-33	868.45	MH-R29	CONVERT EXIST. BOX TO MH	I85	432+94.00	69	868.04	

	GEOMETRY			UPSTREAM						DOWNSTREAM						
	PIPE			NODE						NODE						
ID	DIA. AND MATERIAL	NO. OF BARRELS	LENGTH (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	SPT "N"

	GEOMETRY			UPSTREAM						DOWNSTREAM						
	PIPE			NODE						NODE						
ID	DIA. AND MATERIAL	NO. OF BARRELS	LENGTH (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	ID	DESCRIPTION	ROAD / ROUTE	STATION	OFFSET	PIPE INVERT (FT)	SPT "N"

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	04/20/17	NP-R1,NP-R11,NP-R13,NP-R14,NP-R23,NP-R24, NP-R25,NP-R3,NP-R32,NP-R33,NP-R35, NP-R36,NP-R37 AND ASSOCIATED STRUCTURES DELETED.	D.K.A.	B.G.N.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER DONALD KRISHJEN ABLO No. 38706

6/6/2018 10:56:07 AM PDT

I–85

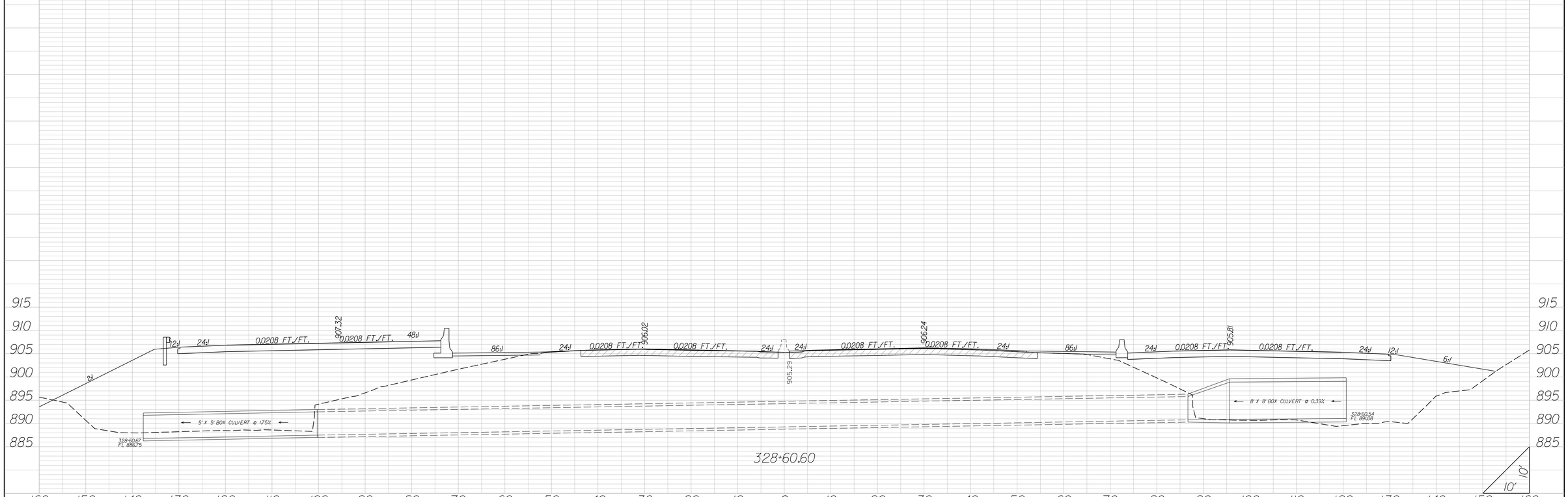
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	DRAIN XI

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION
CIVIL ENGINEERING CONSULTING SERVICES, INC.
ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER
Paul Hanna Raad
No. 19597
PAUL HANNA RAAD

6/7/2018 12:43:42 PM PDT

1	7/22/16	ADDED NP-R32
2	5/3/18	REMOVED X-LINE STA. 421+61



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	EC8

EROSION CONTROL DATA SHEET

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH STATION	SIDE	NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS	ROAD / ROUTE	OUTFALL DITCH STATION	SIDE	NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS
I-85	385+05	LT	ROCKY CREEK	ENOREE RIVER					
I-85	386+53	LT	ROCKY CREEK	ENOREE RIVER					
I-85	387+61	RT	ROCKY CREEK	ENOREE RIVER					
I-85	389+05	LT	ROCKY CREEK	ENOREE RIVER					
I-85	413+26	LT	ROCKY CREEK	ENOREE RIVER					
I-85	418+24	RT	ROCKY CREEK	ENOREE RIVER					
I-85	423+25	RT	ROCKY CREEK	ENOREE RIVER					
I-85	427+99	RT	ROCKY CREEK	ENOREE RIVER					
PEL. RA.*	53+31	RT	ROCKY CREEK	ENOREE RIVER					
PEL. RA.*	54+67	RT	ROCKY CREEK	ENOREE RIVER					
			*PELHAM_RAMP						

SOIL TYPES

ROAD / ROUTE	STATION	TO STATION	SOIL PARTICLE SIZE (COARSE / FINE)	ZONE
I-85	BEG.	413+22	FINE	PIEDMONT
I-85	413+22	426+17	COARSE	PIEDMONT
I-85	426+17	END	FINE	PIEDMONT
PEL. RA. *	BEG.	END	FINE	PIEDMONT
*PELHAM	RAMP			

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION	TO STATION	SIDE	DEPTH OF BLANKET (FT)	SLOPES $x:1$ FRONT	BACK	DITCH BOTTOM WIDTH (FT)	MSY
							TOTALS	

SEE SHTS. EC9 FOR TEMPORARY EROSION CONTROL BLANKET

SEDIMENT DAM

* NOTE BASIN INCISEMENT TO BE CONSTRUCTED WITH VERTICAL SIDE SLOPES TO DEPTH SHOWN IN "DEPTH OF BASIN".

ROAD / ROUTE	NO	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF BASIN	WIDTH OF BASIN	DEPTH OF BASIN	SIDE SLOPE OF BASIN	SPILLWAY WIDTH	SPILLWAY DEPTH	TOTAL HEIGHT TO SPILLWAY	SEDIMENT STORAGE VOLUME	RUNOFF STORAGE VOLUME	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH
I-85	RC1	381+40	RT	UNDRAINED	118	25	1	6:1/2:1	2	1.9	2.9	109	135			
I-85	RC2	386+24	RT	UNDRAINED	112	40	2.5	6:1/2:1	10	2	4.5	414	199			
I-85	RC3	395+00	RT	UNDRAINED	100	10	2	6:1/2:1	3	3.5	5.5	74	156			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION	TO STATION	SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
I-85	387+14	388+92	LT	20	150	60	
I-85	376+00	383+50	RT	10	150	60	
I-85	383+50	384+00	RT	10	100	20	
I-85	384+00	385+50	RT	10	150	20	
I-85	385+50	386+50	RT	10	100	20	
I-85	388+50	389+50	RT	10	75	30	
I-85	389+50	391+50	RT	10	150	30	
I-85	391+50	395+00	RT	10	100	50	
I-85	395+00	397+00	RT	10	25	90	
I-85	401+00	409+00	RT	10	150	70	
PELHAM	54+00	55+00	LT	10	150	20	
PELHAM	61+00	61+25	LT	10	25	20	
PELHAM	55+00	61+25	RT	10	50	140	
					GRAND TOTAL	630	

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION	TO STATION	SIDE	DEPTH OF MAT (FT)	SLOPES $x:1$ FRONT	BACK	DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
I-85	381+50	387+00	RT	3	6	2	0	1	1.525	0.000	0.000
I-85	415+00	418+00	RT	2	1	0	0	3	0.000	0.000	0.094
I-85	423+00	426+00	RT	5	1.5	0	0	2	0.000	0.300	0.000
PELHAM	55+00	61+25	RT	2	6	2	0	1	1.155	0.000	0.000
								TOTALS	2.681	0.300	0.094

△1 04/25/18 ADJUSTED EROSION CONTROL ITEMS TO REFLECT REVISED CONST. LIMITS

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 30706 DONALD KRISHJEN AULD

DocuSigned by: Donald Krishjen Auld

6/6/2018 10:56:07 AM PDT

EROSION CONTROL DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	EC9

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	SLOPES		DITCH BOTTOM WIDTH (FT)	MSY
					x : 1			
					FRONT	BACK		
I-85	375+00	375+50	LT	10	4	0	0	0.229
I-85	375+50	375+25	LT	10	2	0	0	0.062
I-85	377+00	379+50	LT	6	2	0	0	0.373
I-85	381+50	386+00	LT	8	2	0	0	0.894
I-85	386+50	387+00	LT	14	2	0	0	0.174
I-85	387+50	388+50	LT	6	2	2	10	0.409
I-85	376+50	376+50	RT	12	0	2	0	0.000
I-85	377+00	380+50	RT	20	0	2	0	1.739
I-85	381+00	381+50	RT	15	0	2	0	0.186
I-85	381+50	382+00	RT	9	0	2	0	0.112
I-85	384+50	385+50	RT	6	0	2	0	0.149
I-85	388+50	389+00	RT	8	6	2	0	0.370
I-85	389+00	389+50	RT	18	0	2	0	0.224
I-85	389+50	390+00	RT	21	0	2	0	0.261
I-85	390+00	391+50	RT	31	0	2	0	1.155
I-85	391+50	392+50	RT	25	0	2	0	0.621
I-85	392+50	394+00	RT	20	0	2	0	0.745
I-85	393+50	396+00	RT	8	6	0	0	1.352
I-85	394+00	396+00	RT	8	0	2	0	0.398
I-85	397+00	398+00	RT	8	2	0	0	0.199
I-85	398+00	401+00	RT	8	4	0	0	1.099
I-85	402+00	403+00	RT	10	0	2	0	0.248
I-85	403+00	405+00	RT	20	0	2	0	0.994
I-85	405+00	408+00	RT	25	0	2	0	1.863
I-85	408+00	409+00	RT	10	0	2	0	0.248
I-85	424+00	426+00	RT	5	1.5	0	0	0.200
I-85	426+00	427+50	RT	8	4	0	0	0.550

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	SLOPES		DITCH BOTTOM WIDTH (FT)	MSY
					x : 1			
					FRONT	BACK		

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	SLOPES		DITCH BOTTOM WIDTH (FT)	MSY
					x : 1			
					FRONT	BACK		

04/25/18 ADJUSTED EROSION CONTROL ITEMS TO REFLECT REVISED CONST. LIMITS

SEE SHEET IL1FOR INDEX OF SHEETS

	BRIDGES TO BE CONSTRUCTED			
BRIDGE NO.	ROAD NO.	LENGTH	STA. TO STA.	LOCATION
1/2A	I-385 SB	201.85'	374+34.76 TO 376+36.61	GARLINGTON RD. & GE RAILROAD OVERPASS
2B	I-385 NB	201.50'	374+96.79 TO 376+98.29	GARLINGTON RD. & GE RAILROAD OVERPASS
3	I-385 NB CD	201.50'	376+37.60 TO 378+39.10	GARLINGTON RD. & GE RAILROAD OVERPASS
4	RAMP 8	148.17'	57+85.53 TO 59+33.70	I-385 NB CD OVERPASS
5	RAMP 1A	1522.83'	72+79.42 TO 88+02.25	I-385 & I-85 OVERPASS
6	RAMP 4B	1962.83'	390+18.50 TO 409+81.33	I-385 & I-85 OVERPASS
7	RAMP 2B	475.00'	34+16.95 TO 38+91.95	I-85 OVERPASS
8	RAMP 3A	254.85'	297+81.45 TO 300+36.30	I-85 OVERPASS
9	RAMP 2A	368.84'	71+70.81 TO 75+39.65	I-85 OVERPASS
10	RAMP 1B	220.05'	69+11.35 TO 71+31.40	RAMP 4B OVERPASS
12	I-385	497.17'	395+34.84 TO 400+32.01	I-85 OVERPASS
BRIDGE PLANS BOUND UNDER SEPARATE COVER				

South Carolina Department of Transportation

PROPOSED PLANS FOR GREENVILLE COUNTY

PROJECT ID 0038111 - R02

INTERSTATE 85 / 385 INTERCHANGE

FROM: 0.20 MILES SOUTH OF S-326
TO: ROAD S-492

PROJECT ID 0038111-R02
INTERSTATE 385
447+60.00 END

PROJECT ID 0038111-R02
INTERSTATE 385
303+89.49 BEGIN

PROJECT ID 0038111-R02
INTERSTATE 85
203+00.00 BEGIN

PROJECT ID 0038111-R02
INTERSTATE 85
STA. 435+00.00 END

GREENVILLE COUNTY MAP

LAYOUT
(NOT TO SCALE)

	I-85	I-385	RAMPS	CD's	TOTAL
NET LENGTH OF ROADWAY	4.394 MILES	2.551 MILES	9.035 MILES	2.867 MILES	18.757 MILES
NET LENGTH OF BRIDGES	- MILES	0.171 MILES	0.938 MILES	0.038 MILES	1.147 MILES
NET LENGTH OF PROJECT	4.394 MILES	2.722 MILES	9.973 MILES	2.905 MILES	19.993 MILES
LENGTH OF EXCEPTIONS	- MILES	- MILES	- MILES	- MILES	- MILES
GROSS LENGTH OF PROJECT	4.394 MILES	2.722 MILES	9.973 MILES	2.905 MILES	19.993 MILES

EQUALITIES IN STATIONING

NONE

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF LETTING.

RELEASE FOR CONSTRUCTION PLANS

CONTRACT ID 5384210

SHEET NO.	TOTAL SHEETS
1	1918

Hydraulic Design Reference for these plans in the:

2009

Edition of SCDOT'S "Requirements for Hydraulic Design Studies"

Design Reference for these plans is the:

2001

AASHTO "A Policy on Geometric Design of Highways and Streets"

UNLESS OTHERWISE NOTED ON TYPICAL SECTION

6	1/9/18	SHEET TOTAL REVISED	B.G.N.
7	5/3/18	SHEET TOTAL REVISED	B.G.N.

NPDES PERMIT INFORMATION

Disturbed Area = 160.5 Acre(s)

Permitted Area = 349.7 Acre(s)

Approximate Location of Roadway is

Begin
Latitude 34° 50' 20' N
Longitude 82° 17' 26' W

End
Latitude 34° 50' 02' N
Longitude 82° 17' 27' W

Hydraulic and NPDES Design provided by:

CECS, Inc.

Designs may be obtained from the SCDOT Regional Production Group

SCDOT REVIEW	RIGHT-OF-WAY INITIAL	RIGHT-OF-WAY DATE	CONSTRUCTION INITIAL	CONSTRUCTION DATE
PRECONSTRUCTION SUPPORT - ROAD				
PRECONSTRUCTION SUPPORT - STRUCTURES				
RPG - DESIGN MANAGER				
RPG - PROGRAM MANAGER				

THE INITIALS ABOVE DO NOT RELIEVE THE ENGINEER OF RECORD OF THE RESPONSIBILITY TO DESIGN THIS PROJECT IN ACCORDANCE WITH ALL APPLICABLE CRITERIA.

ENVIRONMENTAL PERMIT INFORMATION

USACE PERMIT	X YES	NO
NEPA DOCUMENT	X YES	NO
401 CERTIFICATION	X YES	NO
OCRM CAP	YES	X NO
NAVIGABLE WATERS	SC USCG USACE	X N/A

3 DAYS BEFORE DIGGING IN SOUTH CAROLINA

CALL 811

SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

RAILROAD INVOLVEMENT?
(YES) / NO

TRAFFIC DATA

	I-85	I-385
2015 ADT	118,200	106,500
2035 ADT	174,700	171,400
TRUCKS	18 %	18 %

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	1/27/16	SHEET TOTAL REVISED	D.R.R.	B.G.N.
2	5/02/16	SHEET TOTAL REVISED	D.R.R.	B.G.N.
3	5/12/16	SHEET TOTAL REVISED	D.R.R.	B.G.N.
4	6/17/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
5	7/8/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
6	8/9/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
7	8/18/16	SHEET TOTAL REVISED	D.R.R.	R.L.K
8	9/12/16	BRIDGE LENGTHS 1/2A, 2B, 3, SHT. TTL RVSD	D.R.R.	
9	9/28/16	SHEET TOTAL REVISED	B.G.N.	
10	10/21/16	SHEET TOTAL REVISED	B.G.N.	
11	10/28/16	SHEET TOTAL REVISED	B.G.N.	
12	1/12/17	SHEET TOTAL REVISED	B.G.N.	
13	2/2/17	SHEET TOTAL REVISED	B.G.N.	
14	3/16/17	SHEET TOTAL REVISED	B.G.N.	
15	12/18/17	SHEET TOTAL REVISED	B.G.N.	

For Right Of Way Acquisition:

Consultant Engineer of Record — Date

Regional Production Engineer — Date

CONSULTING ENGINEERING FIRM

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.
2000 PARK STREET
SUITE 201
COLUMBIA, S.C. 29201

ENGINEER OF RECORD

SOUTH CAROLINA — CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA — REGISTERED PROFESSIONAL ENGINEER — Faisal Hanna Rady — No. 31591 — FAISAL HANNA RADY

6/7/2018 12:48:12 PM EDT

FOR CONSTRUCTION: _____ DATE

S:\Proj\20II\4II1A\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\Sht_01_Title_I-85.dgn
5/30/2018

I–85

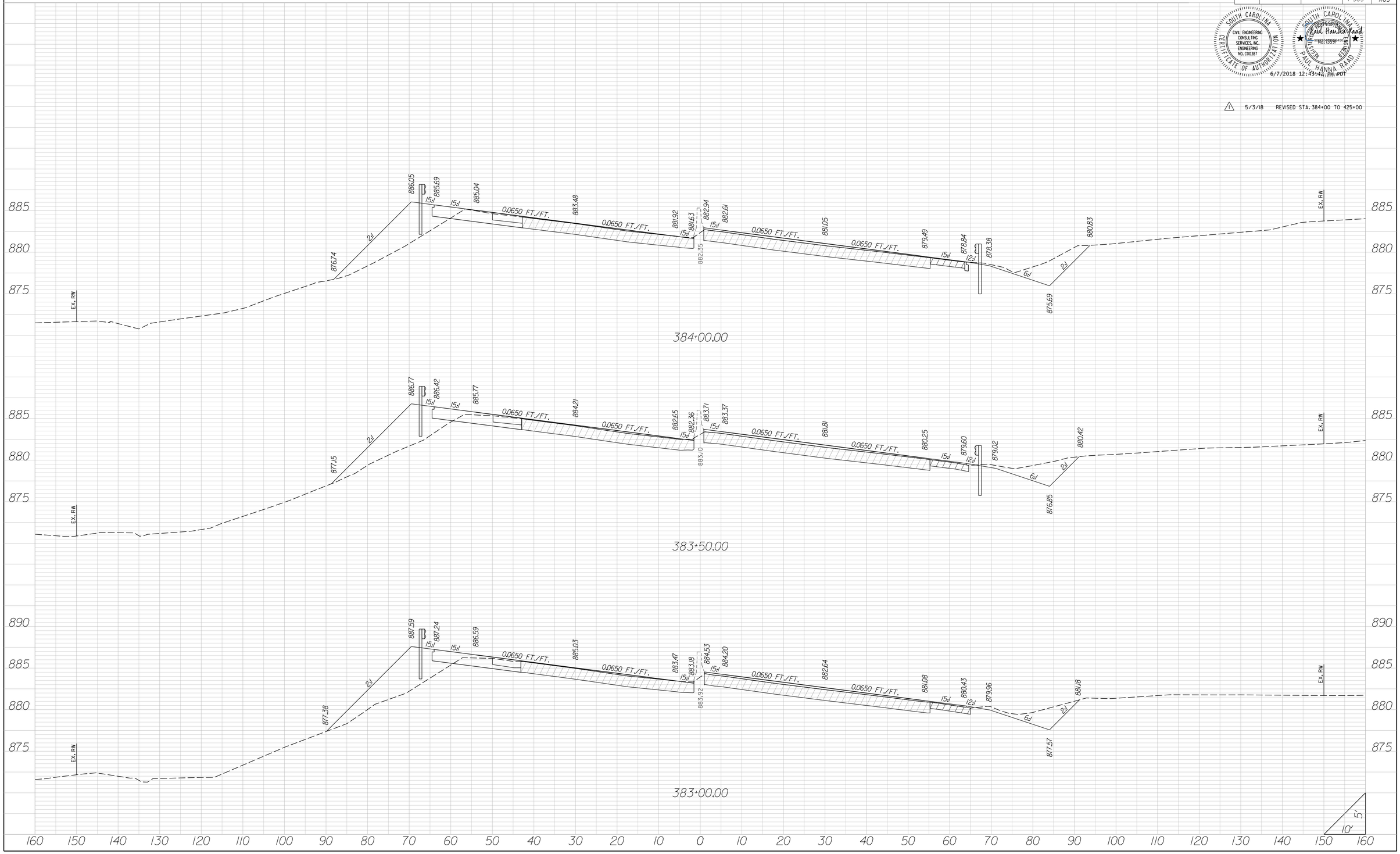
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X83

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — No. 31559

6/7/2018 12:43:42 PM EDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X84

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 31359 DATE

6/7/2018 12:43:41 PM EDT

5/3/18 REVISED STA. 384+00 TO 425+00

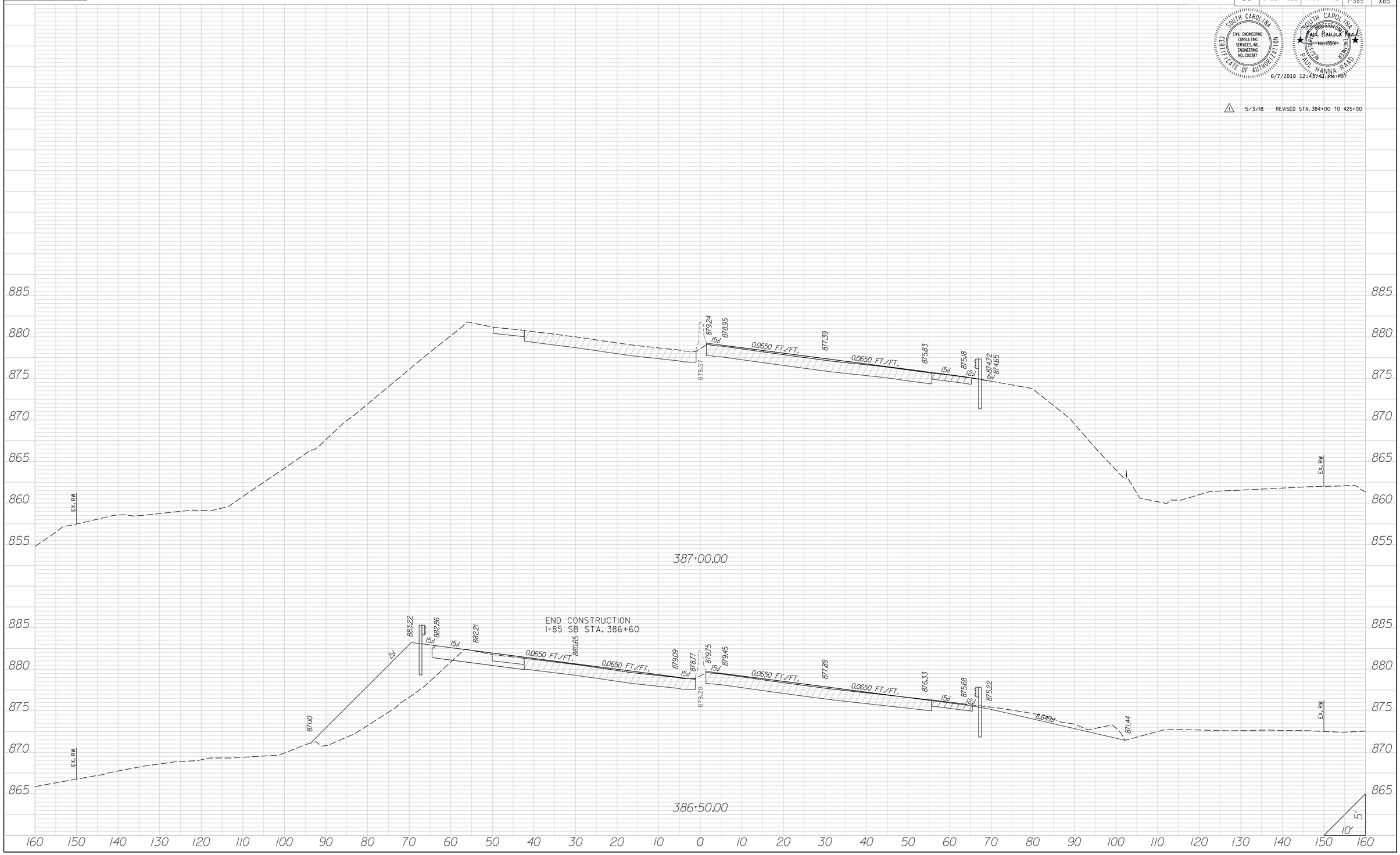
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X85

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 19598

6/7/2018 12:49:42 PM PDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

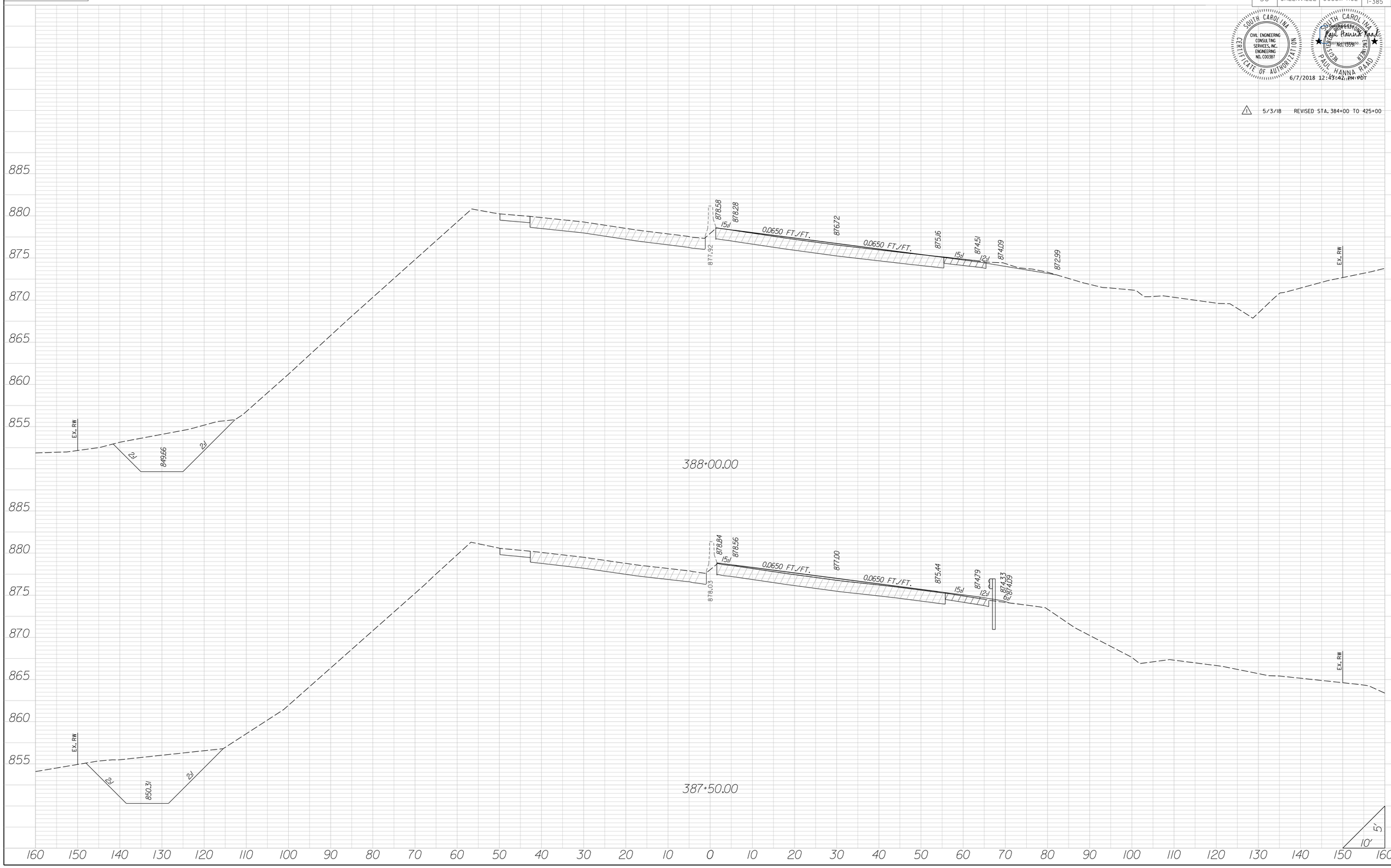
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X86

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00038

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — No. 19591

6/7/2018 12:43:42 PM PDT

1 5/3/18 REVISED STA. 384+00 TO 425+00



I-85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038111-R02	I-85/ I-385	I-85 X87

I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X88

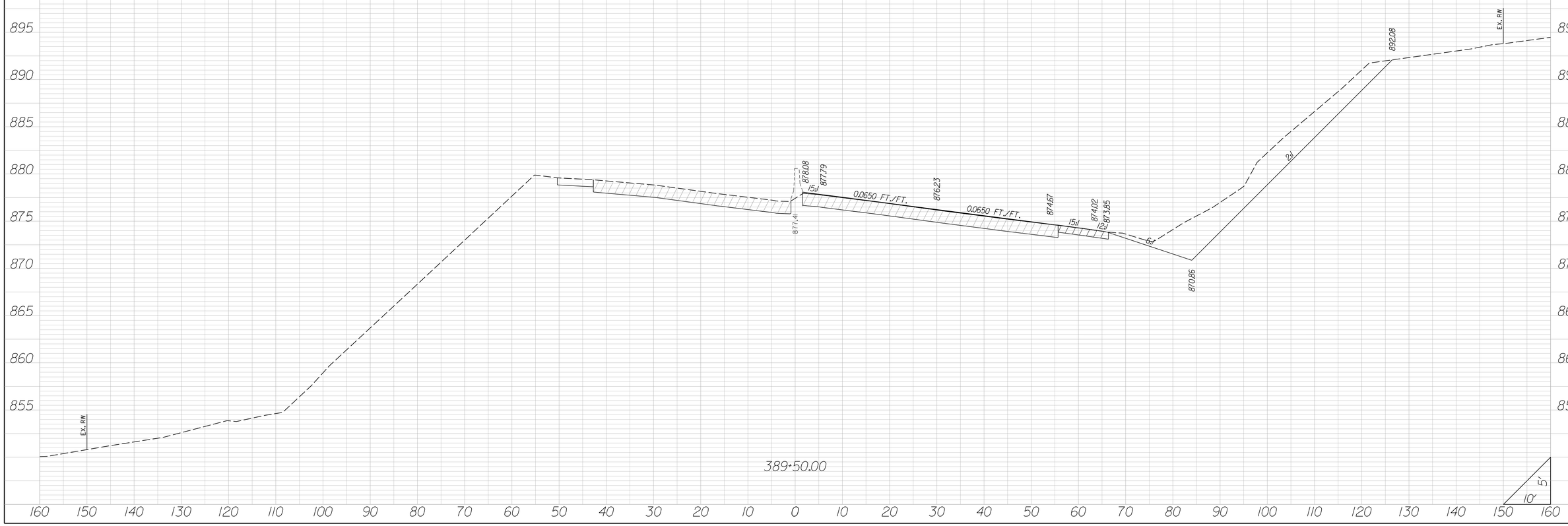
SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD NO. 19599

Paul Hanna Raad

6/7/2018 12:43:42 PM EDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X89

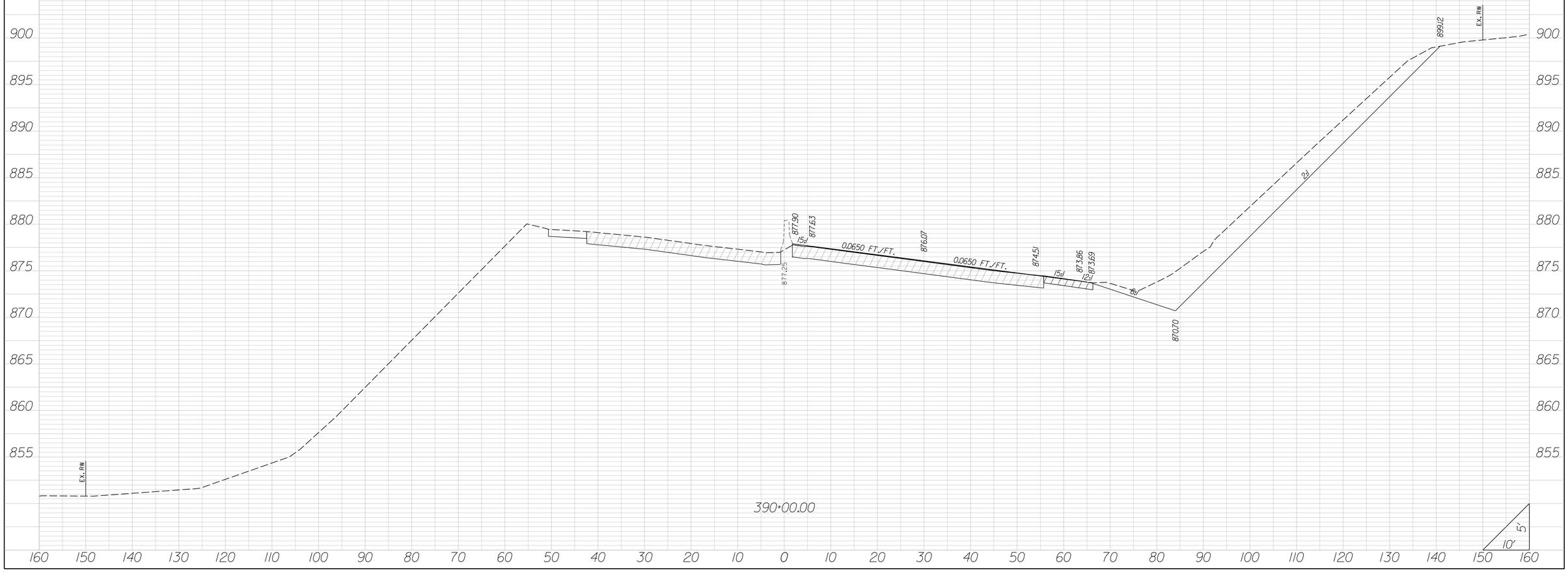
SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 32591

Paul Hanna Raad

6/7/2018 12:43:43 PM PDT

1	5/3/18	REVISED STA. 384+00 TO 425+00



I–85

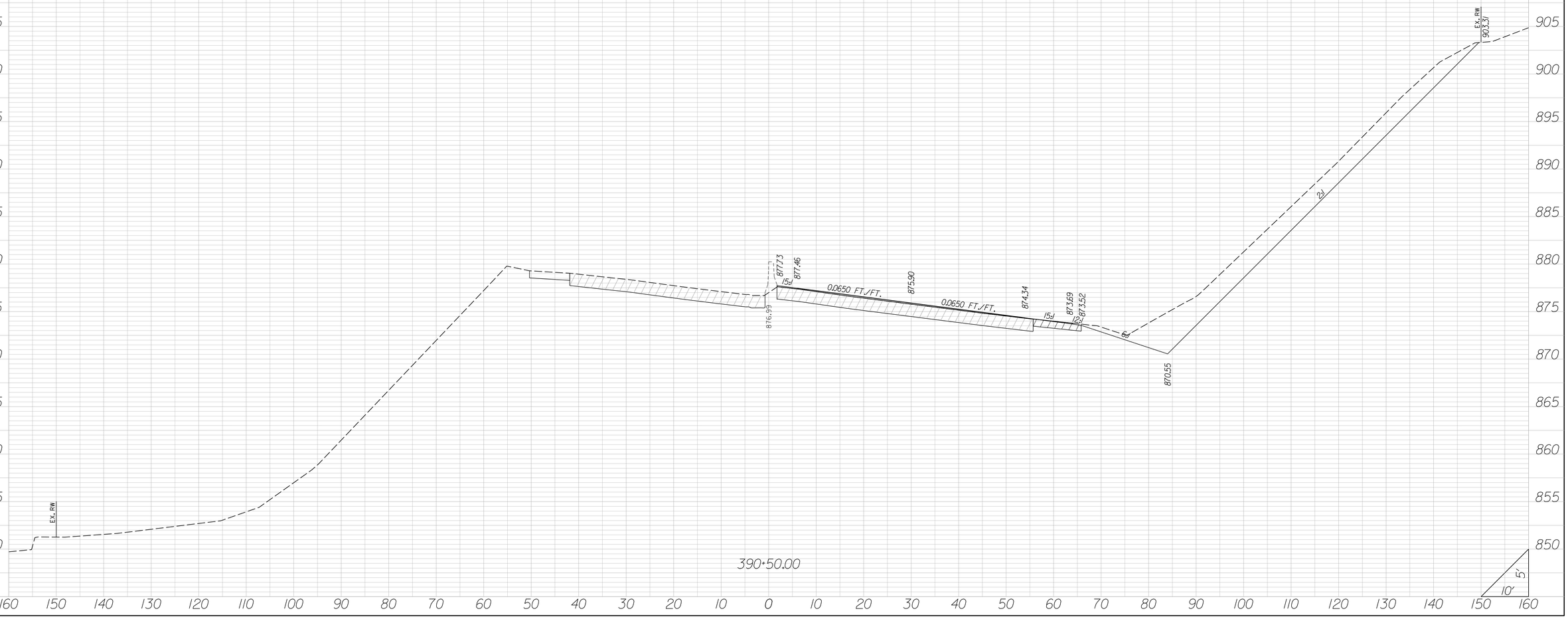
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X90

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — NO. 19559

6/7/2018 12:43:42 PM EDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

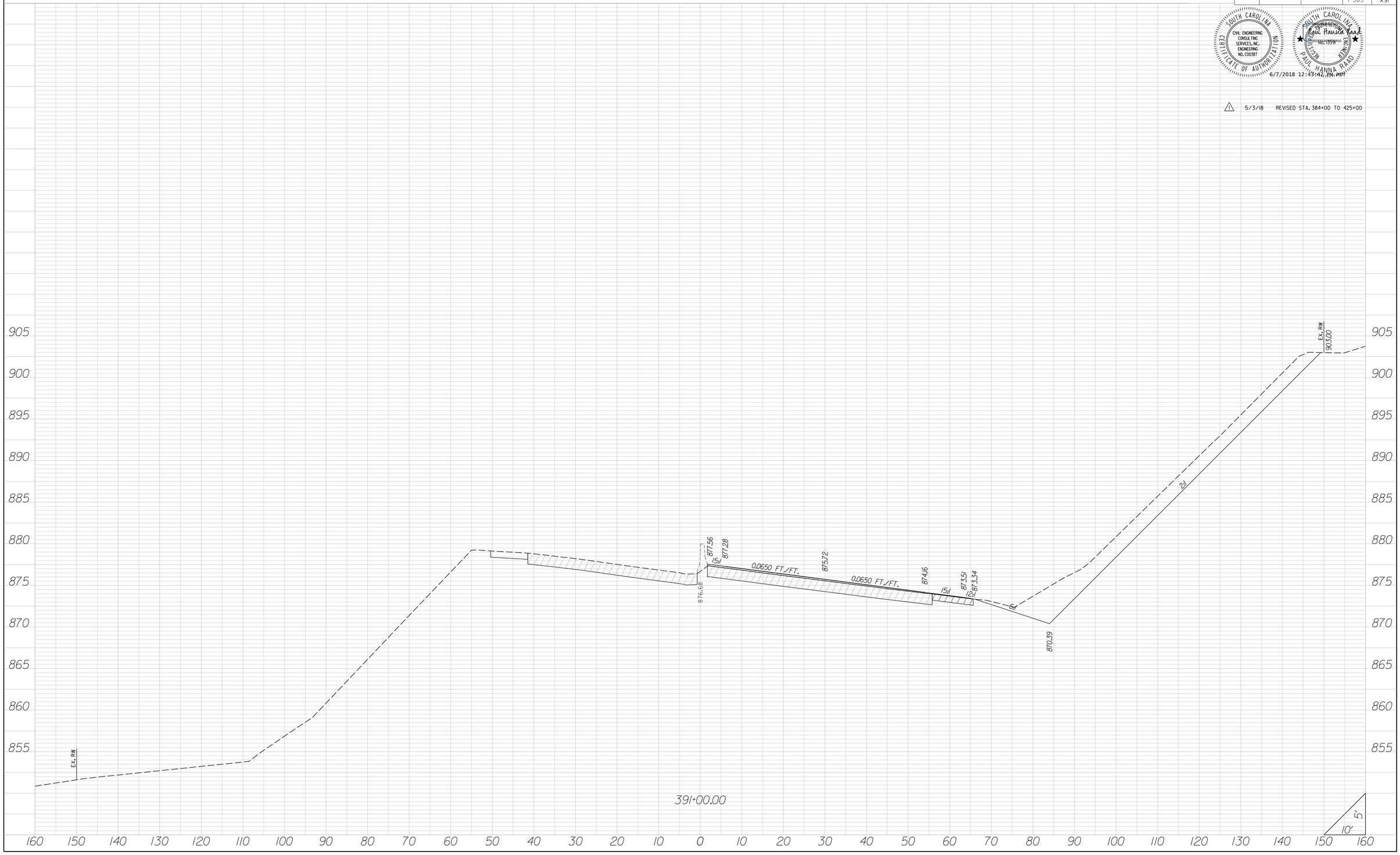
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X91

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA PROFESSIONAL ENGINEER — REGISTRATION NO. 11999 — PAUL HANNA RAAD

6/7/2018 12:43:42 PM EDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

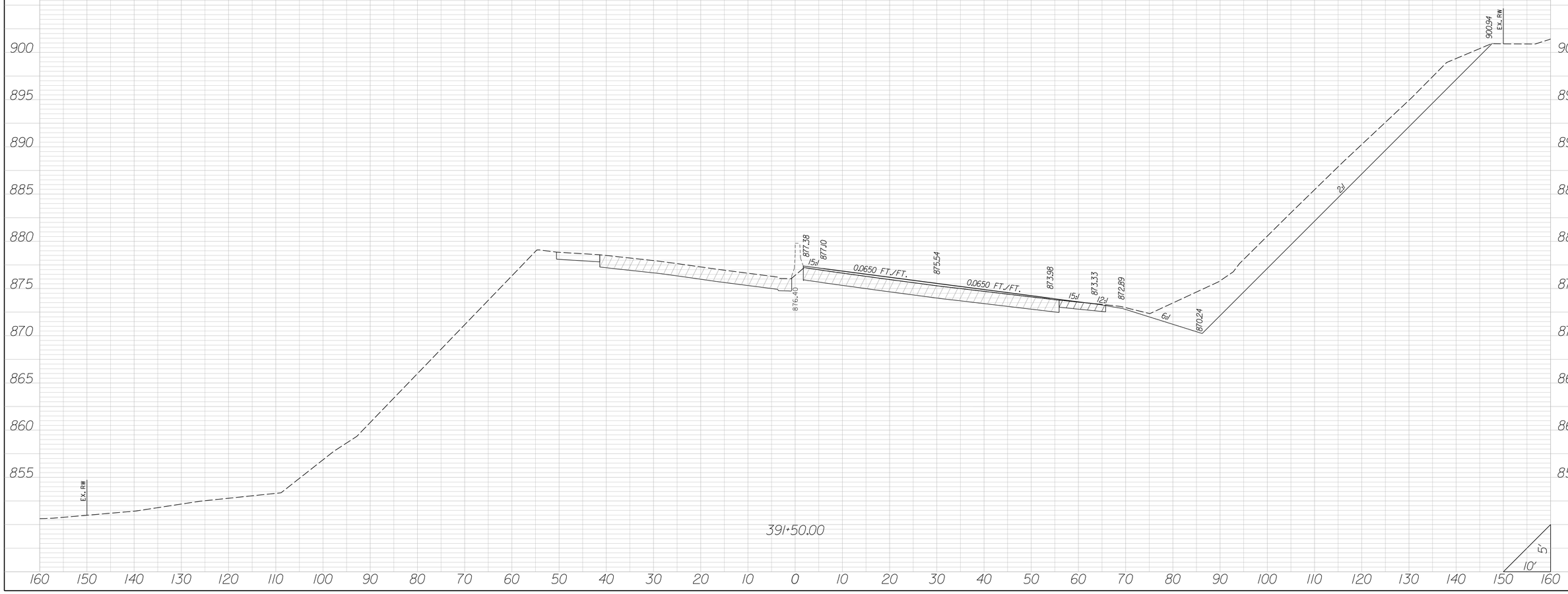
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X92

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — Paul Hanna Raad No. 13591 — PAUL HANNA RAAD

6/7/2018 12:43:42 PM PDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

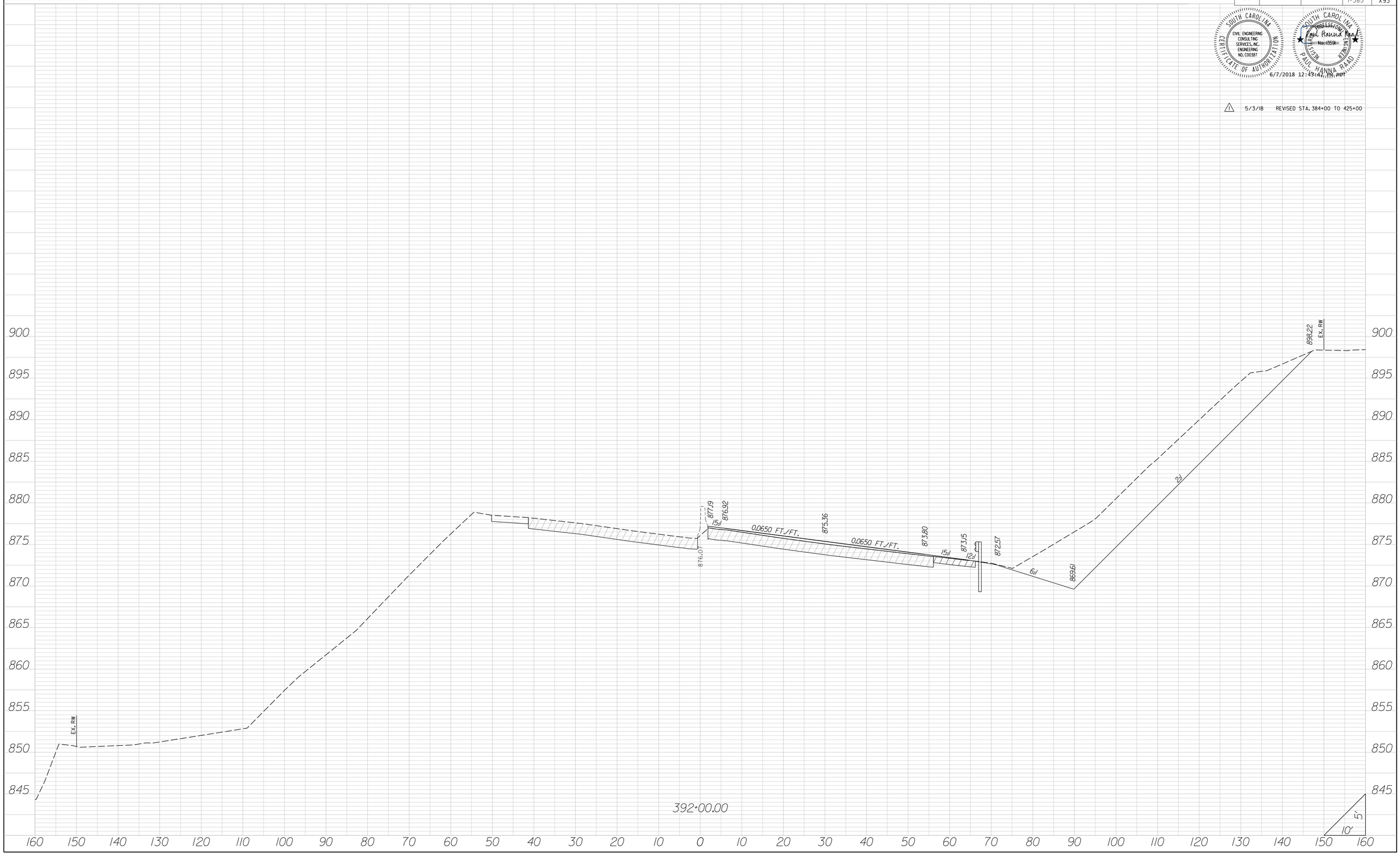
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X93

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 35980

6/7/2018 12:43:42 PM EDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

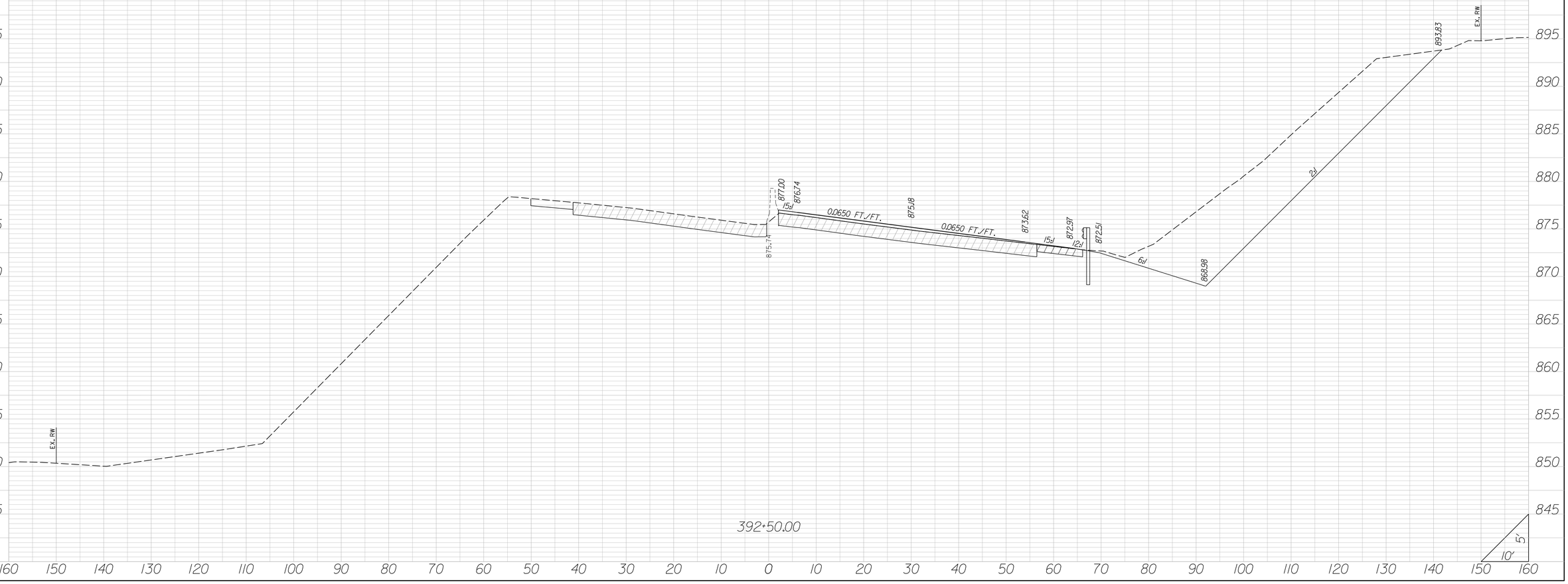
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X94

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 33591

6/7/2018 12:43:42 PM PDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X95

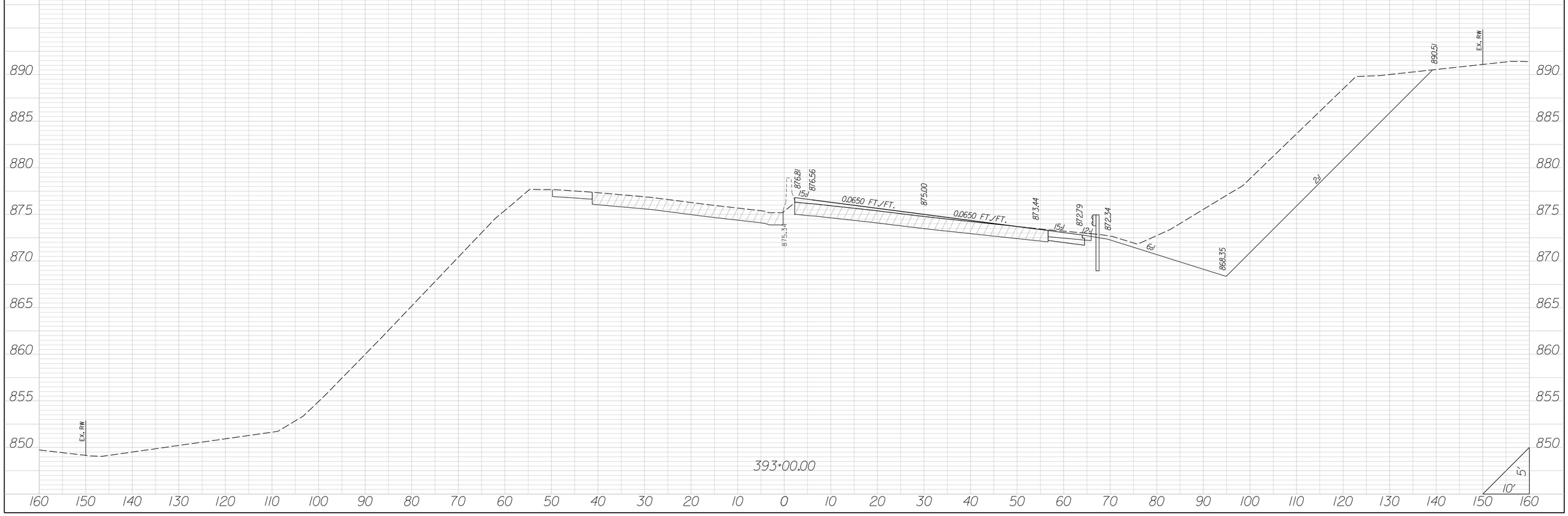
SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — No. 32598

Paul Hanna Raad

6/7/2018 12:43:42 PM PDT

1	5/3/18	REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038111-R02	I-85/ I-385	I-85 X96

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION
CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER
PAUL HANNA RAAD No. 13591
DocuSigned by: Paul Hanna Raad
900786469FDB450...
6/7/2018 12:43:42 PM PDT

1 5/3/18 REVISED STA. 384+00 TO 425+00

I–85

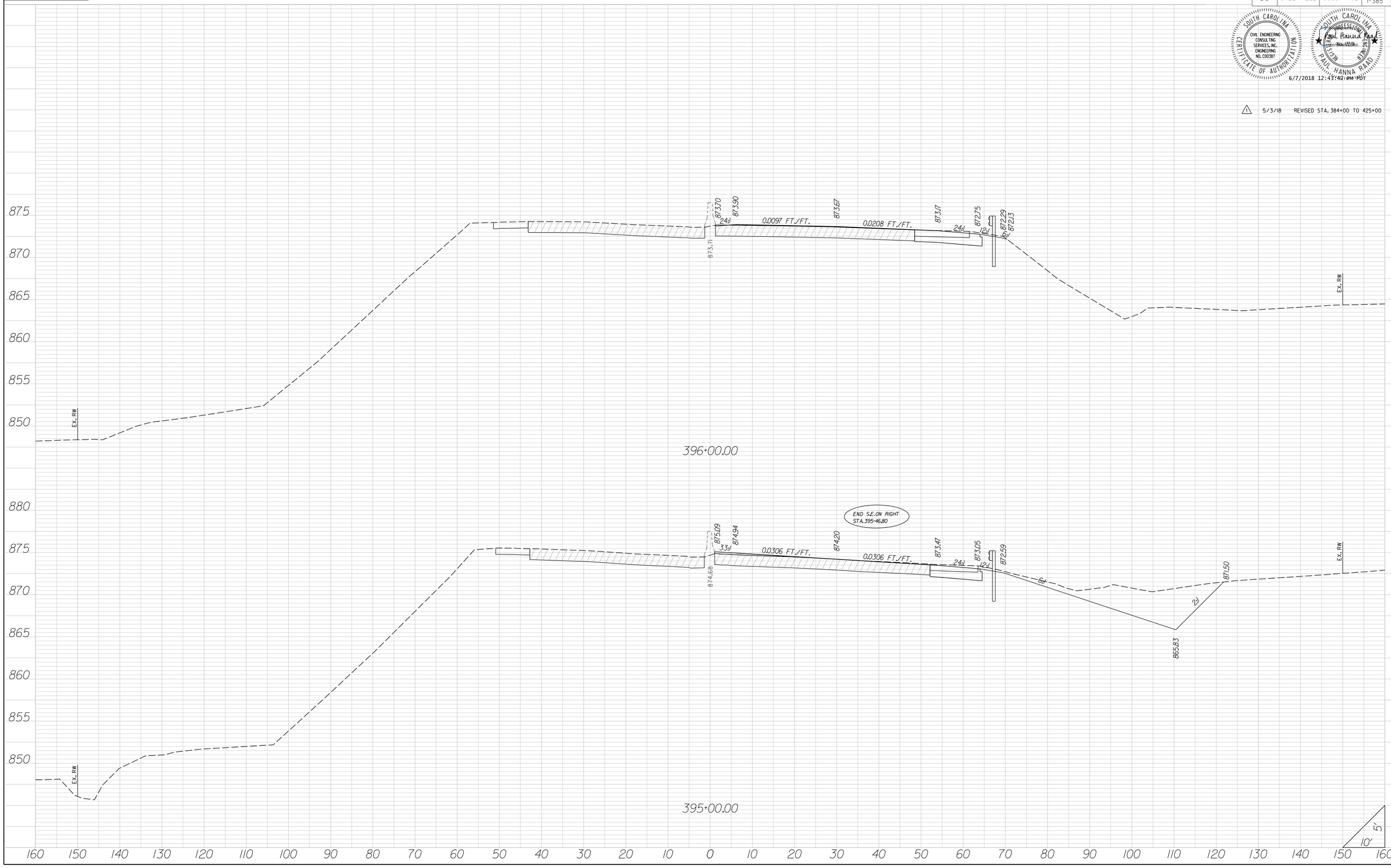
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X97

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER Paul Hanna Raad No. 17591 PAUL HANNA RAAD

6/7/2018 12:43:42 PM PDT

1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

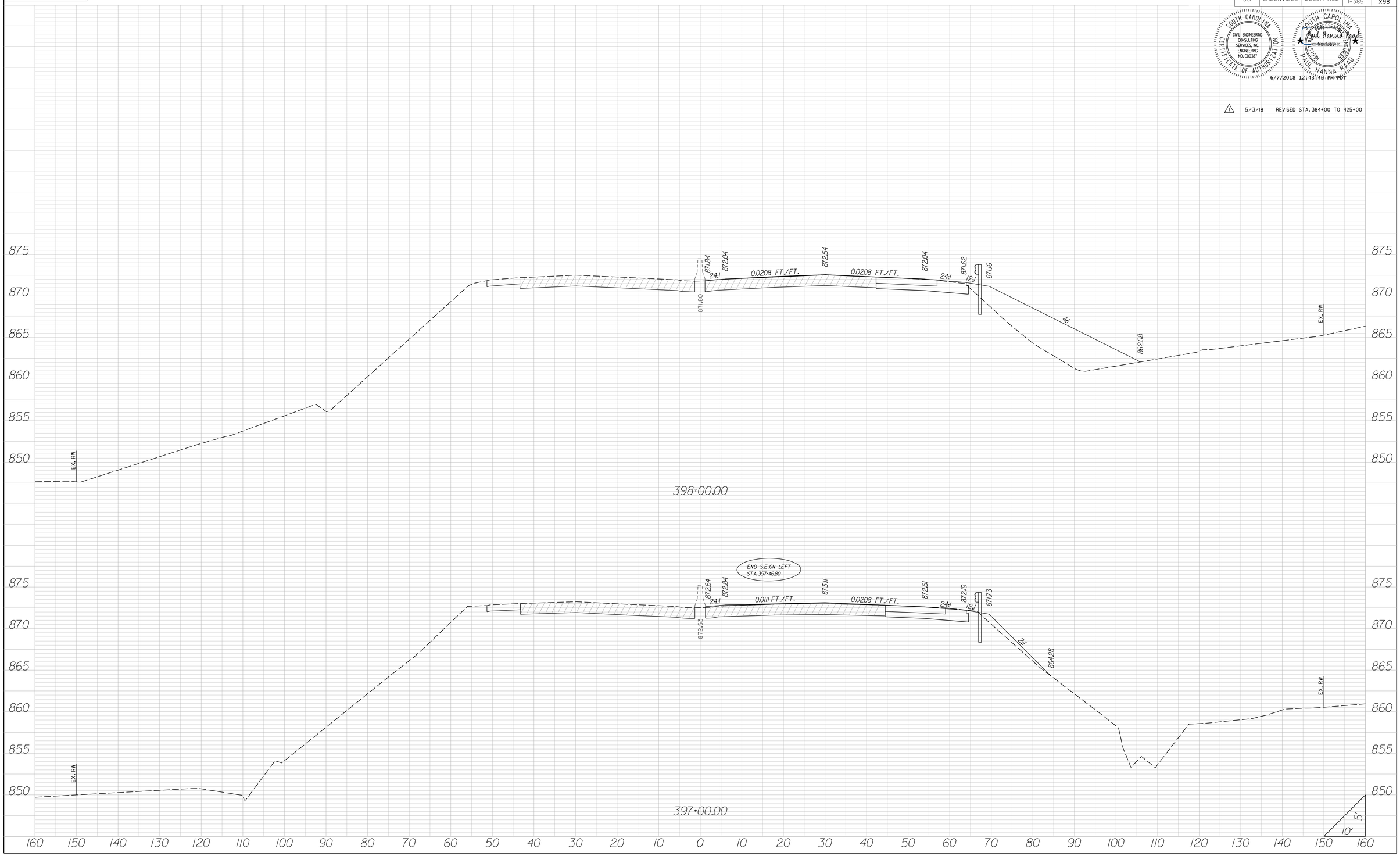
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X98

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 31591

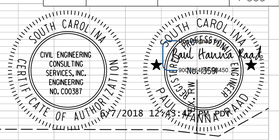
6/7/2018 12:43:40 PM PDT

1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X99



⚠1 5/3/18 REVISED STA. 384+00 TO 425+00

I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X100

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 17591

Paul Hanna Raad

6/7/2018 12:45:40 PM PDT

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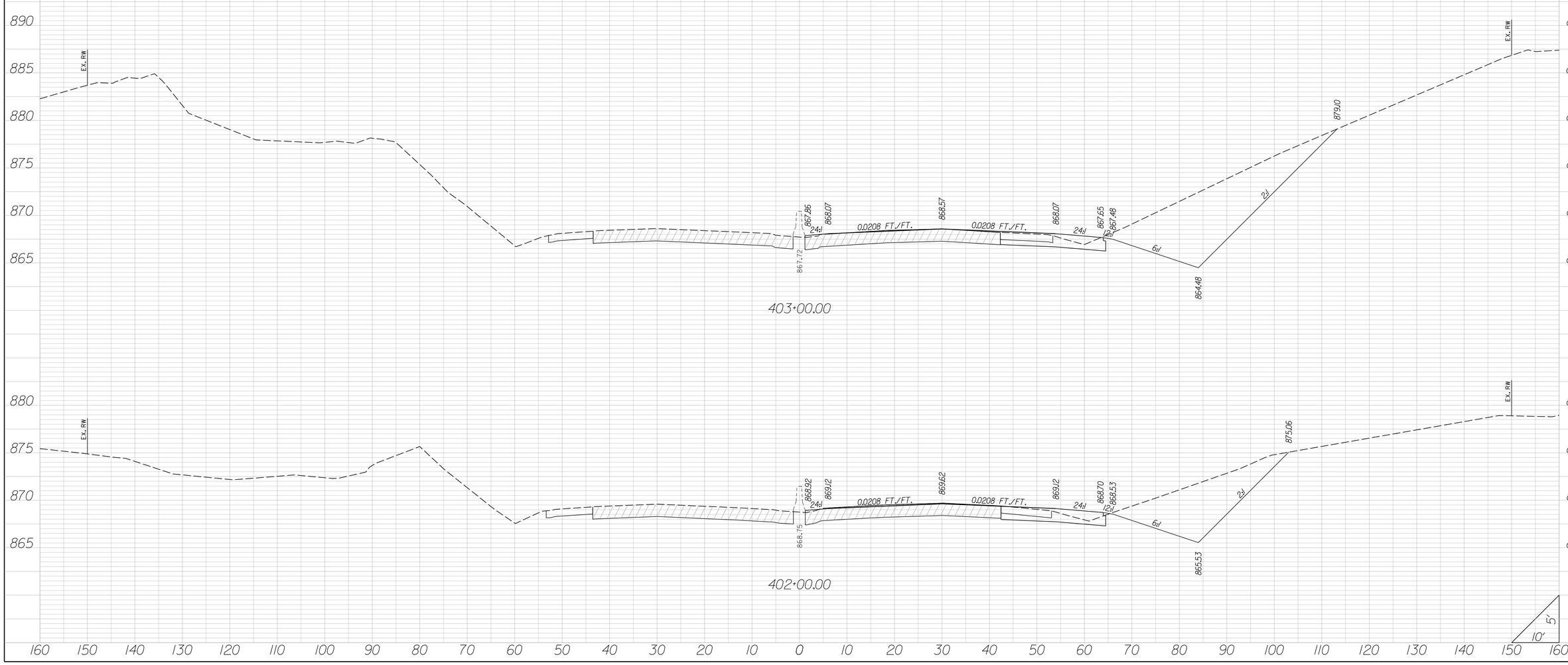


I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X101

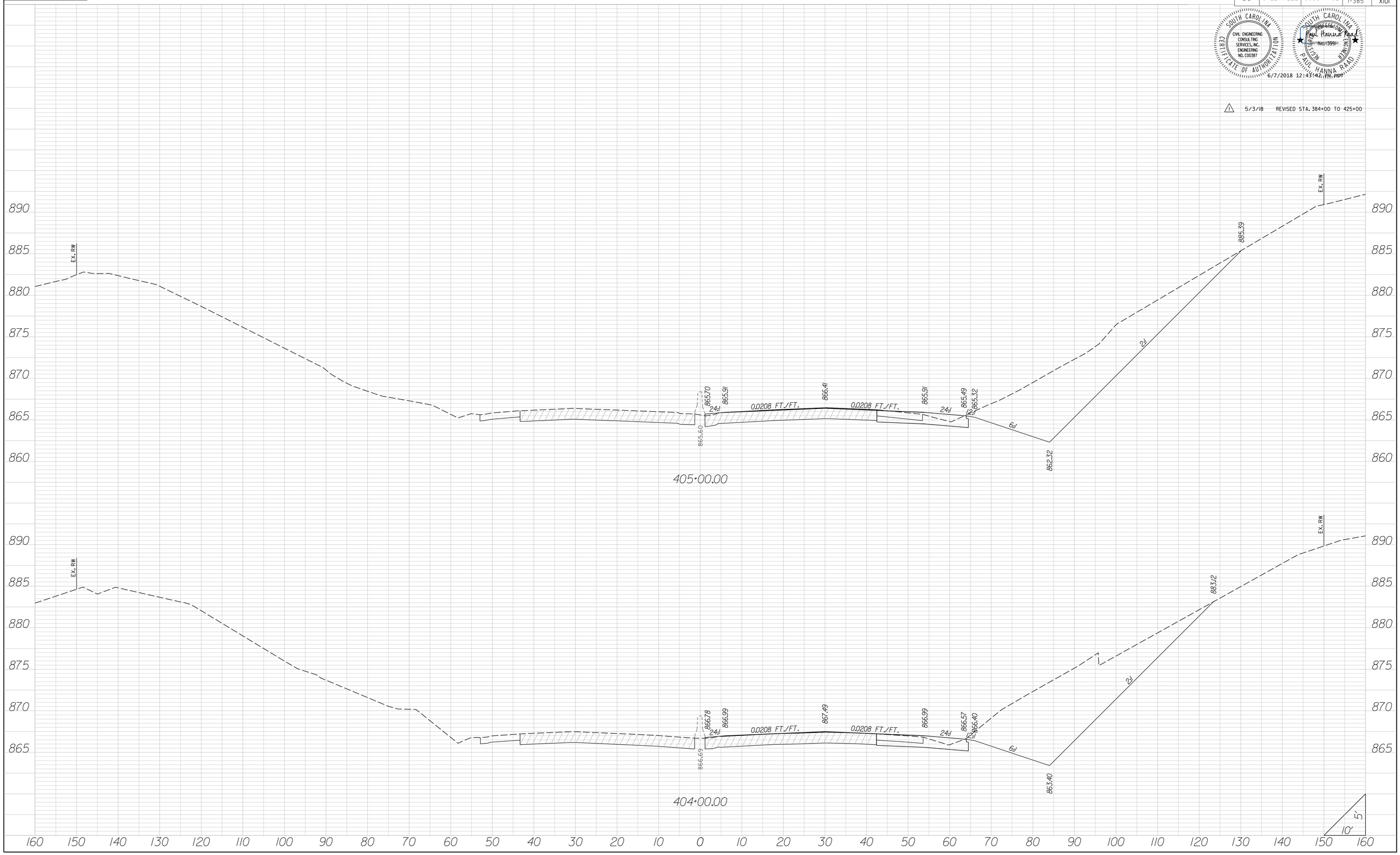
SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — No. 35910

Paul Hanna Raad

6/7/2018 12:43:42 PM EDT

1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

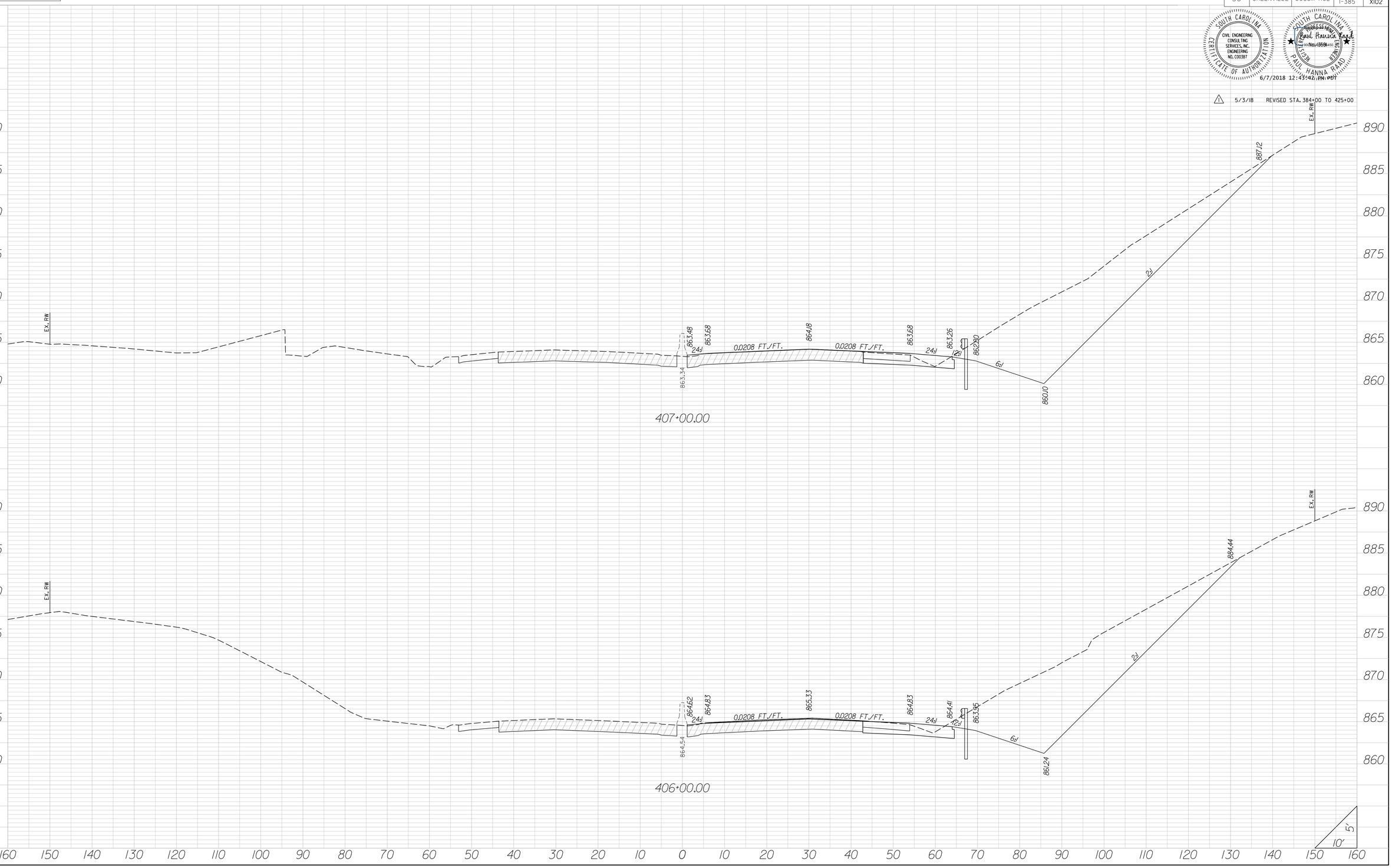
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X102

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — Raul Hanna Rajab — No. 31359 — RAUL HANNA RAJAB

6/7/2018 12:43:42 PM EDT

⚠ 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

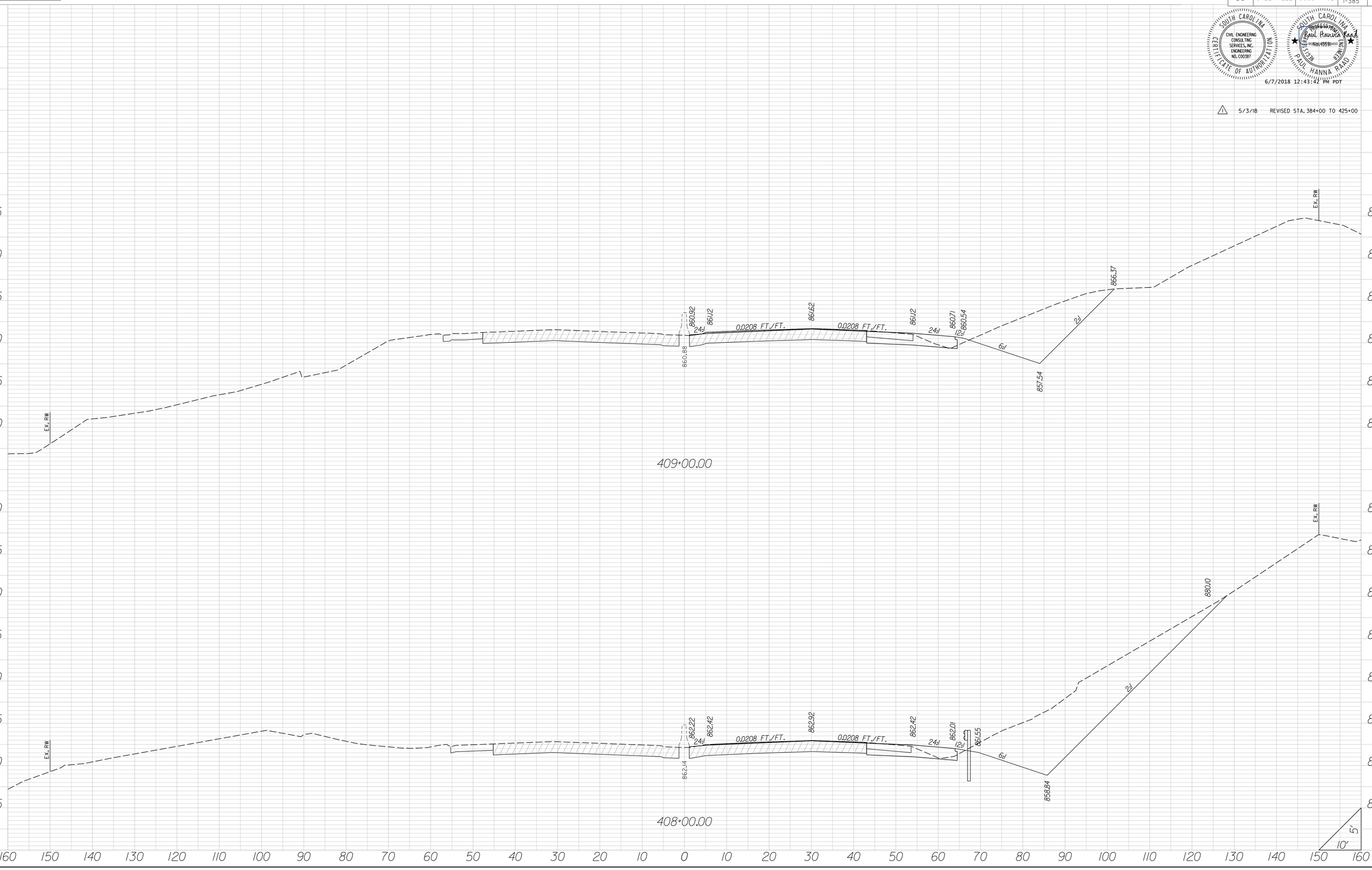
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X103

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00038

SOUTH CAROLINA REGISTERED — Paul Hanna Rad — No. 19591 — PAUL HANNA RAD

6/7/2018 12:43:42 PM PDT

1 5/3/18 REVISED STA. 384+00 TO 425+00



I-85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038111-R02	I-85/ I-385	I-85 X104

I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X105

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — Raul Hanna Rajad — No. 40559 — RAUL HANNA RAJAD

6/7/2018 12:43:42 PM EDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00

I–85

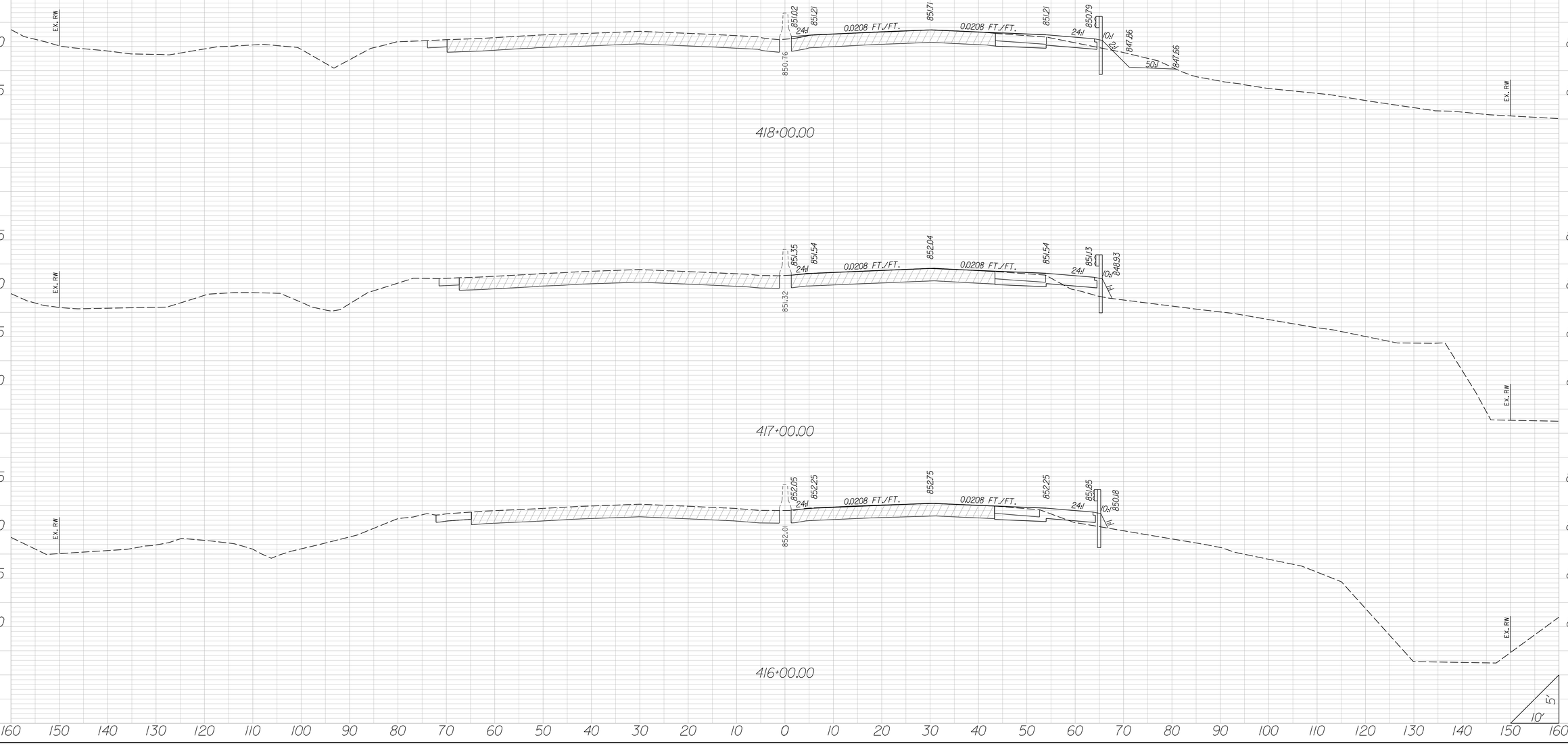
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X106

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00038

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 29590

6/7/2018 12:43:42 PM PDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

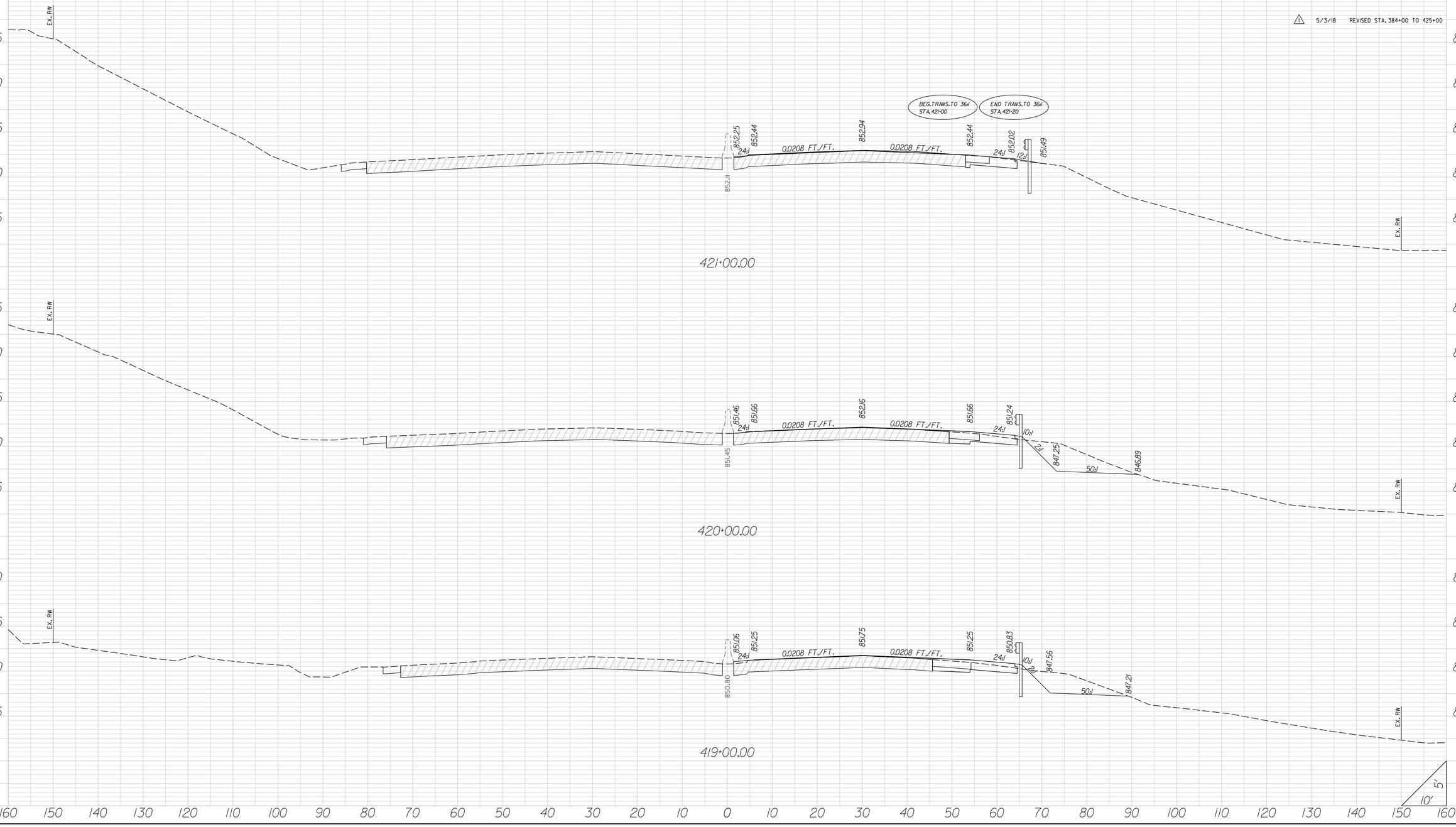
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X107

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — No. 19598

6/7/2018 12:43:42 PM PDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

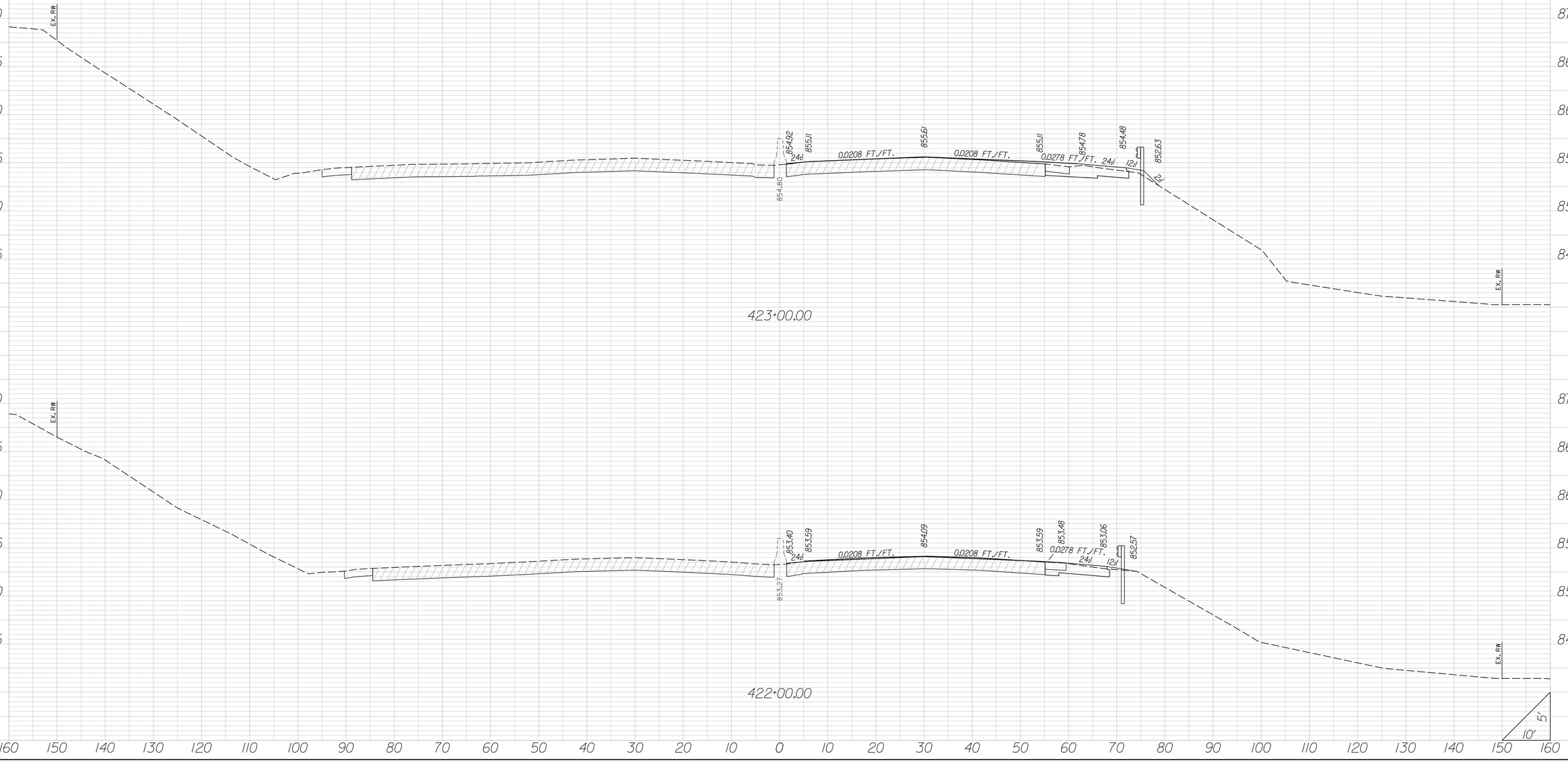
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X108

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — Paul Hanna Rand — No. 33591 — PAUL HANNA RAND

6/7/2018 12:43:42 PM PDT

1	5/3/18	REVISED STA. 384+00 TO 425+00



I–85

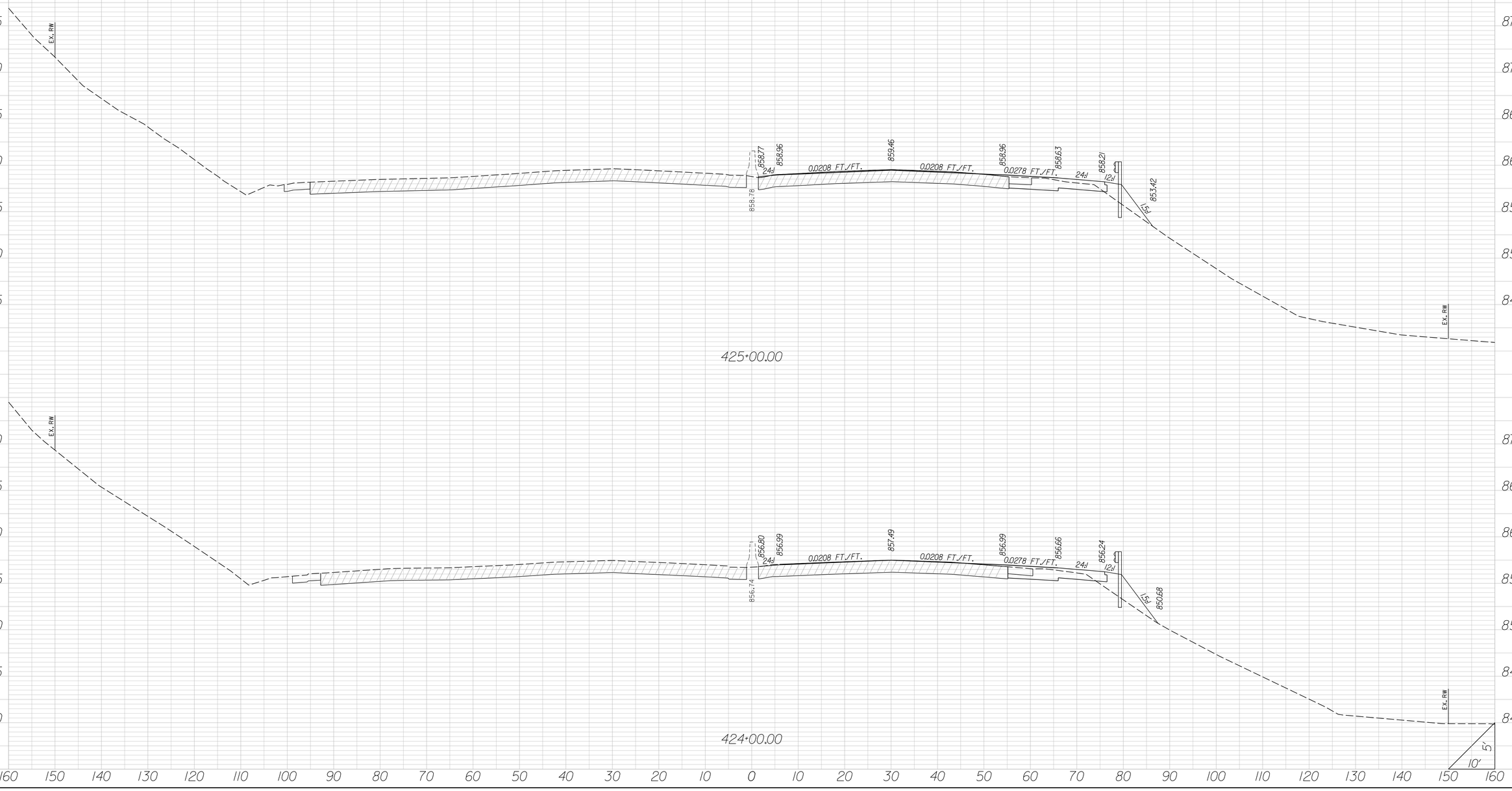
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X109

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — Raul Hanna Rajad — No. 13590 — RAUL HANNA RAJAD

6/7/2018 12:43:42 PM PDT

1	5/3/18	REVISED STA. 384+00 TO 425+00



ECS SOUTHEAST, LLP
"Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities
NC Registered Engineering Firm F-1078
NC Registered Geologists Firm C-406
SC Registered Engineering Firm 3241

May 22, 2018

Mr. Maher Almassri
Civil Engineering Consulting Services, Inc.
2000 Park Street – Suite 201
Columbia, SC 29201

Re: Interstate 85/385 Interchange Improvements
Rocky Mountain Creek Retaining Wall 18
Greenville County, SC
ECS Project No. 08-9283-B6

Dear Mr. Almassri:

As you are aware, ECS Southeast provided Mechanically Stabilized Earth (MSE) Wall recommendations as part of the Final Roadway Geotechnical Engineering Report titled Rocky Mountain Creek Roadway and Retaining Walls, dated October 25, 2016. It is our understanding that since the completion of the report, revisions were made to the retaining walls. Walls 18B, 18C, and 55 have been removed from the project, and require no further analysis. Wall 18A has been revised and was renumbered to wall 18. The purpose of this letter is to provide supplementary geotechnical recommendations for wall 18.

Wall 18A previously consisted of a wire faced MSE wall from station 413+00 to 419+40 (640 feet long) ranging in height from 4.33 feet to 10.27 feet tall. We understand that the wall has been shortened to 200 feet long with an alignment from station 413+00 to 415+00. Wall heights have also been decreased to a range of 3.21 feet to 6.75 feet.

An external stability analysis was performed for Wall 18 at station 413+50 with a design height of 7 feet. The results of the analysis are summarized below in Tables 1.0 and 1.1.

Table 1.0 – MSE Wall External Stability Analysis Results

Wall Number	Design Height, H, ft[1]	Minimum Reinforcement Length, B_{req}, ft (%H)	Calculated Resistance Factor		Max. Factored Bearing Resistance, psf
			Bearing Capacity[2]	Sliding[3]	
18	3 < H ≤ 7	12.5 (1.79H)	0.23	0.47	5,400

Table 1.1 – MSE Wall External Stability Analysis Results (Extreme Event 1)

Wall Number	Design Height, H, ft[1]	Minimum Reinforcement Length, B_{req}, ft (%H)	Calculated Resistance Factor		Max. Factored Bearing Resistance, psf
			Bearing Capacity[2]	Sliding[3]	
18	3 < H ≤ 7	12.5 (1.79H)	0.17	0.52	8,400

Notes:
1. Height analyzed is measured from PGL to embedment depth.
2. Maximum Resistance factor is 0.65 for Static Bearing Capacity and 1.0 for Seismic Bearing Capacity.
3. Maximum resistance factor is 1.0 for sliding.

Static and extreme limit state global stability was also evaluated for Wall 18 at station 414+00. Extreme limit state (seismic) considers a pseudo-static horizontal acceleration (kh) of 0.20. Results are summarized below in Tables 1.2 and 1.3.

Table 1.2 – Static Global Stability Analysis						
Wall Number	**Direction**	**Loading Condition**	**Demand/ Capacity, D/C**			**Performance Criteria Met**
			Morganstern-Price	**Bishop**	**Spencer**	
Wall 18 I-85 Station 413+50	Transverse	ESA	0.61	0.61	0.61	Yes
		TSA	0.41	0.41	0.41	Yes

Table 1.3 – Extreme Limit State Global Stability Analysis						
Wall Number	**Direction**	**k_h**	**Demand/Capacity, D/C**			**Performance Criteria Met**
			Morganstern-Price	**Bishop**	**Spencer**	
Wall 18 I-85 Station 413+50	Transverse	0.20	0.61	0.62	0.61	Yes

Revisions to the Geotechnical Notes on Plans have been made to reflect the changes to walls 18 and 55, and are provided in attached Roadway Notes on Plans. As shown in the attached analysis, the proposed wall 18 meets the SCDOT GDM performance requirements.

If you have any questions concerning the MSE Wall recommendations, please do not hesitate to contact us.

Respectfully,

ECS SOUTHEAST, LLP

Jacob E. Erickson, E.I.
Geotechnical Staff Project Manager

Marc F. Plotkin, P.E., D.GE
Principal Engineer
SC Registration No. 30565

Attachments: MSE External Stability Results
MSE Global Stability Results
Geotechnical Notes on Plans

SOUTH CAROLINA
ECS
SOUTHEAST, LLP
No. COA3239
CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 30565
5-22-18
MARC F PLOTKIN

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
1589 MAIL SERVICE CENTER

WBS NO.: | TIP NO.: | COUNTY:
SUBJECT: LRFD External Stability Analysis for MSE Walls
I-85 Wall 18
PREPARED BY: JEE | DATE: 05/22/18 | STATION: 413+50
CHECKED BY: | DATE: | STR. NO.: | SHEET: 1 OF 8

Input Traffic Surcharge, Backslope, Wall Geometry, and Soil Parameters

Traffic and Overlay Surcharge Surcharge

q =	390	psf	*Live Load Traffic Surcharge and Pavement Overlay*
	35.9	%	Surcharge due to overlay
q_{ol} =	140	psf	*Pavement overlay surcharge*

Backslope

Horizontal Backslope

(d = horizontal distance from back of wall face to top of backslope)

Wall Geometry

H =	7.00	ft	*Wall Height*
L/H =	1.79		*Ratio of Reinforcement Length to Wall Height (L/H ≥ 0.7 per NCDOT MSE Wall Standard Provision)*
L =	12.50	ft	*Reinforcement Length (L ≥ 6 ft per NCDOT MSE Wall Standard Provision)*
h =	7.00	ft	*Height of Wall & Slope at the back of Reinforced Zone*
D_w =	10.00	ft	*Distance of Water Table below the Bottom of the Wall*

Soil Parameters for Reinforced Zone

ϕ'_r =	36	deg	*Effective Friction Angle*
γ'_r =	120	pcf	*Effective Unit Weight*
K_{a_r} =	0.260		*Active Earth Pressure Coefficent (AASHTO Eqn 3.11.5.3-2)*

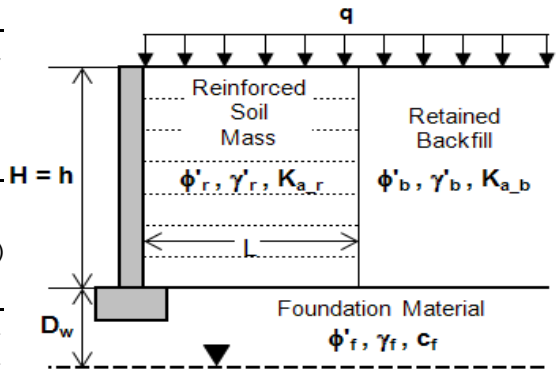
Soil Parameters for Retained Backfill

ϕ'_b =	30	deg	*Effective Friction Angle*
γ'_b =	117	pcf	*Effective Unit Weight*
K_{a_b} =	0.333		*Active Earth Pressure Coefficent (AASHTO Eqn 3.11.5.3-2)*

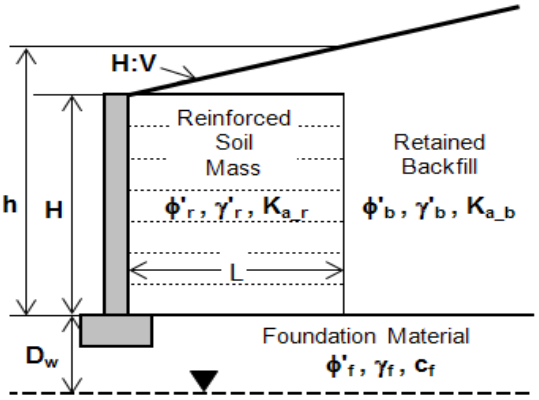
Soil Parameters for Foundation Soil

ϕ'_f =	26	deg	*Effective Friction Angle*
γ_f =	105	pcf	*Total Unit Weight*
c_f =	100	psf	*Undrained Shear Strength (Cohesion)*
μ =	0.49		*Coefficient of Friction (AASHTO 11.10.5.3)*

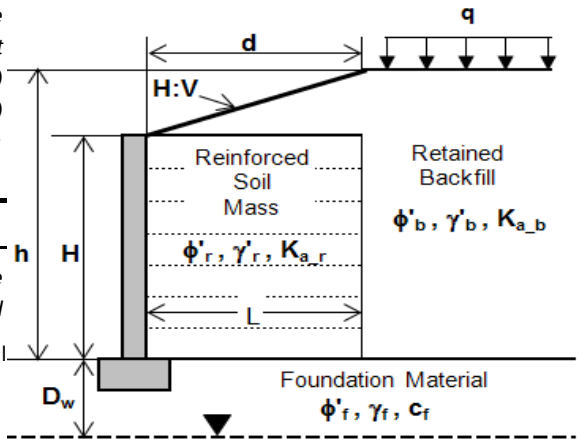
The coefficient of friction shall be based on the lesser of ϕ'_r and ϕ'_f.



Typical MSE Wall with Level Backslope and Traffic Surcharge



Typical MSE Wall with Infinite Backslope



Typical MSE Wall with Broken Backslope and Traffic Surcharge

Input Load and Resistance Factors

Load Factors (See AASHTO Table 3.4.1-1 and 2)

Ψ_{LS} =	1.75		*Lilve Load Surcharge*
$\Psi_{EH(A)}$ =	1.50		*Horizontal (Active) Earth Pressure Load*
Ψ_{EV} =	1.00	min	Vertical Dead Load Generated from Earth Fill
	1.35	max	
Ψ_{EQ-p} =	1.00		
Ψ_{EQ-LL} =	0.50		

Resistance Factors (See AASHTO Table 11.5.6-1)

φ_b =	0.65	*Bearing Resistance for MSE Walls*
φ_τ =	1.00	*Sliding Resistance for MSE Walls*

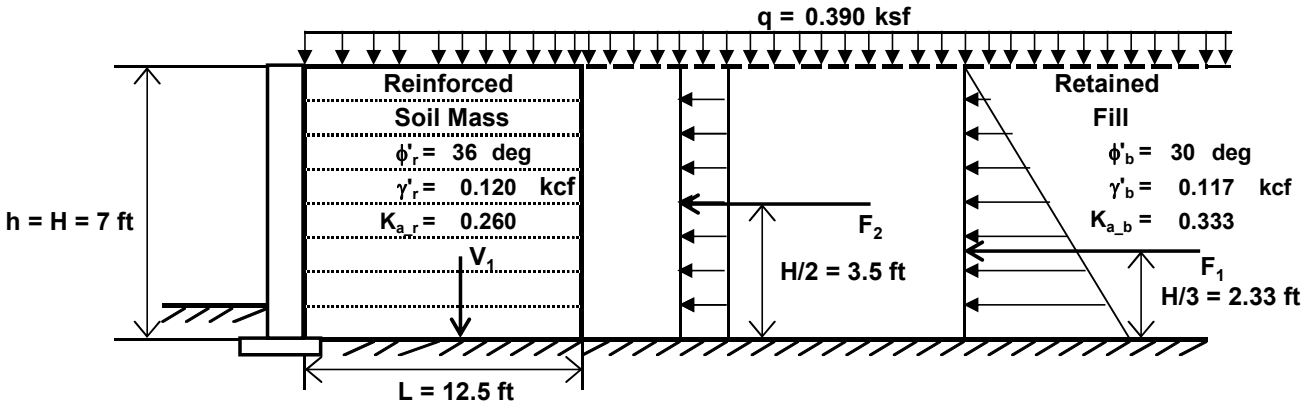
Seismic Design Acceleration Parameters

k_{max} =	0.20	*Maximum Horizontal Ground Acceration (PGA)*
S_{d1} =	0.14	*Peak spectral acceleration at 1 second*

References:

1. *AASHTO LRFD Bridge Design Specifications, 5th Edition, 2010*
2. *FHWA-NHI-10-024 Design and Construction of MSE Walls and Reinforced Soil Slopes - Vol I, 2009*
3. *SCDOT Geotechnical Design Manual version 1.1, 2010*

Calculate Forces acting on Wall



External Stability for MSE Walls: Earth Pressure - Level Backslope with Surcharge Case
(Based on FHWA Figure 4-2 and AASHTO Figure 11.10.5.2-1)
All Forces are Calculated per Unit Length of Wall
Figure Not Drawn to Scale

Forces from Vertical Earth Loads

V_1 = Total Vertical Force from the Reinforced Soil Mass = $(\gamma'_r)(H)(L)$
= (0.120 kcf)(7.00 ft)(12.50 ft) = 10.500 kips

Forces from Lateral Earth Pressure

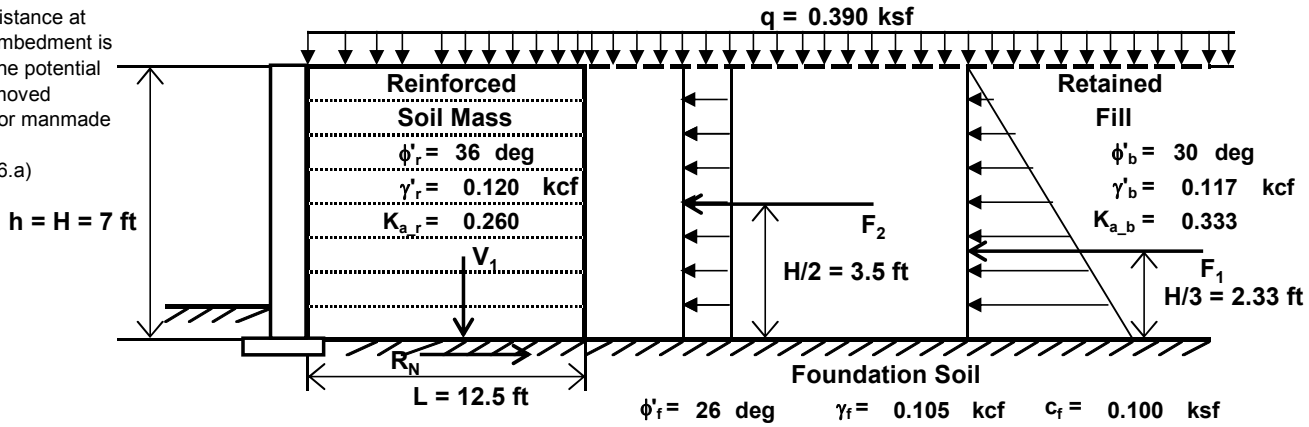
F_1 = Total Force Generated from Lateral Earth Pressure = $0.5(\gamma'_b)(H^2)(K_{ab})$ FHWA Eqn. 4-5
= (0.5)(0.117 kcf)(7.00 ft)^2(0.333) = 0.955 kips

Horizontal Force from Traffic Surcharge

F_2 = Force Generated from Traffic Surcharge = $(q)(H)(K_{ab})$ *FHWA Eqn. 4-6*
= (0.390 ksf)(7.00 ft)(0.333) = 0.909 kips

Sliding Stability - AASHTO 11.10.5.3, AASHTO 10.6.3.4, and FHWA 4.4.6.a

The passive resistance at the toe due to embedment is ignored due to the potential for soil to be removed through natural or manmade processes. (per FHWA 4.4.6.a)



External Stability for MSE Walls: Sliding Stability - Level Backslope with Surcharge Case
(Based on FHWA Figure 4-2 and AASHTO Figure 11.10.5.2-1)
All Forces are Calculated per Unit Length of Wall
Figure Not Drawn to Scale

Calculate Factored Sliding Resistance (R_R)

$R_R = \varphi R_N = \varphi_\tau R_\tau$ *AASHTO Eqn. 10.6.3.4-1*

Sliding Stability Continued - AASHTO 11.10.5.3, AASHTO 10.6.3.4, and FHWA 4.4.6.a

φ_τ = *Resistance Factor for Sliding* = 1.00 — *AASHTO Table 11.5.6-1*

R_τ = *Nominal Sliding Resistance between Reinforced Soil Mass and Foundation Soil*

$= \Psi_{EV}(V_1)\mu + (c_f)(L)$ — *FHWA Eqn. 4-12 and AASHTO 10.6.3.4*

Ψ_{EV} = Load Factor for Dead Load of Earth Fill = 1.00 — *AASHTO Table 3.4.1-1*

(Use the Min Value of Ψ_{EV} per FHWA 4.4.6.a, AASHTO C3.4.1, and AASHTO C11.5.5)

V_1 = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips

μ = Coefficent of Friction between Reinforced Soil Mass and Foundation Soil = 0.49 — *AASHTO 11.10.5.3*

c_f = Cohesion for Foundation Soil = 0.100 ksf

L = Reinforcement Length = 12.50 ft

R_τ = (1.00)(10.50 kips)(0.49) + (0.100 ksf)(12.50 ft) = 6.40 kips

R_R = (1.00)(6.40 kips) = 6.40 kips

Calculate Factored Horizontal Driving Force (P_d)

$P_d = (\Psi_{EHA})(F_1) + (\Psi_{LS})(F_2)$ — *FHWA Eqn. 4-9*

Ψ_{EHA} = Load Factor for Horizontal (Active) Earth Pressure = 1.50 — *AASHTO Table 3.4.1-1*

F_1 = Force Generated from Lateral Earth Pressure = 0.955 kips — *FHWA Eqn. 4-5*

Ψ_{LS} = Load Factor for Horizontal (Active) Earth Pressure = 1.75 — *AASHTO Table 3.4.1-1*

F_2 = Force Generated from Traffic Surcharge = 0.909 kips — *FHWA Eqn. 4-6*

P_d = (1.50)(0.955 kips) + (1.75)(0.909 kips) = 3.023 kips

Check Sliding

R_R must be greater than or equal to P_d

6.395 kips ≥ 3.023 kips

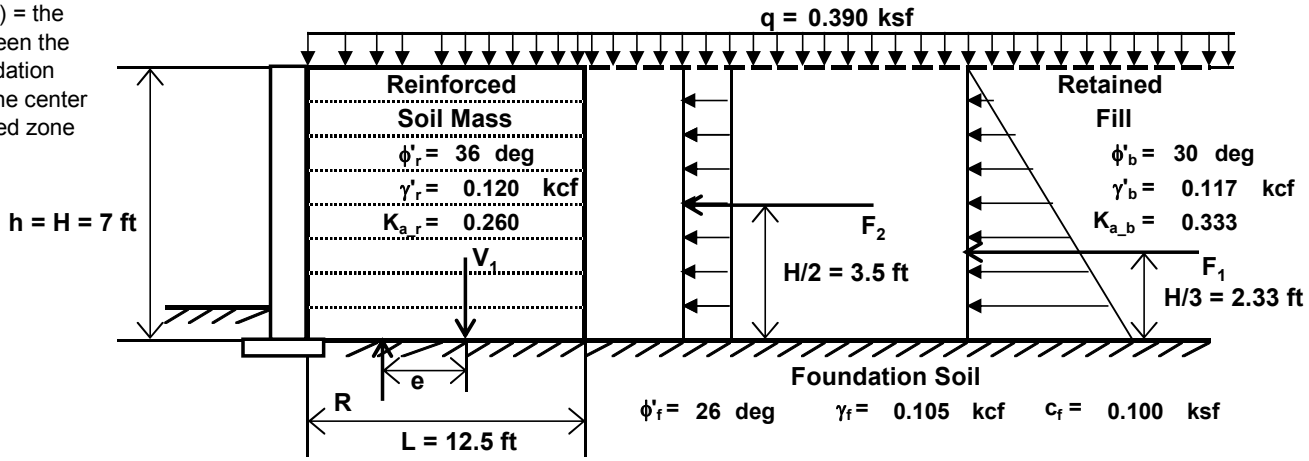
OK

Calculated Resistance Factor

$P_d/(Rr/\varphi_t)$ = **0.47**

Overturning (Limiting Eccentricity) - AASHTO 11.6.3.3, AASHTO 11.10.5.5 and FHWA 4.4.6.b

Eccentricity (e) = the distance between the resultant foundation load (R) and the center of the reinforced zone



External Stability for MSE Walls: Overturning - Level Backslope with Surcharge Case
(Based on FHWA Figure 4-7 and AASHTO Figure 11.10.5.2-1)
Figure Not Drawn to Scale - All Forces are Calculated per Unit Length of Wall
Figure Not Drawn to Scale

Calculate Eccentricity (e)

$$e = \frac{\Psi_{EHA}F_1(H/3) + \Psi_{LS}F_2(H/2)}{\Psi_{EV}V_1}$$

FHWA Eqn. 4-15

Overturning (Limiting Eccentricity) Continued - AASHTO 11.6.3.3, AASHTO 11.10.5.5 and FHWA 4.4.6.b

Ψ_{EHA} = Load Factor for Horizontal (Active) Earth Pressure = 1.50
Ψ_{EV} = Load Factor for Dead Load of Earth Fill = 1.00
(Use the Min Value of Ψ_{EV} per FHWA 4.4.6.a, AASHTO C3.4.1, and AASHTO C11.5.5)
Ψ_{LS} = Load Factor for Surcharge = 1.75
F_1 = Force Generated from Lateral Earth Pressure = 0.955 kips
F_2 = Force Generated from Traffic Surcharge = 0.909 kips
V_1 = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips
H = MSE Wall Height = 7.00 ft

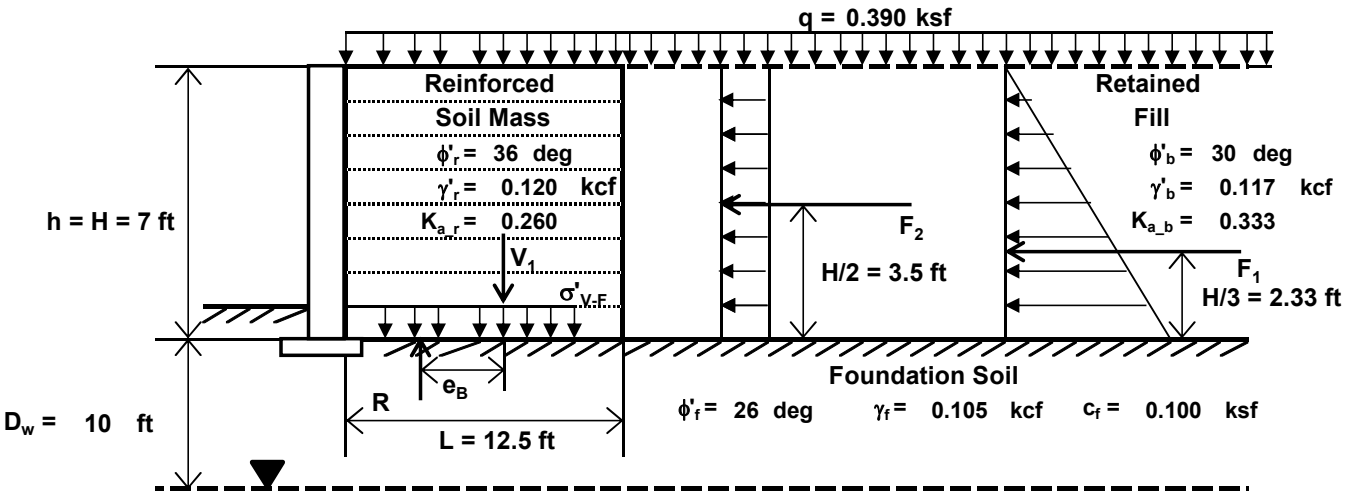
$$e = \frac{(\ 1.50\ )(\ 0.955\ \text{kips}\ )(\ 2.33\ \text{ft}\ ) + (\ 1.75\ )(\ 0.909\ \text{kips}\ )(\ 3.50\ \text{ft}\ )}{(\ 1.00\ )(\ 10.500\ \text{kips}\ )}$$

$$= 0.85\ \text{ft}$$

Check Eccentricity

e must be less than or equal to L/4 per AASHTO 11.6.3.3
0.85 ft ≤ 3.13 ft
OK

Bearing Resistance (General Shear) - AASHTO 11.10.5.4, AASHTO 10.6.3.1, and FHWA 4.4.6.c



External Stability for MSE Walls: Bearing Resistance - Level Backslope with Surcharge Case
(Based on FHWA Figure 4-7 and AASHTO Figure 11.10.5.2-1)
All Forces are Calculated per Unit Length of Wall
Figure Not Drawn to Scale

Calculate Eccentricity for Bearing, (e_B)

$$e_B = \frac{\Psi_{EHA}F_1(H/3) + \Psi_{LS}F_2(H/2)}{\Psi_{EV}V_1 + \Psi_{LS}qL}$$ *FHWA Eqn. 4-19*

Ψ_{EHA} = Load Factor for Horizontal (Active) Earth Pressure = 1.50 *AASHTO Table 3.4.1-1*
Ψ_{EV} = Load Factor for Dead Load of Earth Fill = 1.35 *AASHTO Table 3.4.1-1 and FHWA 4.4.6.a*
(Use the Max Value of Ψ_{EV} per FHWA 4.4.6.a, AASHTO C3.4.1, and AASHTO C11.5.5)
Ψ_{LS} = Load Factor for Surcharge = 1.75 *AASHTO Table 3.4.1-1*
F_1 = Force Generated from Lateral Earth Pressure = 0.955 kips *FHWA Eqn. 4-5*
F_2 = Force Generated from Traffic Surcharge = 0.909 kips *FHWA Eqn. 4-6*
V_1 = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips

Bearing Resistance Continued (General Shear) - AASHTO 11.10.5.4, AASHTO 10.6.3.1, and FHWA 4.4.6.c

q = Live Load Traffic Surcharge = 0.390 ksf
H = MSE Wall Height = 7.00 ft
L = Reinforcement Length = 12.50 ft

$$e_B = \frac{(1.50)(0.955 \text{ kips})(2.33 \text{ ft}) + (1.75)(0.909 \text{ kips})(3.50 \text{ ft})}{(1.35)(10.5 \text{ kips}) + (1.75)(0.390 \text{ ksf})(12.50 \text{ ft})}$$

$= 0.39$ ft

Calculate Nominal Bearing Resistance, (q_n) — *AASHTO Eqn. 10.6.3.1.2a-1*

$q_n = c_f N_c + 0.5\gamma B' N_\gamma C_{w\gamma}$ — *AASHTO Eqn. 10.6.3.1.2a-1*

c_f = Cohesion for Foundation Soil = 0.100 ksf
N_c = Bearing Capacity Factor (based on ϕ'_f) = 22.30 — *AASHTO Table 10.6.3.1.2a-1*
γ_f = Total Unit Weight for Foundation Soil = 0.105 kcf
B' = Effective Foundation Width = L - $2e_B$ — *AASHTO C11.10.5.4*
= 12.5 ft - 2(0.39 ft) = 11.72 ft
N_γ = Bearing Capacity Factor (based on ϕ'_f) = 12.50 — *AASHTO Table 10.6.3.1.2a-1*
$C_{w\gamma}$ = Correction Factor to Account for Location of Groundwater Table = 0.8 — *AASHTO Table 10.6.3.1.2a-2*

$q_n = (0.100 \text{ ksf})(22.30) + (0.5)(0.105 \text{ kcf})(11.72 \text{ ft})(12.50)(0.80)$

$= 8.383$ ksf

Calculate Factored Bearing Resistance, (q_r)

$q_r = \varphi_b q_n$ — *AASHTO Eqn. 10.6.3.1.1-1*

φ_b = Resistance Factor for Bearing = 0.65 — *AASHTO Table 11.5.6-1*
q_n = Nominal Bearing Resistance = 8.383 ksf — *AASHTO Eqn. 10.6.3.1.2a-1*

$q_r = (0.65)(8.383 \text{ ksf}) = 5.449$ ksf

Calculate Factored Vertical Bearing Pressure at the base, ($q_{V\text{-}F}$)

$$\sigma_{V\text{-}F} = \frac{\Psi_{EV} V_1 + \Psi_{LS} qL}{L - 2e_B}$$ — *FHWA Eqn. 4-20*

Ψ_{EV} = Load Factor for Dead Load of Earth Fill = 1.35 — *AASHTO Table 3.4.1-1 and FHWA 4.4.6.a*
(Use the Max Value of Ψ_{EV} per FHWA 4.4.6.c, AASHTO C3.4.1, and AASHTO C11.5.5)
V_1 = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips
Ψ_{LS} = Load Factor for Surcharge = 1.75 — *AASHTO Table 3.4.1-1*
q = Live Load Traffic Surcharge = 0.390 ksf
L = Reinforcement Length = 12.50 ft
e_B = Eccentricity for Bearing = 0.39 ft — *FHWA Eqn. 4-19*

$$\sigma_{V\text{-}F} = \frac{(1.35)(10.50 \text{ kips ft}) + (1.75)(0.390 \text{ ksf})(12.50 \text{ ft})}{12.50 \text{ ft} - 2(0.39 \text{ ft})}$$

$= 1.937$ ksf

Check Bearing

q_R must be greater than or equal to $q_{V\text{-}F}$

5.449 ksf ≥ 1.937 ksf

OK

Calculated Resistance Factor

$\sigma_{V\text{-}F}/q_n$ = **0.23**

Bearing Resistance (Local/Punching Shear) - AASHTO 11.10.5.4, AASHTO 10.6.3.1.2b, and FHWA 4.4.6.c

Local and Punching shear failure occurs in loose or compressible soils and in weak soils under slow (drained) loading. This mode of failure will only be considered for foundation material that is cohesive.

To prevent Local/Punching Shear on weak cohesive soils

$(\gamma_r)(H) \leq 3c_f$ *FHWA Eqn. 4-24*

γ_r = Effective Unit Weight of Reinforced Soil Mass = 0.120 kcf
H = Height of MSE Wall = 7.00 ft
c_f = Undrained Shear Strength (Cohesion) of Foundation Soil = 0.100 ksf

(0.120 kcf)(7.00 ft) ≤ 3 (0.100 ksf)

0.840 ksf > 0.300 ksf **The foundation is subject to Local/Punching Shear. Check Reduced Bearing Resistance**

Calculate Reduced Nominal Bearing Resistance, (q_n)

$q_n = c^*_f N_c + 0.5\gamma B' N_\gamma C_{w\gamma}$ *AASHTO Eqn. 10.6.3.1.2a-1*

c^*_f = Reduced Cohesion for Foundation Soil = $0.67c_f$
= 0.67 (0.100 ksf) = 0.067 ksf *AASHTO 10.6.3.1.2b-1*
N_c = Bearing Capacity Factor (based on f'^*_f) = 13.10 *AASHTO Table 10.6.3.1.2a-1*
γ = Effective Unit Weight for Foundation Soil = 0.105 ksf
B' = Effective Foundation Width = L - $2e_B$ *AASHTO C11.10.5.4*
= 12.5 ft - 2 (0.39 ft) = 11.72 ft
N_γ = Bearing Capacity Factor (based on ϕ'^*_f) = 4.10 *AASHTO Table 10.6.3.1.2a-1*
$C_{w\gamma}$ = Correction Factor to Account for Location of Groundwater Table = 0.8 *AASHTO Table 10.6.3.1.2a-2*
ϕ'^*_f = Reduced Friction Angle for Foundation Soil = $\tan^{-1}(0.67 \tan \phi'_f)$
= $\tan^{-1}$[0.67 tan (26 deg)] = 18 deg *AASHTO 10.6.3.1.2b-2*

q_n = (0.067 ksf)(13.10) + (0.5)(0.105 kcf)(12.50 ft)(4.10)(0.8)
= 3.030 ksf

Calculate Reduced Factored Bearing Resistance, (q_r)

$q_r = \varphi_b q_n$ *AASHTO Eqn. 10.6.3.1.1-1*

φ_b = Resistance Factor for Bearing = 0.65 *AASHTO Table 11.5.6-1*
q_n = Nominal Bearing Resistance = 3.030 ksf *AASHTO Eqn. 10.6.3.1.2a-1*

q_r = (0.65)(3.030 ksf) = 1.970 ksf

Check Bearing

q_R must be greater than or equal to $q_{V\text{-}F}$
1.97 ksf ≥ 1.937 ksf
OK

Seismic Stablity - SCDOT GDM Section 14.12

Calculate Wave Scattering Effects

Wave Scattering Coefficient, α_w =1+0.01H((0.5β)-1<1.0 SCDOT Equation 13-103

α_w = 0.9545

Ground Motion Index, $\beta = k_{max}/S_{d1}$ = 0.70 SCDOT Equation 13-104

Average seismic horizontal coefficient due to wave scattering

$k_h = \alpha_w * k_{max}$ = 0.2 SCDOT Equation 13-102

Calculate Seismic Active Earth Pressure Coefficinet (Mononobe -Kobe Method) SCDOT GDM Section 14.4.1

Seismic Active Earth Pressure Coefficient Reinforced Soils, K_{AEr} = 0.584

Seismic Active Earth Pressure Coefficient Retained, K_{AEb} = 0.678

$$K_{ae} = \frac{\cos^2(\phi - \Psi - \theta)}{\cos(\Psi)\cos^2(\theta)\cos(\delta + \theta + \Psi)\left[1 + \sqrt{\frac{\sin(\phi + \delta)\sin(\phi - \Psi - \beta)}{\cos(\delta + \theta + \Psi)\cos(\beta - \theta)}}\right]^2}$$ Equation 14-2

Where,

γ	=	unit weight of soil
H	=	height of wall or effective height of wall (h_{eff})
ϕ	=	angle of internal friction of soil
Ψ	=	$\tan^{-1}[k_h/(1-k_v)]$
δ	=	angle of friction between soil and wall
k_h	=	horizontal acceleration coefficient
k_v	=	vertical acceleration coefficient, typically set to zero.
β	=	backfill slope angle
θ	=	angle of backface of the wall with the vertical

Reinforced Soil				Retained Soil			
φ	=	36.0	deg	φ	=	30.0	deg
Ψ	=	11.3	deg	Ψ	=	11.3	deg
θ	=	0	deg	θ	=	0	deg
δ	=	0	deg	δ	=	0.00	deg
β	=	0	deg	β	=	0	deg

Calculate Inertial Wall Width, $B_{inertial} = \omega H$ 5

coefficient, ω = 0.70

Calculate Active Earth Thrust Force, $P_{AE} = \gamma_p * 0.5 K_{AEr} * \gamma_p * H^2$ = 1.9 kips GDM Eq. 14-40

Calculate Intertial Reinforced Soil Mass Force, $P_{IR} = \gamma_p * k_{avg} * B_{inertial} * H_{wall} *$ = 0.12 kips GDM Eq. 14-41

Dead Load Surcharge Force, P_{DC} = = 0.664 kips GDM Eq. 14-45

Live Load Surcharge Force, P_{LL} = = 0.593 kips GDM Eq. 14-46

Total Seismic Driving Force, F_H = 3.3 kip Calculated Resistance Factor, $\varphi = F_H/R_t$ = **0.52**

Calculate Eccentricity for Bearing, (e_B)

$$e_B = \frac{\Psi_{EQ\text{-}P}F_{1s}(H/2) + \Psi_{EQ\text{-}LL}F_{2s}(H/2)}{\Psi_{EV}V_I + \Psi_{EQ\text{-}LL}qL}$$ *FHWA Eqn. 4-19*

$\Psi_{EHAeq} = \Psi_{EQ\text{-}p}$ = Load Factor for Horizontal (Active) Earth Pressure = 1.00 *AASHTO Table 3.4.1-1*

Ψ_{EV} = Load Factor for Dead Load of Earth Fill = 1.00 *AASHTO Table 3.4.1-1 and FHWA 4.4.6.a*

(Use the Min Value of Ψ_{EV} per FHWA 4.4.6.a, AASHTO C3.4.1, and AASHTO C11.5.5)

$\Psi_{LSeq} = \Psi_{EQ\text{-}p}$ = Load Factor for Surcharge = 1.00 *AASHTO Table 3.4.1-1*

F_{1s} = Force Generated from Lateral Earth Pressure = 2.725 kips *FHWA Eqn. 4-5*

F_{2s} = Force Generated from Traffic Surcharge = 0.593 kips *FHWA Eqn. 4-6*

V_I = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips

q = Live Load Traffic Surcharge = 0.250 ksf *FHWA Eqn. 4-19*

H = MSE Wall Height = 7.00 ft

L = Reinforcement Length = 12.50 ft

$$e_B = \frac{(\ 1.00\ )(\ 2.725\ \text{kips}\ )(\ 3.50\ \text{ft}\ ) + (\ 1.00\ )(\ 0.593\ \text{kips}\ )(\ 3.50\ \text{ft}\ )}{(\ 1.00\ )(\ 10.5\ \text{kips}\ ) + (\ 1.00\ )(\ 0.250\ \text{ksf}\ )(\ 12.50\ \text{ft}\ )}$$

$= 0.85$ ft

Calculate Factored Vertical Bearing Pressure at the base, ($q_{V\text{-}F}$)

$$\sigma_{V\text{-}F} = \frac{\Psi_{EQ\text{-}P}V_I + \Psi_{EQ\text{-}LS}qL}{L - 2e_B}$$ *FHWA Eqn. 4-20*

$\Psi_{EQ\text{-}p}$ = Load Factor for Dead Load of Earth Fill = 1.00

V_I = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips

$\Psi_{LSeq} = \Psi_{EQ\text{-}ll}$ = Load Factor for Surcharge = 1.00

q = Live Load Traffic Surcharge = 0.250 ksf

L = Reinforcement Length = 12.50 ft

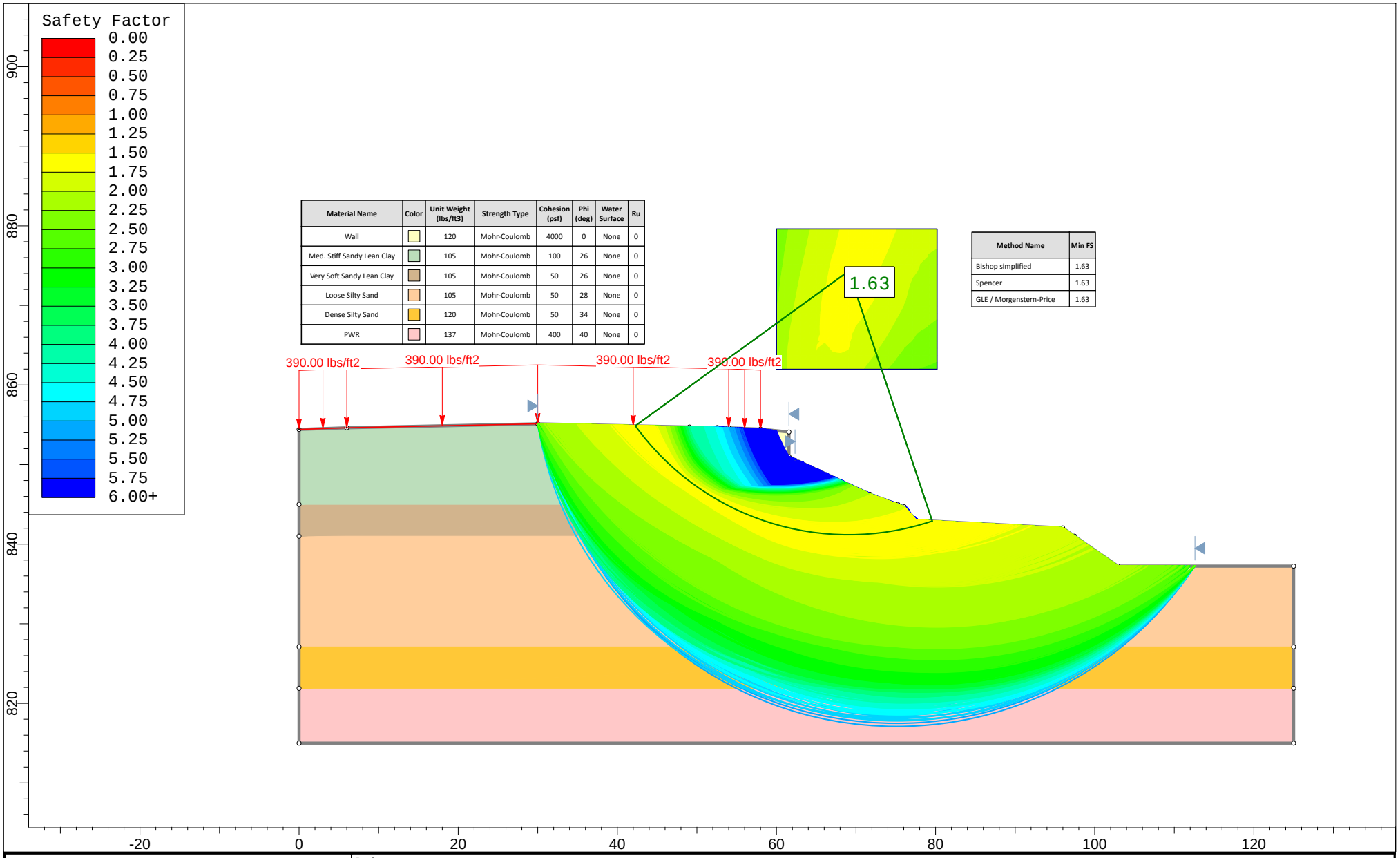
e_B = Eccentricity for Bearing = 0.85 ft

$$\sigma_{V\text{-}F} = \frac{(\ 1.00\ )(\ 10.50\ \text{kips}\ )(\ \text{ft}\ ) + (\ 1.00\ )(\ 0.250\ \text{ksf}\ )(\ 12.50\ \text{ft}\ )}{12.5\ \text{ft} - 2(\ 0.85\ \text{ft}\ )}$$

$= 1.424$ ksf

Calculated Resistance Factor

$\sigma_{V\text{-}F}/q_n$ = **0.17**

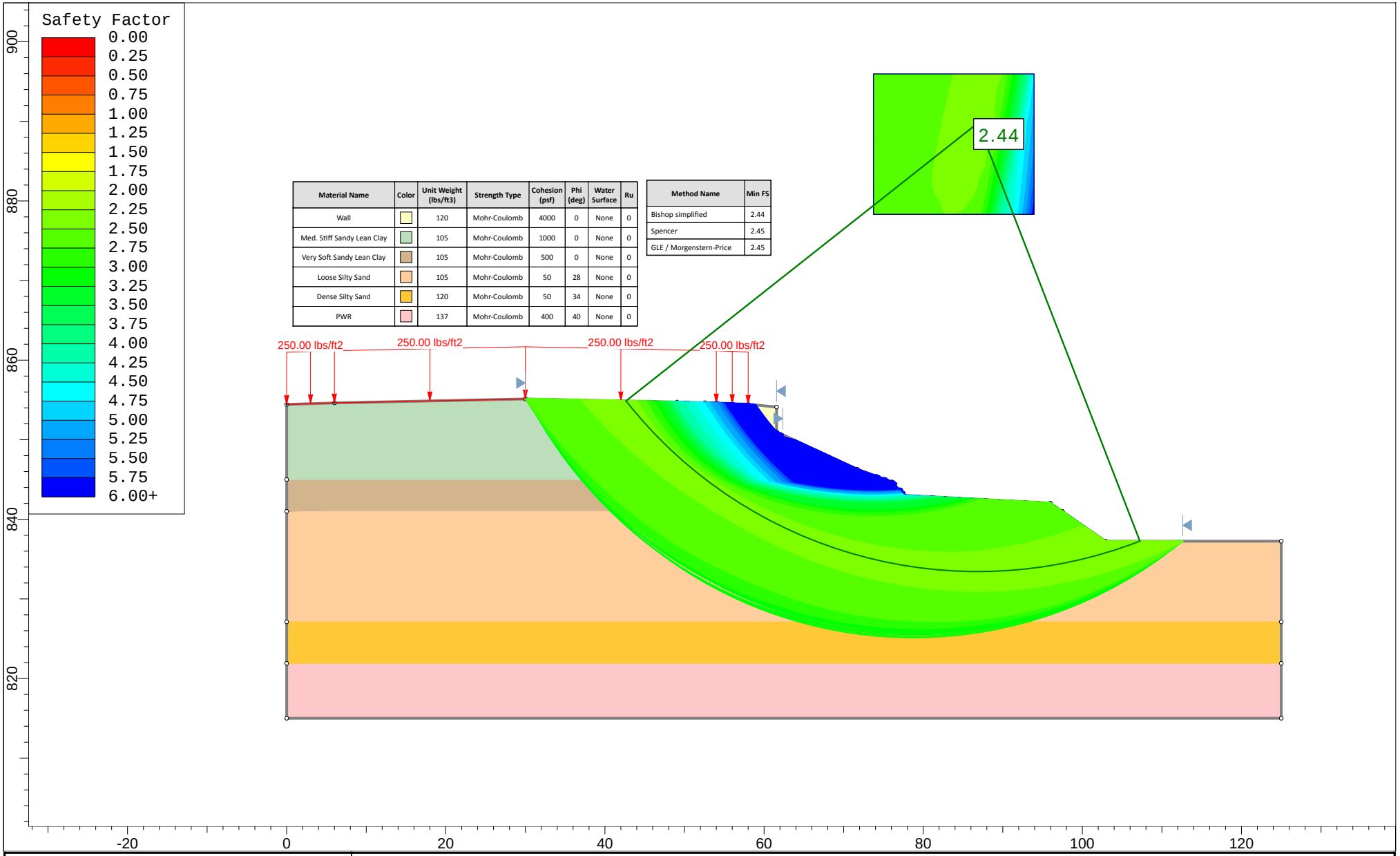


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Wall		120	Mohr-Coulomb	4000	0	None	0
Med. Stiff Sandy Lean Clay		105	Mohr-Coulomb	100	26	None	0
Very Soft Sandy Lean Clay		105	Mohr-Coulomb	50	26	None	0
Loose Silty Sand		105	Mohr-Coulomb	50	28	None	0
Dense Silty Sand		120	Mohr-Coulomb	50	34	None	0
PWR		137	Mohr-Coulomb	400	40	None	0

Method Name	Min FS
Bishop simplified	1.63
Spencer	1.63
GLE / Morgenstern-Price	1.63

Project	I-85/385 Interchange Improvements - Project ID: 003811; ECS Project No. 9283		
Analysis Description	Rocky Mountain Creek Roadway and Retaining Walls - Wall 18 Sta 414+00		
Drawn By	JEE	*Scale* 1:200	*Company* ECS Southeast LLP
Date	05-22-2018	*File Name*	STA 414+00 ESA.slim

SLIDEINTERPRET 8.010

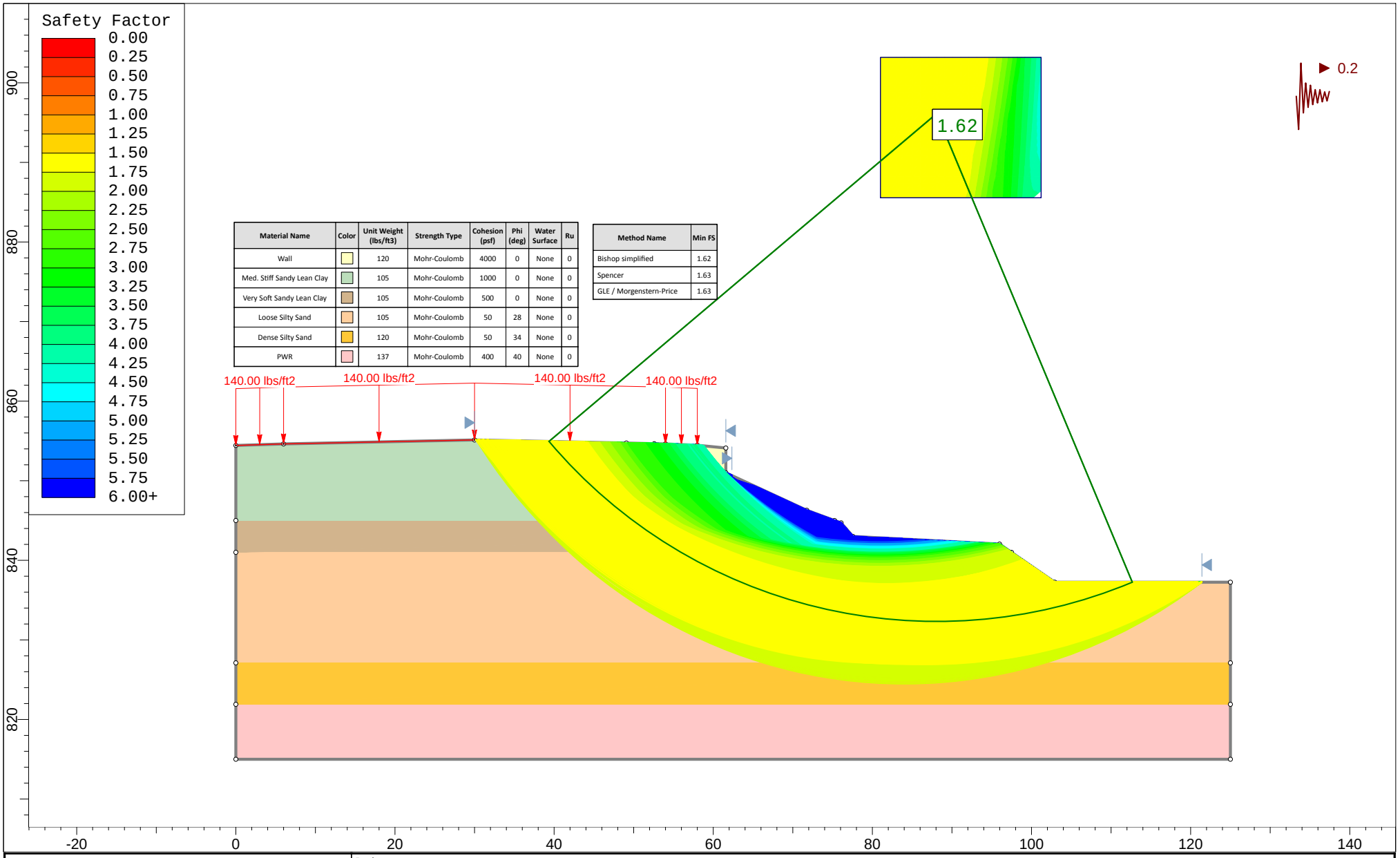


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Wall		120	Mohr-Coulomb	4000	0	None	0
Med. Stiff Sandy Lean Clay		105	Mohr-Coulomb	1000	0	None	0
Very Soft Sandy Lean Clay		105	Mohr-Coulomb	500	0	None	0
Loose Silty Sand		105	Mohr-Coulomb	50	28	None	0
Dense Silty Sand		120	Mohr-Coulomb	50	34	None	0
PWR		137	Mohr-Coulomb	400	40	None	0

Method Name	Min FS
Bishop simplified	2.44
Spencer	2.45
GLE / Morgenstern-Price	2.45

Project	I-85/385 Interchange Improvements - Project ID: 003811; ECS Project No. 9283		
Analysis Description	Rocky Mountain Creek Roadway and Retaining Walls - Wall 18 Sta 414+00		
Drawn By	JEE	*Scale* 1:200	*Company* ECS Southeast LLP
Date	05-22-2018		*File Name* STA 414+00 TSA.slim

SLIDEINTERPRET 8.010



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Wall		120	Mohr-Coulomb	4000	0	None	0
Med. Stiff Sandy Lean Clay		105	Mohr-Coulomb	1000	0	None	0
Very Soft Sandy Lean Clay		105	Mohr-Coulomb	500	0	None	0
Loose Silty Sand		105	Mohr-Coulomb	50	28	None	0
Dense Silty Sand		120	Mohr-Coulomb	50	34	None	0
PWR		137	Mohr-Coulomb	400	40	None	0

Method Name	Min FS
Bishop simplified	1.62
Spencer	1.63
GLE / Morgenstern-Price	1.63

Project	I-85/385 Interchange Improvements - Project ID: 003811; ECS Project No. 9283		
Analysis Description	Rocky Mountain Creek Roadway and Retaining Walls - Wall 18 Sta 414+00		
Drawn By	JEE	Scale 1:200	Company ECS Southeast LLP
Date	05-22-2018		File Name STA 414+00 TSA -EQ.slim

SLIDEINTERPRET 8.010

NOTES ON PLANS

The following notes apply to borrow materials:

Provide borrow materials meeting the following minimum requirements:

- **A sandy material (35% or less passing 0.075 mm) with a minimum total soil unit weight, γ_{total} of 110 pcf, with a maximum dry density exceeding 100 pcf.**
- **Minimum friction angle, φ, of 30° and cohesion, c, of 50 psf for embankment fill, alternatively embankment fill may consist of a minimum friction angle (φ) of 34° with zero cohesion.**
- **No. 57 Stone backfill for Mechanically Stabilized Earth Walls**

In addition, determine the moisture-density relationship and classification of the material. Test and submit the classification, moisture-density relationship, and soil strength parameters of the material to the Engineer for acceptance. An AASHTO certified laboratory is required to perform the testing. Contact the RPG Geotechnical Engineer for a list of locally available AASHTO certified laboratories. The Department may perform independent testing to assure quality.

Determine the friction angle and cohesion using either direct shear testing or consolidated-undrained triaxial shear testing with pore pressure measurements. Direct Shear testing shall only be performed on soils with a fines content of less than 25 percent. Classification testing includes grain-size distribution with wash #200 sieve, moisture plasticity testing and natural moisture content. Use the Standard Proctor test to determine the moisture-density relationship. Remold all samples used in shear strength testing to 95 percent of the Standard Proctor density. Conduct shear strength testing at the initial selection of the borrow pit, any subsequent changes in borrow pits, and for every 10,000 cy of materials placed. Perform classification testing for every 50,000 cy of materials placed, including the material used for the shear strength testing. Additional shear testing may be required if, in the opinion of the RCE, the materials being placed are different from those originally tested.

If these minimum criteria cannot be met, provide the soil parameters for the intended borrow excavation material for the project site to the Engineer for review and acceptance. After acceptable borrow material is obtained, compact the fill to the required finish grade line using the compactive effort indicated in the Standard Specifications for Highway Construction, Section 205 (Embankment Construction).

The following notes apply to muck excavation:

Any areas identified on the plans and any additional areas that are discovered to deflect or settle may require corrective action as directed by the RCE. This may include undercutting; placing No. 57 stone aggregate that is separated from other borrow materials by a geotextile for separation of sub-grade and sub-base, and/or additional compactive effort to the approval of the RCE.

In areas that require mucking or undercutting, borrow material soil may be placed as a bridge lift as long as the grade on which the material is being placed is at least 2 feet above ground water level. In the event that groundwater does not allow backfilling with a

borrow material soil, use a No. 57 stone as the bridge lift material. Borrow material bridge lifts may not exceed a 2-foot thickness. The depth at which mucking or undercutting is required is dependent upon encountering a suitable bearing material within the excavation or if a predetermined elevation or depth is required. In most cases, do not undercut more than 3 to 5 feet. The RCE will determine the final mucking or undercutting thickness, unless otherwise specified in the project plans and/or specifications. If a suitable bearing soil is not encountered within this depth range, place a P1 biaxial geogrid with an aperture size of less than or equal to 1 inch and in accordance with the project special provisions beneath a 2-foot thick bridge lift of No. 57 stone. If additional compacted borrow material soil is needed to reach grade, place a geotextile for separation of sub-grade and sub-base between the No. 57 stone and the overlying compacted soil. A bridge lift consisting of borrow material soil may not be placed within 3 feet of the base of the pavement section. Place only compacted borrow material soil or No. 57 stone within this zone. Reference the Standard Specifications for Highway Construction, Earthwork Section, Division 200.

The following notes apply for MSE Wall Subgrades:

Prior to construction of the leveling pad and MSE fill, the RCE shall verify that the retaining wall is founded on subgrade materials possessing the minimum allowable bearing capacity noted on wall plan and elevation sheets. If the RCE determines that the subgrade is unacceptable for placement of MSE fill, the contractor shall undercut the subgrade to the limits directed by the RCE. Unacceptable subgrade materials include, but are not limited to, all high plasticity clays and elastic silts (CH, MH), low plasticity clays and silts (CL, ML) with an unconfined compressive strength less than 2,000 psf, and deleterious debris. Replacement of undercut material will be with Backfill Material, meeting requirements outlined in the SCDOT Standard Specifications for Highway Construction.

The foundation area for the MSE walls might have scattered pockets of soft soils that might be present at the surface or just below the surface for the base of the MSE fill. These soft pockets are only expected to extend a few feet below the base of the MSE fill. The quality assurance representative shall proofroll the subgrade in this area and/or conduct dynamic cone tests at regular intervals to determine that the subgrade meets the requirements of the paragraph above.

There are several locations along the roadway alignment where proposed drainage structures are situated in front of (i.e. parallel) MSE walls, or where new and existing draining structures pass beneath the MSE walls. Where new pipes are parallel to the proposed wall, the pipe should be installed prior to the proposed wall or the wall design should account for the temporary reduction in passive resistance. Where pipes pass beneath walls, the pipes should be designed to account for the increased loading associated with the wall backfill. We recommend the top of each pipe be situated a minimum of 1 foot below the bottom of retaining.

The following notes apply for settlement and displacement monitoring:

The contractor shall establish a monitoring program consisting of settlement instruments. The settlement monitoring program must include establishing settlement monitoring instruments on the subgrade soils prior to fill placement, and at design

pavement subgrade elevation. Settlement monitoring instruments are required at a spacing of every 100 feet along MSE Walls and every 500 feet along embankments with new fill thicknesses exceeding 20 feet. Instruments shall be established at the centerline of road and edge of pavement. Settlement monitoring shall continue until three consecutive measurements demonstrate the rate of settlement is less than 0.1 inches per year. No more than one measurement shall be obtained on a single day.

A minimum of 2 measurements shall be obtained on monuments prior to fill placement, and instruments shall be measured weekly during fill placement. Instrumentation measurements shall be provided to the Geotechnical Engineer within 24 hours of measurements for interpretation. Interpreted results shall be provided to the RCE.

The following notes apply to slope construction:

Where the new fill meets the existing slope, the existing slope shall be benched to limit the potential for a preferential failure surface and to allow compaction at the interface. Benches shall have a minimum horizontal length of 8 feet and a vertical rise of no more than 3 feet. Fill slopes of 2H:1V or steeper shall be overbuilt (i.e. fill should temporarily extend beyond the final slope face) to allow compaction at the slope face. After compaction is complete, the slope may be regraded to the final inclination.

Should seeps or thick lenses of highly plastic soils be observed in the planned fill and cut slopes that are steeper than 2H:1V, ECS must be contacted to determine if the steeper slopes may be constructed as planned or if slope flattening or reinforcing is required. Similarly, if soft or wet ground conditions are observed at the base of planned fill embankments, the QA representative must determine the limits of undercutting required or required in-situ treatment.

The following Plan Notes apply to Mechanically Stabilized Earth walls:

Reinforced Backfill (Granular Fill or stone.)

Internal Friction Angle (deg) = 36
Total Unit Weight = 120 pcf
Surcharge Dead Load for Pavement Overlay = 140 psf
Active Earth Pressure Coefficient = 0.26

Retained Backfill

Internal Friction Angle (deg) = 30
Total Unit Weight = 117 pcf
Active Earth Pressure Coefficient = 0.33

Wall 17 – I-85 Station
Foundation Soils
Total – Internal Friction Angle (deg) = 26
Total – Cohesion = 0 psf
Effective – Internal Friction Angle (deg) = 26
Effective – Cohesion = 0 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
0 < H ≤ 7.5	14.5 ft	2,000 psf	3,100 psf

Wall 18 – I-85 Station 413+00 to 415+00
Foundation Soils
Total – Internal Friction Angle (deg) = 0
Total – Cohesion = 1000 psf
Effective – Internal Friction Angle (deg) = 26
Effective – Cohesion = 100 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
3 < H ≤ 7	12.5 ft	5,400 psf	8,400 psf

Stantec Consulting Services Inc.
4969 Centre Pointe Drive Suite 200, North Charleston SC 29418-6952

April 26, 2015
Revised April 26, 2015
Revised March 29, 2018

File: 171001537

Attention: Rocque Kneece
CECS, Inc
2000 Part Street, Suite 201
Columbia SC, 29201

Dear Rocque,

Reference: I-85 / I-385 Interchange – FEMA No-Rise Study – SCDOT Review

Introduction
Stantec performed a FEMA No-Rise analysis for an approximately 5000 foot reach of Rocky Creek at Interstate 85 in Greenville, South Carolina. Per FEMA regulations (44 CFR 60.3(d)(3)), a No-Rise analysis must demonstrate a zero-increase (0.00 feet) in the base flood elevation (BFE), floodway elevations, or floodway widths through hydrologic and hydraulic analysis before land development occurs within a floodway. A No-Rise analysis was performed due to proposed interstate modifications within the effective floodway.

The No-Rise analysis utilized the effective FEMA hydraulic model (HEC-RAS version 4.0) which provided cross sections, surveyed structures, and hydrology (steady-state flow rates). Detailed design of the proposed conditions were provided to Stantec and then incorporated into the hydraulic model using HEC-RAS version 4.1. Water surface profiles were produced for the 2-, 10-, 25-, 50-, 100-, and 500-year storm events.

Effective Model
The Flood Insurance Rate Maps for Greenville County became effective in August 18, 2014, and the project area is located in FEMA Map Number 45045C0407E. The Rocky Creek hydraulic model is comprised of the main channel and 6 additional tributaries. There are 2 areas of interest for this No-Rise study. The first location is at the I-85 culvert bridge crossing, and the second location is approximately 2500 feet upstream of the culvert bridge where Rocky Creek meanders back towards I-85. This location was included into the study because of the close proximity between the 100-year floodplain, floodway, and proposed I-85 modifications.

Duplicate Effective Model
The duplicate effective model is a truncated reproduction of the effective model for the specific project area. The two areas of interest described above are located between cross sections 24541 and 28374. However, the actual project limits for the No-Rise analysis are extended to 3 additional upstream cross sections and 1 additional downstream cross section. The project limits

for the No-Rise analysis are defined from cross section 24314 to 28944 as seen in the main channel of the hydraulic model. Boundary conditions for each water surface profile are known water surface elevations from the results of the original effective model. Results of the duplicate effective model come within 0.1 feet of the effective model.

Corrected Effective Model

A corrected effective model includes any significant corrections or errors to the effective model. For this study, no corrections or errors were discovered in the effective model.

Existing Conditions Model

The existing conditions model reflects any modifications or updated topography within the project area since the date of the effective model. Because the effective model was dated August 2014, no modifications or topography were incorporated into the model.

Proposed Conditions

Land development activity within the floodway includes I-85 road widening for portions of the north bound and south bound lanes. No modifications to the existing box culverts are proposed. All proposed modifications described in this report are within the 300 foot I-85 right-of-way.

The hydraulic methodologies for the proposed conditions model match the effective model. For instance, no additional cross sections were created, contraction/expansion coefficients were not revised, the jersey barrier was disregarded, and the bridge modeling approach was not adjusted. However, Manning's n values were adjusted as necessary to match proposed conditions.

The proposed conditions were the result of an iterative process to add or reduce modifications to reach zero increase (0.00) in the BFE, floodway elevation, and floodway width. For instance, retaining walls are proposed to limit the embankment impact to the BFE. There is approximately1400 LF of retaining wall proposed in the southbound lane, and approximately 800 LF of retaining wall proposed in the north bound lane. The proposed modifications were represented in the hydraulic model by overlaying the effective model cross sections, proposed road design stationing centerline, and ESRI aerial imagery in ArcGIS software. The proposed roadway design was the foundation to the proposed conditions hydraulic model. However, the No-Rise analysis is iterative in nature and additional revisions to the proposed roadway design were made. The additional revisions were agreed upon during phone conversations and are not reflected in the original roadway design plans. Upon approval of this report, the intent is to update the roadway design plans with the additional revisions. Proposed conditions within the No-Rise project area are more specifically described by the following:

1. I-85 Northbound lane widening between Station 387+00 to Station 422+00
    a. Proposed conditions incorporated from roadway design plans

Reference: I-85 / I-385 Interchange – FEMA No-Rise Study – SCDOT Review

~~b. Additional revisions include the off-ramp taper beginning at Station 414+00 was shifted north to Station 421+00. Stantec was instructed to maintain 17 feet between existing edge of pavement and outside edge of guardrail from Station 414+00 to Station 421+00, then maintain 21 feet starting at STA422+00~~

c. Additional revisions include off ramp taper starting at 421+00. Revisions also include a reduction in the earthen shoulder from approximately 410+00 to 426+00 per the revised plans.

~~2. I-85 Southbound lane widening between Station 387+00 to Station 412+00~~

~~a. Proposed conditions incorporated from roadway design plans~~

~~b. Additional revisions include:~~

~~i. Reduced embankment impact to 10 feet from existing edge-of-pavement at Station 410+00~~

~~ii. Southbound lane extended 18 additional feet between Station 386+00 and Station 400+00~~

3. I-85 Northbound retaining wall between Station 414+00 to ~~Station 422+00~~ Station 416+00

~~a. A retaining wall was incorporated as an additional revision at Cross Section 24541 and Cross Section 24668 with embankment cuts~~

b. Additional revisions include embankment cuts at Cross Sections 24541 and 24668 per the proposed plans.

~~4. I-85 Southbound retaining wall between Station 387+00 to Station 401+00~~

~~a. A retaining wall was incorporated as an additional revision at Cross Sections 28374, 28216, 27999, 27809, 27572, and 27339~~

Reference: I-85 / I-385 Interchange – FEMA No-Rise Study – SCDOT Review

Results

Since there was no corrected effective model and no modifications to topography/structures needed, the existing conditions model would be a replica of the duplicate effective model. Therefore, the proposed conditions model results were compared against the duplicate effective model. The difference between the two models resulted in a 0.00 feet (or less) increase in the BFE, floodway elevations, and floodway widths thus satisfying the FEMA No-Rise requirement.

Table 1 – No-Rise Analysis Results (BFE)

	100-yr Water Surface Elevations (feet NAVD88)				
Cross Section	**Effective**		**Existing***	**Proposed**	**Delta**
					(Proposed - Existing)
Rocky Creek_24314.4			848.25	848.25	0.00
Rocky Creek_24541.44			849.51	849.5	-0.01
Rocky Creek_24668.16	AQ	849.9	849.94	849.77	-0.17
Rocky Creek_25380.96			851.44	851.23	-0.21
Rocky Creek_25539.36			853.49	853.43	-0.06
Rocky Creek_25687.2	AR	853.6	853.56	853.5	-0.06
Rocky Creek_25893.12			853.58	853.53	-0.05
Rocky Creek_26083.2			853.6	853.54	-0.06
Rocky Creek_26220.48			853.6	853.55	-0.05
Rocky Creek_26400	AS	853.6	853.64	853.58	-0.06
Rocky Creek_26574.24			853.72	853.67	-0.05
Rocky Creek_26806.56			853.74	853.69	-0.05
Rocky Creek_27033.6	AT	853.9	853.85	853.8	-0.05
Rocky Creek_27155.04			853.95	853.94	-0.01
Rocky Creek_27339.84			854.11	854.1	-0.01
Rocky Creek_27572.16	AU	854.2	854.19	854.18	-0.01
Rocky Creek_27809.76			854.49	854.48	-0.01
Rocky Creek_27999.84			854.91	854.91	0.00
Rocky Creek_28216.32	AV	856.5	856.48	856.48	0.00
Rocky Creek_28374.72			857.19	857.19	0.00
Rocky Creek_28570.08			857.42	857.42	0.00
Rocky Creek_28707.36	AW	857.4	857.46	857.45	-0.01
Rocky Creek_28944.96			857.59	857.59	0.00

*Results from duplicate effective model

Reference: I-85 / I-385 Interchange – FEMA No-Rise Study – SCDOT Review

Table 2 – No-Rise Analysis Results (Floodway)

		Floodway Elevations (feet NAVD88)				Floodway Widths (feet)			
Cross Section		Effective	Existing*	Proposed	Delta	Effective	Existing*	Proposed	Delta
					(Proposed - Existing)				(Proposed - Existing)
Rocky Creek_24314.4			848.98	848.98	0.00		160	160	0.00
Rocky Creek_24541.44			849.95	849.95	0.00		160	160	0.00
Rocky Creek_24668.16	AQ	850.3	850.28	850.20	-0.08	160	160	160	0.00
Rocky Creek_25380.96			851.58	851.50	-0.08		382	382	0.00
Rocky Creek_25539.36			854.35	854.32	-0.03		350	350	0.00
Rocky Creek_25687.2	AR	854.5	854.52	854.49	-0.03	350	350	350	0.00
Rocky Creek_25893.12			854.53	854.50	-0.03		300	300	0.00
Rocky Creek_26083.2			854.53	854.50	-0.03		225	225	0.00
Rocky Creek_26220.48			854.53	854.50	-0.03		225	225	0.00
Rocky Creek_26400	AS	854.6	854.59	854.56	-0.03	225	225	225	0.00
Rocky Creek_26574.24			854.68	854.65	-0.03		270	270	0.00
Rocky Creek_26806.56			854.69	854.66	-0.03		270	270	0.00
Rocky Creek_27033.6	AT	854.8	854.81	854.79	-0.02	270	270	270	0.00
Rocky Creek_27155.04			854.92	854.86	-0.06		270	270	0.00
Rocky Creek_27339.84			855.03	854.97	-0.06		230	230	0.00
Rocky Creek_27572.16	AU	855.2	855.22	855.16	-0.06	215	215	215	0.00
Rocky Creek_27809.76			855.43	855.38	-0.05		155	155	0.00
Rocky Creek_27999.84			855.88	855.84	-0.04		155	155	0.00
Rocky Creek_28216.32	AV	856.9	856.87	856.85	-0.02	155	155	155	0.00
Rocky Creek_28374.72			857.93	857.91	-0.02		235	235	0.00
Rocky Creek_28570.08			858.33	858.32	-0.01		250	250	0.00
Rocky Creek_28707.36	AW	858.3	858.39	858.38	-0.01	250	250	250	0.00
Rocky Creek_28944.96			858.58	858.58	0.00		250	250	0.00
*Results from duplicate effective model									

Regards,
STANTEC CONSULTING SERVICES INC.

Shaun Cavey, PE
Project Engineering Specialist
Phone: (843) 740-6345
shaun.cavey@stantec.com

sc u:\1710\active\171001537 - i-85 & i-385 interchange\design\drainage\fema\20150301-no_rise_analysis\report\20180329-norise-resubmittal\20180329-norise-report.docx

Legend

- FEMA Cross Section
- Tax_Parcel
- Stream Centerline

FEMA Floodplain

Flood Zones

- A,
- AE,
- AE, FLOODWAY
- X, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD

PREPARED BY:
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Stantec

ROCKY CREEK
NO-RISE STUDY
GREENVILLE, SOUTH CAROLINA

DATE:
3/10/2015

PAGE:
1 of 1

PROJECT NO:
-

SCALE:
1 inch = 300 feet

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	IL1

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RAMP 1 X1 - RAMP 1 X36	RAMP 1 CROSS SECTIONS	36
RAMP 1A X1 - RAMP 1A X34	RAMP 1A CROSS SECTIONS	34
RAMP 1B X1 - RAMP 1B X13	RAMP 1B CROSS SECTIONS	13
RAMP 2 X1 - RAMP 2 X10	RAMP 2 CROSS SECTIONS	10
RAMP 2A X1 - RAMP 2A X50	RAMP 2A CROSS SECTIONS	50
RAMP 2B X1 - RAMP 2B X25	RAMP 2B CROSS SECTIONS	25
RAMP 3 X1 - RAMP 3 X20	RAMP 3 CROSS SECTIONS	20
RAMP 3A X1 - RAMP 3A X17	RAMP 3A CROSS SECTIONS	17
RAMP 4 X1 - RAMP 4 X33	RAMP 4 CROSS SECTIONS	33
RAMP 4B X1 - RAMP 4B X28	RAMP 4B CROSS SECTIONS	28
RAMP 5 X1 - RAMP 5 X14	RAMP 5 CROSS SECTIONS	14
RAMP 7 X1 - RAMP 7 X5	RAMP 7 CROSS SECTIONS	5
RAMP 8 X1 - RAMP 8 X12	RAMP 8 CROSS SECTIONS	12
RAMP 8A X1 - RAMP 8A X10	RAMP 8A CROSS SECTIONS	10
RAMP 9 X1 - RAMP 9 X4	RAMP 9 CROSS SECTIONS	6
RAMP 10 X1 - RAMP 10 X9	RAMP 10 CROSS SECTIONS	9
RAMP 11 X1 - RAMP 11 X12	RAMP 11 CROSS SECTIONS	12
DRAIN X1 - DRAIN X22	DRAINAGE CROSS SECTIONS	22
	TOTAL SHEETS	1917

8 ADDED SHEETS 3G, TA-X63A TO TA-X63E, TA-X145A TO TA-X145D, TA-X151A, TA-X157A, TA-X157B, TA-X182 TO TA-X210, I-385 X52A, I-385 X52B, I-385 NBCD X34A, I-385 NBCD X12A, RAMP 9 X0, RAMP 9 X5.

9 10/21/16 - ADDED SHEETS IL33, TA-24, TA-X211 TO TA-X220.

10 10/28/16 - ADDED SHEETS IL34, D33, TC4.2AA TO TC4.2AC, TC4.2BA TO TC4.2BC, TC4.2CA TO TC4.2CH, TC4.2Q, TA-2C, TA-25, TA-X221 TO TA-X235, S0-40 TO S0-43, S17-1, S18-1 TO S18-4, S55-1 TO S55-5, EC8 TO EC10.

11 1/12/17 - ADDED SHEET S32-7

12 2/2/17 - ADDED SHEETS TA-26, TA-X236 TO TA-X241

13 3/16/17 - ADDED SHEET D32A

14 12/18/17 - ADDED SHEETS TC4.2A.1A AND TC4.2A.1B

15 1/9/18 - ADDED SHEET SC9

16 5/3/18 - REMOVED SHEETS S18-2, S18-3, S18-4, S55-1, S55-2, S55-3, S55-4, S55-5

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	1/27/16	ADDED SHEET TC2H TO TC SERIES	D.R.R.	B.G.N.
2	4/29/16	PLAN SHEET/ REVISION LOGS ADDED	D.P.M.	B.G.N.
3	5/12/16	TAX84A-C ADDED	D.R.R.	B.G.N.
4	6/17/16	SHEET S0-39 ADDED	D.R.R.	R.L.K.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
5	7/8/16	TC/TA SERIES SHTS ADDED,IL32 ADDED	D.R.R.	B.G.N.
6	8/9/16	ADDED SHT TC4.2G.1	D.R.R.	R.L.K.
7	8/18/16	ADDED SHEET S0-44	D.R.R.	R.L.K.
8	9/28/16	ADDED SHEETS	B.G.N.	R.L.K.

DRAWN BY : A.W.F DATE : 6/10/15

REVIEWED BY : B.A.H. DATE : 09/04/15

APPROVED BY : B.G.N. DATE : 09/20/15

FLATIRON ZACHRY

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 32591

6/7/2018 12:33:47 PM

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

INDEX OF SHEETS

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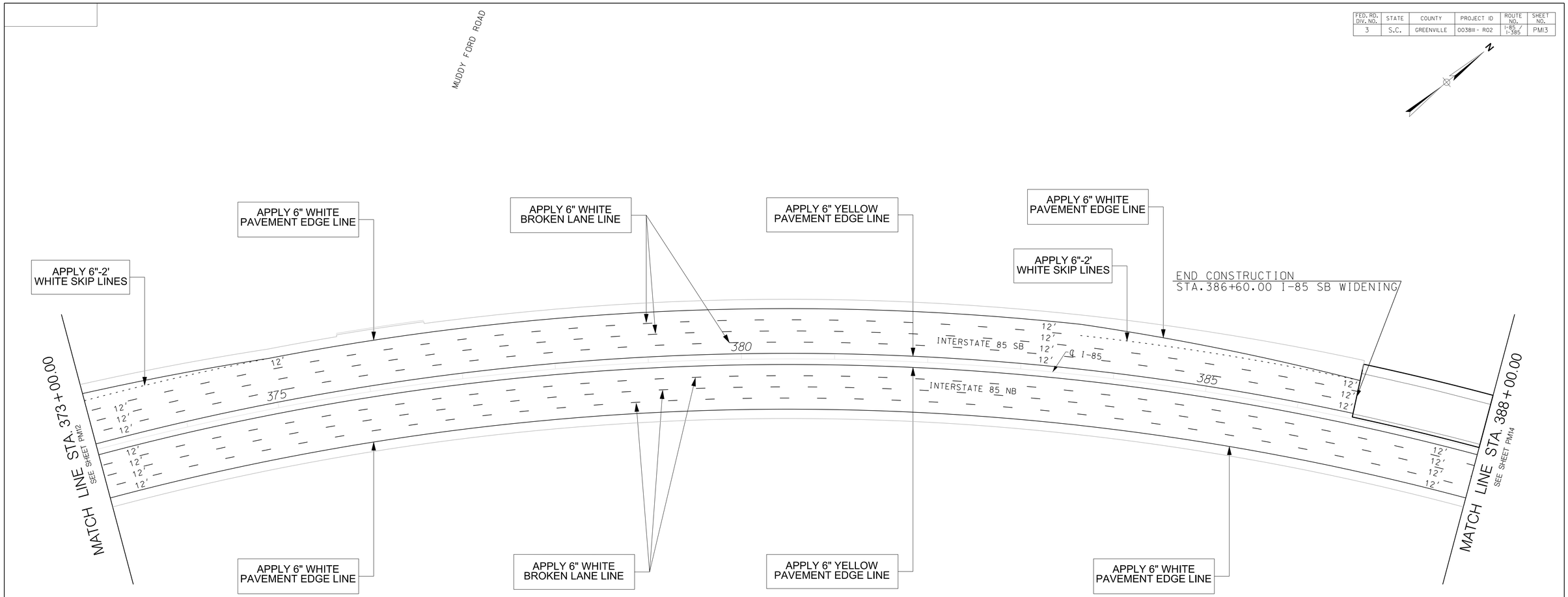
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	PMI3



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	05/02/18	REMOVED I85 SB PAVEMENT MARKINGS STA. 386+60.00 TO STA. 388+00.00	R.L.D.	B.G.N.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F. DATE : 9/4/15

REVIEWED BY : D.B.R. DATE : 9/4/15

APPROVED BY : B.G.N. DATE : 9/4/15

FLATIRON ZACHRY

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER NO. 29889 BRIAN G. NICKERSON

6/6/2018 11:30:44 AM EDT

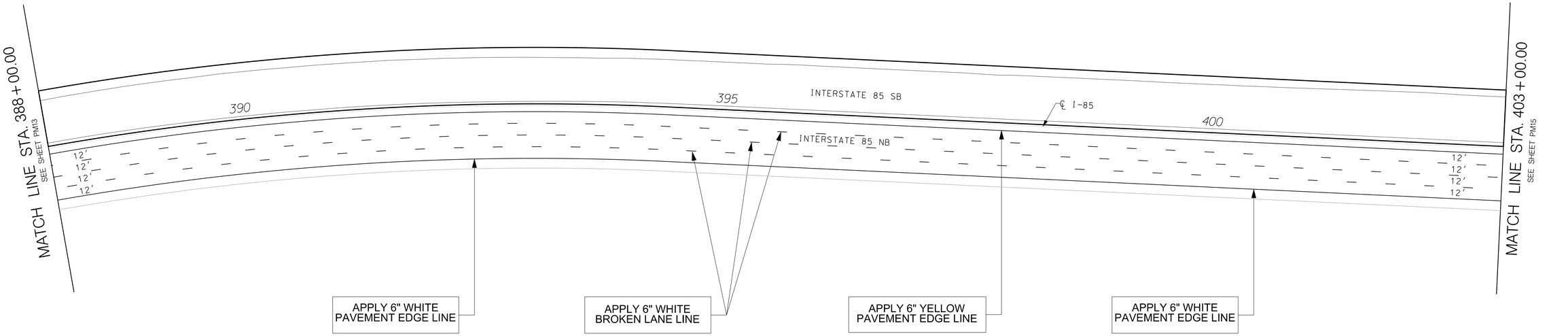
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

PAVEMENT MARKING PLAN SHEET STA. 373+00.00 TO STA. 388+00.00

S:\Proj\2011\471IA\Design\Project PIN Number\Traffic\Pavement Markings\Interchange\PAVEMARK SHEETS\PMI3.dgn 5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - RO2	I-85 / I-385	PMI4



REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED
1	05/02/18	REMOVED I85 SB PAVEMENT MARKINGS STA. 388+00.00 TO STA. 403+00.00	R.L.D.	B.G.N.

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F. DATE : 9/4/15

REVIEWED BY : D.R.R. DATE : 9/4/15

APPROVED BY : B.G.N. DATE : 9/4/15

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 33889 BRIAN G. NICKERSON

6/6/2018 11:30:41 AM EDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

PAVEMENT MARKING PLAN SHEET STA. 388+00.00 TO STA. 403+00.00

S:\Proj\2011471IA\Design\Project PIN Number\Traffic\Pavement Markings\Interchange\PAVEMARK SHEETS\PM4.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	PM15

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	05/16/16	ADJUSTED PAVEMENT MARKINGS FOR PELHAM ROAD EXIT	R.L.D.	B.G.N.					
2	05/02/18	REMOVED I85 SB PAVEMENT MARKINGS STA. 403+00.00 TO STA. 414+30.20	R.L.D.	B.G.N.					

DRAWN BY : A.W.F.
DATE : 9/4/15

REVIEWED BY : D.R.R.
DATE : 9/4/15

APPROVED BY : B.G.N.
DATE : 9/4/15

FLATIRON / ZACHRY

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 23889

6/6/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

PAVEMENT MARKING PLAN SHEET
STA. 403+00.00 TO STA. 418+00.00

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5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	S0-1

INTERCHANGE WALL SUMMARY

WALL #	WALL TYPE	FROM STA.	TO STA.	ALIGNMENT
1	MSE	1+00.00	3+63.51	WALL 1
1	MSE	-	-	SEE BRIDGE 10 PLANS
1	MSE	8+31.02	12+09.78	WALL 1
2	MSE	-	-	SEE BRIDGE 10 PLANS
2A	MSE	4+74.09	8+13.33	WALL 2A
2B	BARRIER	8+13.33	61+43.24	WALL 2B
3	MSE	-	-	SEE BRIDGE 7/9 PLANS
4	MSE	-	-	SEE BRIDGE 9 PLANS
5	MSE	-	-	SEE BRIDGE 12 PLANS
6	MSE	-	-	SEE BRIDGE 12 PLANS
7	MSE	-	-	SEE BRIDGE 6 PLANS
8	MSE	-	-	SEE BRIDGE 8 PLANS
9	MSE	-	-	SEE BRIDGE 8 PLANS
10	SOIL NAIL	10+00.00	14+68.53	WALL 10
11	BARRIER	10+00.00	14+83.98	WALL 11
12	PILE AND PANEL	9+98.70	17+50.70	WALL 12
12	MSE/SOIL NAIL	-	-	SEE BRIDGE 11 PLANS
12	PILE AND PANEL	18+57.39	30+81.39	WALL 12
12	MSE	30+81.39	39+04.30	WALL 12
12	MSE			SEE BRIDGE 5 PLANS
13	MSE	10+50.00	18+85.45	WALL 13
14	R. CONCRETE	10+00.00	15+84.09	WALL 14
15	BARRIER	1+00.00	32+38.27	WALL 15
16A	BARRIER	10+00.00	17+70.00	WALL 16A
16B	SOIL NAIL	17+74.84	19+34.84	WALL 16B
16B	PILE AND PANEL	19+34.84	21+58.84	WALL 16B
16B	MSE/SOIL NAIL	-	-	SEE BRIDGE 11 PLANS
16B	SOIL NAIL	22+75.00	26+51.00	WALL 16B
17	MSE	10+30.00	11+25.00	WALL 17
18	WIRE FACED MSE	413+00.00	415+00.00	I85
19	OMITTED			
20	56" RIGID SLOPE BARRIER	327+50.37	329+27.97	I385/I 385 NBCD
21	PILE AND PANEL	10+00.00	19+28.00	WALL 21
22	BARRIER	10+00.00	104+49.65	WALL 22
23	BARRIER	0+33.82	11+53.89	WALL 23
24	BARRIER	1+00.00	38+99.60	WALL 24
25	BARRIER	1+00.00	6+39.83	WALL 25
26	SOIL NAIL	10+00.00	12+70.00	WALL 26
27	SOIL NAIL	10+10.00	12+16.00	WALL 27
27	SOIL NAIL	12+16.00	16+09.30	WALL 27
28	MSE	-	-	SEE BRIDGE 4 PLANS
29	MSE	-	-	SEE BRIDGE 4 PLANS
30	MOMENT SLAB BARRIER	374+25.00	375+42.02	I385 NBCD
31A	BARRIER	10+00.00	18+75.60	WALL 31A
31B	MSE	18+75.60	21+30.57	WALL 31B
32	MSE	-	-	SEE BRIDGE 3 PLANS
32	MSE	10+15.75	24+34.33	WALL 32
33	MSE	-	-	SEE BRIDGE 7 PLANS
33	MSE	11+62.10	21+56.10	WALL 33
34	BARRIER	10+00.00	15+12.17	WALL 34
35	MSE	-	-	SEE BRIDGE 5/7 PLANS
36A	BARRIER	10+00.00	13+48.33	WALL 36A
36B	MSE	13+48.33	17+10.00	WALL 36B
37	MSE	-	-	SEE BRIDGE 6 PLANS
38	SOIL NAIL	10+00.00	33+52.00	WALL 38
39	BARRIER	9+97.93	23+92.04	WALL 39
40A	MOMENT SLAB BARRIER	110+53.13	110+74.86	RAMP 5
40B	MOMENT SLAB BARRIER	258+78.00	258+99.86	I-85
41	56" RIGID SLOPE BARRIER	36+30.00	36+90.00	RAMP 3
42	56" RIGID SLOPE BARRIER	37+47.81	38+15.35	RAMP 3
43	MOMENT SLAB BARRIER	80+70.03	81+28.36	RAMP 2A
44	BARRIER	285+99.60	286+68.15	I85 NBCD
45	56" RIGID SLOPE BARRIER	293+68.75	294+25.95	I85 NBCD
46	56" RIGID SLOPE BARRIER	400+34.77	401+60.00	I385
47	56" RIGID SLOPE BARRIER	113+61.84	114+49.21	RAMP 1
48	56" RIGID SLOPE BARRIER	300+54.58	301+20.00	RAMP 3A
49	BARRIER	283+64.53	291+57.42	I-85
50	BARRIER	296+05.48	298+26.76	I-85
51	BARRIER	289+80.65	291+04.92	RAMP 3A
52	BARRIER	319+15.71	321+32.21	I-85
53	56" RIGID SLOPE BARRIER	78+33.85	79+89.60	RAMP 2A
54	56" RIGID SLOPE BARRIER	293+92.54	294+68.88	RAMP 3A
56	MSE	-	-	SEE BRIDGE2A,2B,3

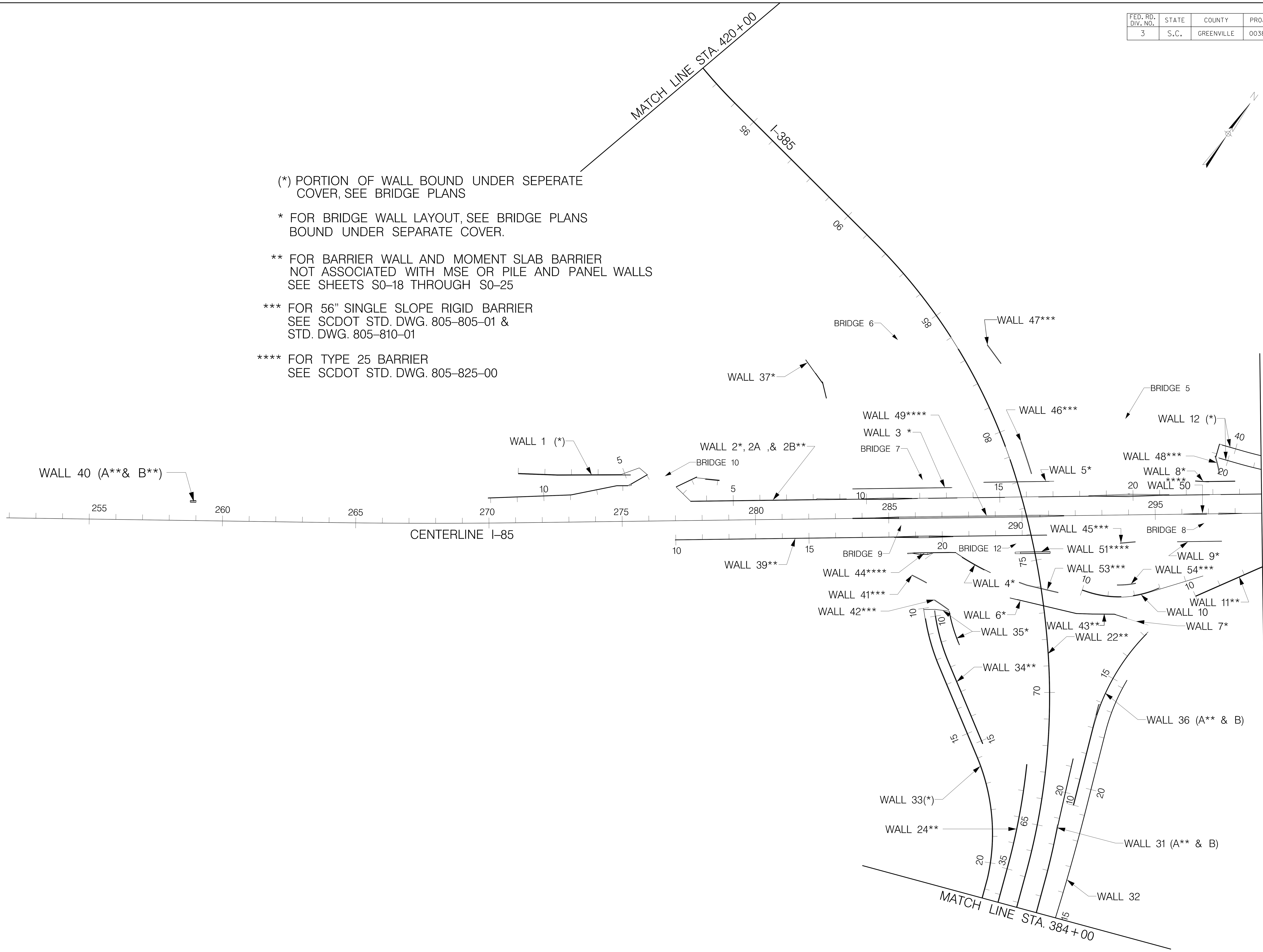
(*) PORTION OF WALL BOUND UNDER SEPERATE COVER, SEE BRIDGE PLANS

* FOR BRIDGE WALL LAYOUT, SEE BRIDGE PLANS BOUND UNDER SEPARATE COVER.

** FOR BARRIER WALL AND MOMENT SLAB BARRIER NOT ASSOCIATED WITH MSE OR PILE AND PANEL WALLS SEE SHEETS S0-18 THROUGH S0-25

*** FOR 56" SINGLE SLOPE RIGID BARRIER SEE SCDOT STD. DWG. 805-805-01 & STD. DWG. 805-810-01

**** FOR TYPE 25 BARRIER SEE SCDOT STD. DWG. 805-825-00



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/16/16	REVISED WALL 27 TYPE AND BEGIN STA.	D.R.R.	B.G.N.
2	7/22/16	REVISED WALLS 17, 18, 38, & 55	D.R.R.	B.G.N.
3	11/1/16	REVISED WALL 16B	B.G.N.	R.L.K.
4	1/19/17	REVISED WALL 10	B.G.N.	R.L.K.
5	10/20/17	REVISED WALL 23	B.G.N.	R.L.K.
6	5/3/18	REVISED WALL 18, REMOVED WALL 55	B.G.N.	P.H.R.

DRAWN BY : D.M. DATE : 06/19/15
REVIEWED BY : J.C. DATE : 06/24/15
APPROVED BY : M.A. DATE : 06/26/15

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

SCALE: 1" = 200' HORIZ (0 200 400 600 800)

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

Paul Hanna Raad No. 15591

6/7/2018 12:43

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

WALL LAYOUT SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	SO-2

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	7/22/16	REVISED WALLS 17, 18, & 55	D.R.R.	B.G.N.					
2	5/3/18	REVISED WALL 18, REMOVED WALL 55	B.G.N.	P.H.R.					

DRAWN BY : D.M.
DATE : 06/19/15

REVIEWED BY : J.C.
DATE : 06/24/15

APPROVED BY : M.A.
DATE : 06/26/15

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 200 400 600 800

SCALE: 1" = 200' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 15591 PAUL HANNA RAAD

DocuSigned by: Paul Hanna Raad 6/18/2018 12:05:59 PM PDT

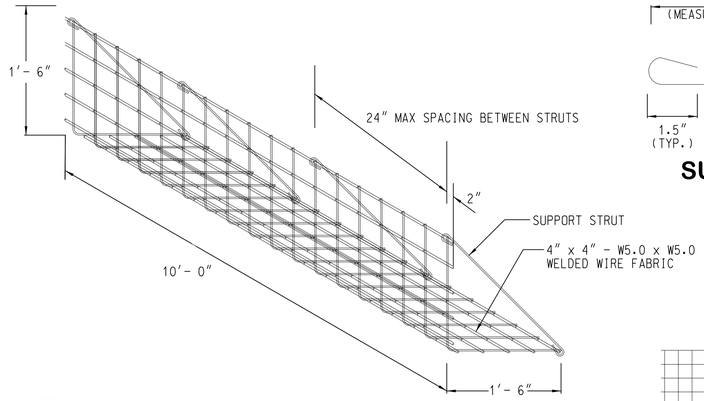
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

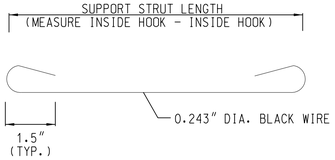
WALL LAYOUT SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SO-40

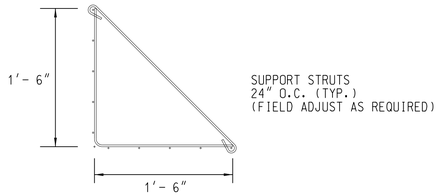


NOTES:

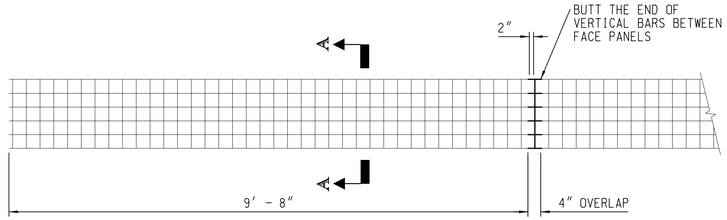
1. Facing to consist of fabricated Welded Wire Forms 4" X 4" - W5.0 X W5.0 forms.
2. All forms and struts shall be fabricated with black wire.
3. Overall length of wire forms shall be 10'- 0". Effective constructed width is 9'- 8" with a 4" overlap at ends.



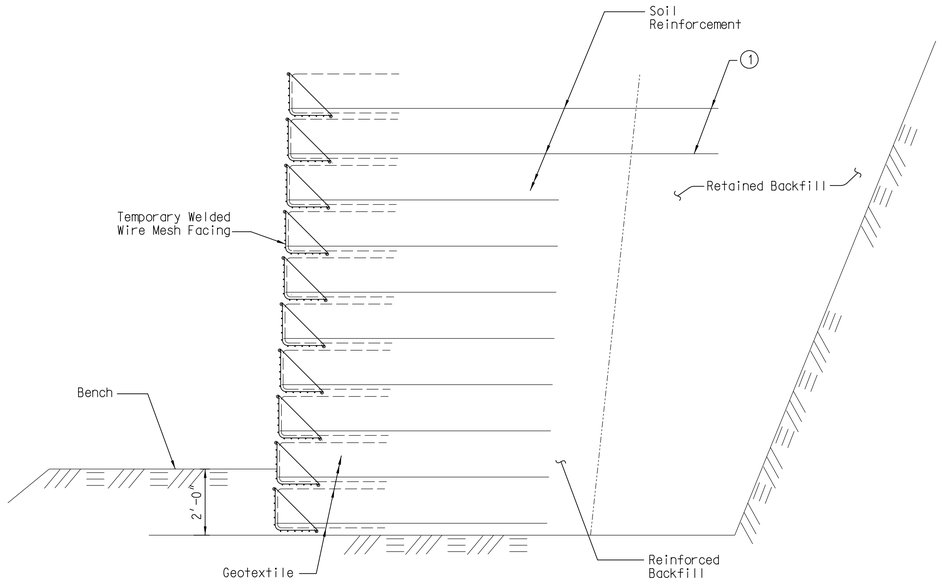
SUPPORT STRUT



SECTION A-A

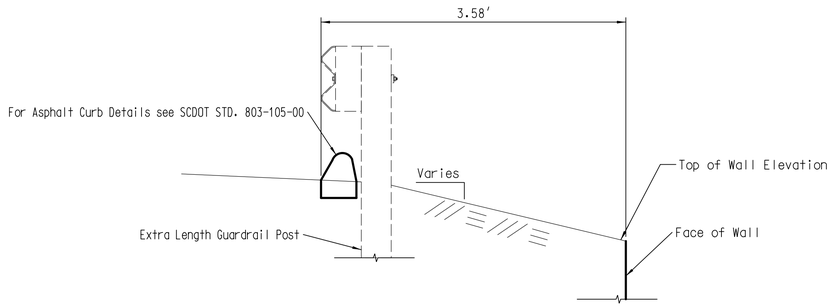


WELDED WIRE FORM FACING UNIT



TEMPORARY MSE WALL TYPICAL SECTION

(1) Extend top two layers of soil reinforcement 5 feet beyond the end of the lower layers of soil reinforcement.



WALL FACE AND GUARDRAIL DETAIL

Notes:

Extra Length Guardrail post to be used. Contractor shall take the necessary measures needed to avoid conflict between guardrail post and wire wall soil reinforcements.

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED WALL FACE/GUARDRAIL DETAIL REMOVED MOMENT SLAB DETAIL REMOVED MSE WALL INTERACTION DETAIL	D.P.M.	M.S.A.

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : D.P.M.
DATE : 07/26/16

REVIEWED BY : M.S.A.
DATE : 07/26/16

APPROVED BY : R.R.C
DATE : 07/26/16

FLATIRON ZACHRY a joint venture

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION 6/6/2018 12:48:11 PM EDT

SOUTH CAROLINA PROFESSIONAL ENGINEER NO. 11904 RANDY R. RAM CANNON

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT South Carolina Department of Transportation

I-85 / I-385 INTERCHANGE

WALL DETAILS

$$$$$$path$$$$$$$$$$filename$$$$$$$$
$$$date$$$$

The following notes apply to borrow materials:

Provide borrow materials meeting the following minimum requirements:

- **A sandy material (35% or less passing 0.075 mm) with a minimum total soil unit weight, γ_{total} of 110 pcf, with a maximum dry density exceeding 100 pcf.**
- **Minimum friction angle, φ, of 30° and cohesion, c, of 50 psf for embankment fill, alternatively embankment fill may consist of a minimum friction angle (φ) of 34° with zero cohesion.**
- **No. 57 Stone backfill for Mechanically Stabilized Earth Walls**

In addition, determine the moisture-density relationship and classification of the material. Test and submit the classification, moisture-density relationship, and soil strength parameters of the material to the Engineer for acceptance. An AASHTO certified laboratory is required to perform the testing. Contact the RPG Geotechnical Engineer for a list of locally available AASHTO certified laboratories. The Department may perform independent testing to assure quality.

Determine the friction angle and cohesion using either direct shear testing or consolidated-undrained triaxial shear testing with pore pressure measurements. Direct Shear testing shall only be performed on soils with a fines content of less than 25 percent. Classification testing includes grain-size distribution with wash #200 sieve, moisture plasticity testing and natural moisture content. Use the Standard Proctor test to determine the moisture-density relationship. Remold all samples used in shear strength testing to 95 percent of the Standard Proctor density. Conduct shear strength testing at the initial selection of the borrow pit, any subsequent changes in borrow pits, and for every 10,000 cy of materials placed. Perform classification testing for every 50,000 cy of materials placed, including the material used for the shear strength testing. Additional shear testing may be required if, in the opinion of the RCE, the materials being placed are different from those originally tested.

If these minimum criteria cannot be met, provide the soil parameters for the intended borrow excavation material for the project site to the Engineer for review and acceptance. After acceptable borrow material is obtained, compact the fill to the required finish grade line using the compactive effort indicated in the Standard Specifications for Highway Construction, Section 205 (Embankment Construction).

The following notes apply to muck excavation:

Any areas identified on the plans and any additional areas that are discovered to deflect or settle may require corrective action as directed by the RCE. This may include undercutting; placing No. 57 stone aggregate that is separated from other borrow materials by a geotextile for separation of sub-grade and sub-base, and/or additional compactive effort to the approval of the RCE.

In areas that require mucking or undercutting, borrow material soil may be placed as a bridge lift as long as the grade on which the material is being placed is at least 2 feet above ground water level. In the event that groundwater does not allow backfilling with a borrow material soil, use a No. 57 stone as the bridge lift material. Borrow material bridge lifts may not exceed a 2-foot thickness. The depth at which mucking or undercutting is required is dependent upon encountering a suitable bearing material within the excavation or if a predetermined elevation or depth is required. In most cases, do not undercut more than 3 to 5 feet. The RCE will determine the final mucking or undercutting thickness, unless otherwise specified in the project plans and/or specifications. If a suitable bearing soil is not encountered within this depth range, place a P1 biaxial geogrid with an aperture size of less than or equal to 1 inch and in accordance with the project special provisions beneath a 2-foot thick bridge lift of No. 57 stone. If additional compacted borrow material soil is needed to reach grade, place a geotextile for separation of sub-grade and sub-base between the No. 57 stone and the overlying compacted soil. A bridge lift consisting of borrow material soil may not be placed within 3 feet of the base of the pavement section. Place only compacted borrow material soil or No. 57 stone within this zone. Reference the Standard Specifications for Highway Construction, Earthwork Section, Division 200.

Additional Notes:

See S0-16 and S0-17 for additional MSE Wall Design Parameters.

The following notes apply for MSE Wall Subgrades:

Prior to construction of the leveling pad and MSE fill, the RCE shall verify that the retaining wall is founded on subgrade materials possessing the minimum allowable bearing capacity noted on wall plan and elevation sheets. If the RCE determines that the subgrade is unacceptable for placement of MSE fill, the contractor shall undercut the subgrade to the limits directed by the RCE. Unacceptable subgrade materials include, but are not limited to, all high plasticity clays and elastic silts (CH, MH), low plasticity clays and silts (CL, ML) with an unconfined compressive strength less than 2,000 psf, and deleterious debris. Replacement of undercut material will be with Backfill Material, meeting requirements outlined in the SCDOT Standard Specifications for Highway Construction.

The foundation area for the MSE walls might have scattered pockets of soft soils that might be present at the surface or just below the surface for the base of the MSE fill. These soft pockets are only expected to extend a few feet below the base of the MSE fill. The quality assurance representative shall proofroll the subgrade in this area and/or conduct dynamic cone tests at regular intervals to determine that the subgrade meets the requirements of the paragraph above. There are several locations along the roadway alignment where proposed drainage structures are situated in front of (i.e. parallel) MSE walls, or where new and existing draining structures pass beneath the MSE walls. Where new pipes are parallel to the proposed wall, the pipe should be installed prior to the proposed wall or the wall design should account for the temporary reduction in passive resistance. Where pipes pass beneath walls, the pipes should be designed to account for the increased loading associated with the wall backfill. We recommend the top of each pipe be situated a minimum of 1 foot below the bottom of retaining.

The following notes apply for settlement and displacement monitoring:

The contractor shall establish a monitoring program consisting of settlement instruments. The settlement monitoring program must include establishing settlement monitoring instruments on the subgrade soils prior to fill placement, and at design pavement subgrade elevation. Settlement monitoring instruments are required at a spacing of every 100 feet along MSE Walls and every 500 feet along embankments with new fill thicknesses exceeding 20 feet. Instruments shall be established at the centerline of road and edge of pavement. Settlement monitoring shall continue until three consecutive measurements demonstrate the rate of settlement is less than 0.1 inches per year. No more than one measurement shall be obtained on a single day.

A minimum of 2 measurements shall be obtained on monuments prior to fill placement, and instruments shall be measured weekly during fill placement. Instrumentation measurements shall be provided to the Geotechnical Engineer within 24 hours of measurements for interpretation. Interpreted results shall be provided to the RCE.

The following notes apply to slope construction:

Where the new fill meets the existing slope, the existing slope shall be benched to limit the potential for a preferential failure surface and to allow compaction at the interface. Benches shall have a minimum horizontal length of 8 feet and a vertical rise of no more than 3 feet. Fill slopes of 2H:1V or steeper shall be overbuilt (i.e. fill should temporarily extend beyond the final slope face) to allow compaction at the slope face. After compaction is complete, the slope may be regraded to the final inclination.

Should seeps or thick lenses of highly plastic soils be observed in the planned fill and cut slopes that are steeper than 2H:1V, ECS must be contacted to determine if the steeper slopes may be constructed as planned or if slope flattening or reinforcing is required. Similarly, if soft or wet ground conditions are observed at the base of planned fill embankments, the QA representative must determine the limits of undercutting required or required in-situ treatment.

The following Plan Notes apply to Mechanically Stabilized Earth walls:

Reinforced Backfill (Granular Fill or stone.)

Internal Friction Angle (deg) = 36
Total Unit Weight = 120 pcf
Surcharge Dead Load for Pavement Overlay = 140 psf
Active Earth Pressure Coefficient = 0.26

Retained Backfill

Internal Friction Angle (deg) = 30
Total Unit Weight = 117 pcf
Active Earth Pressure Coefficient = 0.33

Wall 17 I-85 Station
Foundation Soils
Total Internal Friction Angle (deg) = 26
Total Cohesion = 0 psf
Effective Internal Friction Angle (deg) = 26
Effective Cohesion = 0 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
0 < H ≤ 7.5	14.5 ft	2,000	3,100

Wall 18 I-85 Station 413+00 to 415+00
Foundation Soils
Total Internal Friction Angle (deg) = 0
Total Cohesion = 1000 psf
Effective Internal Friction Angle (deg) = 26
Effective Cohesion = 100 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
3 < H ≤ 7	12.5 ft	5,400	8,400

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED WALL 18, REMOVED WALL 55	D.P.M.	M.S.A.					

DRAWN BY : D.P.M. DATE : 07/26/16
REVIEWED BY : M.S.A. DATE : 07/26/16
APPROVED BY : R.R.C. DATE : 07/26/16

FLATIRON / ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — RANDY RAY CANNON — DocuSigned by: Cannon, Randy 849B9D8D21514E3...
6/6/2018 12:48:34 PM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION — SCDOT

I-85 / I-385 INTERCHANGE

GEOTECH & MSE WALL NOTES FOR ROCKY CREEK

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	S18-1

** CONTRACTOR TO VERIFY

FOR WIRE FACED MSE WALL DETAILS SEE SH. SC-40

CARE SHALL BE TAKEN TO AVOID DRAINAGE BOX WHEN WITHIN LIMITS OF MSE WALL. WALL VENDER TO PROVIDE DETAILS ON SHOP PLANS TO AVOID CONFLICT BETWEEN WALL REINFORCING AND DRAINAGE STRUCTURES.

WALL STATION	413+00	413+25	413+50	413+75	414+00	414+25	414+50	414+75	415+00
I-85 STATION	413+00	413+25	413+50	413+75	414+00	414+25	414+50	414+75	415+00
TOP OF WALL	855.37	855.08	854.75	854.43	854.10	853.78	853.42	853.06	852.71
FINISHED GRADE @ BACK FACE	855.37	855.08	854.75	854.43	854.10	853.78	853.42	853.06	852.71
FINISHED GRADE @ FRONT FACE	853.61	852.25	851.07	851.10	851.00	851.54	851.71	851.50	851.06
BOTTOM OF WALL	851.00	849.50	848.00	848.00	848.00	849.50	849.50	849.50	849.50
WALL HEIGHT	4.37	5.58	6.75	6.43	6.10	4.28	3.92	3.56	3.21

413+00 414+00 415+00

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED WALL 18 LOCATION AND TYPE	D.P.M.	R.R.C.

DRAWN BY : D.P.M. DATE : 04/24/18
REVIEWED BY : R.R.C. DATE : 04/26/18
APPROVED BY : R.R.C. DATE : 04/26/18

FLATIRON / ZACHRY a joint venture

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 10 20 30 40
SCALE: 1" = 10' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 7904 RANDY RAY CANNON

6/6/2018 12:46:32 PM

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

WALL 18
PLAN & PROFILE

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	SL13

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED
1	05/02/18	MOVED SIGN LIGHTING STRUCTURE NO. 21 TO STA. 382+50	R.L.D.	B.G.N.					

DRAWN BY : A.W.F.
DATE : 9/4/15

REVIEWED BY : D.R.R.
DATE : 9/4/15

APPROVED BY : B.G.N.
DATE : 9/4/15

FLATIRON ZACHRY a joint venture

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION
CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER
ROBERT LEE DRUMMOND
NO. 30342

DocuSigned by:
3C747DCDB4A443...
6/6/2018 1:00:31 PM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT South Carolina Department of Transportation

I-85 / I-385 INTERCHANGE

SIGN LIGHTING PLAN SHEET
STA. 373+00.00 TO STA. 388+00.00

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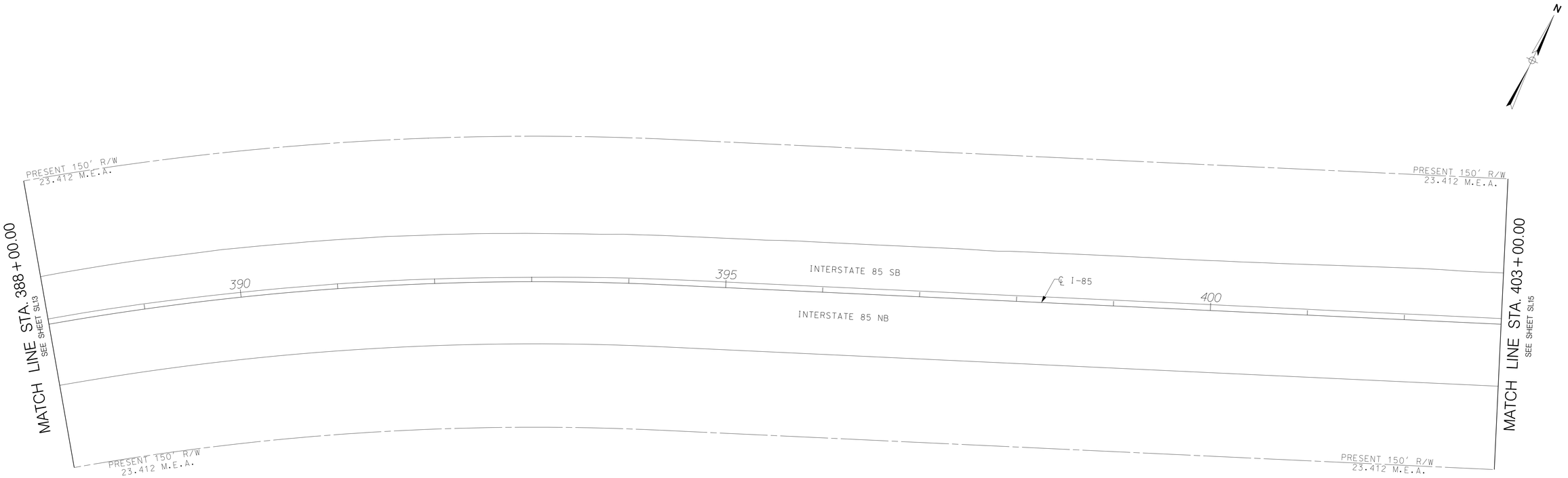
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SL14



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	05/02/18	REVISED SOUTHBOUND EDGE LINE	R.L.D.	B.G.N.					

DRAWN BY : A.W.F. DATE : 9/4/15

REVIEWED BY : D.R.R. DATE : 9/4/15

APPROVED BY : B.G.N. DATE : 9/4/15

FLATIRON ZACHRY a joint venture

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER ROBERT L. DRUMMOND

6/6/2018 1:00:31 PM EDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

SIGN LIGHTING PLAN SHEET
STA. 388+00.00 TO STA. 403+00.00

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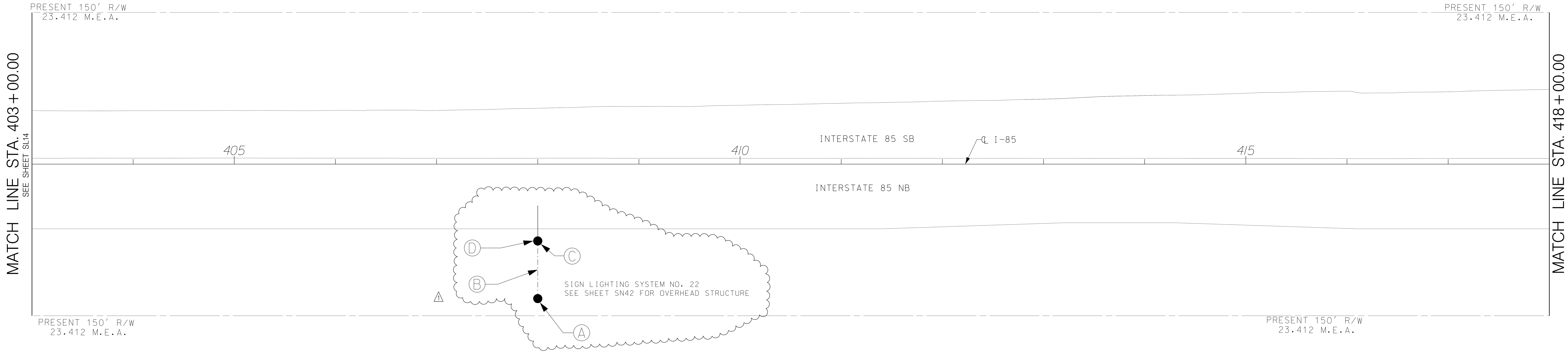
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	SL15



REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED
1	04/07/16	MOVED SIGN LIGHTING STRUCTURE TO STA. 408+00	R.L.D.	B.G.N.					
2	05/02/18	MOVED SIGN LIGHTING STRUCTURE NO. 21 TO STA. 382+50	R.L.D.	B.G.N.					

DRAWN BY : A.W.F.
DATE : 9/4/15

REVIEWED BY : D.R.R.
DATE : 9/4/15

APPROVED BY : B.G.N.
DATE : 9/4/15

FLATIRON ZACHRY a joint venture

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION
CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

6/6/2018 1:00:31 PM EDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

SIGN LIGHTING PLAN SHEET
STA. 403+00.00 TO STA. 418+00.00

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5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SNI

MULTIPLE PANEL SIGNS TO BE MOUNTED ON I-BEAM BREAKAWAY POSTS

ITEMIZED LISTING OF ESTIMATED QUANTITIES

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SIGN NUMBER	STATION NUMBER L=LEFT R=RIGHT	P.E.C. (FEET)	M.H. (FEET)	SOIL TYPE (G, A, P)	REFLECT-ORIZATION	SIGN WIDTH - HEIGHT (FEET)		EXIT PANEL WIDTH (FEET)	EXIT PANEL AREA (SQ FT)	AREA (SQ. FEET)	NO. POSTS	AREA PER POST (SQ FT)	SIGN NUMBER	DISTANCE FROM REFERENCE GRADE (EDGE OF TRAVELWAY) TO GROUND LINE				dH $H/2+MH+L_D$	POST SIZE	POST LENGTH ABOVE SLIP PLATE (H+MH+L-O.25)			STUB LENGTH	TOTAL STUB LENGTH	TOTAL LENGTH OF POST PER SIGN	LBS. OF POST STEEL PER SIGN
														POSTS			DESIGN									
														L_1	L_2	L_3	$L_D = \sum L_S$/ # POSTS			P_1	P_2	P_3		(# POSTS X STUB LGTH)		
																								S	$P_1 + P_2 + P_3 + S$	
Q-1-51C	220+00R	30.0	7.0	G	TYPE III	18.0	6.5	9.0	22.5	117.00	2	69.75	Q-1-51C	4.10	6.00	----	5.05	16.30	W8x21	17.35	19.25	---	5.50	11.00	47.60	1000
Q-2-51C	255+00R	20.0	7.0	G	TYPE III	18.0	6.5			117.00	2	58.50	Q-2-51C	4.00	7.10	----	5.55	15.80	W8x18	17.25	20.35	---	4.75	9.50	47.10	848
Q-3-51C	70+00R RP 1	16.0	7.0	G	TYPE III	21.5	9.0	9.0	22.5	193.50	3	72.00	Q-3-51C	3.20	7.00	10.50	6.90	19.40	W10x22	18.95	22.75	26.25	5.75	17.25	85.20	1874
Q-4-51C	62+50R RP 1	16.0	7.0	G	TYPE III	18.0	6.5	9.0	22.5	117.00	2	69.75	Q-4-51C	3.50	9.00	----	6.25	17.50	W8x21	16.75	22.25	---	5.50	11.00	50.00	1050
Q-5-51C	361+00L	16.0	7.0	G	TYPE III	18.0	6.5	9.5	23.8	117.00	2	70.38	Q-5-51C	2.90	4.80	----	3.85	15.10	W8x21	16.15	18.05	---	5.50	11.00	45.20	949
Q-6-51C	378+00L	16.0	7.0	G	TYPE III	21.5	12.0	9.0	22.5	258.00	3	93.50	Q-6-51C	2.86	6.77	5.26	4.96	18.96	W10x26	21.61	25.52	24.01	6.00	18.00	89.14	2318
Q-7	54+50L RP 8	15.0	7.0	G	TYPE III	12.5	9.5			118.75	2	59.38	Q-7	0.50	1.60	----	1.05	12.80	W8x15	16.75	17.85	---	4.50	9.00	43.60	654
Q-8	54+50R RP 8	15.0	7.0	G	TYPE III	14.0	11.5			161.00	2	80.50	Q-8	0.90	5.10	----	3.00	15.75	W10x22	19.15	23.35	---	5.75	11.50	54.00	1188

NOTE (3) NOTE (4) NOTE (1) NOTE (2)

⚠	05/02/18	RELOCATED Q-6 AND ADJUSTED POST LENGTHS	R.L.D. B.G.N.

NOTE: ANY BLANK SPACES UNDER THE BREAKAWAY POST CALCULATIONS, MEANS NO POST REQUIRED.

NOTES:

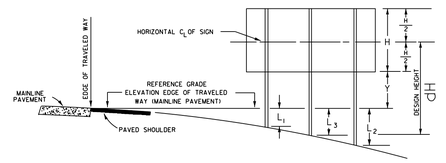
1) INCLUDES AREA OF EXIT PANEL WHERE APPLICABLE
2) INCLUDES HEIGHT OF EXIT PANEL WHERE APPLICABLE
3) SIZE DENOTES ACTUAL DIMENSIONS OF SIGN TO BE ERECTED
4) AREA DENOTES ACTUAL AREA OF SIGN TO BE ERECTED

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — ROBERT L. DIAMOND — No. 30242 — Engineering, LLC

8/6/2018 1:00:31 PM

SEE TYPICAL INSTALLATION GUIDE (I) FOR LOCATION AND ERECTION DETAILS.



$L_D = \frac{\Sigma L's}{\text{NO. POSTS}}$

NOTE:

USE THREE POSTS TO SUPPORT ALL SIGNS HAVING A WIDTH EQUAL TO OR GREATER THAN 18.5 FEET.

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5/3/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SN3

MULTIPLE PANEL SIGNS TO BE MOUNTED ON I-BEAM BREAKAWAY POSTS

ITEMIZED LISTING OF ESTIMATED QUANTITIES

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

						NOTE (3)				NOTE (4)	NOTE (1)						NOTE (2)									
SIGN NUMBER	STATION NUMBER L=LEFT R=RIGHT	P.E.C. (FEET)	M.H. (FEET)	SOIL TYPE (G, A, P)	REFLECT-ORIZATION	SIGN WIDTH - HEIGHT (FEET)		EXIT PANEL WIDTH (FEET)	EXIT PANEL AREA (SQ FT)	AREA (SQ. FEET)	NO. POSTS	AREA PER POST (SQ FT)	SIGN NUMBER	DISTANCE FROM REFERENCE GRADE (EDGE OF TRAVELWAY) TO GROUND LINE				dH H/2+MH+L_D	POST SIZE	POST LENGTH ABOVE SLIP PLATE (H+MH+L-O.25)			STUB LENGTH	TOTAL STUB LENGTH (# POSTS X STUB LGTH)	TOTAL LENGTH OF POST PER SIGN	LBS. OF POST STEEL PER SIGN
														POSTS			DESIGN									
														L_1	L_2	L_3	L_D= åL$_S$/ # POSTS			P_1	P_2	P_3		S	P_1 + P_2 + P_3 +S	
LODGING 51A	206+00R I85	25.0	7.0	G	TYPE III	15.0	10.0			150.00	2	75.00	LODGING 51A	3.10	2.80	----	2.95	14.95	W8x21	19.85	19.55	---	5.50	11.00	50.40	1058
FOOD 51A	212+50R I85	22.0	7.0	G	TYPE III	15.0	10.0			150.00	2	75.00	FOOD 51A	3.50	2.00	----	2.75	14.75	W8x21	20.25	18.75	---	5.50	11.00	50.00	1050
GAS 51A	223+00R I85	30.0	7.0	G	TYPE III	15.0	10.0			150.00	2	75.00	GAS 51A	5.70	8.10	----	6.90	18.90	W10x22	22.45	24.85	---	5.75	11.50	58.80	1294
LOGO 51A	252+00R I85NBCD	20.0	7.0	G	TYPE III	9.5	7.5			71.25	2	35.63	LOGO 51A	2.80	3.80	----	3.30	14.05	W8x10	17.05	18.05	---	4.00	8.00	43.10	431
LODGING 54	396+00R I85	20.0	7.0	G	TYPE III	15.0	10.0			150.00	2	75.00	LODGING 54	3.50	6.80	----	5.15	17.15	W10x22	20.25	23.55	---	5.75	11.50	55.30	1217
FOOD 54	404+00R I85	30.0	7.0	G	TYPE III	15.0	10.0			150.00	2	75.00	FOOD 54	2.10	-2.20	----	-0.05	11.95	W8x18	18.85	14.55	---	4.75	9.50	42.90	772
GAS 54	412+00R I85	20.0	7.0	G	TYPE III	15.0	10.0			150.00	2	75.00	GAS 54	2.00	3.50	----	2.75	14.75	W8x21	18.75	20.25	---	5.50	11.00	50.00	1050
RAMP LOD 54	56+50R PEL R	22.0	7.0	G	TYPE III	8.5	6.5			55.25	2	27.63	RAMP LOD 54	0.70	0.00	----	0.35	10.60	W6x9	13.95	13.25	---	4.00	8.00	35.20	317
RAMP FD 54	58+50R PEL R	22.0	7.0	G	TYPE III	8.5	6.5			55.25	2	27.63	RAMP FD 54	0.80	-0.30	----	0.25	10.50	W6x9	14.05	12.95	---	4.00	8.00	35.00	315
RAMP GAS 54	60+50R PEL R	22.0	7.0	G	TYPE III	8.5	6.5			55.25	2	27.63	RAMP GAS 54	0.80	-0.60	----	0.10	10.35	W6x9	14.05	12.65	---	4.00	8.00	34.70	312
FOOD 35	317+00R I385	16.0	7.0	G	TYPE III	15.0	10.0			150.00	2	75.00	FOOD 35	1.50	2.80	----	2.15	14.15	W8x21	18.25	19.55	---	5.50	11.00	48.80	1025
GAS 35	325+00R I385	22.0	7.0	G	TYPE III	15.0	10.0			150.00	2	75.00	GAS 35	1.80	-2.70	----	-0.45	11.55	W8x18	18.55	14.05	---	4.75	9.50	42.10	758
RAMP FD 35	57+00R R11	22.0	7.0	G	TYPE III	8.5	6.5			55.25	2	27.63	RAMP FD 35	2.00	0.80	----	1.40	11.65	W6x9	15.25	14.05	---	4.00	8.00	37.30	336
RAMP GAS 35	59+00R R11	22.0	7.0	G	TYPE III	8.5	6.5			55.25	2	27.63	RAMP GAS 35	2.00	0.50	----	1.25	11.50	W6x9	15.25	13.75	---	4.00	8.00	37.00	333
G/F/L 34	320+00L I385	25.0	7.0	G	TYPE III	15.0	10.0			150.00	2	75.00	G/F/L 34	2.50	0.60	----	1.55	13.55	W8x18	19.25	17.35	---	4.75	9.50	46.10	830
G/F/L 35	420+00L I385	25.0	7.0	G	TYPE III	15.0	10.0			150.00	2	75.00	G/F/L 35	0.50	1.30	----	0.90	12.90	W8x18	17.25	18.05	---	4.75	9.50	44.80	806
R2-4a-48-60/45	388+10R I85	20.0	5.0	G	TYPE III	4.0	8.0			32.00	2	16.00	R2-4a-48-60/45	2.30	2.70	----	2.50	11.50	S4x7.7	15.05	15.45	---	4.00	8.00	38.50	296
⚠1																										
R2-4a-48-60/45	198+00L I85	20.0	5.0	G	TYPE III	4.0	8.0			32.00	2	16.00	R2-4a-48-60/45	0.40	0.60	----	0.50	9.50	S3x5.7	13.15	13.35	---	4.00	8.00	34.50	197
R2-4a-48-65/45	313+00L I385	20.0	5.0	G	TYPE III	4.0	8.0			32.00	2	16.00	R2-4a-48-65/45	1.80	2.50	----	2.15	11.15	S3x5.7	14.55	15.25	---	4.00	8.00	37.80	215
R2-4a-48-55/45	313+00R I385	20.0	5.0	G	TYPE III	4.0	8.0			32.00	2	16.00	R2-4a-48-55/45	2.30	2.90	----	2.60	11.60	S4x7.7	15.05	15.65	---	4.00	8.00	38.70	298

6520200 TOTAL	

6541005 TOTAL	

⚠1	05/16/16	ADJUSTED PEC AND POSTS FOR R2-4a-48-60/45 AT STA.395+00L I-85	R.L.D.	B.G.N.
⚠2	05/02/18	REMOVED R2-4a-48-60/45 AT STA. 395+00L I85	R.L.D.	B.G.N.

NOTES:

1) INCLUDES AREA OF EXIT PANEL WHERE APPLICABLE
2) INCLUDES HEIGHT OF EXIT PANEL WHERE APPLICABLE
3) SIZE DENOTES ACTUAL DIMENSIONS OF SIGN TO BE ERECTED
4) AREA DENOTES ACTUAL AREA OF SIGN TO BE ERECTED

NOTE: ANY BLANK SPACES UNDER THE BREAKAWAY POST CALCULATIONS, MEANS NO POST REQUIRED.

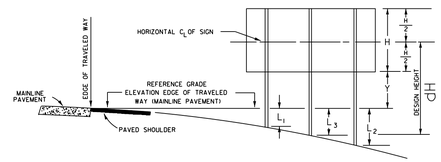
* SIGN TO BE MOUNTED ON WALL, USE PAYITEM NO. 6513000

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA PROFESSIONAL ENGINEER — Digitally signed by Robert L. Diamond Jr. PE LS No. 30342 — ROBERT L. DIAMOND JR.

6/6/2018 1:00:41 PM GB

SEE TYPICAL INSTALLATION GUIDE (I) FOR LOCATION AND ERECTION DETAILS.



$L_D = \frac{\Sigma L's}{NO. POSTS}$

NOTE:

USE THREE POSTS TO SUPPORT ALL SIGNS HAVING A WIDTH EQUAL TO OR GREATER THAN 18.5 FEET.

S:\Proj\20II\47IIA\Design\Project PIN Number\Traffic\Signing\INTERCHANGE\SIGN SHEETS\SN003_BREAKAWAY POST3.dgn
5/3/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SN5

ITEMIZED LISTING OF ESTIMATED QUANTITIES

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

6573100 OVERHEAD STRUCTURES

OVERHEAD STRUCTURE NUMBER	STATION LOCATION	QUANTITY	TYPE	SPAN LENGTH (FT)	SUPPORTS LENGTH (FT) (GROUND TO LOWEST HORIZONTAL MEMBER) LEFT	SUPPORTS LENGTH (FT) (GROUND TO LOWEST HORIZONTAL MEMBER) RIGHT	FOOTING REQUIRED FOR THIS BID ITEM	SIGNS SUPPORTED
OH-18	360+00	1	CANTILEVER	35.00	-	22.21	1	OH-18
OH-19	371+50	1	SIGN BRIDGE	87.82	16.21	20.62	2	OH-19
OH-20	377+00	1	CANTILEVER	34.78	-	21.25	1	OH-20
OH-21	382+50	1	SIGN BRIDGE	75.91	17.20	19.74	2	OH-21
1 OH-22	408+00	1	CANTILEVER	35.00	-	20.17	1	OH-22
1 OH-23	427+35	1	SIGN BRIDGE	87.86	15.41	20.83	2	OH-23A, OH-23B
OH-24	445+00	1	CANTILEVER	34.50	-	17.99	1	OH-24
2 OH-27	306+00	1	SIGN BRIDGE	83.43	15.59	19.31	2	OH-27
OH-28	315+00	1	CANTILEVER	34.00	-	19.78	1	OH-28
2 OH-30	327+50	1	SIGN BRIDGE	89.17	14.83	22.02	2	OH-30
OH-31	328+00	1	BRIDGE MOUNT	-	-	-	-	OH-31
OH-32	336+50	1	CANTILEVER	35.00	-	20.57	1	OH-32
2 OH-33	344+65	1	SIGN BRIDGE	69.42	14.61	11.69	2	OH-33
OH-34	105+75	1	CANTILEVER	45.00	-	19.65	1	OH-34
OH-35	375+00	1	CANTILEVER	36.50	13.74	-	1	OH-35A, OH-35B
OH-36	41+25	1	CANTILEVER	45.00	14.75	-	1	OH-36A, OH-36B
						6573100	TOTAL	16

6573106 REFURBISH OVERHEAD STRUCTURES

OH-25	278+00	1	SIGN BRIDGE	-	-	-		OH-25A, OH-25B
OH-26	302+00	1	SIGN BRIDGE	-	-	-		OH-26A, OH-26B
						6573106	TOTAL	2

6573103 RELOCATION OF OVERHEAD STRUCTURE

OH-29	337+00	1	BUTTERFLY	-	-	-		OH-29
						6573115	TOTAL	1

PANELS TO BE MOUNTED OVERHEAD

SIGN NUMBER MOUNTED ON CORRESPONDING STRUCTURE NO.	SIGN SURFACE TYPE	SIGN SIZE WIDTH X HEIGHT (FEET)	AREA (SQ. FT.)	QUANTITY	TOTAL AREA (SQ. FT.)
OH-18	TYPE XI	14 X 7.5	105.00	1	105.00
OH-19-51B-C-A	TYPE XI	59 X 20	1180.00	1	1180.00
OH-20-54	TYPE XI	14.5 X 8	116.00	1	116.00
OH-21-51B-C-A	TYPE XI	50.5 X 20	1010.00	1	1010.00
1 OH-22-54	TYPE XI	15 X 6.5	97.50	1	97.50
OH-23A	TYPE XI	24.5 X 10.5	257.25	1	257.25
OH-23B-54	TYPE XI	16.5 X 6.5	107.25	1	107.25
OH-24-51B-C-A	TYPE XI	23.5 X 13	305.50	1	305.50
OH-25A-35 & 36A-B	TYPE XI	24 X 14	336.00	1	336.00
OH-25B-34	TYPE XI	12 X 6	72.00	1	72.00
OH-26A-33	EXISTING SIGN TO BE RETAINED				
OH-26B-34	TYPE XI	14.5 X 8.5	123.25	1	123.25
OH-27-35 & 36A-B	TYPE XI	50.5 X 20	1010.00	1	1010.00
OH-28-36A	TYPE XI	18 X 12.5	225.00	1	225.00
OH-29	EXISTING SIGN TO BE RETAINED				
OH-30-35 & 36A-B	TYPE XI	59 X 17	1003.00	1	1003.00
OH-31-34	TYPE XI	14.5 X 10.5	152.25	1	152.25
OH-32	TYPE XI	14 X 7.5	105.00	1	105.00
OH-33-35 & 36A-B	TYPE XI	39 X 18.5	721.50	1	721.50
OH-34-35	TYPE XI	32 X 12.5	400.00	1	400.00
OH-35A-36B	TYPE XI	14 X 10	140.00	1	140.00
OH-35B-36A	TYPE XI	21.5 X 13	279.50	1	279.50
OH-36A-36B	TYPE XI	17 X 8	136.00	1	136.00
OH-36B-36A	TYPE XI	21.5 X 13.5	290.25	1	290.25
			6520250	TOTAL	8067.25

EXIT PANELS FOR OVERHEAD SIGNS

SIGN NUMBER MOUNTED ON CORRESPONDING STRUCTURE NO.	SIGN SURFACE TYPE	SIGN SIZE WIDTH X HEIGHT (FEET)	AREA (SQ. FT.)	QUANTITY	TOTAL AREA (SQ. FT.)
OH-19-51B-C-A	TYPE XI	14.5 X 2.5	36.25	1	36.25
OH-20-54	TYPE XI	7.5 X 2.5	18.75	1	18.75
OH-21-51B-C-A	TYPE XI	14.5 X 2.5	36.25	1	36.25
OH-22-54	TYPE XI	7.5 X 2.5	18.75	1	18.75
OH-23B-54	TYPE XI	7.5 X 2.5	18.75	1	18.75
OH-24-51B-C-A	TYPE XI	14.5 X 2.5	36.25	1	36.25
OH-25A-35 & 36A-B	TYPE XI	17.5 X 2.5	43.75	1	43.75
OH-25B-34	TYPE XI	7.5 X 2.5	18.75	1	18.75
OH-26B-34	TYPE XI	7.5 X 2.5	18.75	1	18.75
OH-27-35 & 36A-B	TYPE XI	17.5 X 2.5	43.75	1	43.75
OH-28-36A	TYPE XI	9.5 X 2.5	23.75	1	23.75
OH-30-35 & 36A-B	TYPE XI	17.5 X 2.5	43.75	1	43.75
OH-31-34	TYPE XI	7.5 X 2.5	18.75	1	18.75
OH-33-35	TYPE XI	7.5 X 2.5	43.75	1	43.75
OH-33-36A-B	TYPE XI	12.5 X 2.5	18.75	1	18.75
OH-34-35	TYPE XI	7.5 X 2.5	18.75	1	18.75
OH-35A-36B	TYPE XI	9.5 X 4.5	42.75	1	42.75
OH-35B-36A	TYPE XI	9.5 X 2.5	23.75	1	23.75
OH-36A-36B	TYPE XI	9.5 X 4.5	42.75	1	42.75
OH-36B-36A	TYPE XI	9.5 X 2.5	23.75	1	23.75
		6520250		TOTAL	590.50

OVERHEAD SPAN WIRE & BRIDGE MOUNTED FLAT SHEET SIGNS

		6510108		TOTAL	0.00

SIGN LIGHTING SYSTEMS

BID ITEM NO.	SYSTEM NO.	SEE PLAN SHEET NO.	QUANTITY
6573200	OH-18	SL12	1
	OH-19	SL12	1
	OH-20	SL13	1
	OH-21	SL15	1
	OH-22	SL15	1
	OH-23	SL16	1
	OH-24	SL17	1
	OH-27	SL18	1
	OH-28	SL19	1
	OH-30	SL20	1
	OH-31	SL20	1
	OH-32	SL20	1
	OH-33	SL21	1
	OH-34	SL23	1
	OH-35	SL23	1
	OH-36	SL23	1
	6573200	TOTAL	16

SIGN LIGHTING NOTES:

1. SEE SPECIAL PROVISIONS FOR SUPPLEMENTAL SPECIFICATIONS FOR SIGN LIGHTING SYSTEMS AND WORK TO BE DONE
2. SEE SHEETS NUMBERED ADJACENT TO SYSTEM NUMBER FOR GENERAL DETAILS OF REQUIREMENTS FOR EACH SYSTEM. 3. NUMBERING OF EACH SIGN LIGHTING SYSTEM CORRESPONDS TO THE NUMBER ON WHICH THE SYSTEM IS TO BE INSTALLED

1	05/16/16	REVISED OH-22 RELOCATED OH-22 AND OH-23	R.L.D.	B.G.N.
2	10/03/17	REVISED OH-27, OH-30, AND OH-33 STRUCTURE, AND RELOCATED OH-33	R.L.D.	B.G.N.
3	05/02/18	RELOCATED OH-21 AND REVISED SUPPORT LENGTHS	R.L.D.	B.G.N.

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

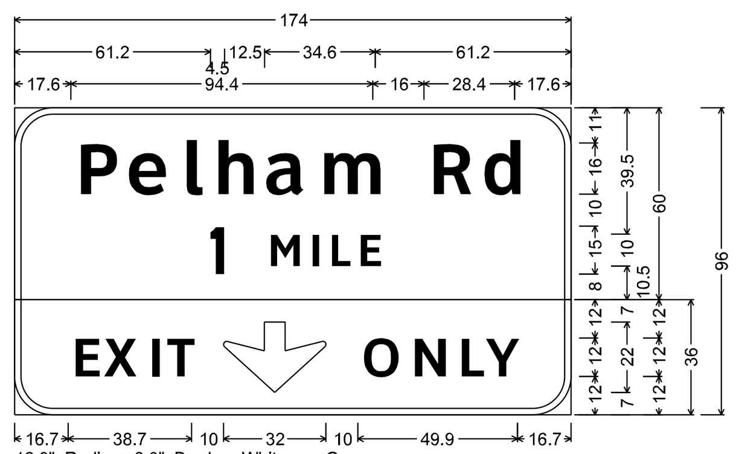
SOUTH CAROLINA PROFESSIONAL ENGINEER — Robert L. Drummond — No. 30242 — REGISTERED — ROBERT L. DRUMMOND

8/6/2018 1:00:31 PM RD

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SN11

SCDOT

Project ID No.: 0038III_R02 County: GREENVILLE

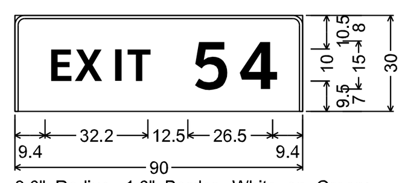


12.0" Radius, 2.0" Border, White on Green;
[Pelham] ClearviewHwy-5-W; [Rd] ClearviewHwy-5-W; [1] E;
[MILE] ClearviewHwy-5-W;
12.0" Radius, 2.0" Border, Black on Yellow;
[EXIT] ClearviewHwy-5-W; Down Arrow 22.0" 270°;
[ONLY] ClearviewHwy-5-W;
Table of distances between letter and object lefts.

	P	e	l	h	a	m	R	d	
17.6	15.9	17.2	9.9	16.2	16.9	34.3	16.7	11.7	17.6

	1	M	I	L	E	
61.2	17.0	13.1	6.0	9.0	6.5	61.2

	E	X	I	T	(arrow)	O	N	L	Y	
16.7	10.3	13.7	5.9	18.8	42.0	15.4	14.7	9.3	10.5	16.7



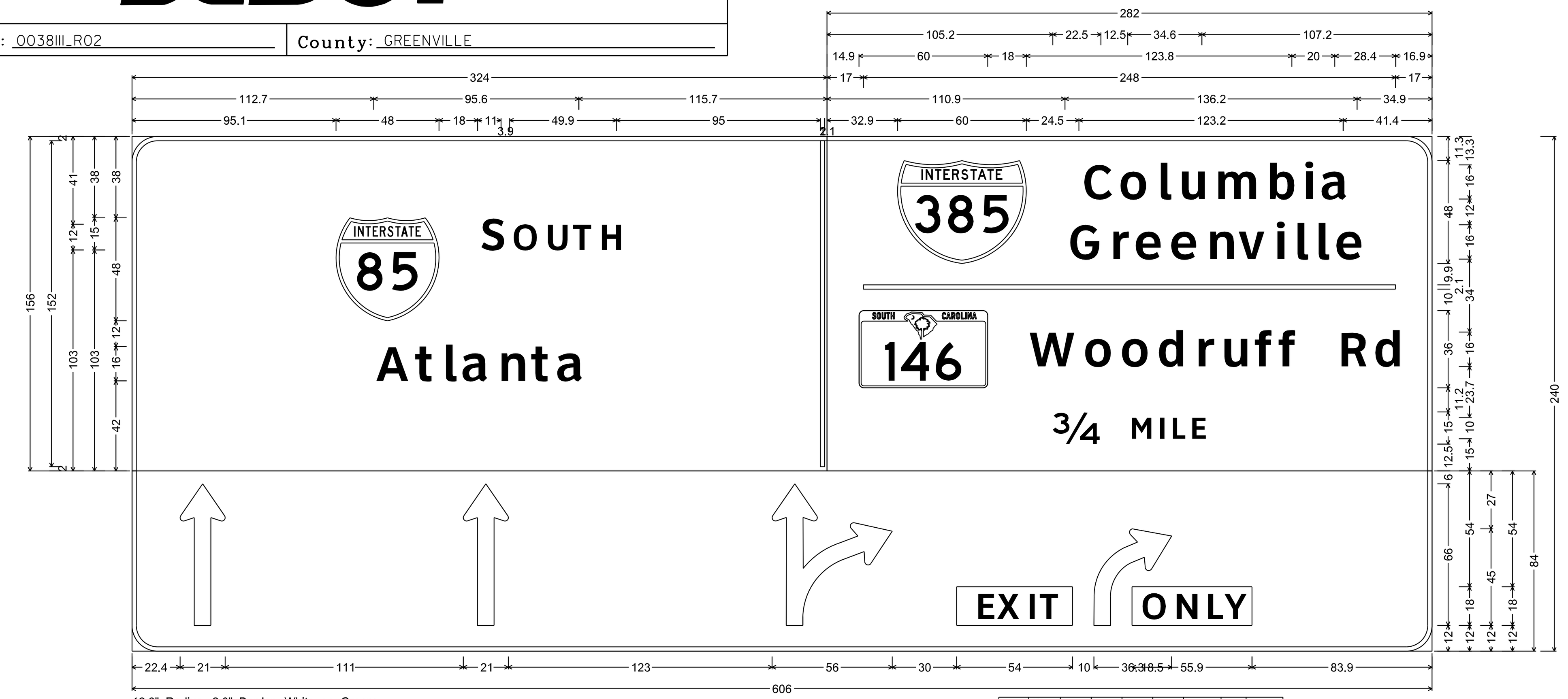
3.0" Radius, 1.0" Border, White on Green;
[EXIT] ClearviewHwy-5-W;
[54] ClearviewHwy-5-W;
Table of distances between letter and object lefts.

	E	X	I	T	5	4	
9.4	8.6	11.4	4.9	19.8	14.6	11.9	9.4

Sign No.: OH-20-54
Number of Signs: 1
Reflec. Type: TYPE XI
Refers to sheet(s): SN80
Panel Size: 14.5' X 8.0'
Exit Panel Size: 7.5' X 2.5'

SCDOT

Project ID No.: 0038III_R02 County: GREENVILLE



12.0" Radius, 2.0" Border, White on Green;
[S OUTH] ClearviewHwy-5-W; [Atlanta] ClearviewHwy-5-W;
12.0" Radius, 2.0" Border, White on Green;
[Columbia] ClearviewHwy-5-W; [Greenville] ClearviewHwy-5-W; [Woodruff] ClearviewHwy-5-W; [Rd] ClearviewHwy-5-W; [3/4] E; [MILE] ClearviewHwy-5-W;
12.0" Radius, 2.0" Border, White on Green;
Standard Arrow Custom 66.0" X 21.0" 90°; Standard Arrow Custom 66.0" X 21.0" 90°; thru-right arrow; Rectangle Yellow;
right arrow; Rectangle Yellow;
Table of distances between letter and object lefts.

	(85)	S	O	U	T	H	(line)	
95.1	66.0	14.9	15.5	12.9	12.3	104.2	2.0	283.1

	A	t	l	a	n	t	a	
112.7	17.8	12.7	8.9	17.0	15.5	11.7	12.0	397.7

	(385)	C	o	l	u	m	b	i	a	
356.9	84.5	17.2	17.8	9.9	17.0	24.1	16.7	8.5	12.0	41.4

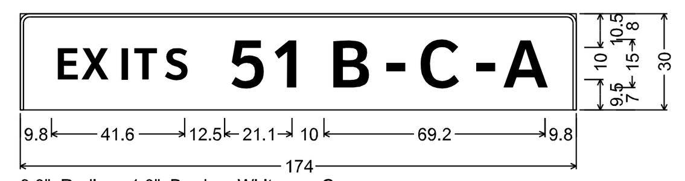
	G	r	e	e	n	v	i	l	l	e	
434.9	19.4	11.4	16.6	17.2	15.2	16.1	9.4	9.9	9.2	11.8	34.9

	—	
341.0	248.0	17.0

	(146)	W	o	o	d	r	u	f	f	R	d	
338.9	78.0	25.3	17.1	17.2	17.6	12.1	15.7	11.0	27.8	16.7	11.7	16.9

	3/4	M	I	L	E	
429.2	35.0	13.1	6.0	9.0	6.5	107.2

	(arrow)	(arrow)	(arrow)	(rectangle)	(arrow)	(rectangle)	
22.4	132.0	144.0	86.0	64.0	17.8	55.9	83.9



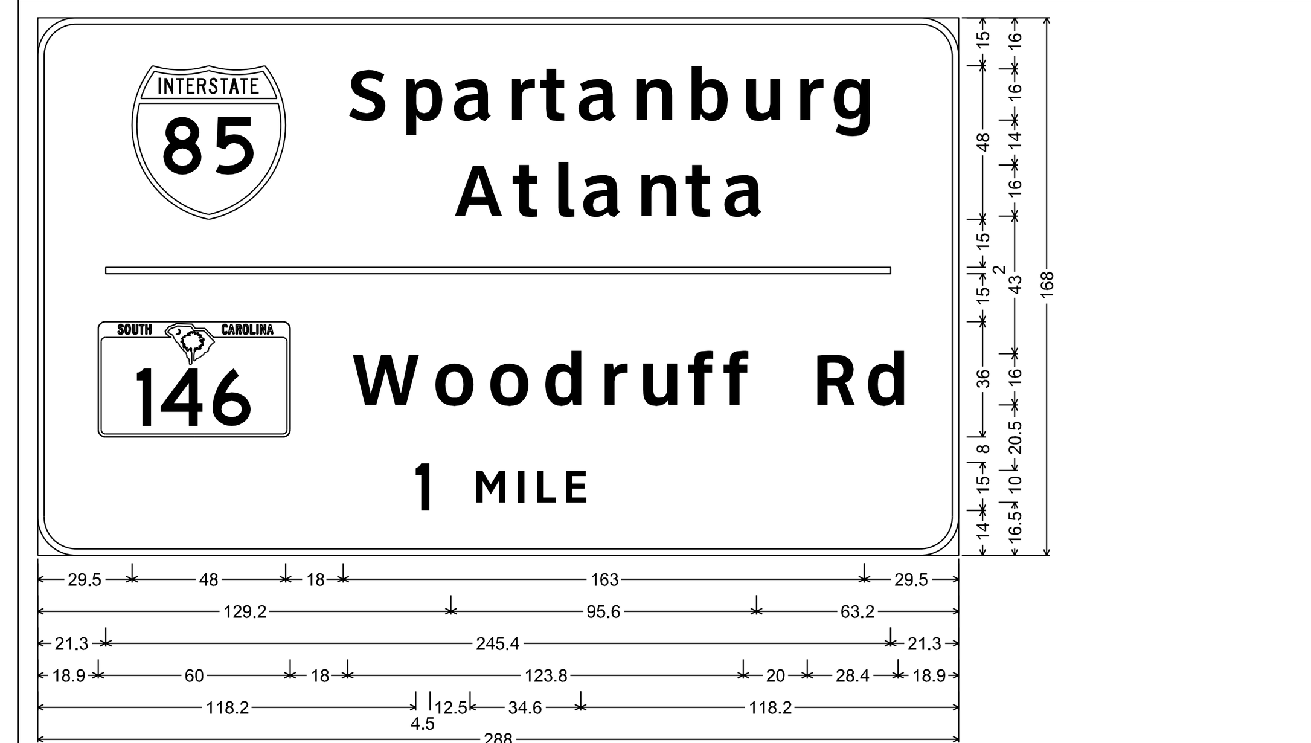
3.0" Radius, 1.0" Border, White on Green;
[EXITS] ClearviewHwy-5-W; [51] ClearviewHwy-5-W;
[B-C-A] ClearviewHwy-5-W;
Table of distances between letter and object lefts.

	E	X	I	T	S	5	1	B	-	C	-	A	
9.8	8.6	11.3	5.0	9.5	19.7	14.3	16.8	16.7	11.2	16.9	10.2	14.2	9.8

Sign No.: OH-21-51B-C-A
Number of Signs: 1
Reflec. Type: TYPE XI
Refers to sheet(s): SN80
Panel Size: 50.5' X 20.0'
Exit Panel Size: 14.5' X 2.5'

SCDOT

Project ID No.: 0038III_R02 County: GREENVILLE



12.0" Radius, 2.0" Border, White on Green;
[Spartanburg] ClearviewHwy-5-W; [Atlanta] ClearviewHwy-5-W; [Woodruff] ClearviewHwy-5-W;
[Rd] ClearviewHwy-5-W; [1] E; [MILE] ClearviewHwy-5-W;
Table of distances between letter and object lefts.

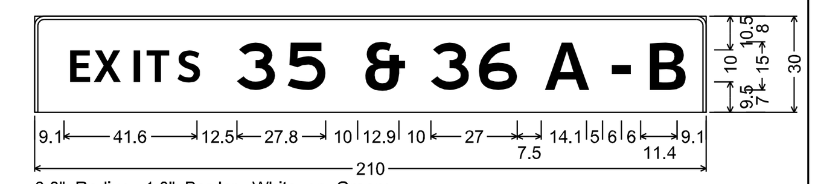
	(85)	S	p	a	r	t	a	n	b	u	r	g	
29.5	66.0	16.6	16.1	16.9	10.4	11.8	17.0	17.1	17.0	17.0	11.3	11.8	29.5

	A	t	l	a	n	t	a	
129.2	17.8	12.7	8.9	17.0	15.5	11.7	12.0	63.2

	—	
21.3	245.4	21.3

	(146)	W	o	o	d	r	u	f	f	R	d	
18.9	78.0	25.3	17.1	17.2	17.6	12.1	15.7	11.0	27.8	16.7	11.7	18.9

	1	M	I	L	E	
118.2	17.0	13.1	6.0	9.0	6.5	118.2



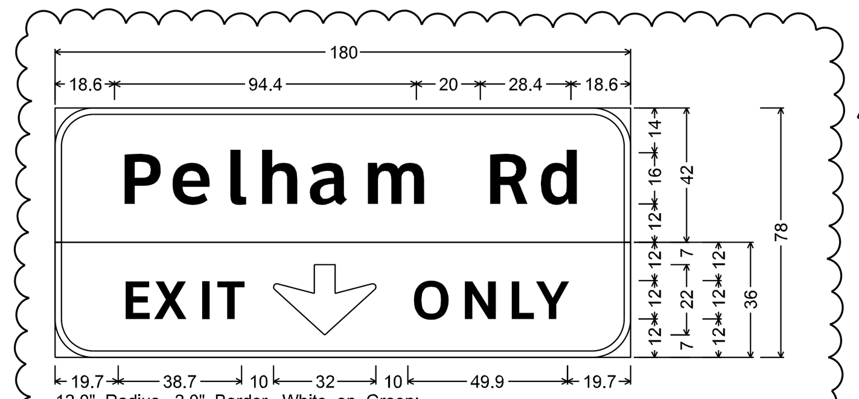
3.0" Radius, 1.0" Border, White on Green;
[EXITS] ClearviewHwy-5-W; [35] E; [&] ClearviewHwy-5-W; [36] E;
[A] ClearviewHwy-5-W; [-] ClearviewHwy-5-W; [B] ClearviewHwy-5-W;
Table of distances between letter and object lefts.

	E	X	I	T	S	3	5	&	3	6	A	-	B	
9.1	8.6	11.3	5.0	9.4	19.8	15.9	21.9	22.9	15.0	19.5	19.1	12.0	11.4	9.1

Sign No.: OH-25A-35 & 36A-B
Number of Signs: 1
Reflec. Type: TYPE XI
Refers to sheet(s): SN85
Panel Size: 24.0' X 14.0'
Exit Panel Size: 17.5' X 2.5'

SCDOT

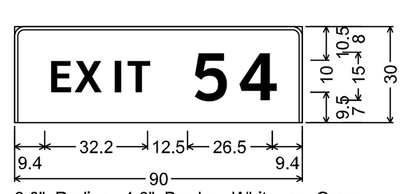
Project ID No.: 0038III_R02 County: GREENVILLE



12.0" Radius, 2.0" Border, White on Green;
[Pelham] ClearviewHwy-5-W; [Rd] ClearviewHwy-5-W;
12.0" Radius, 2.0" Border, Black on Yellow;
[EXIT] ClearviewHwy-5-W; Down Arrow 22.0" 270°;
[ONLY] ClearviewHwy-5-W;
Table of distances between letter and object lefts.

	P	e	l	h	a	m	R	d	
18.6	15.9	17.2	9.9	16.2	16.9	38.3	16.7	11.7	18.6

	E	X	I	T	(arrow)	O	N	L	Y	
19.7	10.3	13.7	5.9	18.8	42.0	15.4	14.7	9.3	10.5	19.7



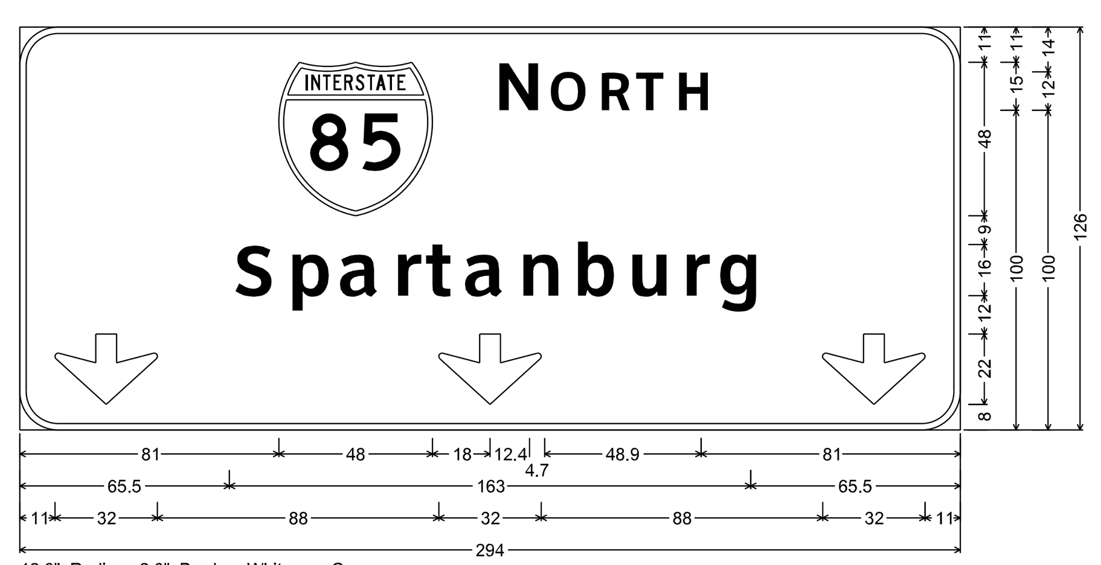
3.0" Radius, 1.0" Border, White on Green;
[EXIT] ClearviewHwy-5-W;
[54] ClearviewHwy-5-W;
Table of distances between letter and object lefts.

	E	X	I	T	5	4	
9.4	8.6	11.4	4.9	19.8	14.6	11.9	9.4

Sign No.: OH-22-54
Number of Signs: 1
Reflec. Type: TYPE XI
Refers to sheet(s): SN82
Panel Size: 15.0' X 6.5'
Exit Panel Size: 7.5' X 2.5'

SCDOT

Project ID No.: 0038III_R02 County: GREENVILLE



12.0" Radius, 2.0" Border, White on Green;
[N ORTH] ClearviewHwy-5-W; [Spartanburg] ClearviewHwy-5-W; Down Arrow 22.0" 270°;
Down Arrow 22.0" 270°; Down Arrow 22.0" 270°;
Table of distances between letter and object lefts.

	(85)	N	O	R	T	H	
81.0	66.0	17.1	15.5	11.9	12.3	9.2	81.0

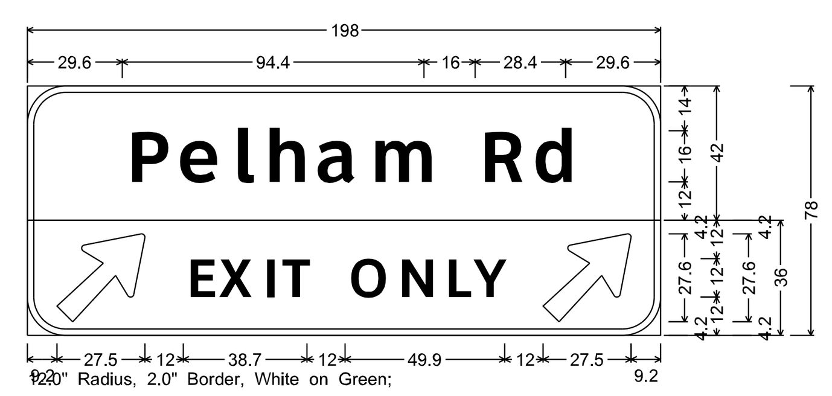
	S	p	a	r	t	a	n	b	u	r	g	
65.5	16.6	16.1	16.9	10.4	11.8	17.0	17.1	17.0	17.0	11.3	11.8	65.5

	(arrow)	(arrow)	(arrow)	
11.0	120.0	120.0	32.0	11.0

Sign No.: OH-23A
Number of Signs: 1
Reflec. Type: TYPE XI
Refers to sheet(s): SN83
Panel Size: 24.5' X 10.5'

SCDOT

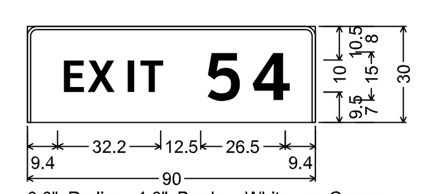
Project ID No.: 0038III_R02 County: GREENVILLE



9.2 12.0" Radius, 2.0" Border, White on Green;
[Pelham] ClearviewHwy-5-W; [Rd] ClearviewHwy-5-W;
12.0" Radius, 2.0" Border, Black on Yellow;
Arrow 160 - 35.0" 45°; [EXIT] ClearviewHwy-5-W;
[ONLY] ClearviewHwy-5-W; Arrow 160 - 35.0" 45°;
Table of distances between letter and object lefts.

	P	e	l	h	a	m	R	d	
29.6	15.9	17.2	9.9	16.2	16.9	34.3	16.7	11.7	29.6

	(arrow)	E	X	I	T	O	N	L	Y	(arrow)	
9.2	39.5	10.3	13.7	5.9	20.8	15.4	14.7	9.3	22.5	27.5	9.2



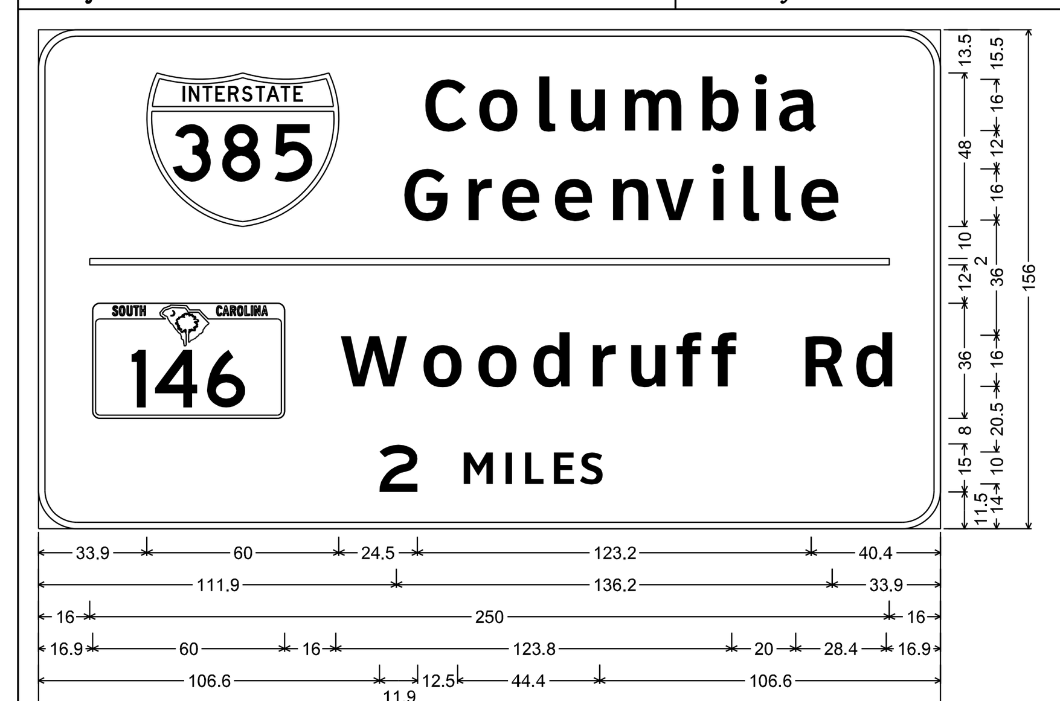
3.0" Radius, 1.0" Border, White on Green;
[EXIT] ClearviewHwy-5-W;
[54] ClearviewHwy-5-W;
Table of distances between letter and object lefts.

	E	X	I	T	5	4	
9.4	8.6	11.4	4.9	19.8	14.6	11.9	9.4

Sign No.: OH-23B-54
Number of Signs: 1
Reflec. Type: TYPE XI
Refers to sheet(s): SN83
Panel Size: 16.5' X 6.5'
Exit Panel Size: 7.5' X 2.5'

SCDOT

Project ID No.: 0038III_R02 County: GREENVILLE



12.0" Radius, 2.0" Border, White on Green;
[Columbia] ClearviewHwy-5-W; [Greenville] ClearviewHwy-5-W; [Woodruff] ClearviewHwy-5-W;
[Rd] ClearviewHwy-5-W; [2] E; [MILES] ClearviewHwy-5-W;
Table of distances between letter and object lefts.

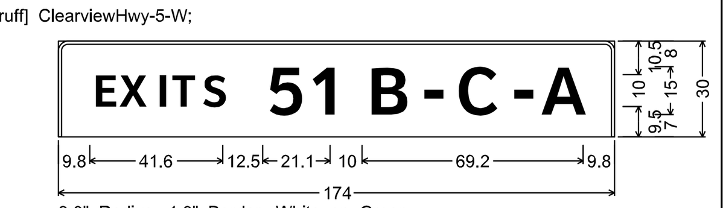
	(385)	C	o	l	u	m	b	i	a	
33.9	84.5	17.2	17.8	9.9	17.0	24.1	16.7	8.5	12.0	40.4

	G	r	e	e	n	v	i	l	l	e	
111.9	19.4	11.4	16.6	17.2	15.2	16.1	9.4	9.9	9.2	11.8	33.9

	—	
16.0	250.0	16.0

	(146)	W	o	o	d	r	u	f	f	R	d	
16.9	76.0	25.3	17.1	17.2	17.6	12.1	15.7	11.0	27.8	16.7	11.7	16.9

	2	M	I	L	E	S	
106.6	24.4	13.1	6.0	9.1	8.9	7.3	106.6

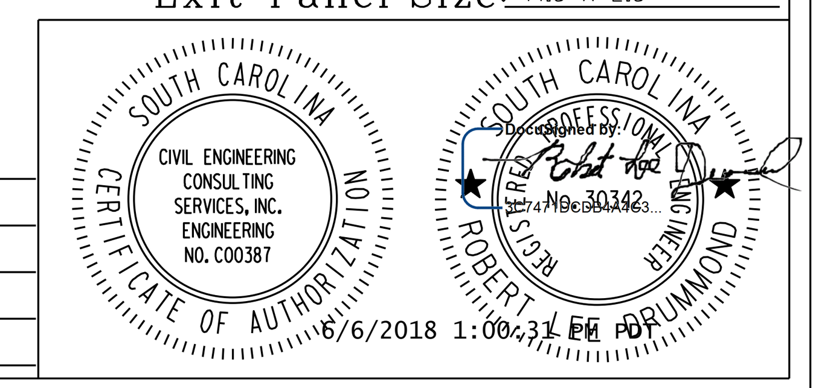


3.0" Radius, 1.0" Border, White on Green;
[EXITS] ClearviewHwy-5-W; [51] ClearviewHwy-5-W;
[B-C-A] ClearviewHwy-5-W;
Table of distances between letter and object lefts.

	E	X	I	T	S	5	1	B	-	C	-	A	
9.8	8.6	11.3	5.0	9.5	19.7	14.3	16.8	16.7	11.2	16.9	10.2	14.2	9.8

Exit Panel Size: 14.5' X 2.5'

Sign No.: OH-24-51B-C-A
Number of Signs: 1
Reflec. Type: TYPE XI
Refers to sheet(s): SN84
Panel Size: 23.5' X 13.0'

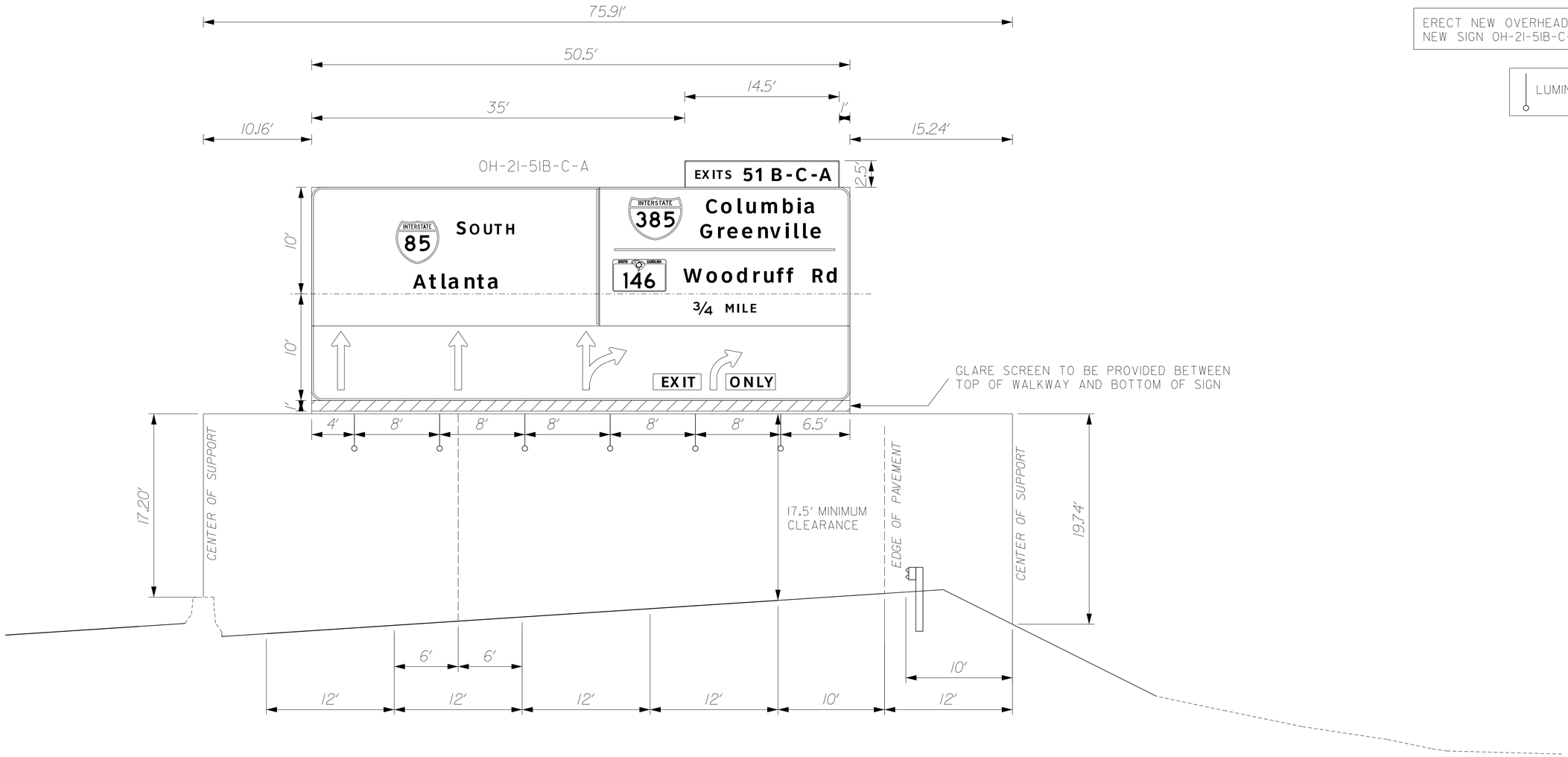


1	05/16/16	ADJUSTED OVERHEAD SIGN #22	R.L.D.	B.G.N.
2	05/02/18	REVISED OVERHEAD OH-21-51B-C-A	R.L.D.	B.G.N.

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SN41

ERECT NEW OVERHEAD STRUCTURE AND NEW SIGN OH-2I-5IB-C-A

LUMINAIRE



*BASED ON 17.5' ROADWAY CLEARANCE
NOTE: DESIGN WIND SPEED = 90 MPH

*FOR DESIGN OF FOOTING USE
2,000 PSI MAX TOE PRESSURE

OVERHEAD STRUCTURE NO. 2I
INTERSTATE 85 SOUTHBOUND
STA. 382+50.00
SHEET SN80

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED
1	05/02/18	MOVED OH-2I FROM STA. 404+00 TO STA. 382+50	R.L.D.	B.G.N.

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F. DATE : 9/4/15
REVIEWED BY : D.R.R. DATE : 9/4/15
APPROVED BY : B.G.N. DATE : 9/4/15

FLATIRON ZACHRY
CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

SCALE = NTS

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER ROBERT L. DRUMMOND No. 30342 REGISTERED

6/6/2018 1:00:31 PM

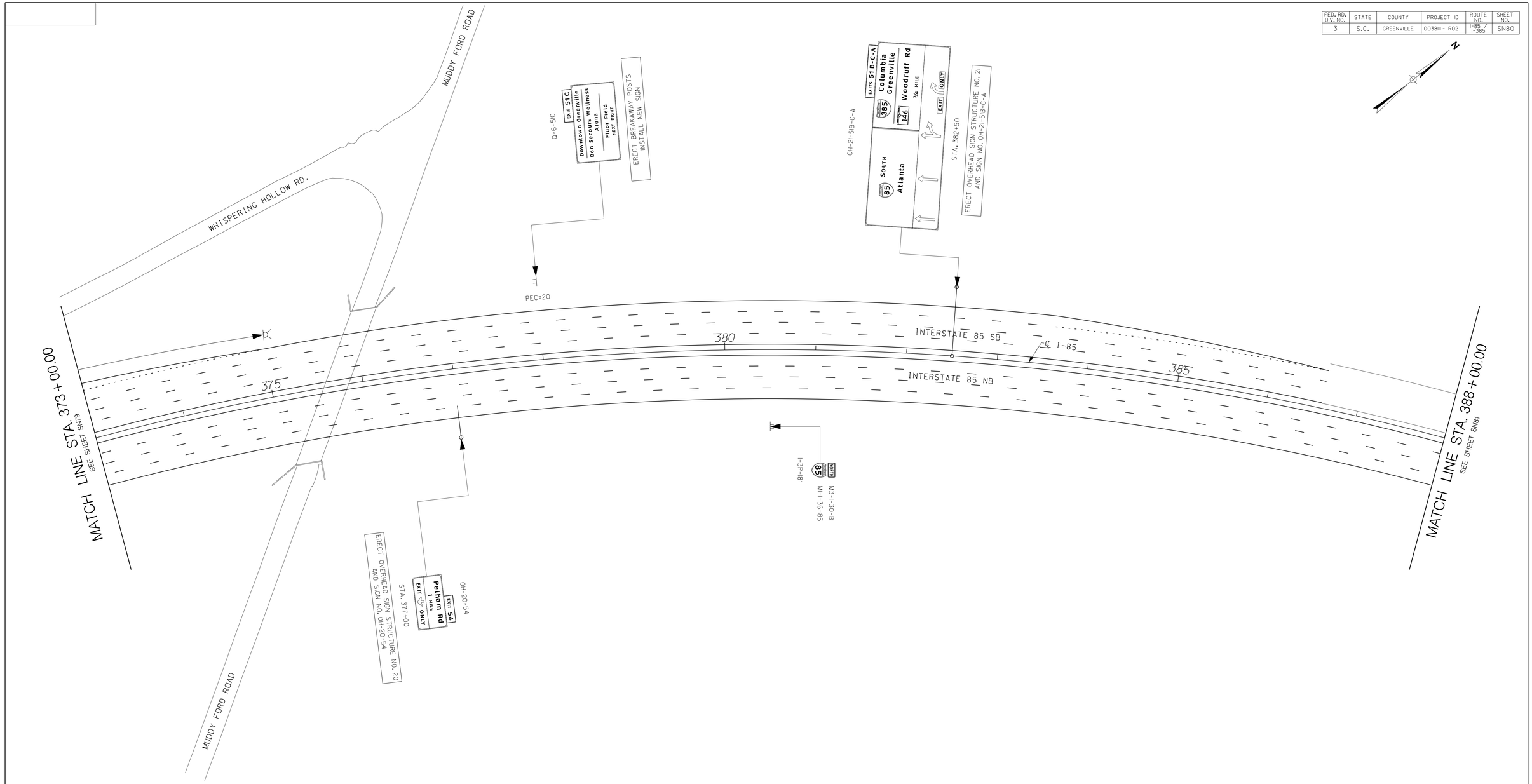
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

SIGNING PLANS

S:\Proj\20IK\47IIA\Design\Project PIN Number\Traffic\Signing\INTERCHANGE\SIGN SHEETS\SN04I_XS_OH-2I.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SN80



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	05/04/17	REVISED Q-6	R.L.D.	B.G.N.
2	05/02/18	RELOCATED AND REVISED OH-21, RELOCATED Q-6	R.L.D.	B.G.N.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F. 9/4/15
DATE :

REVIEWED BY : D.R.R. 9/4/15
DATE :

APPROVED BY : B.G.N. 9/4/15
DATE :

FLATIRON ZACHRY

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER 30342 ROBERT L. DRUMMOND

5/6/2018 1:00:31 PM EDT

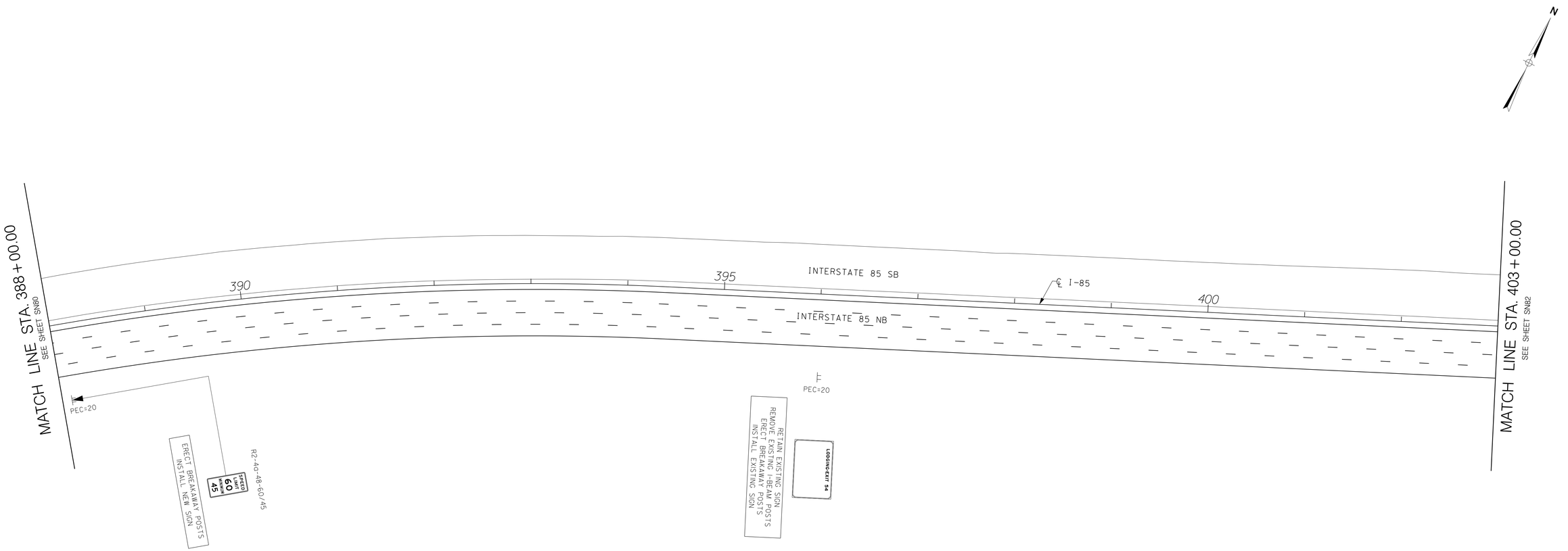
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

SIGNING PLAN SHEET
STA. 373+00.00 TO STA. 388+00.00

S:\Proj\20\47IA\Design\Project PIN Number\Traffic\Signing\INTERCHANGE\SIGN SHEETS\SN080.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SN81



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	05/16/16	CHANGED PEC AT STA. 395+00L	R.L.D.	B.G.N.
2	05/02/18	REMOVED R2-4a-48-60/45 AT STA. 395+00	R.L.D.	B.G.N.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F.
DATE : 9/4/15

REVIEWED BY : D.R.R.
DATE : 9/4/15

APPROVED BY : B.G.N.
DATE : 9/4/15

FLATIRON ZACHRY
CE CS
CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION
SOUTH CAROLINA PROFESSIONAL ENGINEER ROBERT L.E. DRUMOND No. 30342
6/6/2018 1:00:23 PM

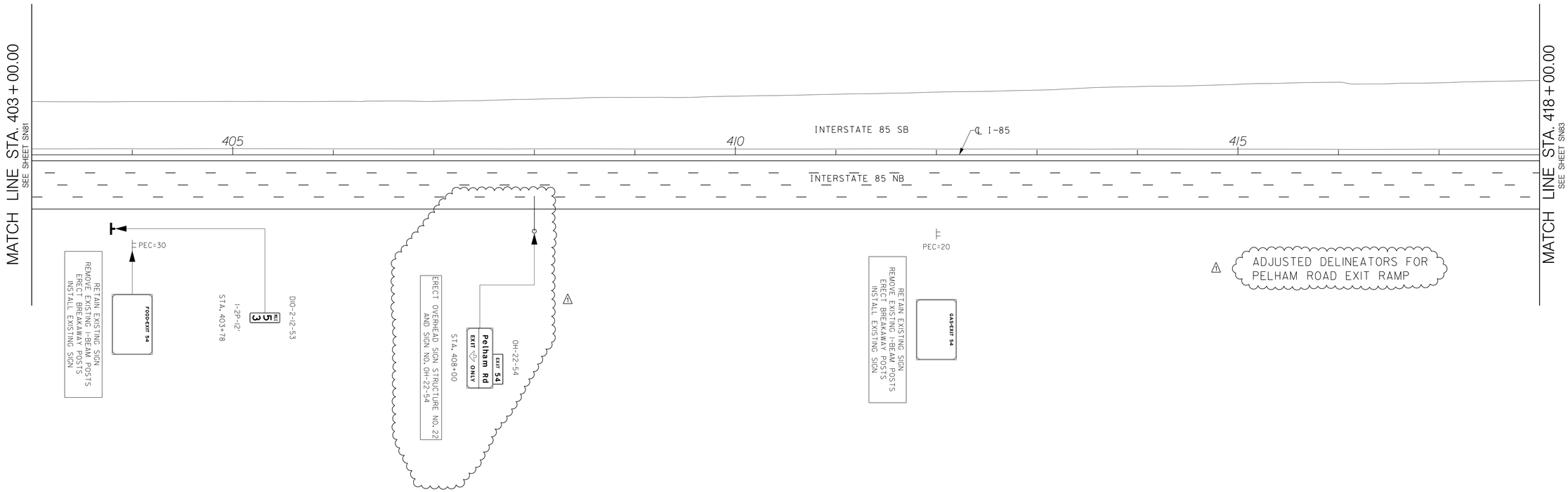
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
SCDOT

I-85 / I-385 INTERCHANGE

SIGNING PLAN SHEET
STA. 388+00.00 TO STA. 403+00.00

S:\Proj\2011471\a\Design\Project PIN Number\Traffic\Signing\INTERCHANGE\SIGN SHEETS\SN081.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SN82



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	05/16/16	RELOCATED OH-22 REMOVED DELINEATORS	R.L.D.	B.G.N.
2	05/02/18	RELOCATED OH-21, REMOVED SB SIGNS AND SB DELINEATORS	R.L.D.	B.G.N.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F. 9/4/15
DATE :

REVIEWED BY : D.R.R. 9/4/15
DATE :

APPROVED BY : B.G.N. 9/4/15
DATE :

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200
SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION
6/6/2018 1:00:34 PM EDT

SOUTH CAROLINA PROFESSIONAL ENGINEER No. 30242 BRUNDIGE

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

SIGNING PLAN SHEET
STA. 403+00.00 TO STA. 418+00.00

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5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC3

I-85
SERIES 4 SHEETS

STEP 1: **SHEETS TC4.1 – 4.1A**

- PREPARE EX 85NB/SB OUTSIDE SHOULDERS FOR STEP 2 I-85 MEDIAN BENT WORK (85NB STA. 279+00 TO 293+40 & 85SB STA. 280+00 TO 303+50).

STEP 2: **SHEETS TC4.2 – 4.2P**

I-85 WIDENING SOUTH OF INTERCHANGE (TC4.2 – 4.2D)

- SHIFT 85NB/SB TRAFFIC TO THE INSIDE, AND COMPLETE OUTSIDE WIDENING (85NB STA. 203+00 TO 249+13 & 85SB STA. 211+80 TO 268+00).
  - ***CONCURRENT CONSTRUCTION:***
    - **R5 STEP 1** (TC14.1)
    - **R5 STEP 2** (TC14.2)

I-85 MEDIAN BENTS (TC4.2E – 4.2G)

- SHIFT 85NB/SB TRAFFIC TO OUTSIDE SHOULDERS.
  WITH 85 TRAFFIC ON OUTSIDE SHOULDERS, COMPLETE MEDIAN BRIDGE BENTS (BR5 BENT 7, BR7 BENT 2, BR8 BENT 2, BR9 BENT 3, BR12 BENT 4).

I-85 WIDENING NORTH OF INTERCHANGE (TC4.2G – 4.2Q)

- SHIFT 85NB/SB TRAFFIC TO THE INSIDE, AND COMPLETE OUTSIDE WIDENING OF 85 TOWARDS PELHAM RD (85NB STA. 304+00 TO 428+25 & 85SB STA. 302+50 TO 386+60).
  - ***CONCURRENT CONSTRUCTION:***
    - **R1**
    - **R1A**
    - **R2A**
    - **CHROME DR.**

- CONSTRUCT WALLS ALONG 85 NEAR ROCKY CREEK.

- SHIFT PELHAM EXIT RAMP TRAFFIC TO THE INSIDE AND COMPLETE TEMP. PELHAM AND OUTSIDE WIDENING (PELHAM STA. 54+79 TO 61+25).

STEP 2A: **SHEETS TC4.2AA – 4.2AC**

- COMPLETE 85NB OUTSIDE WIDENING (85NB STA. 415+50 TO 428+20). SHIFT PELHAM EXIT RAMP TRAFFIC TO THE OUTSIDE (TEMP. PELHAM) AND COMPLETE 85NB/PELHAM GORE AREA, TEMP PVMT, AND PELHAM LEFT SIDE.

STEP 2B: **SHEETS TC4.2BA – 4.2BC**

- SHIFT PELHAM EXIT RAMP TRAFFIC TO THE INSIDE/TEMP PVMT AND COMPLETE PELHAM RIGHT SIDE (PELHAM STA. 50+00 TO 54+79).

**UPON SWITCHING TRAFFIC TO THE LEFT SIDE OF PELHAM RAMP, WORK IN A CONTINUOUS AND EXPEDITIOUS MANNER TO BREAK UP AND REMOVE EXISTING RAMP PAVEMENT ON THE RIGHT SIDE SUCH THAT WATER ENTRAPMENT DOES NOT OCCUR.*

STEP 2C: **SHEETS TC4.2CA – 4.2CH**

- SHIFT 85NB/SB TRAFFIC TO THE OUTSIDE, AND COMPLETE MEDIAN FOUNDATIONS FOR OVERHEAD SIGN STRUCTURES AND MEDIAN DRAINAGE WORK (85 STA. 350+60 TO 428+50).

- REMOVE TEMP PVMT ALONG LEFT SIDE PELHAM (PELHAM STA. 53+88 TO 57+00).

STEP 3: **SHEETS TC4.3 – 4.3B**

- UPON COMPLETION OF MEDIAN BENT WORK, REMOVE TEMP BARRIER, REVISE PVMT MARKINGS, AND SHIFT 85NB/SB OFF OF OUTSIDE SHOULDERS.

- REVISE 85NBCD MARKINGS AT ENTRANCE RAMP TO 85NB AND COMPLETE 85/85NBCD OUTSIDE WIDENING (STA. 295+00 TO 301+50).
  - ***PREREQUISITE CONSTRUCTION:***
    - **85NBCD STEP 3** (TC5.3)
    - **R2A/R4 STEP 3** (TC9.3)

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	10-17-16	PHASING UPDATED TO ADD STEP 2A - 2C	CEO	BLW
2	5-4-18	85 STEP 2 NORTH OF INTERCHANGE 85SB END WIDENING STA. REVISED TO 386+60	CEO	BLW

FLATIRON ZACHRY a joint venture

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606

Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com
License No. F-0672

SOUTH CAROLINA STANTEC CONSULTING SERVICES, INC. No. C02310 CERTIFICATE OF AUTHORIZATION

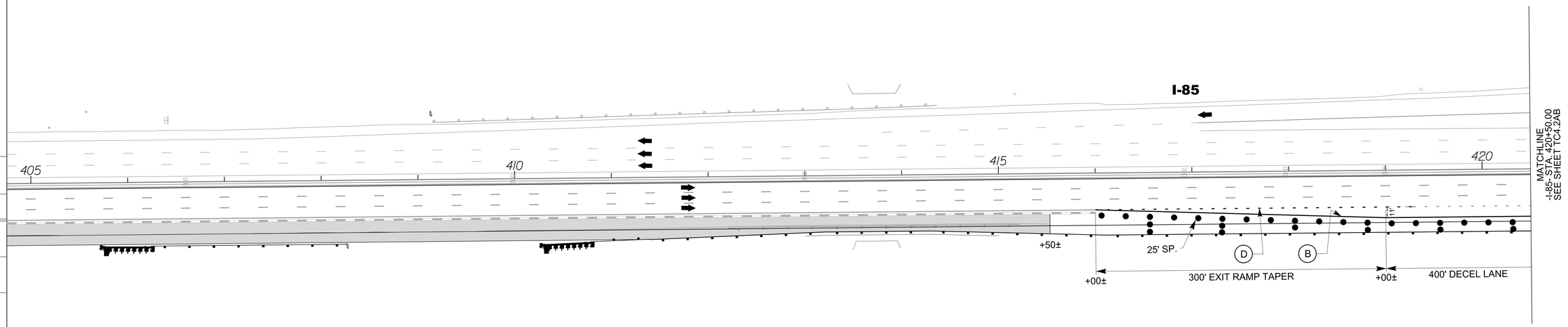
SOUTH CAROLINA PROFESSIONAL ENGINEER Documents Prepared by: Betsy L. Watson No. 27345 BETSY L. WATSON 6/15/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

I-85 / I-385 INTERCHANGE

STAGING NARRATIVE

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2AA



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY; NO WORK ON 85SB	CEO	BLW

FLATIRON ZACHRY a joint venture

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Stantec Consulting Services Inc.
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www.stantec.com
License No. F-0672

SOUTH CAROLINA STANTEC CONSULTING SERVICES, INC. No. C02310 CERTIFICATE OF AUTHORIZATION

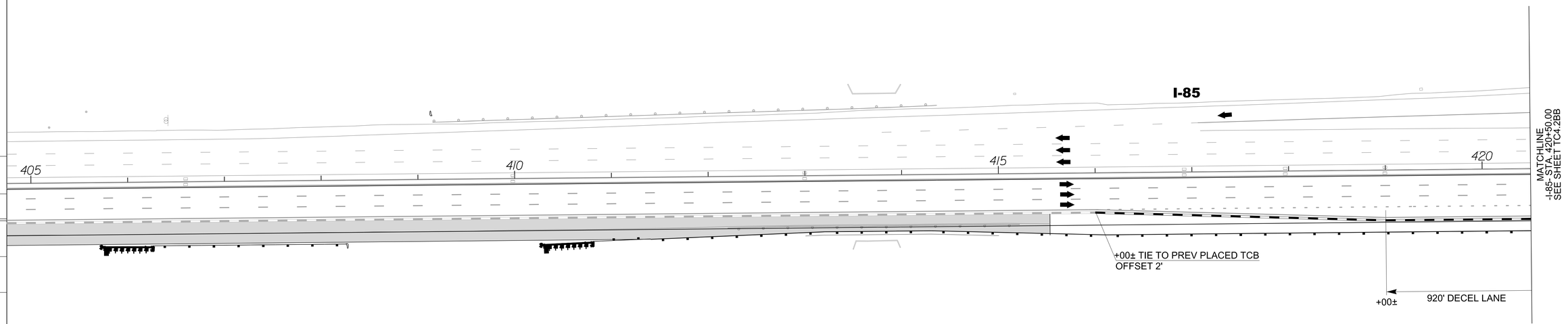
SOUTH CAROLINA PROFESSIONAL ENGINEER
Document signed by: Betsy L. Watson
No. 27345
BETSY L. WATSON 6/15/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
SCDOT South Carolina Department of Transportation

I-85 / I-385 INTERCHANGE

I-85
STEP 2A

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
N	3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2BA



REVISIONS

NO.	DATE	DESCRIPTION
1	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY; NO WORK ON 85SB

BY	CHECKED
CEO	BLW

FLATIRON ZACHRY a joint venture

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SOUTH CAROLINA STANTEC CONSULTING SERVICES, INC. No. C02310 CERTIFICATE OF AUTHORIZATION

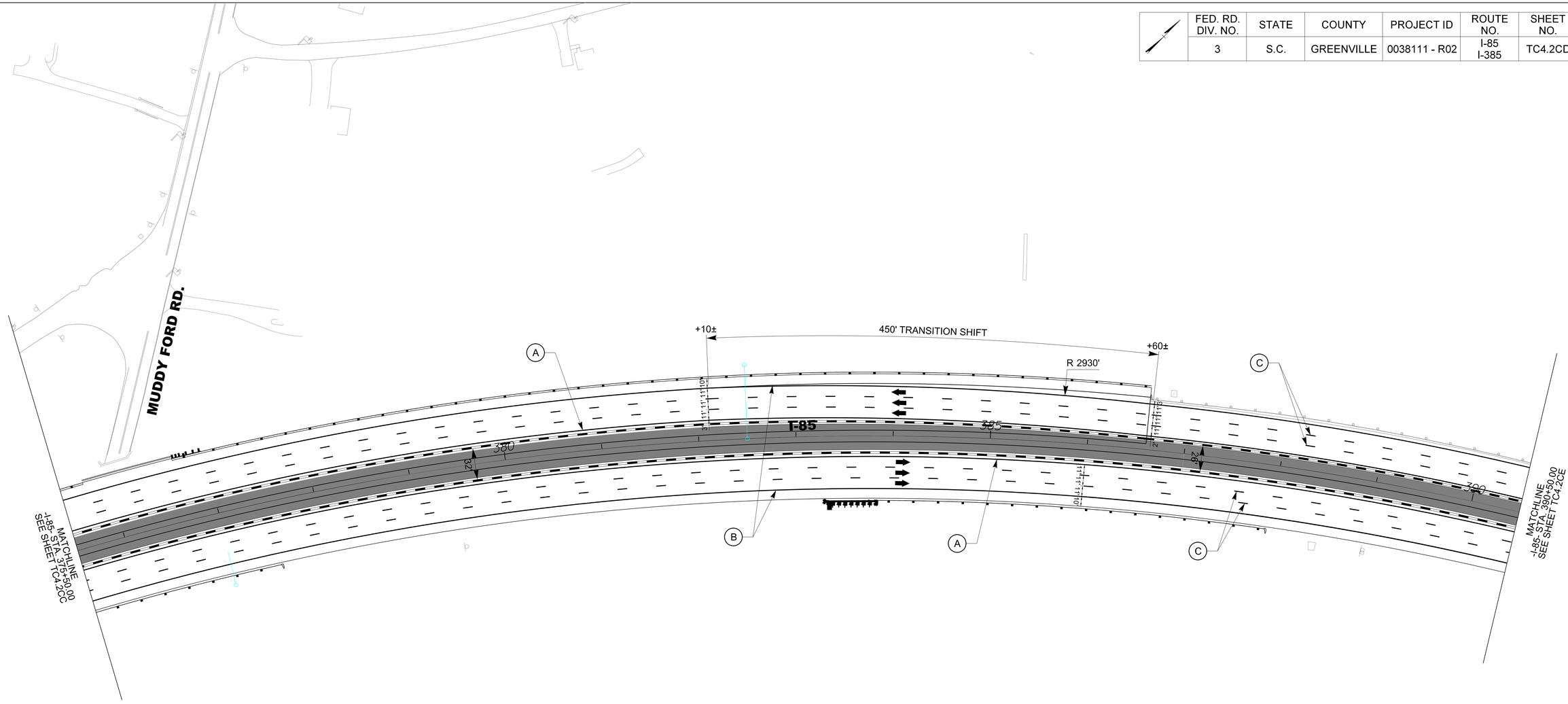
SOUTH CAROLINA PROFESSIONAL ENGINEER Betsy L. Watson No. 27345 BETSY L. WATSON 6/15/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

I-85
STEP 2B

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
	3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2CD



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
			CEO	BLW
1	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS		

FLATIRON ZACHRY a joint venture

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SOUTH CAROLINA PROFESSIONAL ENGINEER
Documents prepared by
Betsy L. Watson
No. 27345
BETSY L. WATSON
6/15/2018

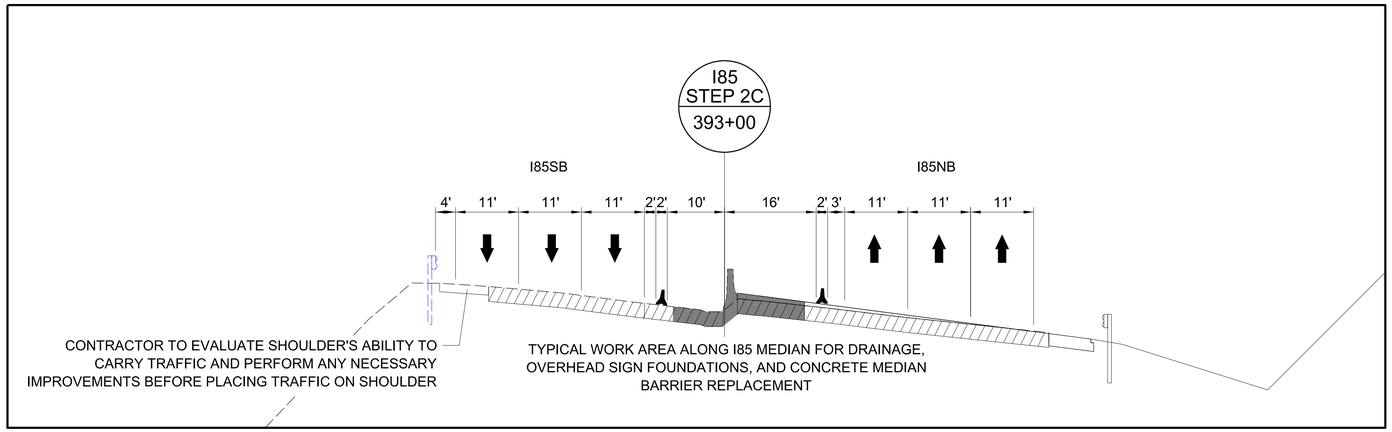
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

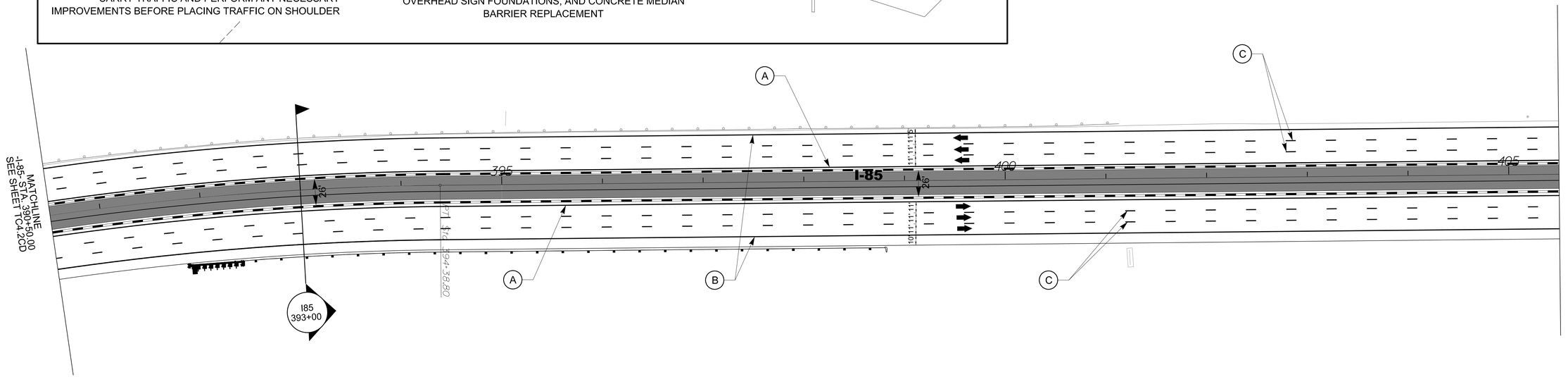
SCDOT

I-85 / I-385 INTERCHANGE

I-85
STEP 2C

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
	3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2CE





REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

FLATIRON ZACHRY a joint venture

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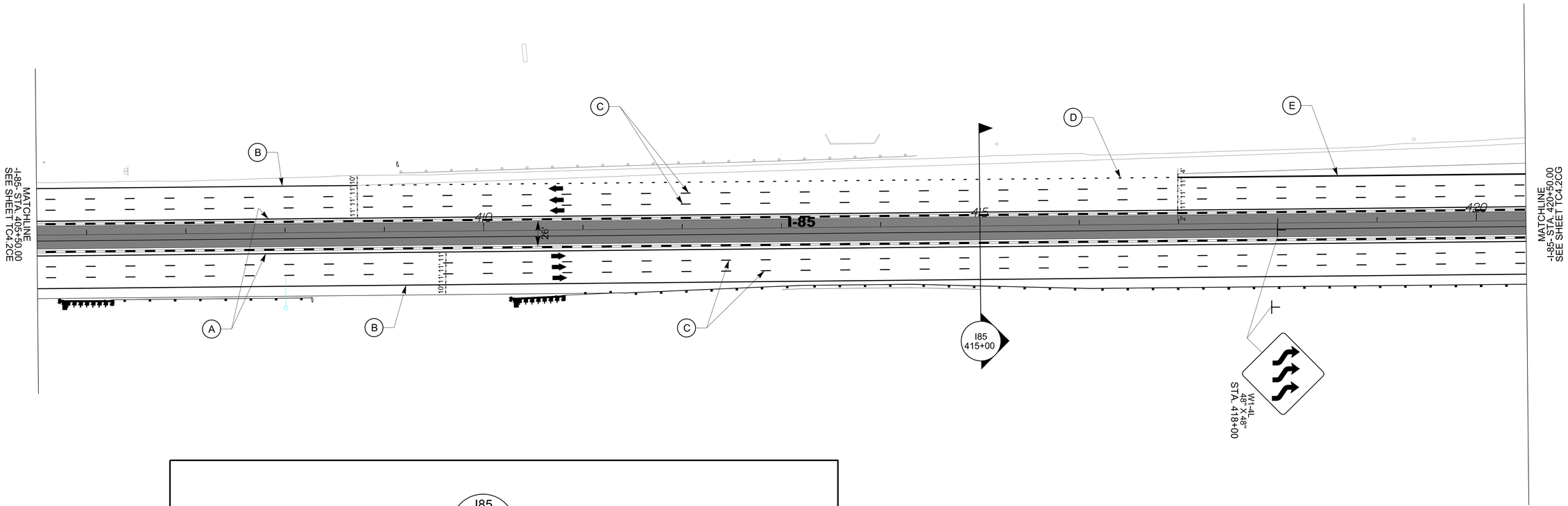
SOUTH CAROLINA PROFESSIONAL ENGINEER Betsy L. Watson No. 27345 BETSY L. WATSON 6/15/2018

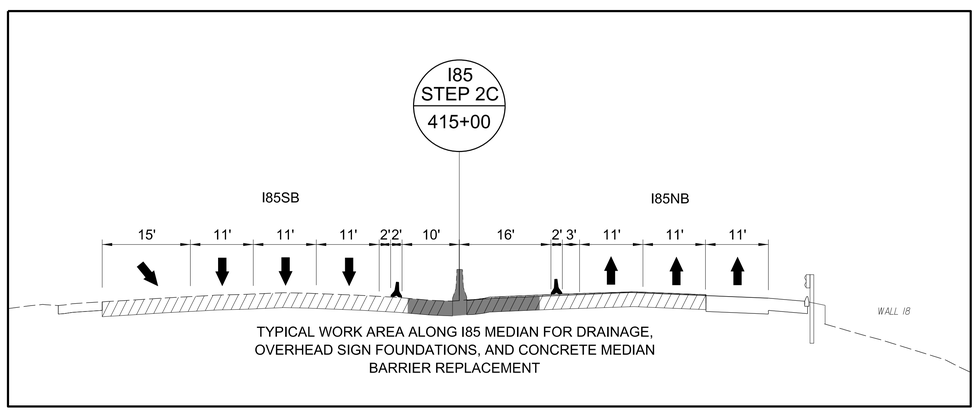
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

I-85
STEP 2C

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
	3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2CF





TYPICAL WORK AREA ALONG I85 MEDIAN FOR DRAINAGE, OVERHEAD SIGN FOUNDATIONS, AND CONCRETE MEDIAN BARRIER REPLACEMENT

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

FLATIRON ZACHRY a joint venture

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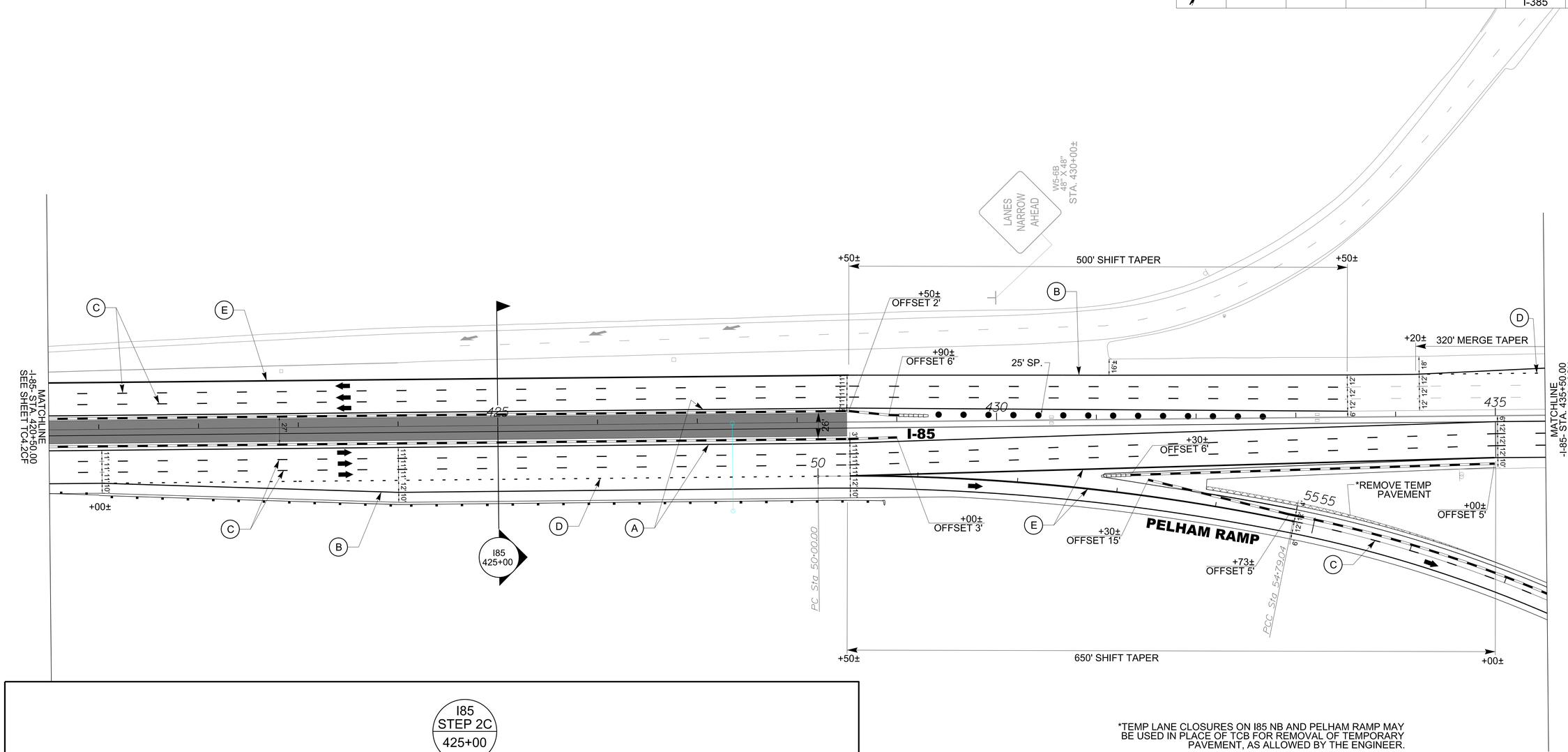
SOUTH CAROLINA PROFESSIONAL ENGINEER
Documents by: Betsy L. Watson
No. 27345
BETSY L. WATSON 6/15/2018

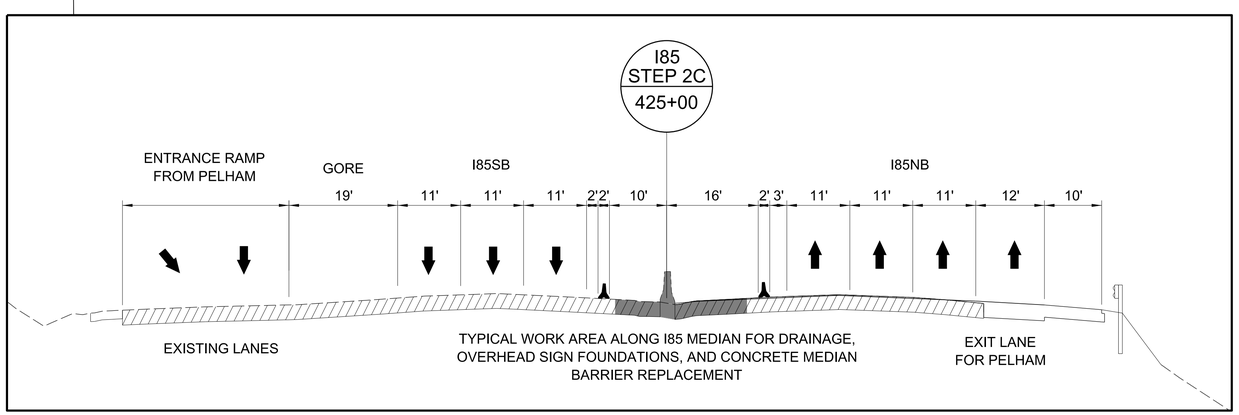
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

I-85
STEP 2C

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
N	3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2CG





*TEMP LANE CLOSURES ON I85 NB AND PELHAM RAMP MAY BE USED IN PLACE OF TCB FOR REMOVAL OF TEMPORARY PAVEMENT, AS ALLOWED BY THE ENGINEER.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	6-13-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

FLATIRON ZACHRY a joint venture

Stantec

Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606

Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com
License No. F-0672

SOUTH CAROLINA STANTEC CONSULTING SERVICES, INC. No. C02310 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER
Document signed by: Betsy L. Watson
No. 27345
BETSY L. WATSON
6/15/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT South Carolina Department of Transportation

I-85 / I-385 INTERCHANGE

I-85
STEP 2C

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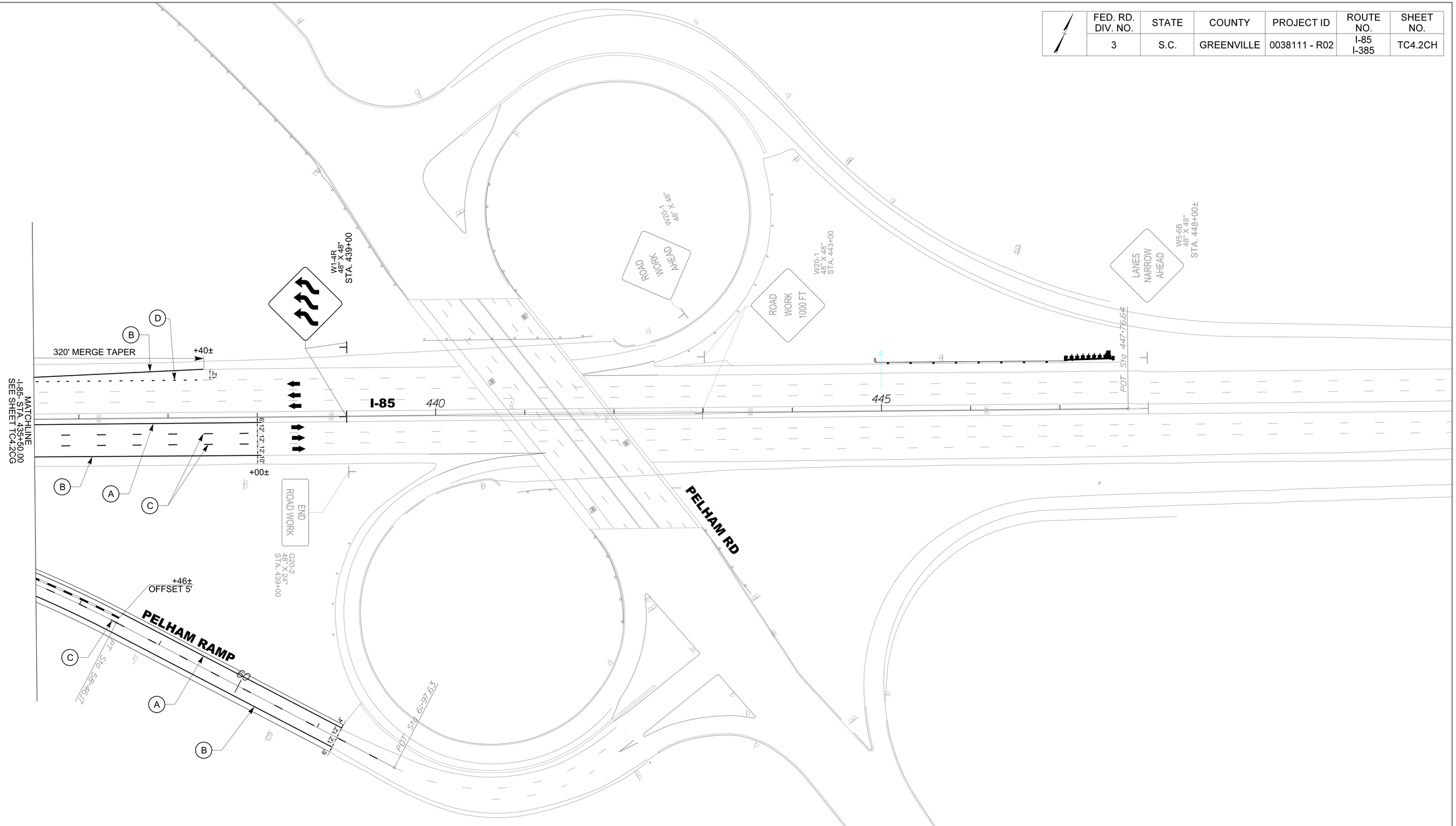
FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2CH



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	6-13-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

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SOUTH CAROLINA STANTEC CONSULTING SERVICES, INC. No. C02310 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER Betsy L. Watson No. 27345 BETSY L. WATSON 6/15/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

I-85
STEP 2C

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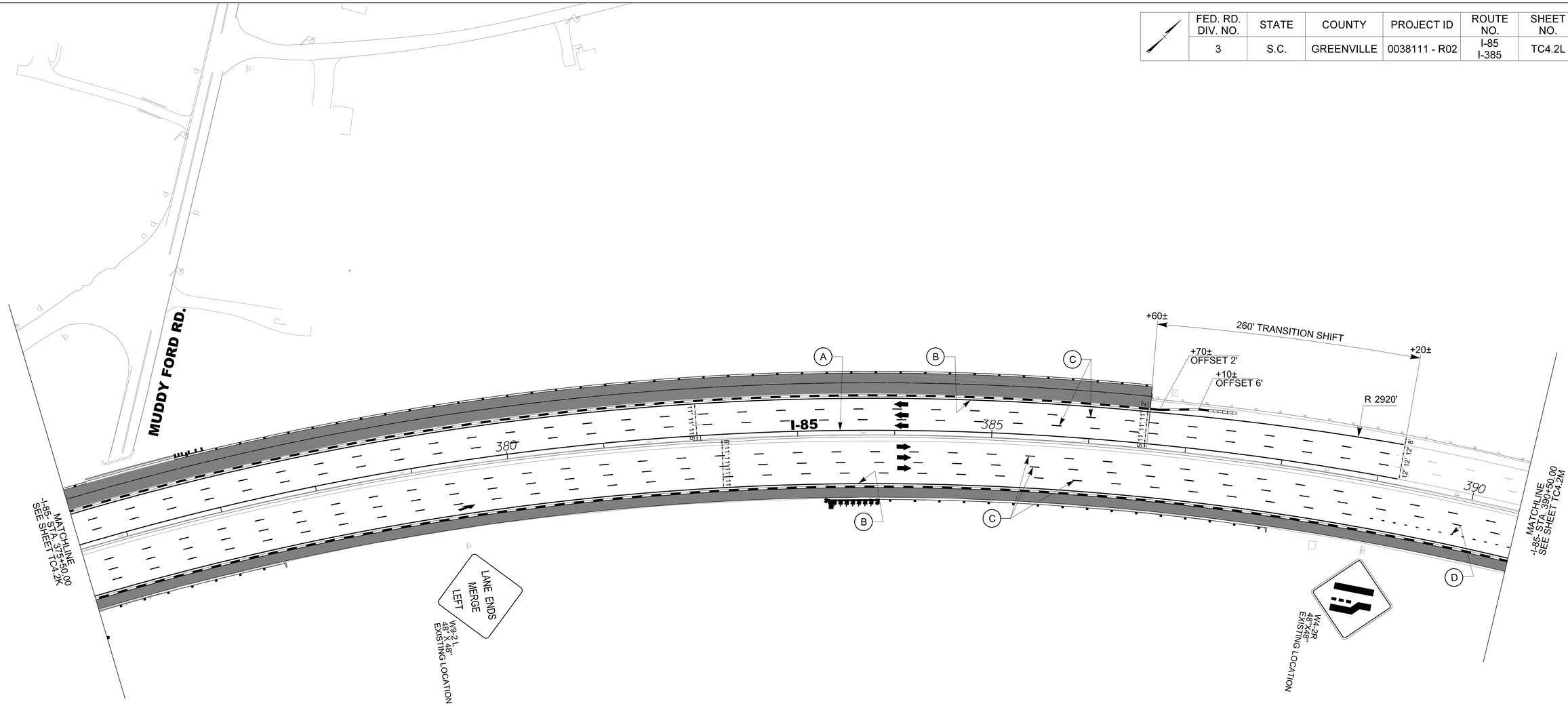
FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2L



NO.	DATE	DESCRIPTION	BY	CHECKED
1	10-17-16	REVISED TO INCORPORATE ROCKY CREEK ROADWAY REVISIONS	CEO	BLW
2	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

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SOUTH CAROLINA STANTEC CONSULTING SERVICES, INC. No. C02310 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER Betsy L. Watson No. 27345 BETSY L. WATSON 6/15/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT South Carolina Department of Transportation

I-85 / I-385 INTERCHANGE

I-85
STEP 2

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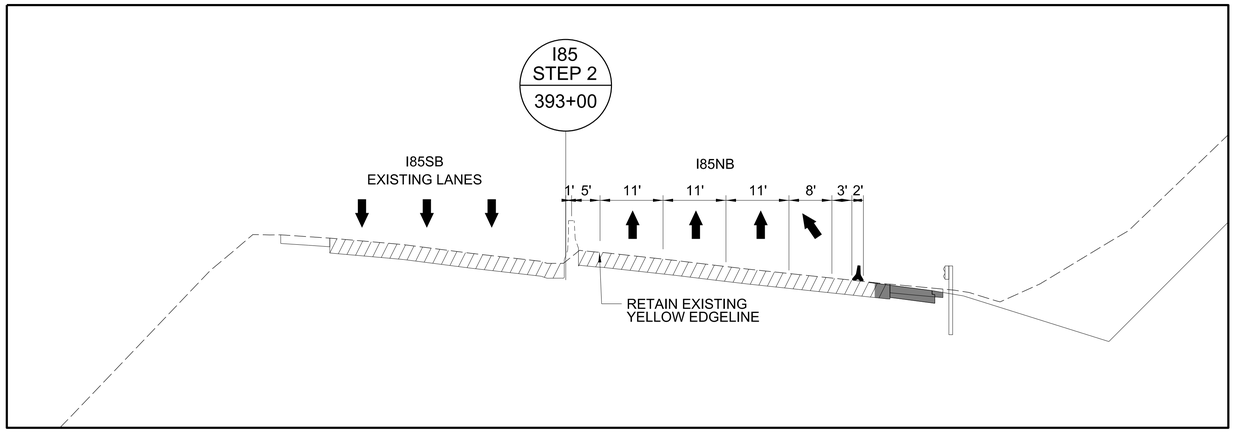
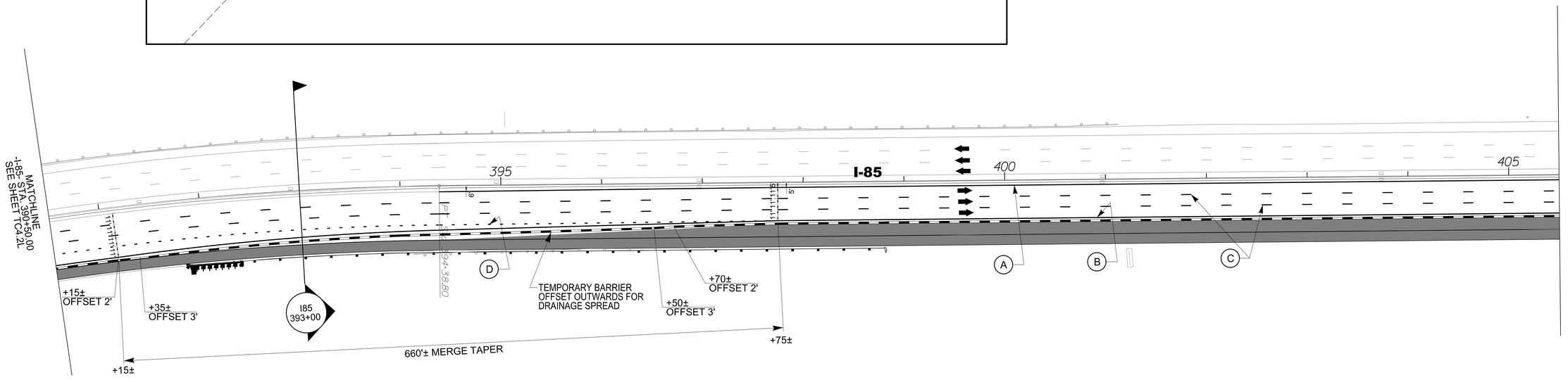
FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2M





REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	10-17-16	REVISED TO INCORPORATE ROCKY CREEK ROADWAY REVISIONS	CEO	BLW
2	6-13-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

FLATIRON ZACHRY a joint venture

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SOUTH CAROLINA CONSULTING SERVICES, INC. No. C02310 CERTIFICATE OF AUTHORIZATION

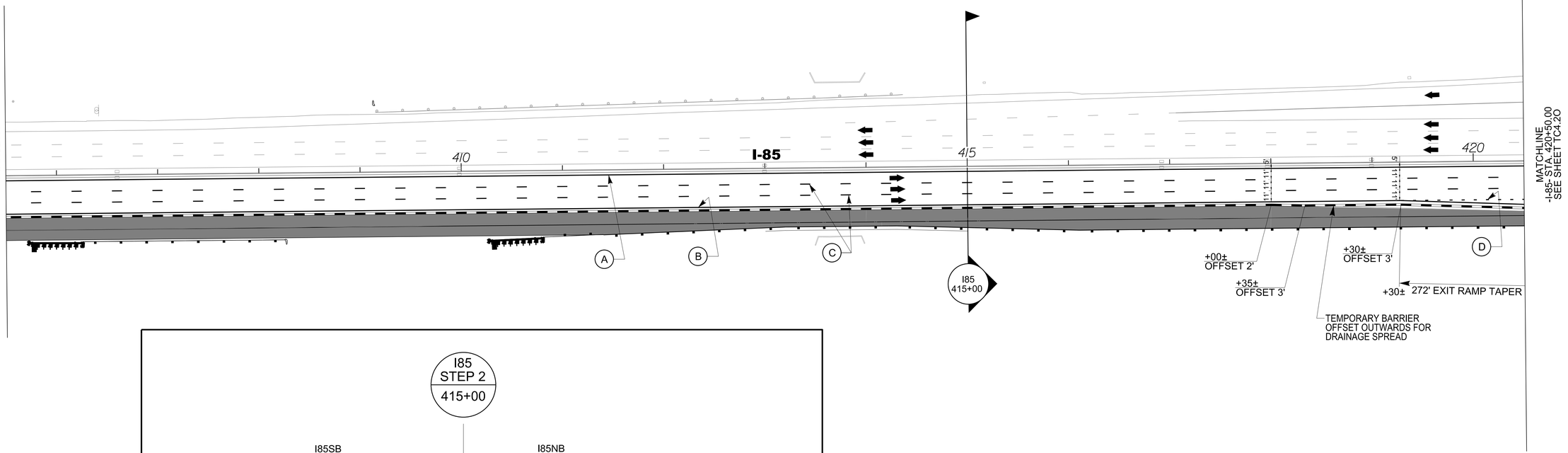
SOUTH CAROLINA PROFESSIONAL ENGINEER
Digitally signed by Betsy L. Watson
No. 27345
BETSY L. WATSON
6/15/2018

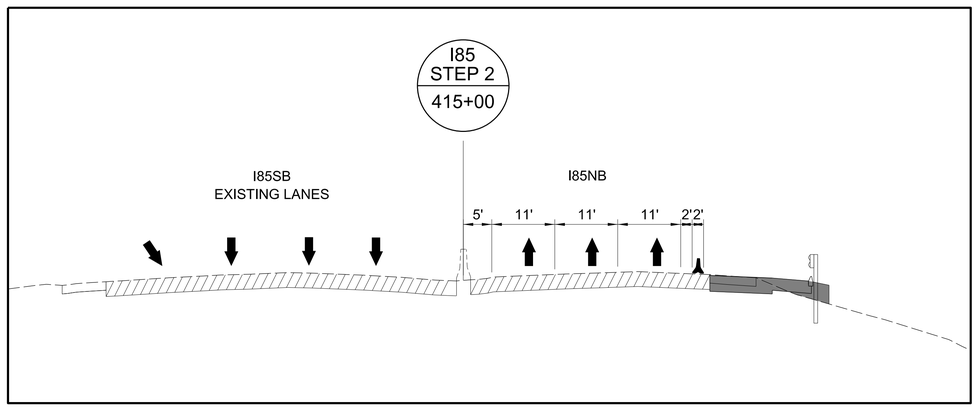
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

I-85 / I-385 INTERCHANGE

I-85
STEP 2

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
N	3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2N





NO.	DATE	DESCRIPTION	BY	CHECKED
1	10-17-16	REVISED TO INCORPORATE ROCKY CREEK ROADWAY REVISIONS	CEO	BLW
2	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

FLATIRON ZACHRY a joint venture

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SOUTH CAROLINA
STANTEC CONSULTING SERVICES, INC.
No. C02310
CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER
Document signed by: Betsy L. Watson
No. 27345
BETSY L. WATSON
6/15/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
SCDOT

I-85 / I-385 INTERCHANGE

I-85
STEP 2

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	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
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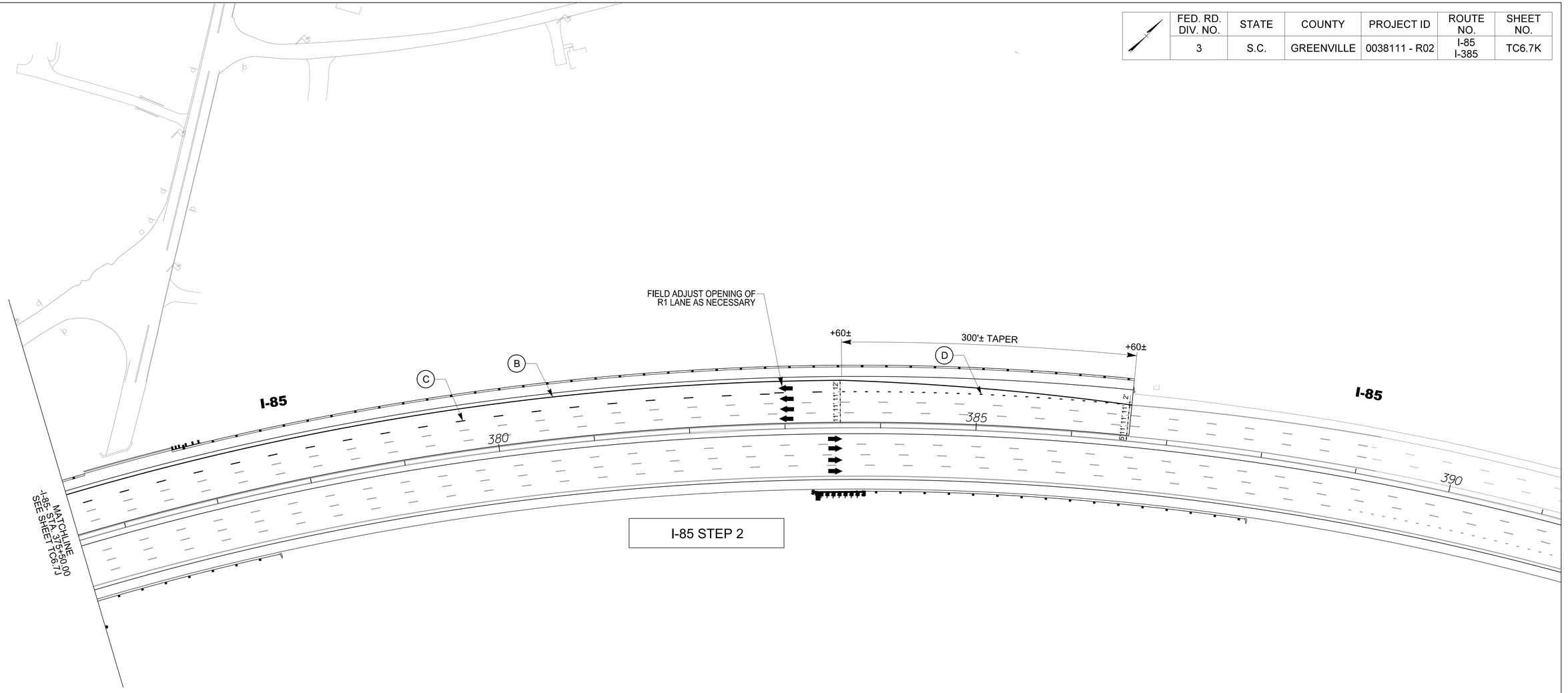

I-85 STEP 2

NO.	DATE	DESCRIPTION
1	5-24-18	PROPOSED 85SB CONSTRUCTION LIMITS ADJUSTED IN ROCKY CREEK REVISIONS

BY: CEO — CHECKED: BLW

FLATIRON ZACHRY a joint venture

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SOUTH CAROLINA STANTEC CONSULTING SERVICES, INC. No. C02310 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER Betsy L. Watson No. 27345 BETSY L. WATSON 6/15/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION — SCDOT

I-85 / I-385 INTERCHANGE

I-385
STEP 7

5/30/2018 4:29:30 PM U:\1710-Transportation Management Plan MOT\DESIGN\AREA 0102 INTERCHANGE TMP\TMP_PLAN_SHEETS\TC06.7K_I385_STEP 07.DGN

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
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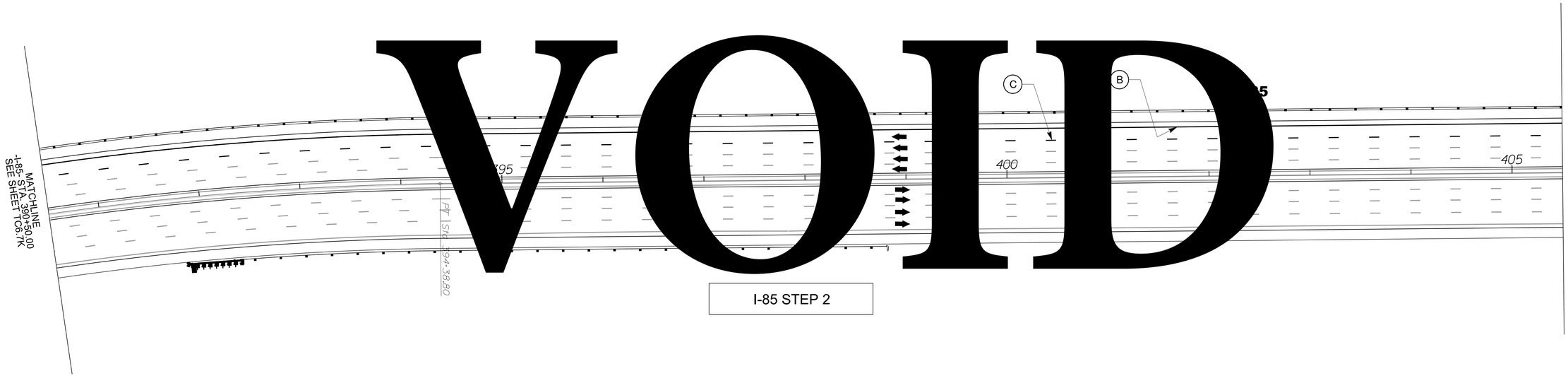

I-85 STEP 2

FLATIRON ZACHRY a joint venture

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SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

I-85 / I-385 INTERCHANGE

I-385
STEP 7

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC6.7M

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12/23/2015

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
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I-85 / I-385 INTERCHANGE

I-385
STEP 7

12/23/2015
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I–85

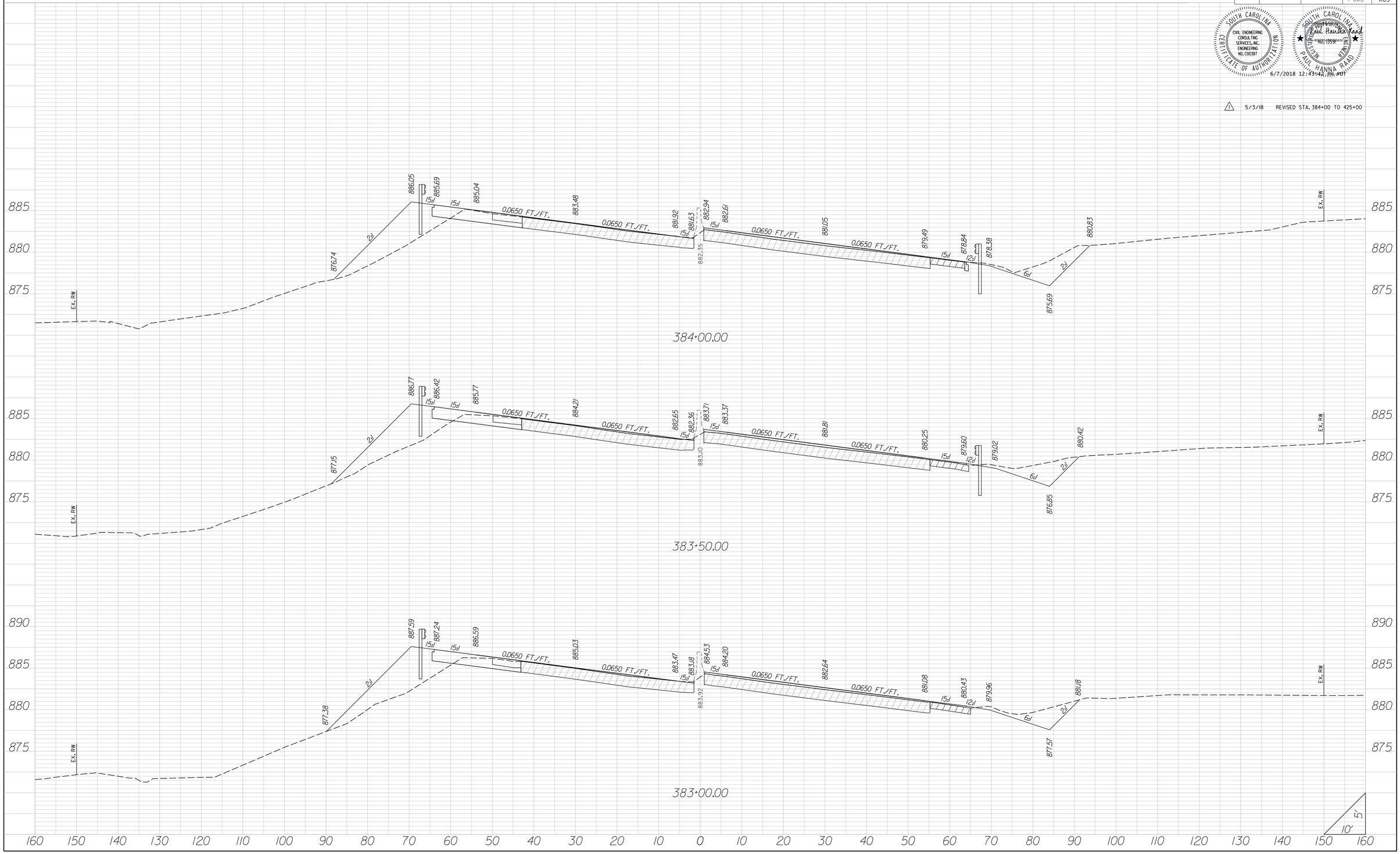
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X83

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — No. 31559

6/7/2018 12:43:42 PM EDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X84

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 31359 DATE

6/7/2018 12:43:41 PM EDT

5/3/18 REVISED STA. 384+00 TO 425+00

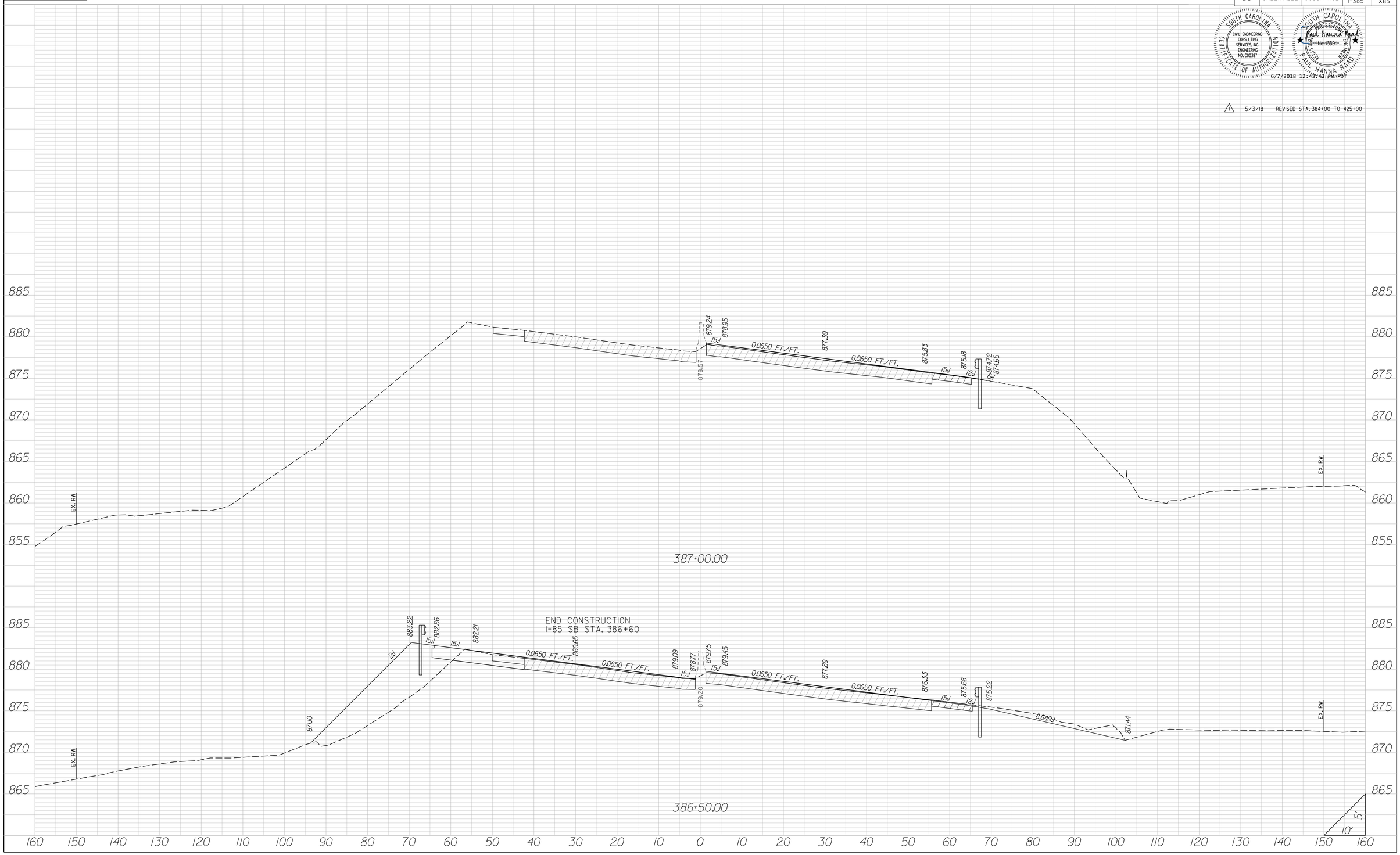
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X85

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 19598

6/7/2018 12:49:42 PM PDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X86

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00038

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — No. 19591

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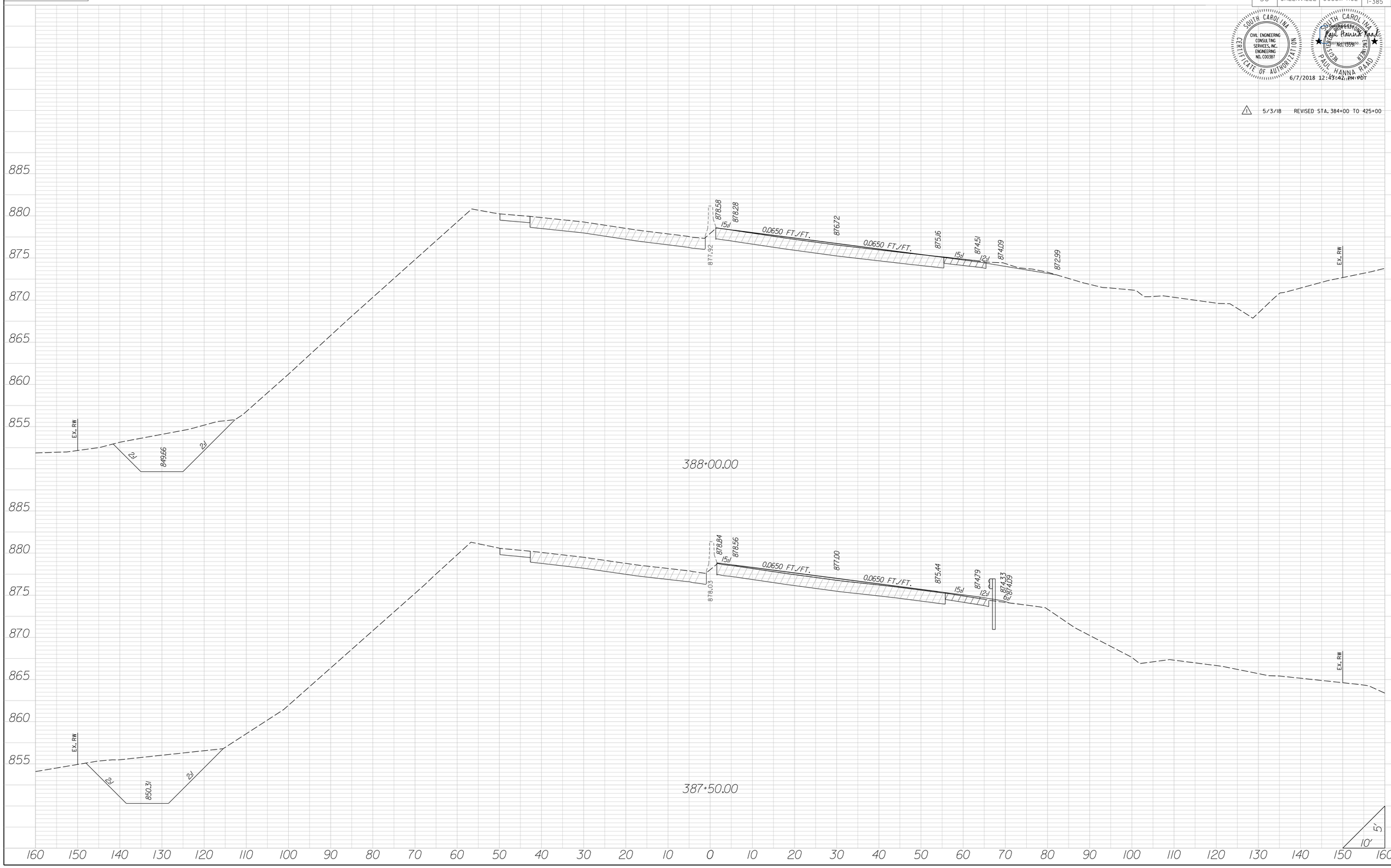

I-85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038111-R02	I-85/ I-385	I-85 X87

I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X88

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD NO. 19599

Paul Hanna Raad

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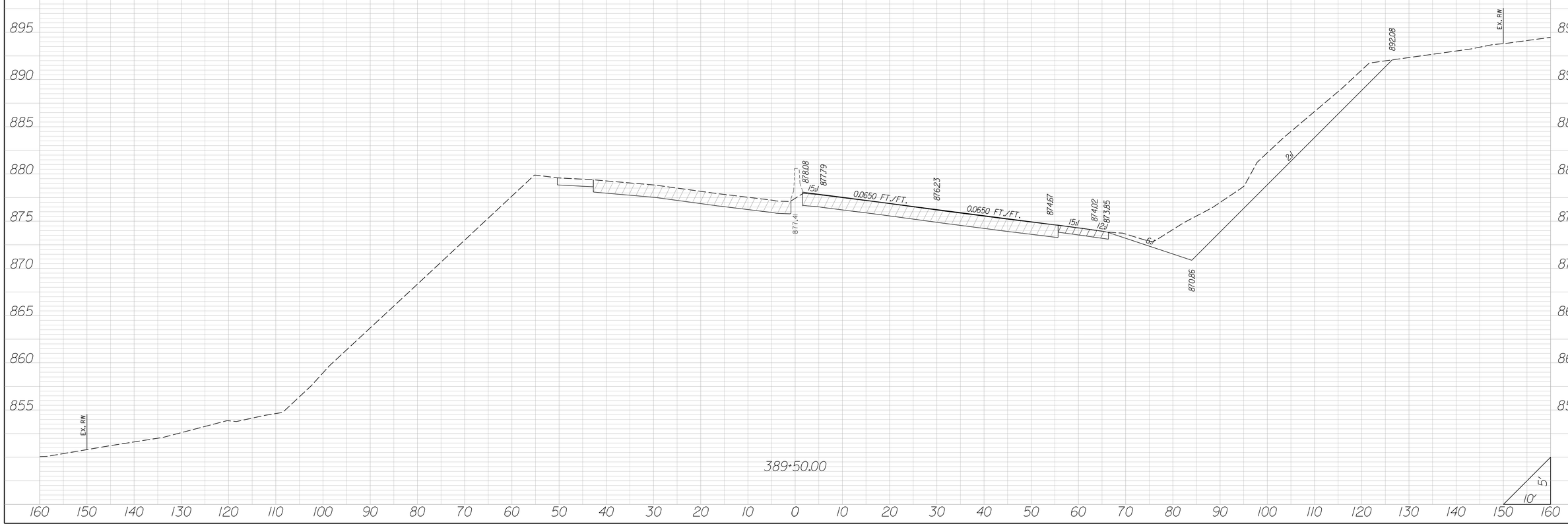


I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X89

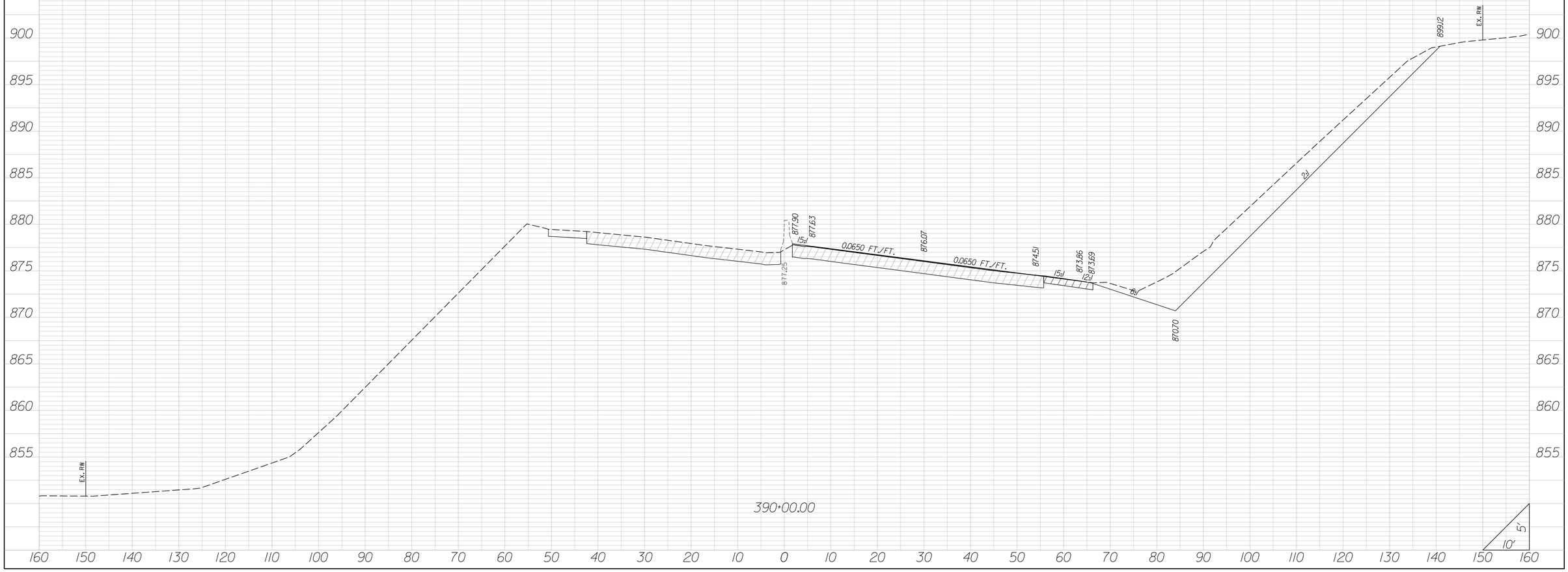
SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 32591

Paul Hanna Raad

6/7/2018 12:43:43 PM PDT

1	5/3/18	REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X90

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — NO. 19559

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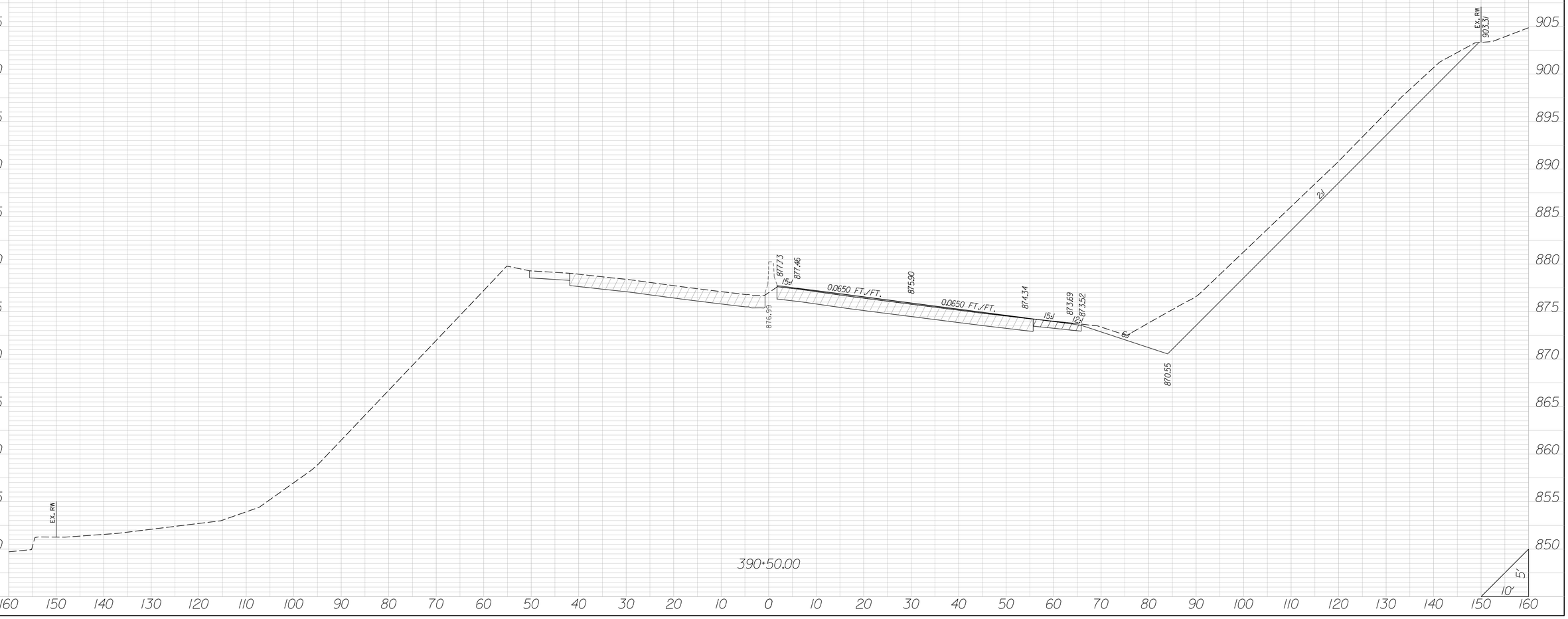
⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X91

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA PROFESSIONAL ENGINEER — REGISTRATION NO. 11999 — PAUL HANNA RAAD

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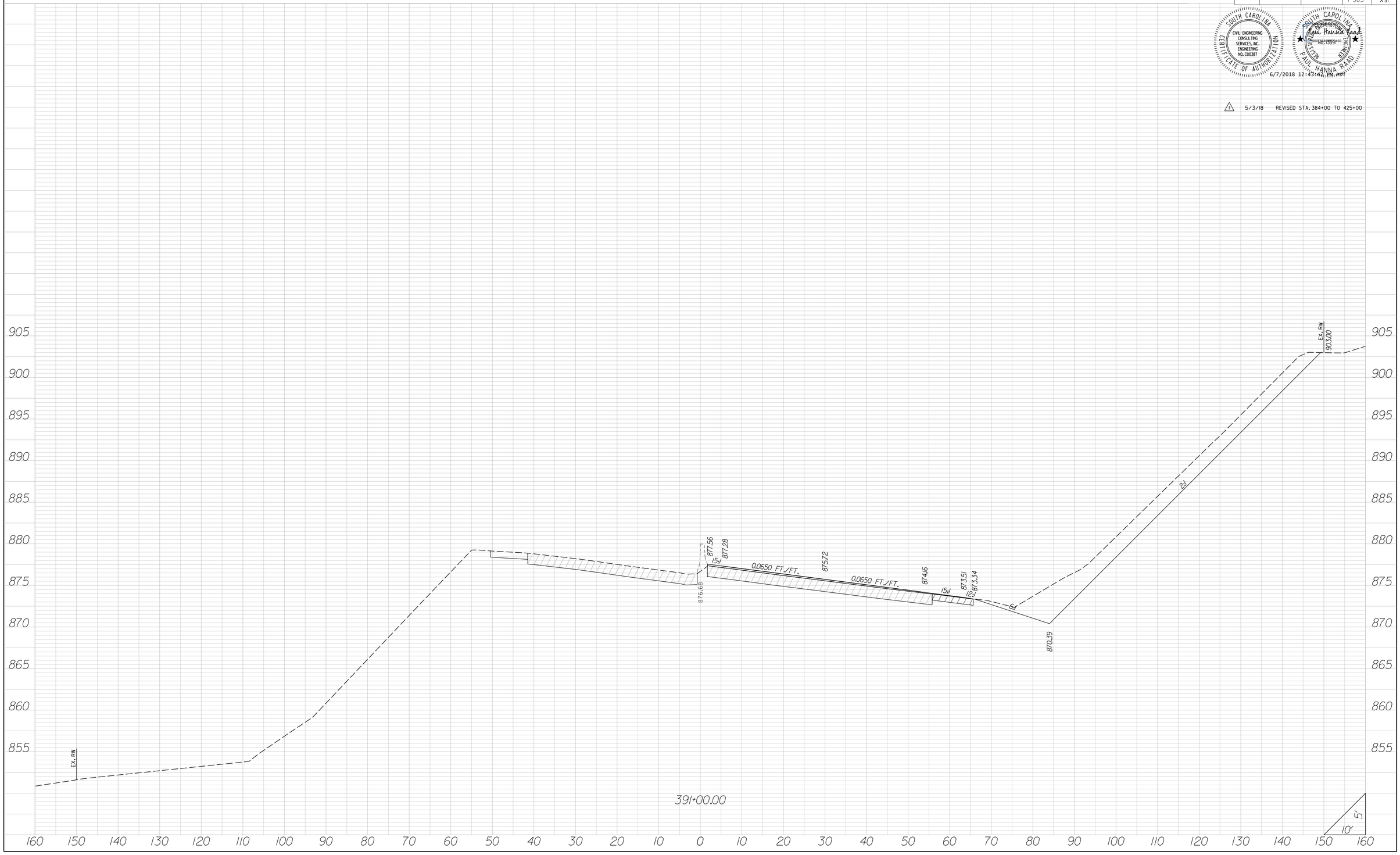
⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

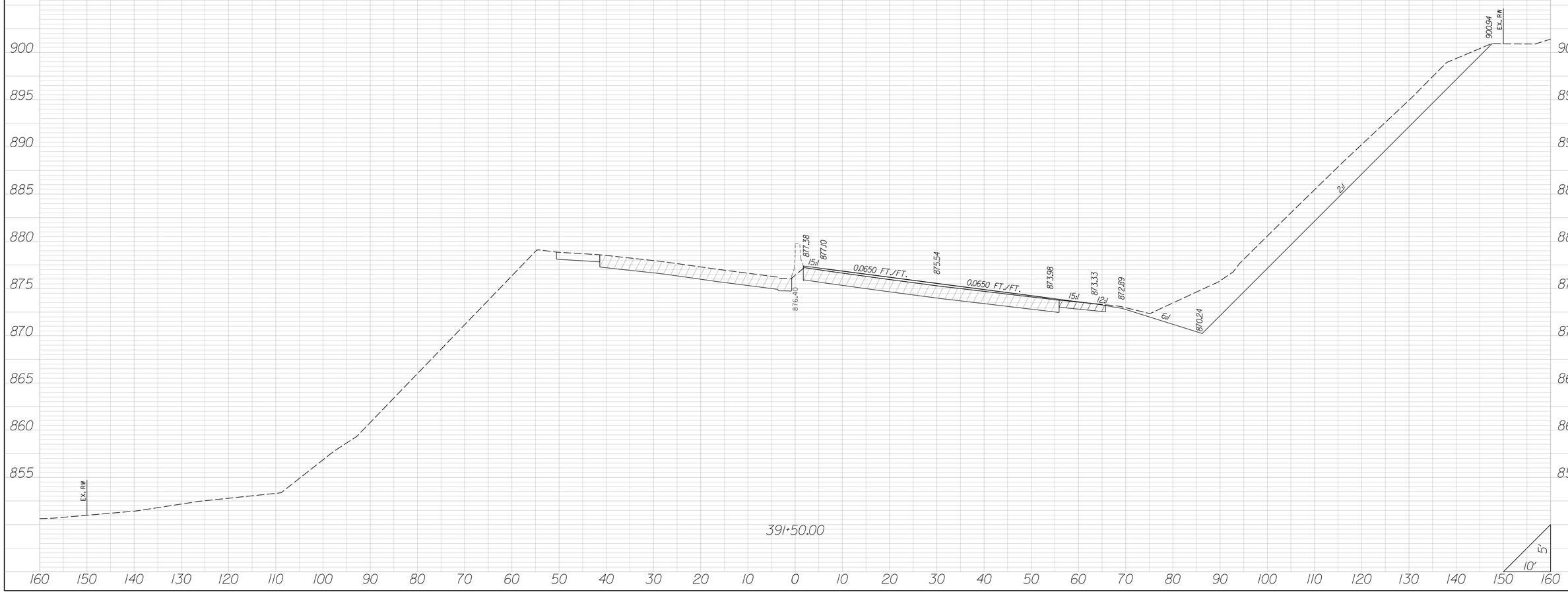
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X92

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — Paul Hanna Raad No. 13591 — PAUL HANNA RAAD

6/7/2018 12:43:42 PM PDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

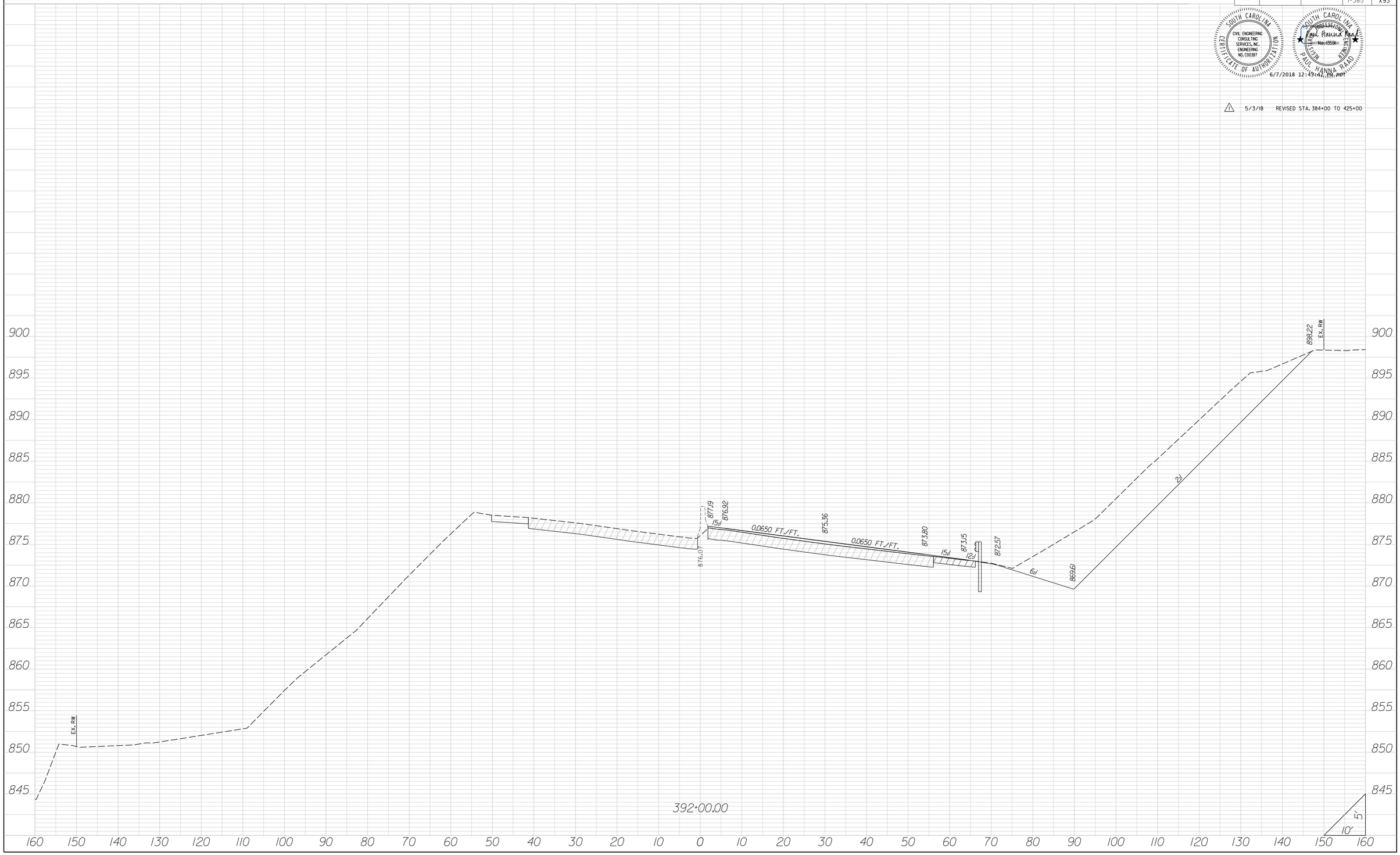
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X93

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 35980

6/7/2018 12:43:42 PM EDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

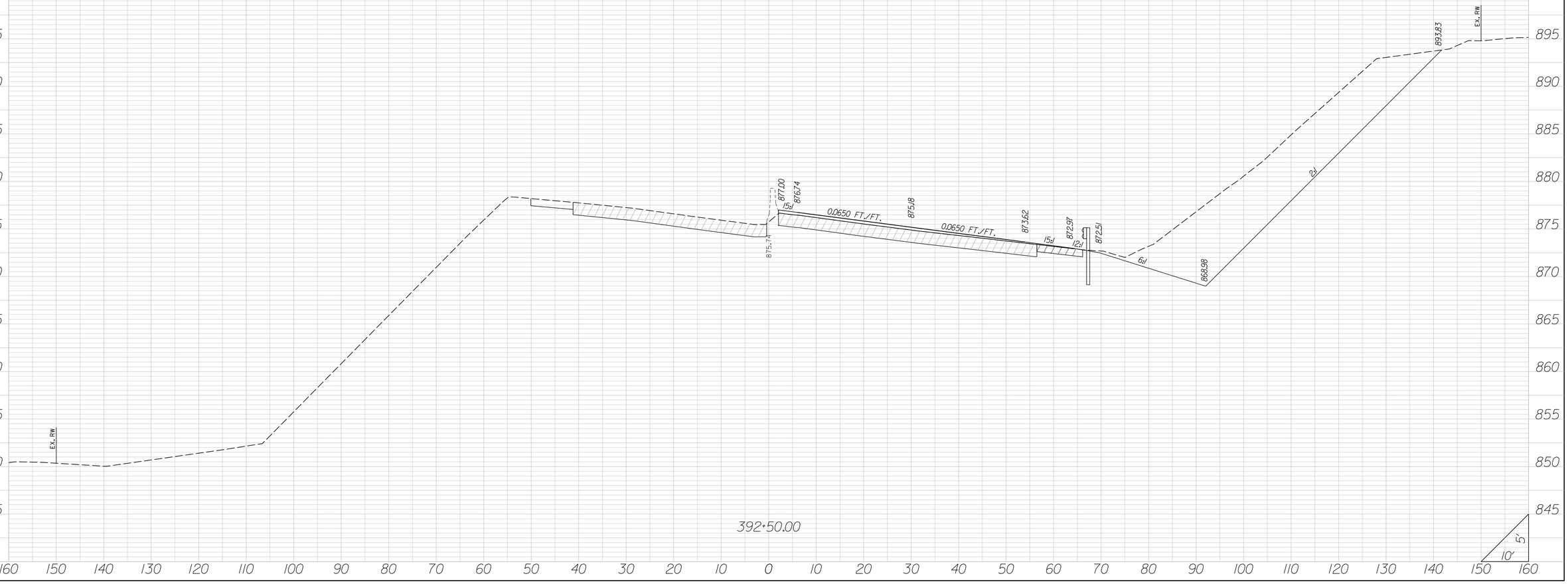
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X94

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 33591

6/7/2018 12:43:42 PM PDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X95

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — No. 32598

Paul Hanna Raad

6/7/2018 12:43:42 PM PDT

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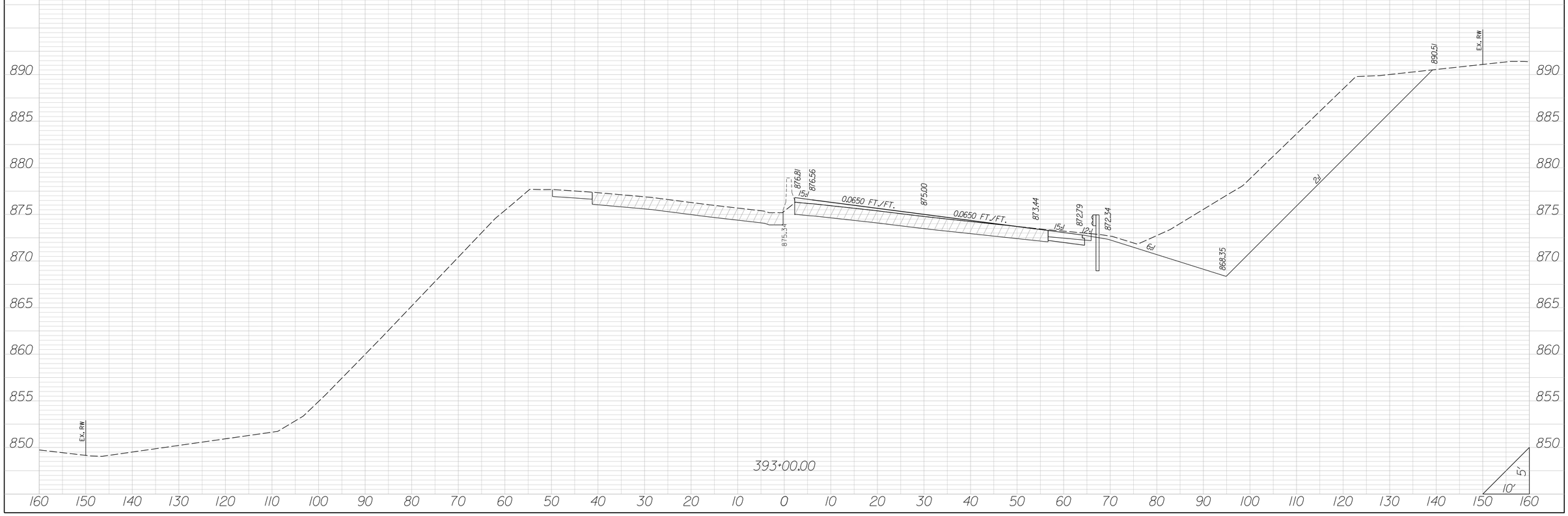


I-85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038111-R02	I-85/ I-385	I-85 X96

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 13591

DocuSigned by: Paul Hanna Raad 900786469FDB450...

6/7/2018 12:43:42 PM PDT

1 5/3/18 REVISED STA. 384+00 TO 425+00

I–85

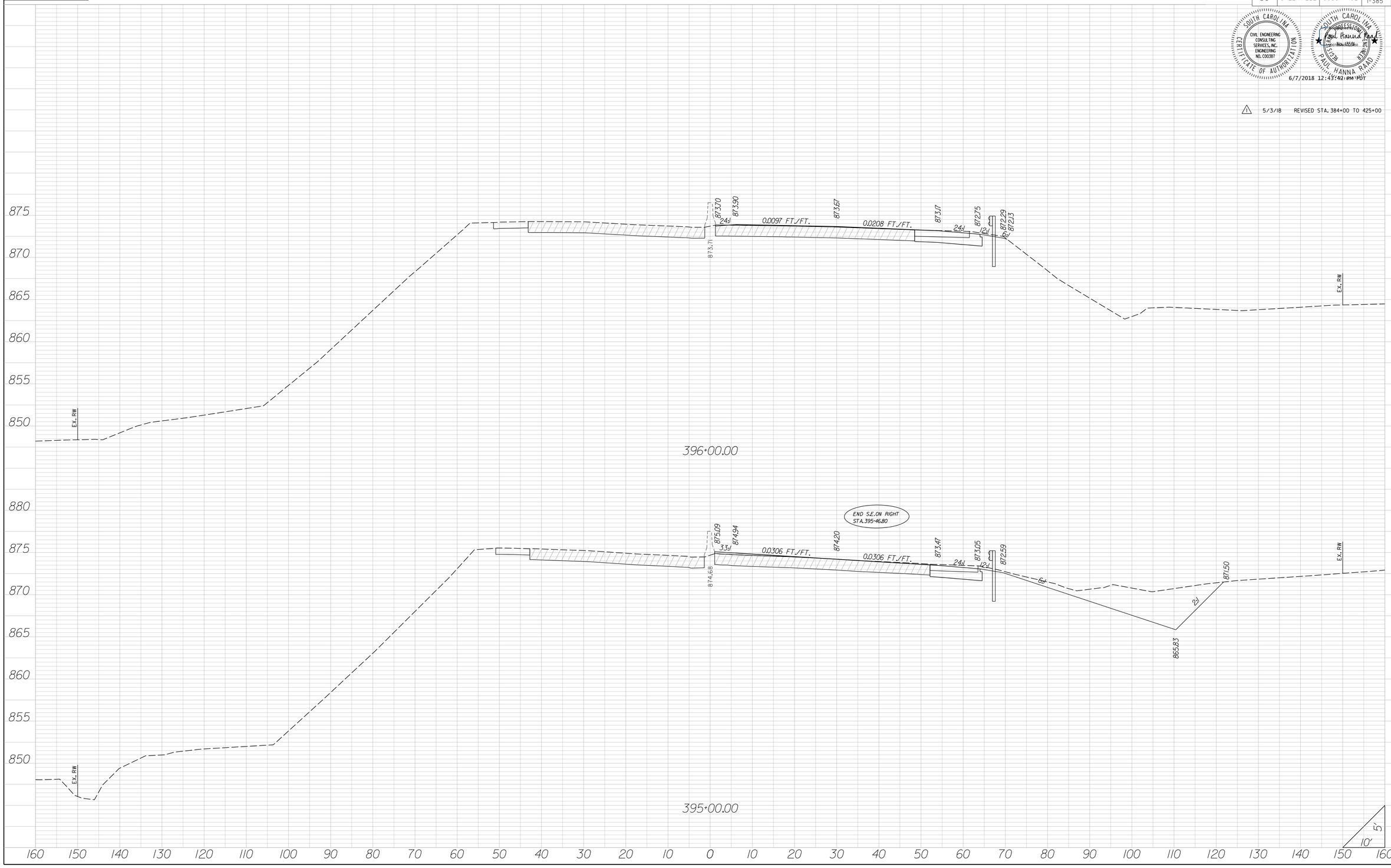
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X97

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER Paul Hanna Raad No. 17591 PAUL HANNA RAAD

6/7/2018 12:43:42 PM PDT

1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

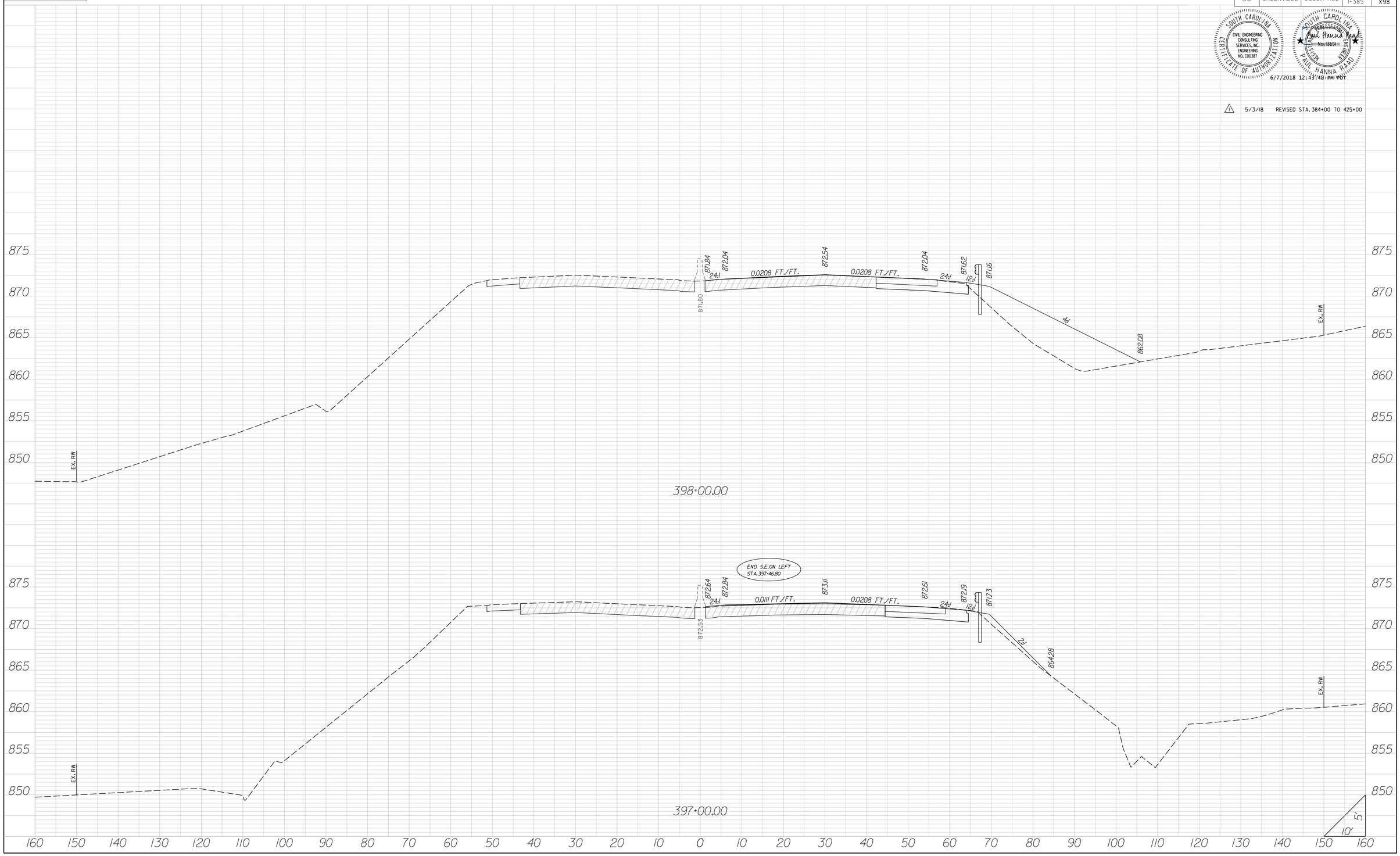
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X98

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 31591

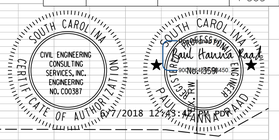
6/7/2018 12:43:40 PM PDT

1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X99



⚠1 5/3/18 REVISED STA. 384+00 TO 425+00

I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X100

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 17591

Paul Hanna Raad

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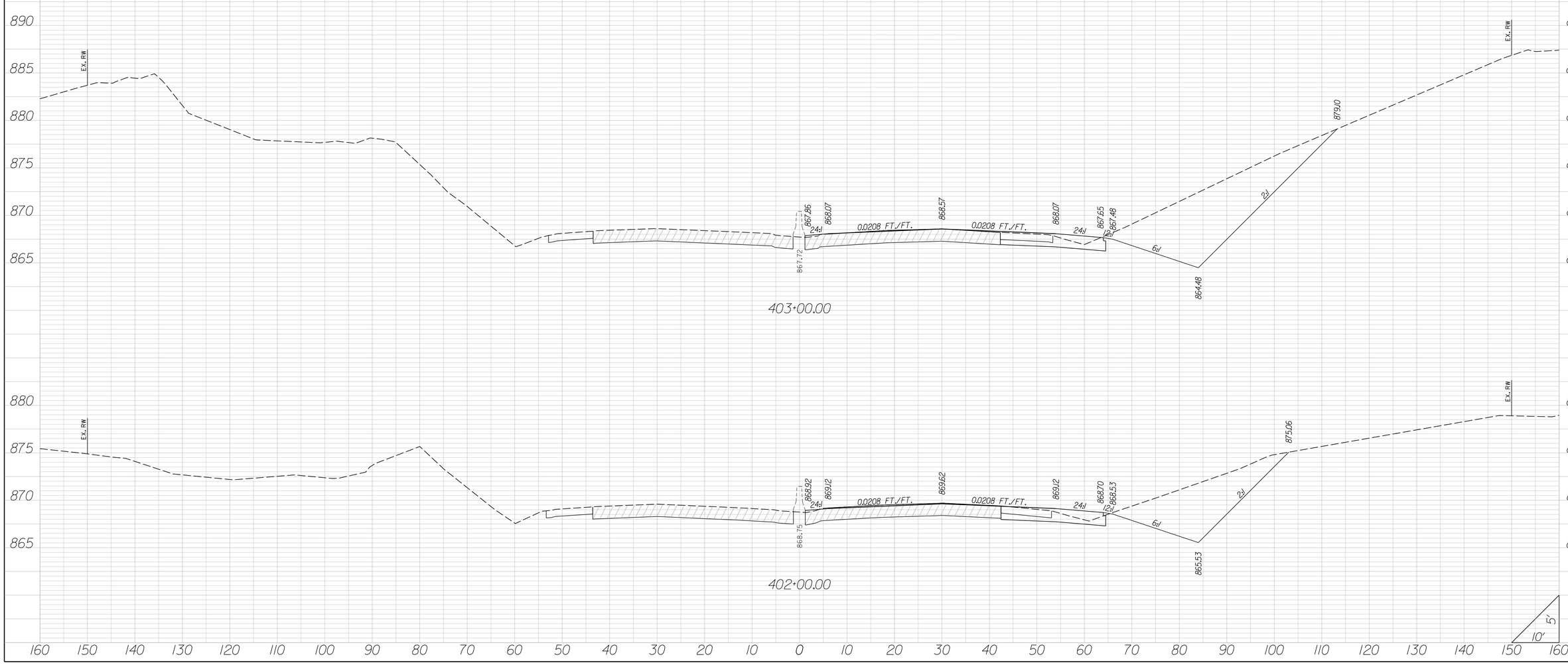

I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X101

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — No. 35910

Paul Hanna Raad

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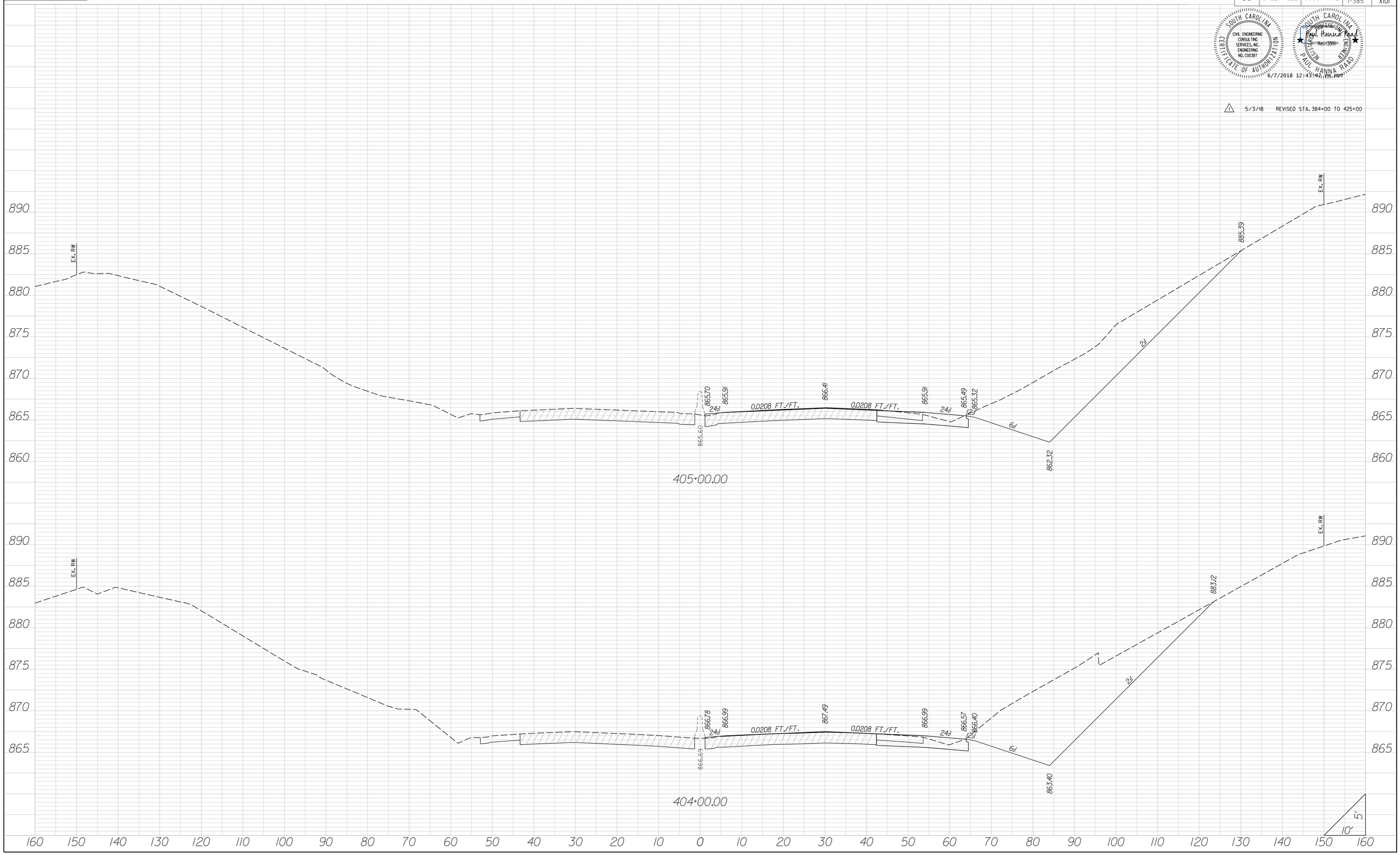
1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X102

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — Raul Hanna Rajab — No. 31359 — RAUL HANNA RAJAB

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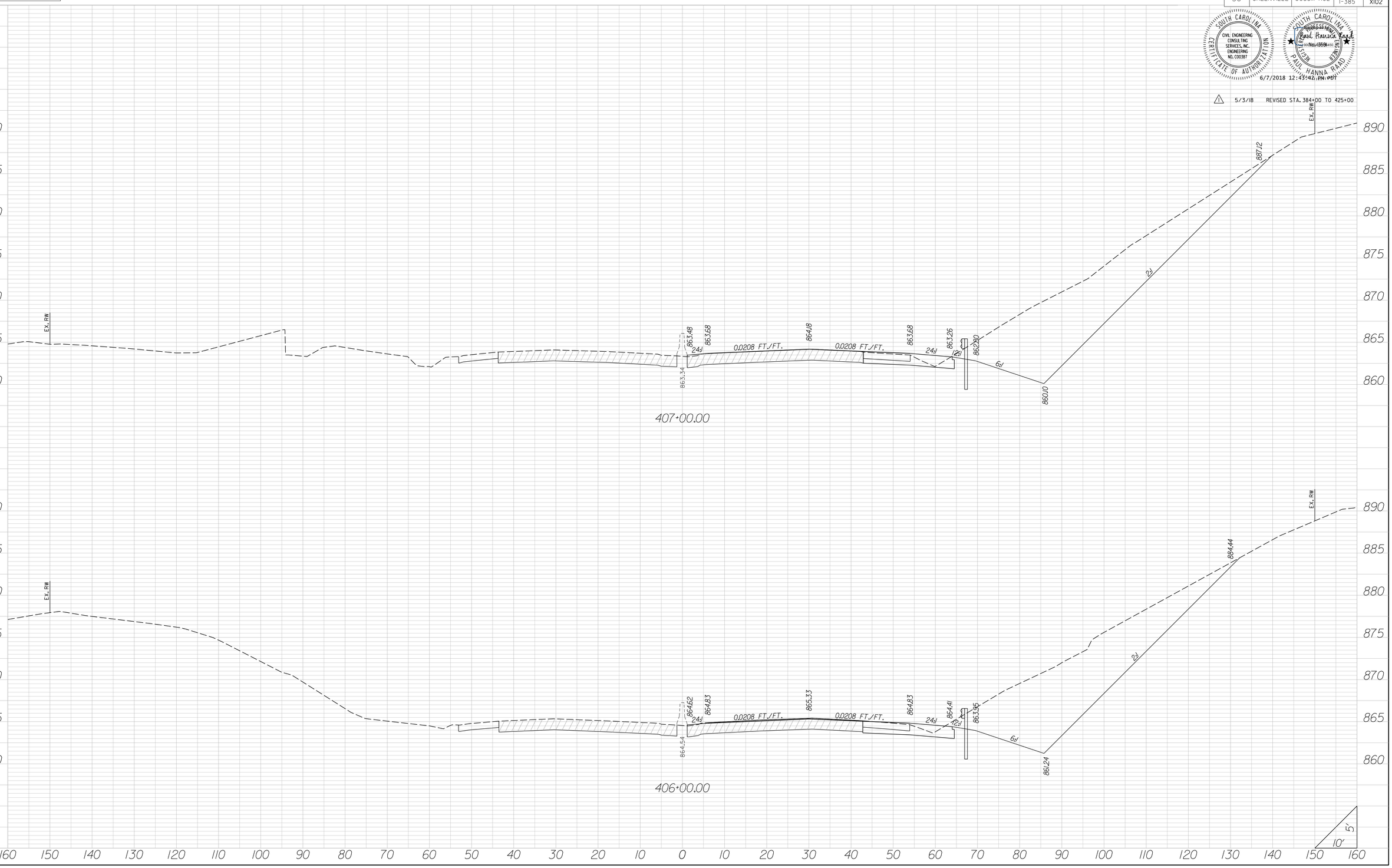
⚠ 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X103

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00038

SOUTH CAROLINA REGISTERED — Paul Hanna Rad — No. 19591 — PAUL HANNA RAD

6/7/2018 12:43:42 PM PDT

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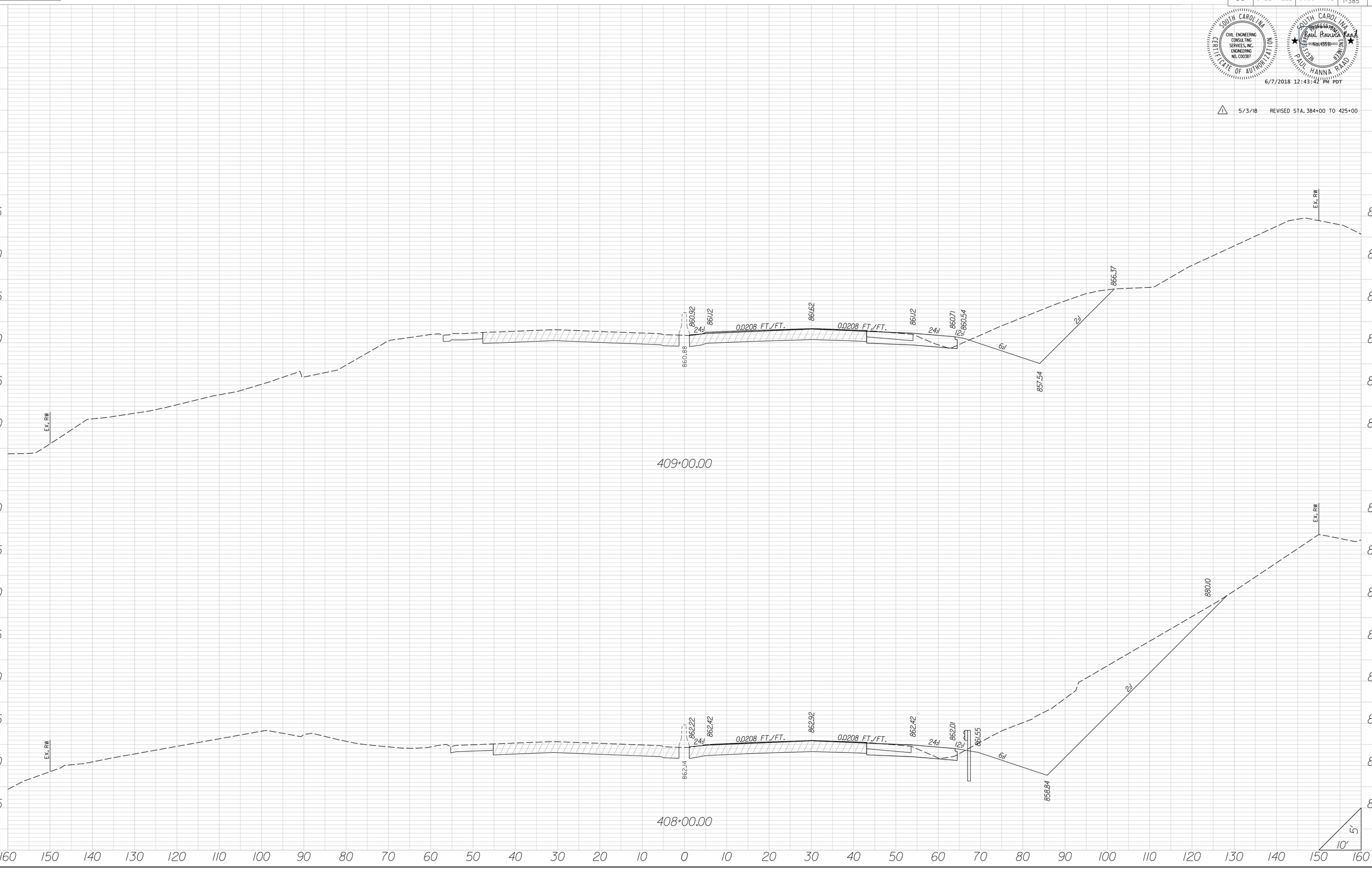

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I-85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038111-R02	I-85/ I-385	I-85 X104

I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X105

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — Raul Hanna Rajad — No. 40559 — RAUL HANNA RAJAD

6/7/2018 12:43:42 PM EDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00

I–85

STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X106

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00038

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 29590

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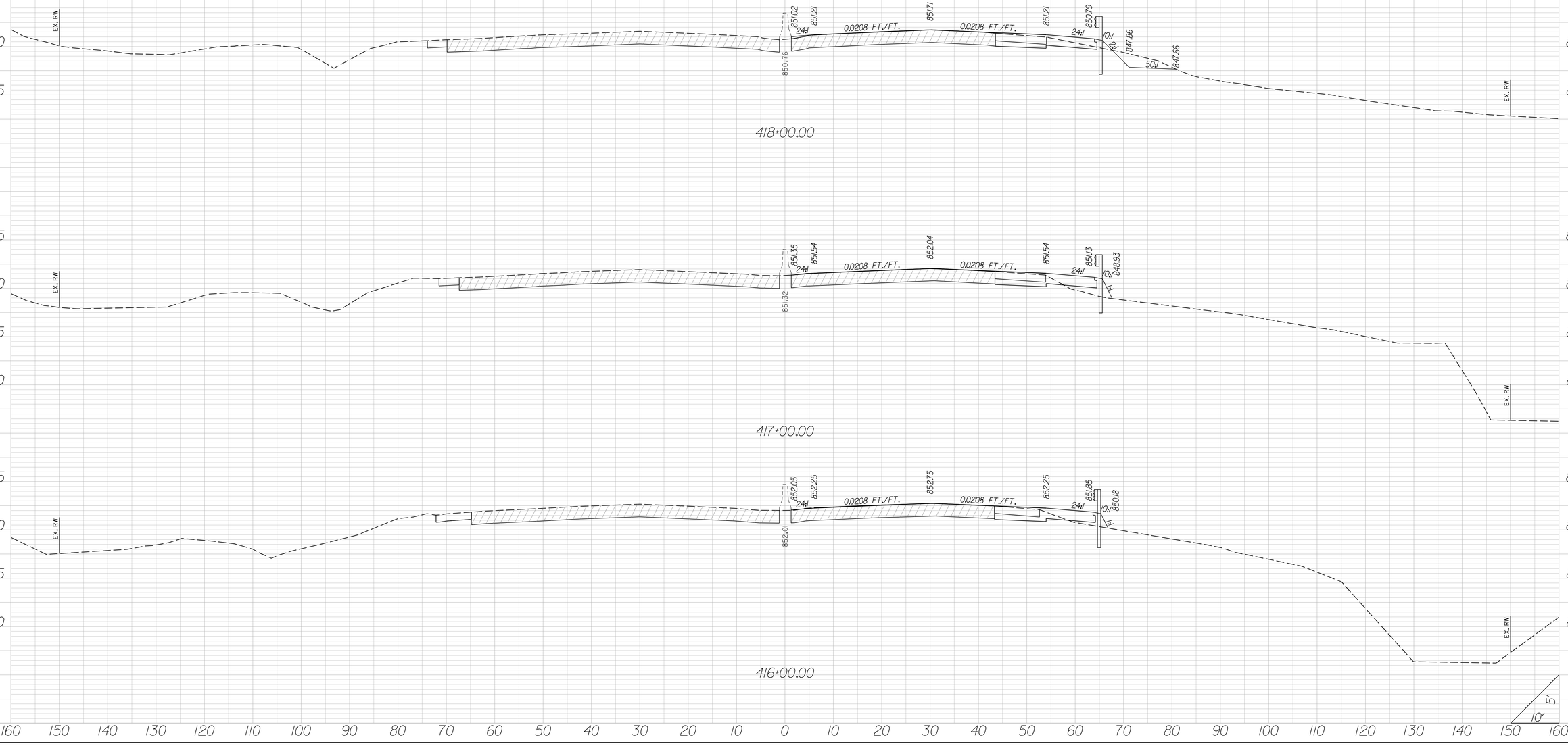
⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

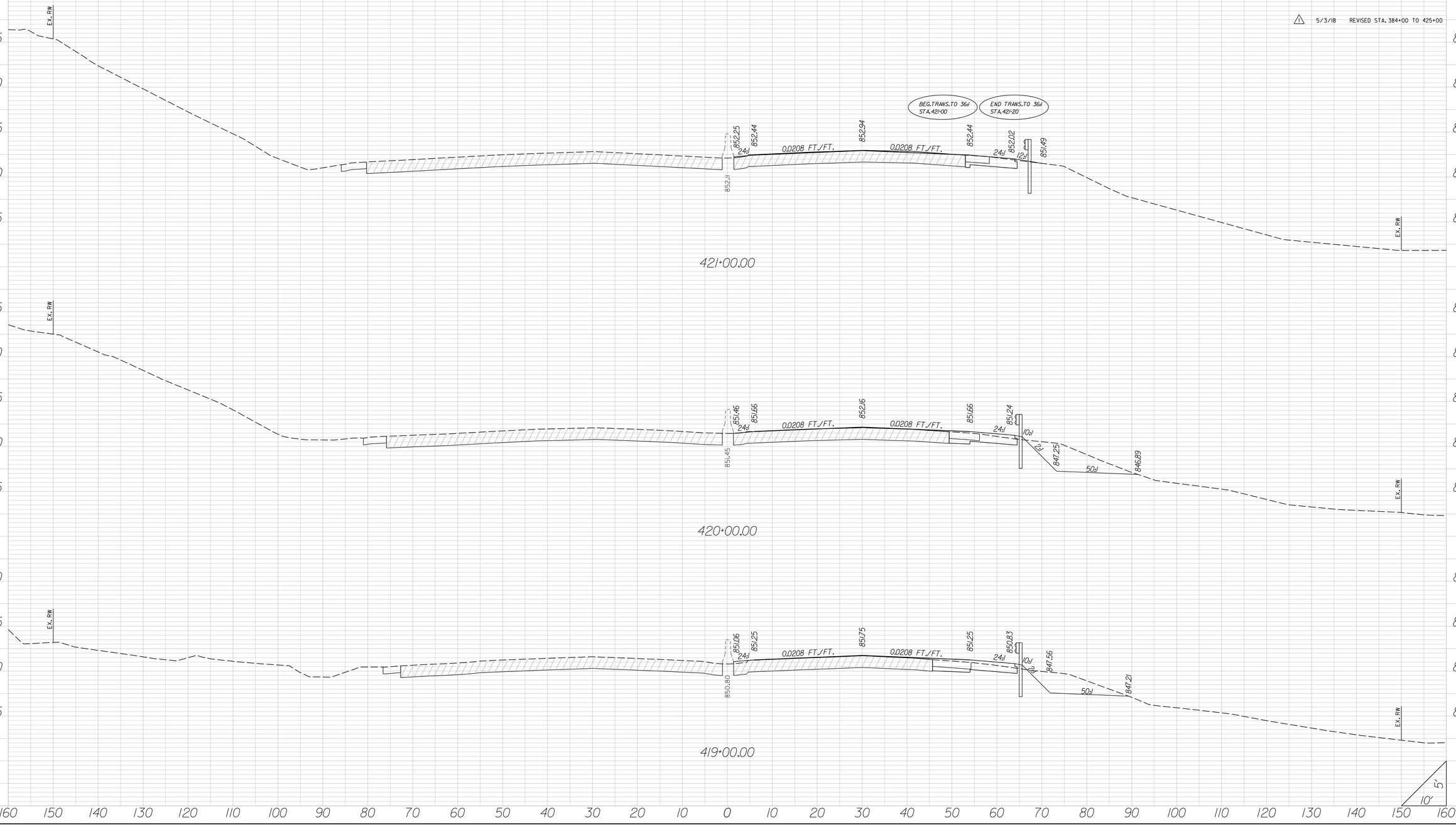
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X107

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — PAUL HANNA RAAD — No. 19598

6/7/2018 12:43:42 PM PDT

⚠1 5/3/18 REVISED STA. 384+00 TO 425+00



I–85

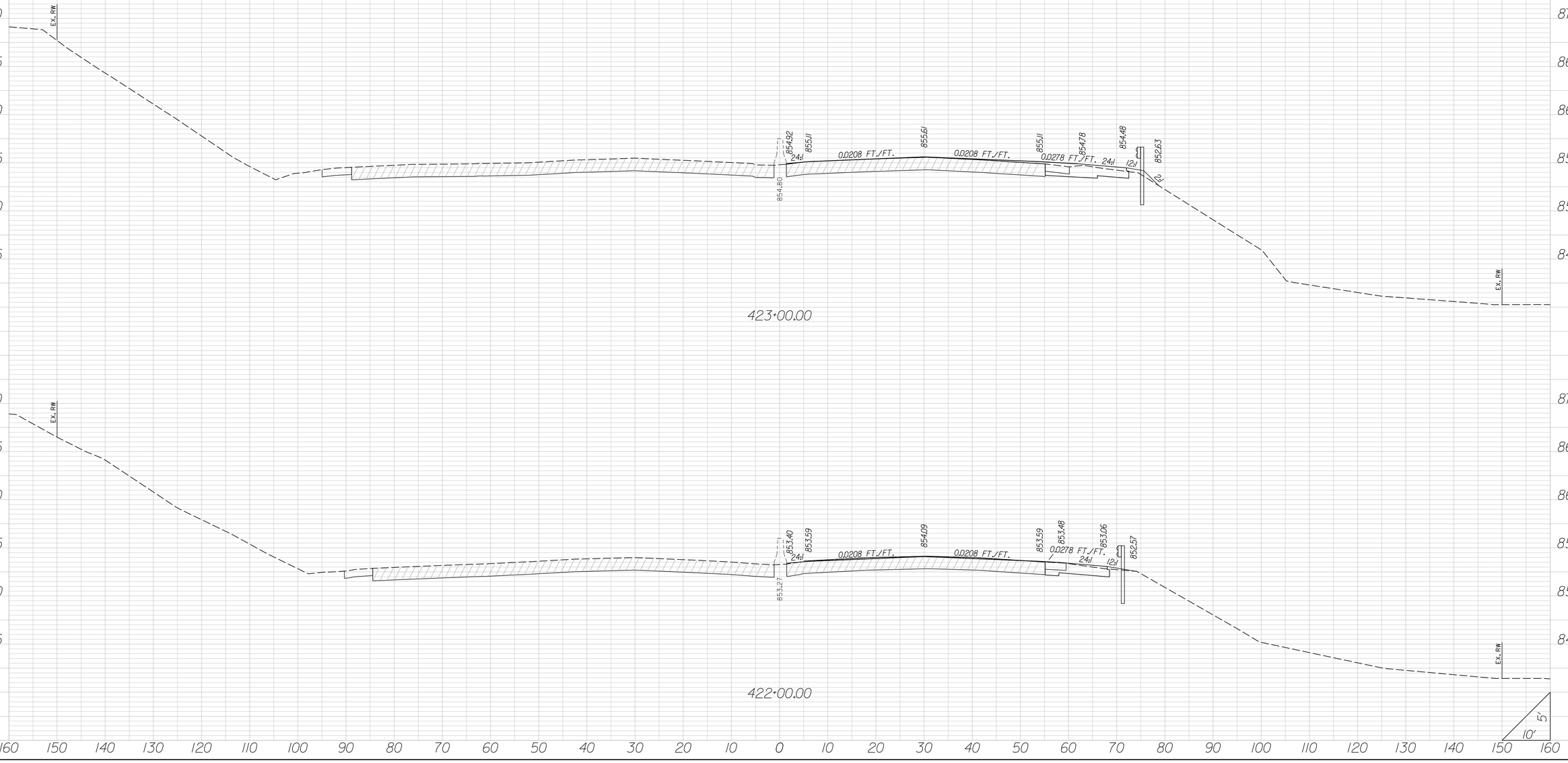
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X108

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — Paul Hanna Rand — No. 33591 — PAUL HANNA RAND

6/7/2018 12:43:42 PM PDT

1	5/3/18	REVISED STA. 384+00 TO 425+00



I–85

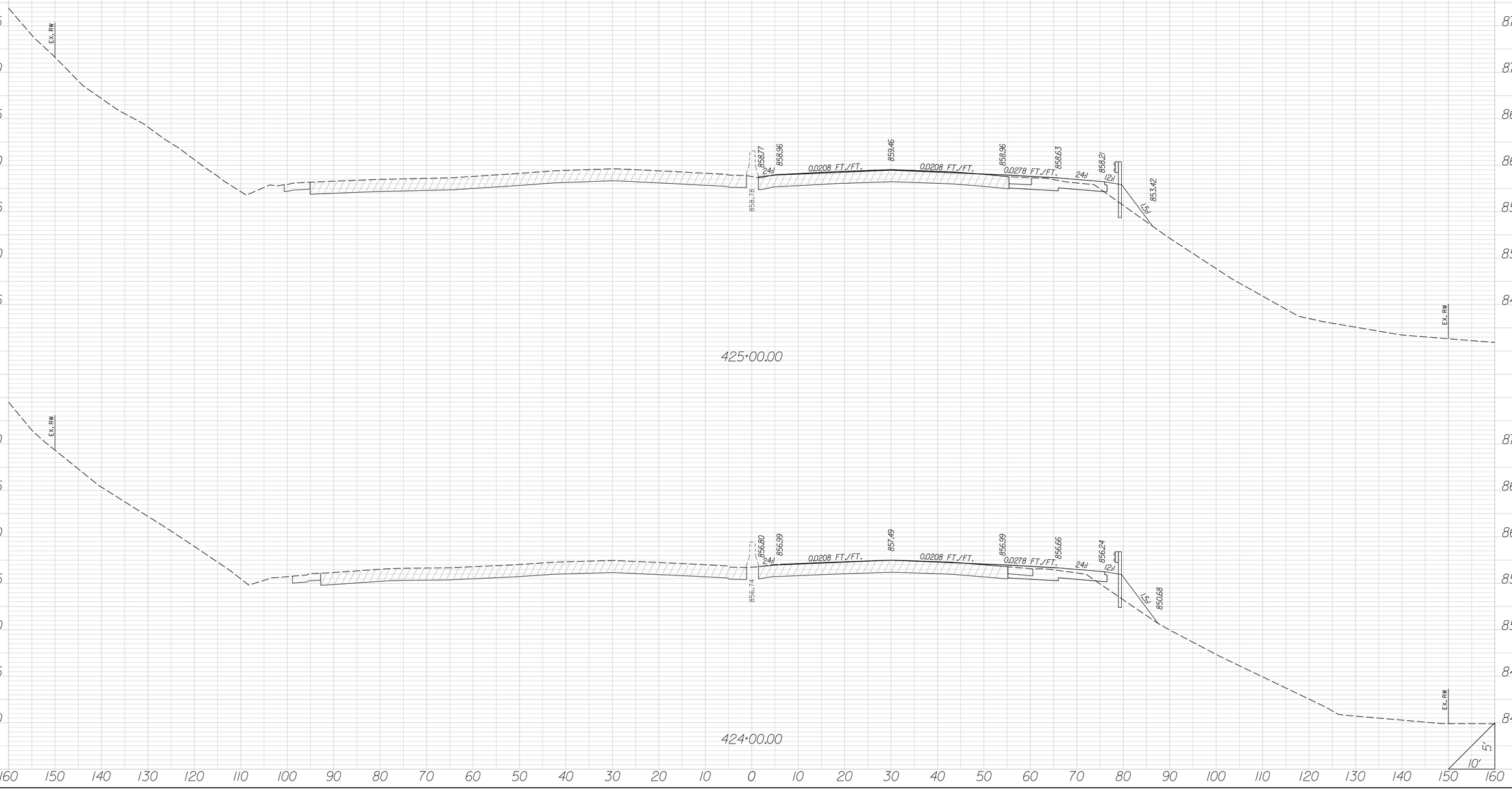
STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
SC	GREENVILLE	0038III-R02	I-85/ I-385	I-85 X109

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER — Raul Hanna Rajad — No. 13590 — RAUL HANNA RAJAD

6/7/2018 12:43:42 PM PDT

1	5/3/18	REVISED STA. 384+00 TO 425+00



ECS SOUTHEAST, LLP
"Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities
NC Registered Engineering Firm F-1078
NC Registered Geologists Firm C-406
SC Registered Engineering Firm 3241

May 22, 2018

Mr. Maher Almassri
Civil Engineering Consulting Services, Inc.
2000 Park Street – Suite 201
Columbia, SC 29201

Re: Interstate 85/385 Interchange Improvements
Rocky Mountain Creek Retaining Wall 18
Greenville County, SC
ECS Project No. 08-9283-B6

Dear Mr. Almassri:

As you are aware, ECS Southeast provided Mechanically Stabilized Earth (MSE) Wall recommendations as part of the Final Roadway Geotechnical Engineering Report titled Rocky Mountain Creek Roadway and Retaining Walls, dated October 25, 2016. It is our understanding that since the completion of the report, revisions were made to the retaining walls. Walls 18B, 18C, and 55 have been removed from the project, and require no further analysis. Wall 18A has been revised and was renumbered to wall 18. The purpose of this letter is to provide supplementary geotechnical recommendations for wall 18.

Wall 18A previously consisted of a wire faced MSE wall from station 413+00 to 419+40 (640 feet long) ranging in height from 4.33 feet to 10.27 feet tall. We understand that the wall has been shortened to 200 feet long with an alignment from station 413+00 to 415+00. Wall heights have also been decreased to a range of 3.21 feet to 6.75 feet.

An external stability analysis was performed for Wall 18 at station 413+50 with a design height of 7 feet. The results of the analysis are summarized below in Tables 1.0 and 1.1.

Table 1.0 – MSE Wall External Stability Analysis Results

Wall Number	Design Height, H, ft[1]	Minimum Reinforcement Length, B_{req}, ft (%H)	Calculated Resistance Factor		Max. Factored Bearing Resistance, psf
			Bearing Capacity[2]	Sliding[3]	
18	3 < H ≤ 7	12.5 (1.79H)	0.23	0.47	5,400

Table 1.1 – MSE Wall External Stability Analysis Results (Extreme Event 1)

Wall Number	Design Height, H, ft[1]	Minimum Reinforcement Length, B_{req}, ft (%H)	Calculated Resistance Factor		Max. Factored Bearing Resistance, psf
			Bearing Capacity[2]	Sliding[3]	
18	3 < H ≤ 7	12.5 (1.79H)	0.17	0.52	8,400

Notes:
1. Height analyzed is measured from PGL to embedment depth.
2. Maximum Resistance factor is 0.65 for Static Bearing Capacity and 1.0 for Seismic Bearing Capacity.
3. Maximum resistance factor is 1.0 for sliding.

Static and extreme limit state global stability was also evaluated for Wall 18 at station 414+00. Extreme limit state (seismic) considers a pseudo-static horizontal acceleration (kh) of 0.20. Results are summarized below in Tables 1.2 and 1.3.

Table 1.2 – Static Global Stability Analysis						
Wall Number	**Direction**	**Loading Condition**	**Demand/ Capacity, D/C**			**Performance Criteria Met**
			Morganstern-Price	**Bishop**	**Spencer**	
Wall 18 I-85 Station 413+50	Transverse	ESA	0.61	0.61	0.61	Yes
		TSA	0.41	0.41	0.41	Yes

Table 1.3 – Extreme Limit State Global Stability Analysis						
Wall Number	**Direction**	**k_h**	**Demand/Capacity, D/C**			**Performance Criteria Met**
			Morganstern-Price	**Bishop**	**Spencer**	
Wall 18 I-85 Station 413+50	Transverse	0.20	0.61	0.62	0.61	Yes

Revisions to the Geotechnical Notes on Plans have been made to reflect the changes to walls 18 and 55, and are provided in attached Roadway Notes on Plans. As shown in the attached analysis, the proposed wall 18 meets the SCDOT GDM performance requirements.

If you have any questions concerning the MSE Wall recommendations, please do not hesitate to contact us.

Respectfully,

ECS SOUTHEAST, LLP

Jacob E. Erickson, E.I.
Geotechnical Staff Project Manager

Marc F. Plotkin, P.E., D.GE
Principal Engineer
SC Registration No. 30565

Attachments: MSE External Stability Results
MSE Global Stability Results
Geotechnical Notes on Plans

SOUTH CAROLINA
ECS
SOUTHEAST, LLP
No. COA3239
CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 30565
5-22-18
MARC F PLOTKIN

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
1589 MAIL SERVICE CENTER

WBS NO.: | TIP NO.: | COUNTY:
SUBJECT: LRFD External Stability Analysis for MSE Walls
I-85 Wall 18
PREPARED BY: JEE | DATE: 05/22/18 | STATION: 413+50
CHECKED BY: | DATE: | STR. NO.: | SHEET: 1 OF 8

Input Traffic Surcharge, Backslope, Wall Geometry, and Soil Parameters

Traffic and Overlay Surcharge Surcharge

q =	390	psf	*Live Load Traffic Surcharge and Pavement Overlay*
	35.9	%	Surcharge due to overlay
q_{ol} =	140	psf	*Pavement overlay surcharge*

Backslope

Horizontal Backslope

(d = horizontal distance from back of wall face to top of backslope)

Wall Geometry

H =	7.00	ft	*Wall Height*
L/H =	1.79		*Ratio of Reinforcement Length to Wall Height (L/H ≥ 0.7 per NCDOT MSE Wall Standard Provision)*
L =	12.50	ft	*Reinforcement Length (L ≥ 6 ft per NCDOT MSE Wall Standard Provision)*
h =	7.00	ft	*Height of Wall & Slope at the back of Reinforced Zone*
D_w =	10.00	ft	*Distance of Water Table below the Bottom of the Wall*

Soil Parameters for Reinforced Zone

ϕ'_r =	36	deg	*Effective Friction Angle*
γ'_r =	120	pcf	*Effective Unit Weight*
K_{a_r} =	0.260		*Active Earth Pressure Coefficent (AASHTO Eqn 3.11.5.3-2)*

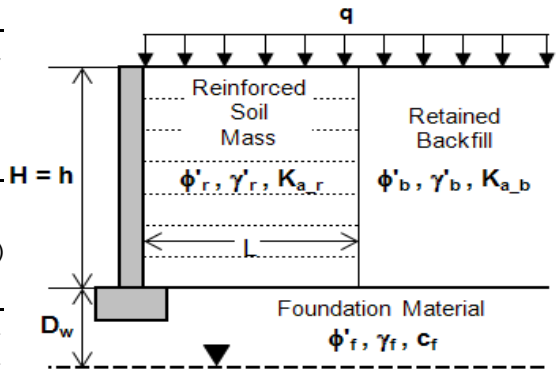
Soil Parameters for Retained Backfill

ϕ'_b =	30	deg	*Effective Friction Angle*
γ'_b =	117	pcf	*Effective Unit Weight*
K_{a_b} =	0.333		*Active Earth Pressure Coefficent (AASHTO Eqn 3.11.5.3-2)*

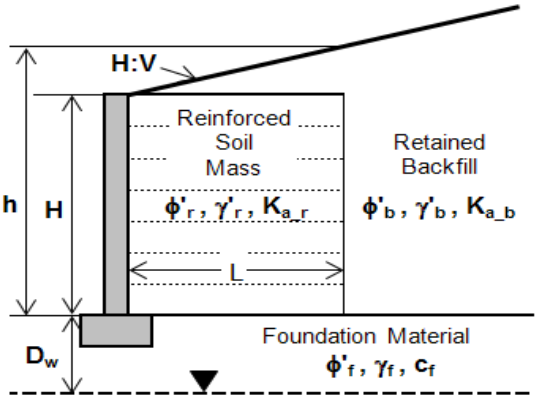
Soil Parameters for Foundation Soil

ϕ'_f =	26	deg	*Effective Friction Angle*
γ_f =	105	pcf	*Total Unit Weight*
c_f =	100	psf	*Undrained Shear Strength (Cohesion)*
μ =	0.49		*Coefficient of Friction (AASHTO 11.10.5.3)*

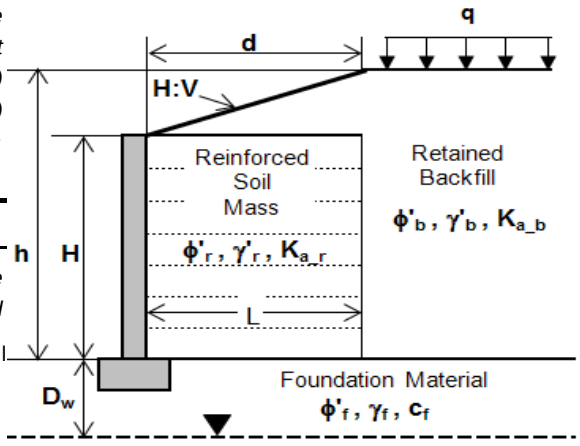
The coefficient of friction shall be based on the lesser of ϕ'_r and ϕ'_f.



Typical MSE Wall with Level Backslope and Traffic Surcharge



Typical MSE Wall with Infinite Backslope



Typical MSE Wall with Broken Backslope and Traffic Surcharge

Input Load and Resistance Factors

Load Factors (See AASHTO Table 3.4.1-1 and 2)

Ψ_{LS} =	1.75		*Lilve Load Surcharge*
$\Psi_{EH(A)}$ =	1.50		*Horizontal (Active) Earth Pressure Load*
Ψ_{EV} =	1.00	min	Vertical Dead Load Generated from Earth Fill
	1.35	max	
Ψ_{EQ-p} =	1.00		
Ψ_{EQ-LL} =	0.50		

Resistance Factors (See AASHTO Table 11.5.6-1)

φ_b =	0.65	*Bearing Resistance for MSE Walls*
φ_τ =	1.00	*Sliding Resistance for MSE Walls*

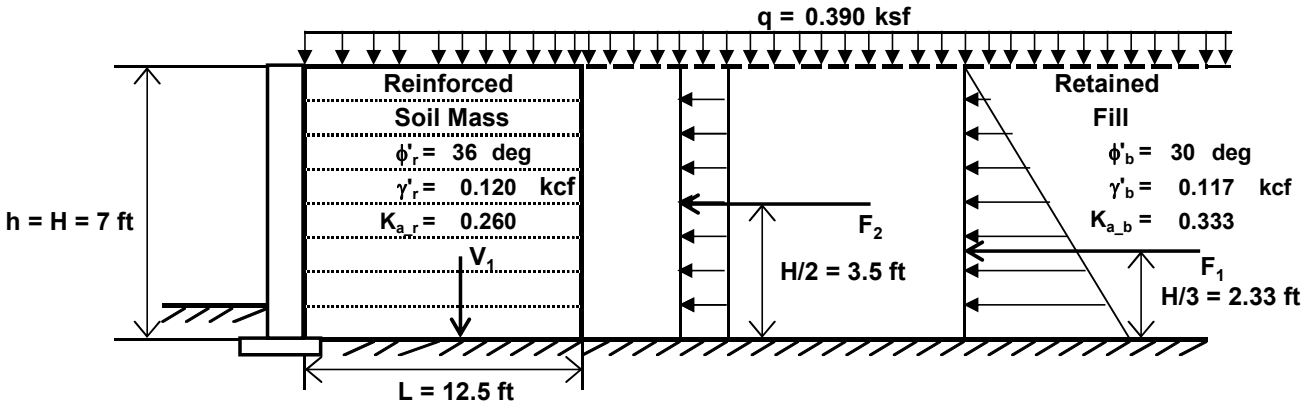
Seismic Design Acceleration Parameters

k_{max} =	0.20	*Maximum Horizontal Ground Acceration (PGA)*
S_{d1} =	0.14	*Peak spectral acceleration at 1 second*

References:

1. *AASHTO LRFD Bridge Design Specifications, 5th Edition, 2010*
2. *FHWA-NHI-10-024 Design and Construction of MSE Walls and Reinforced Soil Slopes - Vol I, 2009*
3. *SCDOT Geotechnical Design Manual version 1.1, 2010*

Calculate Forces acting on Wall



External Stability for MSE Walls: Earth Pressure - Level Backslope with Surcharge Case
(Based on FHWA Figure 4-2 and AASHTO Figure 11.10.5.2-1)
All Forces are Calculated per Unit Length of Wall
Figure Not Drawn to Scale

Forces from Vertical Earth Loads

V_1 = Total Vertical Force from the Reinforced Soil Mass = $(\gamma'_r)(H)(L)$
= (0.120 kcf)(7.00 ft)(12.50 ft) = 10.500 kips

Forces from Lateral Earth Pressure

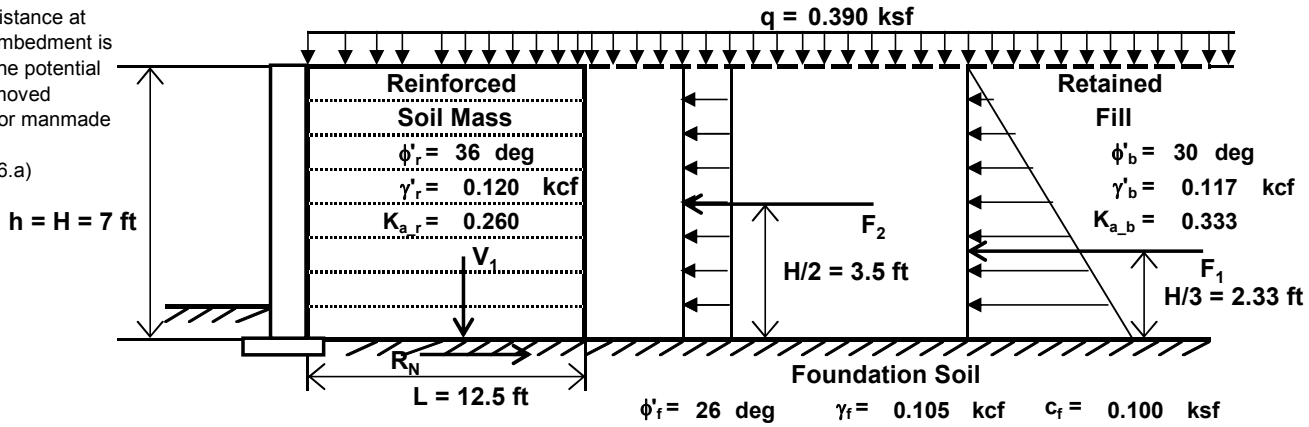
F_1 = Total Force Generated from Lateral Earth Pressure = $0.5(\gamma'_b)(H^2)(K_{ab})$ FHWA Eqn. 4-5
= (0.5)(0.117 kcf)(7.00 ft)^2(0.333) = 0.955 kips

Horizontal Force from Traffic Surcharge

F_2 = Force Generated from Traffic Surcharge = $(q)(H)(K_{ab})$ *FHWA Eqn. 4-6*
= (0.390 ksf)(7.00 ft)(0.333) = 0.909 kips

Sliding Stability - AASHTO 11.10.5.3, AASHTO 10.6.3.4, and FHWA 4.4.6.a

The passive resistance at the toe due to embedment is ignored due to the potential for soil to be removed through natural or manmade processes. (per FHWA 4.4.6.a)



External Stability for MSE Walls: Sliding Stability - Level Backslope with Surcharge Case
(Based on FHWA Figure 4-2 and AASHTO Figure 11.10.5.2-1)
All Forces are Calculated per Unit Length of Wall
Figure Not Drawn to Scale

Calculate Factored Sliding Resistance (R_R)

$R_R = \varphi R_N = \varphi_\tau R_\tau$ *AASHTO Eqn. 10.6.3.4-1*

Sliding Stability Continued - AASHTO 11.10.5.3, AASHTO 10.6.3.4, and FHWA 4.4.6.a

φ_τ = *Resistance Factor for Sliding* = 1.00 — *AASHTO Table 11.5.6-1*

R_τ = *Nominal Sliding Resistance between Reinforced Soil Mass and Foundation Soil*

$= \Psi_{EV}(V_1)\mu + (c_f)(L)$ — *FHWA Eqn. 4-12 and AASHTO 10.6.3.4*

Ψ_{EV} = Load Factor for Dead Load of Earth Fill = 1.00 — *AASHTO Table 3.4.1-1*

(Use the Min Value of Ψ_{EV} per FHWA 4.4.6.a, AASHTO C3.4.1, and AASHTO C11.5.5)

V_1 = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips

μ = Coefficent of Friction between Reinforced Soil Mass and Foundation Soil = 0.49 — *AASHTO 11.10.5.3*

c_f = Cohesion for Foundation Soil = 0.100 ksf

L = Reinforcement Length = 12.50 ft

R_τ = (1.00)(10.50 kips)(0.49) + (0.100 ksf)(12.50 ft) = 6.40 kips

R_R = (1.00)(6.40 kips) = 6.40 kips

Calculate Factored Horizontal Driving Force (P_d)

$P_d = (\Psi_{EHA})(F_1) + (\Psi_{LS})(F_2)$ — *FHWA Eqn. 4-9*

Ψ_{EHA} = Load Factor for Horizontal (Active) Earth Pressure = 1.50 — *AASHTO Table 3.4.1-1*

F_1 = Force Generated from Lateral Earth Pressure = 0.955 kips — *FHWA Eqn. 4-5*

Ψ_{LS} = Load Factor for Horizontal (Active) Earth Pressure = 1.75 — *AASHTO Table 3.4.1-1*

F_2 = Force Generated from Traffic Surcharge = 0.909 kips — *FHWA Eqn. 4-6*

P_d = (1.50)(0.955 kips) + (1.75)(0.909 kips) = 3.023 kips

Check Sliding

R_R must be greater than or equal to P_d

6.395 kips ≥ 3.023 kips

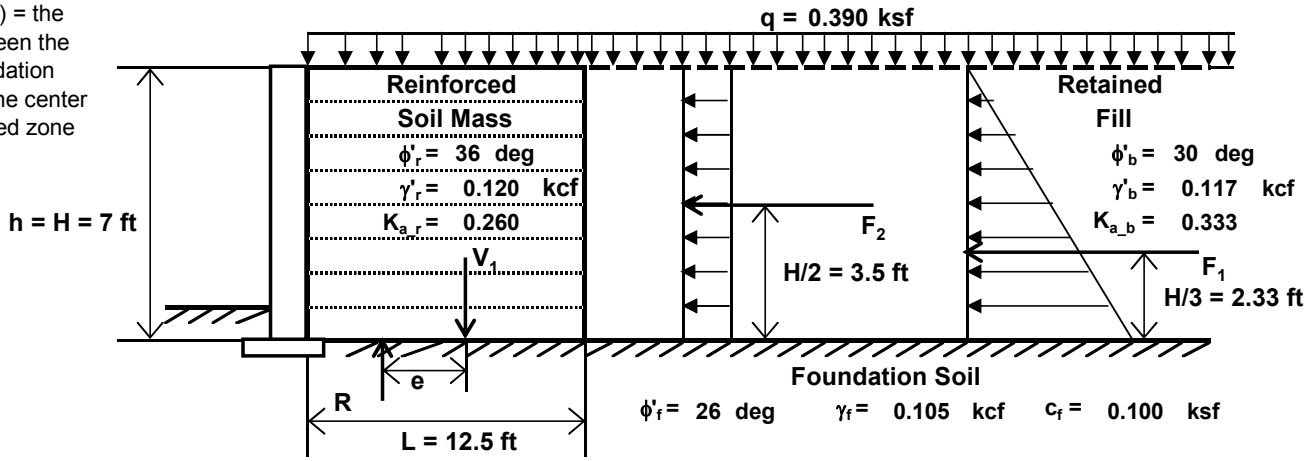
OK

Calculated Resistance Factor

$P_d/(Rr/\varphi_t)$ = **0.47**

Overturning (Limiting Eccentricity) - AASHTO 11.6.3.3, AASHTO 11.10.5.5 and FHWA 4.4.6.b

Eccentricity (e) = the distance between the resultant foundation load (R) and the center of the reinforced zone



External Stability for MSE Walls: Overturning - Level Backslope with Surcharge Case
(Based on FHWA Figure 4-7 and AASHTO Figure 11.10.5.2-1)
Figure Not Drawn to Scale - All Forces are Calculated per Unit Length of Wall
Figure Not Drawn to Scale

Calculate Eccentricity (e)

$$e = \frac{\Psi_{EHA}F_1(H/3) + \Psi_{LS}F_2(H/2)}{\Psi_{EV}V_1}$$

FHWA Eqn. 4-15

Overturning (Limiting Eccentricity) Continued - AASHTO 11.6.3.3, AASHTO 11.10.5.5 and FHWA 4.4.6.b

Ψ_{EHA} = Load Factor for Horizontal (Active) Earth Pressure = 1.50
Ψ_{EV} = Load Factor for Dead Load of Earth Fill = 1.00
(Use the Min Value of Ψ_{EV} per FHWA 4.4.6.a, AASHTO C3.4.1, and AASHTO C11.5.5)
Ψ_{LS} = Load Factor for Surcharge = 1.75
F_1 = Force Generated from Lateral Earth Pressure = 0.955 kips
F_2 = Force Generated from Traffic Surcharge = 0.909 kips
V_1 = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips
H = MSE Wall Height = 7.00 ft

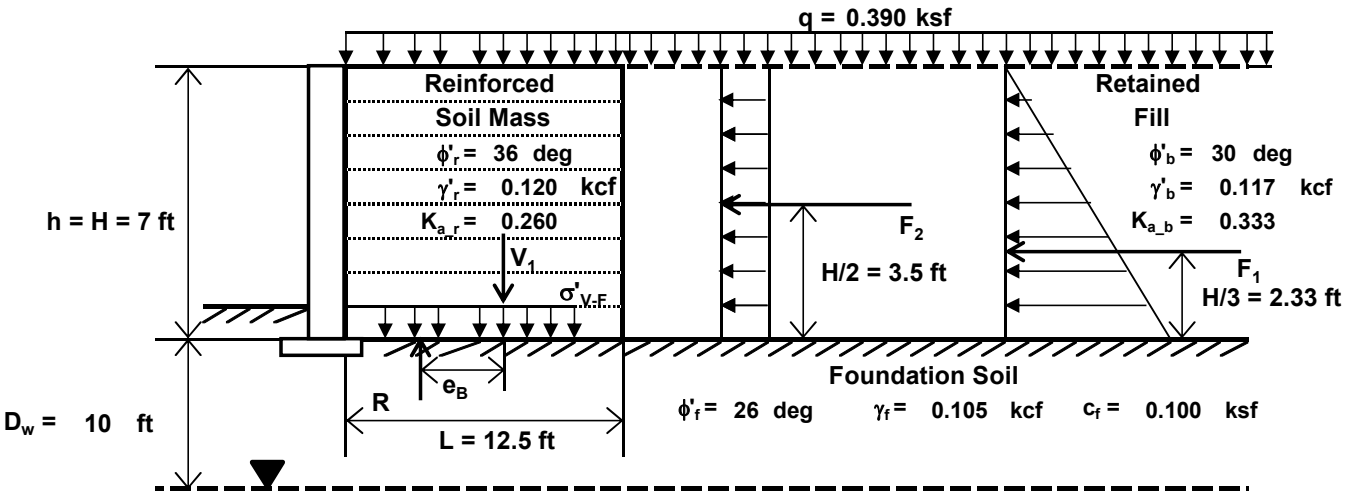
$$e = \frac{(\ 1.50\ )(\ 0.955\ \text{kips}\ )(\ 2.33\ \text{ft}\ ) + (\ 1.75\ )(\ 0.909\ \text{kips}\ )(\ 3.50\ \text{ft}\ )}{(\ 1.00\ )(\ 10.500\ \text{kips}\ )}$$

$$= 0.85\ \text{ft}$$

Check Eccentricity

e must be less than or equal to L/4 per AASHTO 11.6.3.3
0.85 ft ≤ 3.13 ft
OK

Bearing Resistance (General Shear) - AASHTO 11.10.5.4, AASHTO 10.6.3.1, and FHWA 4.4.6.c



External Stability for MSE Walls: Bearing Resistance - Level Backslope with Surcharge Case
(Based on FHWA Figure 4-7 and AASHTO Figure 11.10.5.2-1)
All Forces are Calculated per Unit Length of Wall
Figure Not Drawn to Scale

Calculate Eccentricity for Bearing, (e_B)

$$e_B = \frac{\Psi_{EHA}F_1(H/3) + \Psi_{LS}F_2(H/2)}{\Psi_{EV}V_1 + \Psi_{LS}qL}$$ *FHWA Eqn. 4-19*

Ψ_{EHA} = Load Factor for Horizontal (Active) Earth Pressure = 1.50 *AASHTO Table 3.4.1-1*
Ψ_{EV} = Load Factor for Dead Load of Earth Fill = 1.35 *AASHTO Table 3.4.1-1 and FHWA 4.4.6.a*
(Use the Max Value of Ψ_{EV} per FHWA 4.4.6.a, AASHTO C3.4.1, and AASHTO C11.5.5)
Ψ_{LS} = Load Factor for Surcharge = 1.75 *AASHTO Table 3.4.1-1*
F_1 = Force Generated from Lateral Earth Pressure = 0.955 kips *FHWA Eqn. 4-5*
F_2 = Force Generated from Traffic Surcharge = 0.909 kips *FHWA Eqn. 4-6*
V_1 = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips

Bearing Resistance Continued (General Shear) - AASHTO 11.10.5.4, AASHTO 10.6.3.1, and FHWA 4.4.6.c

q = Live Load Traffic Surcharge = 0.390 ksf
H = MSE Wall Height = 7.00 ft
L = Reinforcement Length = 12.50 ft

$$e_B = \frac{(1.50)(0.955 \text{ kips})(2.33 \text{ ft}) + (1.75)(0.909 \text{ kips})(3.50 \text{ ft})}{(1.35)(10.5 \text{ kips}) + (1.75)(0.390 \text{ ksf})(12.50 \text{ ft})}$$

$= 0.39$ ft

Calculate Nominal Bearing Resistance, (q_n) — *AASHTO Eqn. 10.6.3.1.2a-1*

$q_n = c_f N_c + 0.5\gamma B' N_\gamma C_{w\gamma}$ — *AASHTO Eqn. 10.6.3.1.2a-1*

c_f = Cohesion for Foundation Soil = 0.100 ksf
N_c = Bearing Capacity Factor (based on ϕ'_f) = 22.30 — *AASHTO Table 10.6.3.1.2a-1*
γ_f = Total Unit Weight for Foundation Soil = 0.105 kcf
B' = Effective Foundation Width = L - $2e_B$ — *AASHTO C11.10.5.4*
= 12.5 ft - 2(0.39 ft) = 11.72 ft
N_γ = Bearing Capacity Factor (based on ϕ'_f) = 12.50 — *AASHTO Table 10.6.3.1.2a-1*
$C_{w\gamma}$ = Correction Factor to Account for Location of Groundwater Table = 0.8 — *AASHTO Table 10.6.3.1.2a-2*

$q_n = (0.100 \text{ ksf})(22.30) + (0.5)(0.105 \text{ kcf})(11.72 \text{ ft})(12.50)(0.80)$

$= 8.383$ ksf

Calculate Factored Bearing Resistance, (q_r)

$q_r = \varphi_b q_n$ — *AASHTO Eqn. 10.6.3.1.1-1*

φ_b = Resistance Factor for Bearing = 0.65 — *AASHTO Table 11.5.6-1*
q_n = Nominal Bearing Resistance = 8.383 ksf — *AASHTO Eqn. 10.6.3.1.2a-1*

$q_r = (0.65)(8.383 \text{ ksf}) = 5.449$ ksf

Calculate Factored Vertical Bearing Pressure at the base, ($q_{V\text{-}F}$)

$$\sigma_{V\text{-}F} = \frac{\Psi_{EV} V_1 + \Psi_{LS} qL}{L - 2e_B}$$ — *FHWA Eqn. 4-20*

Ψ_{EV} = Load Factor for Dead Load of Earth Fill = 1.35 — *AASHTO Table 3.4.1-1 and FHWA 4.4.6.a*
(Use the Max Value of Ψ_{EV} per FHWA 4.4.6.c, AASHTO C3.4.1, and AASHTO C11.5.5)
V_1 = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips
Ψ_{LS} = Load Factor for Surcharge = 1.75 — *AASHTO Table 3.4.1-1*
q = Live Load Traffic Surcharge = 0.390 ksf
L = Reinforcement Length = 12.50 ft
e_B = Eccentricity for Bearing = 0.39 ft — *FHWA Eqn. 4-19*

$$\sigma_{V\text{-}F} = \frac{(1.35)(10.50 \text{ kips ft}) + (1.75)(0.390 \text{ ksf})(12.50 \text{ ft})}{12.50 \text{ ft} - 2(0.39 \text{ ft})}$$

$= 1.937$ ksf

Check Bearing

q_R must be greater than or equal to $q_{V\text{-}F}$

5.449 ksf ≥ 1.937 ksf

OK

Calculated Resistance Factor

$\sigma_{V\text{-}F}/q_n$ = **0.23**

Bearing Resistance (Local/Punching Shear) - AASHTO 11.10.5.4, AASHTO 10.6.3.1.2b, and FHWA 4.4.6.c

Local and Punching shear failure occurs in loose or compressible soils and in weak soils under slow (drained) loading. This mode of failure will only be considered for foundation material that is cohesive.

To prevent Local/Punching Shear on weak cohesive soils

$(\gamma_r)(H) \leq 3c_f$ *FHWA Eqn. 4-24*

γ_r = Effective Unit Weight of Reinforced Soil Mass = 0.120 kcf
H = Height of MSE Wall = 7.00 ft
c_f = Undrained Shear Strength (Cohesion) of Foundation Soil = 0.100 ksf

(0.120 kcf)(7.00 ft) ≤ 3 (0.100 ksf)

0.840 ksf > 0.300 ksf **The foundation is subject to Local/Punching Shear. Check Reduced Bearing Resistance**

Calculate Reduced Nominal Bearing Resistance, (q_n)

$q_n = c^*_f N_c + 0.5\gamma B' N_\gamma C_{w\gamma}$ *AASHTO Eqn. 10.6.3.1.2a-1*

c^*_f = Reduced Cohesion for Foundation Soil = $0.67c_f$
= 0.67 (0.100 ksf) = 0.067 ksf *AASHTO 10.6.3.1.2b-1*
N_c = Bearing Capacity Factor (based on f'^*_f) = 13.10 *AASHTO Table 10.6.3.1.2a-1*
γ = Effective Unit Weight for Foundation Soil = 0.105 ksf
B' = Effective Foundation Width = L - $2e_B$ *AASHTO C11.10.5.4*
= 12.5 ft - 2 (0.39 ft) = 11.72 ft
N_γ = Bearing Capacity Factor (based on ϕ'^*_f) = 4.10 *AASHTO Table 10.6.3.1.2a-1*
$C_{w\gamma}$ = Correction Factor to Account for Location of Groundwater Table = 0.8 *AASHTO Table 10.6.3.1.2a-2*
ϕ'^*_f = Reduced Friction Angle for Foundation Soil = $\tan^{-1}(0.67 \tan \phi'_f)$
= $\tan^{-1}$[0.67 tan (26 deg)] = 18 deg *AASHTO 10.6.3.1.2b-2*

q_n = (0.067 ksf)(13.10) + (0.5)(0.105 kcf)(12.50 ft)(4.10)(0.8)
= 3.030 ksf

Calculate Reduced Factored Bearing Resistance, (q_r)

$q_r = \varphi_b q_n$ *AASHTO Eqn. 10.6.3.1.1-1*

φ_b = Resistance Factor for Bearing = 0.65 *AASHTO Table 11.5.6-1*
q_n = Nominal Bearing Resistance = 3.030 ksf *AASHTO Eqn. 10.6.3.1.2a-1*

q_r = (0.65)(3.030 ksf) = 1.970 ksf

Check Bearing

q_R must be greater than or equal to $q_{V\text{-}F}$
1.97 ksf ≥ 1.937 ksf
OK

Seismic Stablity - SCDOT GDM Section 14.12

Calculate Wave Scattering Effects

Wave Scattering Coefficient, α_w =1+0.01H((0.5β)-1<1.0 SCDOT Equation 13-103

α_w = 0.9545

Ground Motion Index, $\beta = k_{max}/S_{d1}$ = 0.70 SCDOT Equation 13-104

Average seismic horizontal coefficient due to wave scattering

$k_h = \alpha_w * k_{max}$ = 0.2 SCDOT Equation 13-102

Calculate Seismic Active Earth Pressure Coefficinet (Mononobe -Kobe Method) SCDOT GDM Section 14.4.1

Seismic Active Earth Pressure Coefficient Reinforced Soils, K_{AEr} = 0.584

Seismic Active Earth Pressure Coefficient Retained, K_{AEb} = 0.678

$$K_{ae} = \frac{\cos^2(\phi - \Psi - \theta)}{\cos(\Psi)\cos^2(\theta)\cos(\delta + \theta + \Psi)\left[1 + \sqrt{\frac{\sin(\phi + \delta)\sin(\phi - \Psi - \beta)}{\cos(\delta + \theta + \Psi)\cos(\beta - \theta)}}\right]^2}$$ Equation 14-2

Where,

γ	=	unit weight of soil
H	=	height of wall or effective height of wall (h_{eff})
ϕ	=	angle of internal friction of soil
Ψ	=	$\tan^{-1}[k_h/(1-k_v)]$
δ	=	angle of friction between soil and wall
k_h	=	horizontal acceleration coefficient
k_v	=	vertical acceleration coefficient, typically set to zero.
β	=	backfill slope angle
θ	=	angle of backface of the wall with the vertical

Reinforced Soil				Retained Soil			
φ	=	36.0	deg	φ	=	30.0	deg
Ψ	=	11.3	deg	Ψ	=	11.3	deg
θ	=	0	deg	θ	=	0	deg
δ	=	0	deg	δ	=	0.00	deg
β	=	0	deg	β	=	0	deg

Calculate Inertial Wall Width, $B_{inertial} = \omega H$ 5

coefficient, ω = 0.70

Calculate Active Earth Thrust Force, $P_{AE} = \gamma_p * 0.5 K_{AEr} * \gamma_p * H^2$ = 1.9 kips GDM Eq. 14-40

Calculate Intertial Reinforced Soil Mass Force, $P_{IR} = \gamma_p * k_{avg} * B_{inertial} * H_{wall} *$ = 0.12 kips GDM Eq. 14-41

Dead Load Surcharge Force, P_{DC} = = 0.664 kips GDM Eq. 14-45

Live Load Surcharge Force, P_{LL} = = 0.593 kips GDM Eq. 14-46

Total Seismic Driving Force, F_H = 3.3 kip Calculated Resistance Factor, $\varphi = F_H/R_t$ = **0.52**

Calculate Eccentricity for Bearing, (e_B)

$$e_B = \frac{\Psi_{EQ\text{-}P}F_{1s}(H/2) + \Psi_{EQ\text{-}LL}F_{2s}(H/2)}{\Psi_{EV}V_I + \Psi_{EQ\text{-}LL}qL}$$ *FHWA Eqn. 4-19*

$\Psi_{EHAeq} = \Psi_{EQ\text{-}p}$ = Load Factor for Horizontal (Active) Earth Pressure = 1.00 *AASHTO Table 3.4.1-1*

Ψ_{EV} = Load Factor for Dead Load of Earth Fill = 1.00 *AASHTO Table 3.4.1-1 and FHWA 4.4.6.a*

(Use the Min Value of Ψ_{EV} per FHWA 4.4.6.a, AASHTO C3.4.1, and AASHTO C11.5.5)

$\Psi_{LSeq} = \Psi_{EQ\text{-}p}$ = Load Factor for Surcharge = 1.00 *AASHTO Table 3.4.1-1*

F_{1s} = Force Generated from Lateral Earth Pressure = 2.725 kips *FHWA Eqn. 4-5*

F_{2s} = Force Generated from Traffic Surcharge = 0.593 kips *FHWA Eqn. 4-6*

V_I = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips

q = Live Load Traffic Surcharge = 0.250 ksf *FHWA Eqn. 4-19*

H = MSE Wall Height = 7.00 ft

L = Reinforcement Length = 12.50 ft

$$e_B = \frac{(\ 1.00\ )(\ 2.725\ \text{kips}\ )(\ 3.50\ \text{ft}\ ) + (\ 1.00\ )(\ 0.593\ \text{kips}\ )(\ 3.50\ \text{ft}\ )}{(\ 1.00\ )(\ 10.5\ \text{kips}\ ) + (\ 1.00\ )(\ 0.250\ \text{ksf}\ )(\ 12.50\ \text{ft}\ )}$$

$= 0.85$ ft

Calculate Factored Vertical Bearing Pressure at the base, ($q_{V\text{-}F}$)

$$\sigma_{V\text{-}F} = \frac{\Psi_{EQ\text{-}P}V_I + \Psi_{EQ\text{-}LS}qL}{L - 2e_B}$$ *FHWA Eqn. 4-20*

$\Psi_{EQ\text{-}p}$ = Load Factor for Dead Load of Earth Fill = 1.00

V_I = Total Vertical Force from the Reinforced Soil Mass = 10.500 kips

$\Psi_{LSeq} = \Psi_{EQ\text{-}ll}$ = Load Factor for Surcharge = 1.00

q = Live Load Traffic Surcharge = 0.250 ksf

L = Reinforcement Length = 12.50 ft

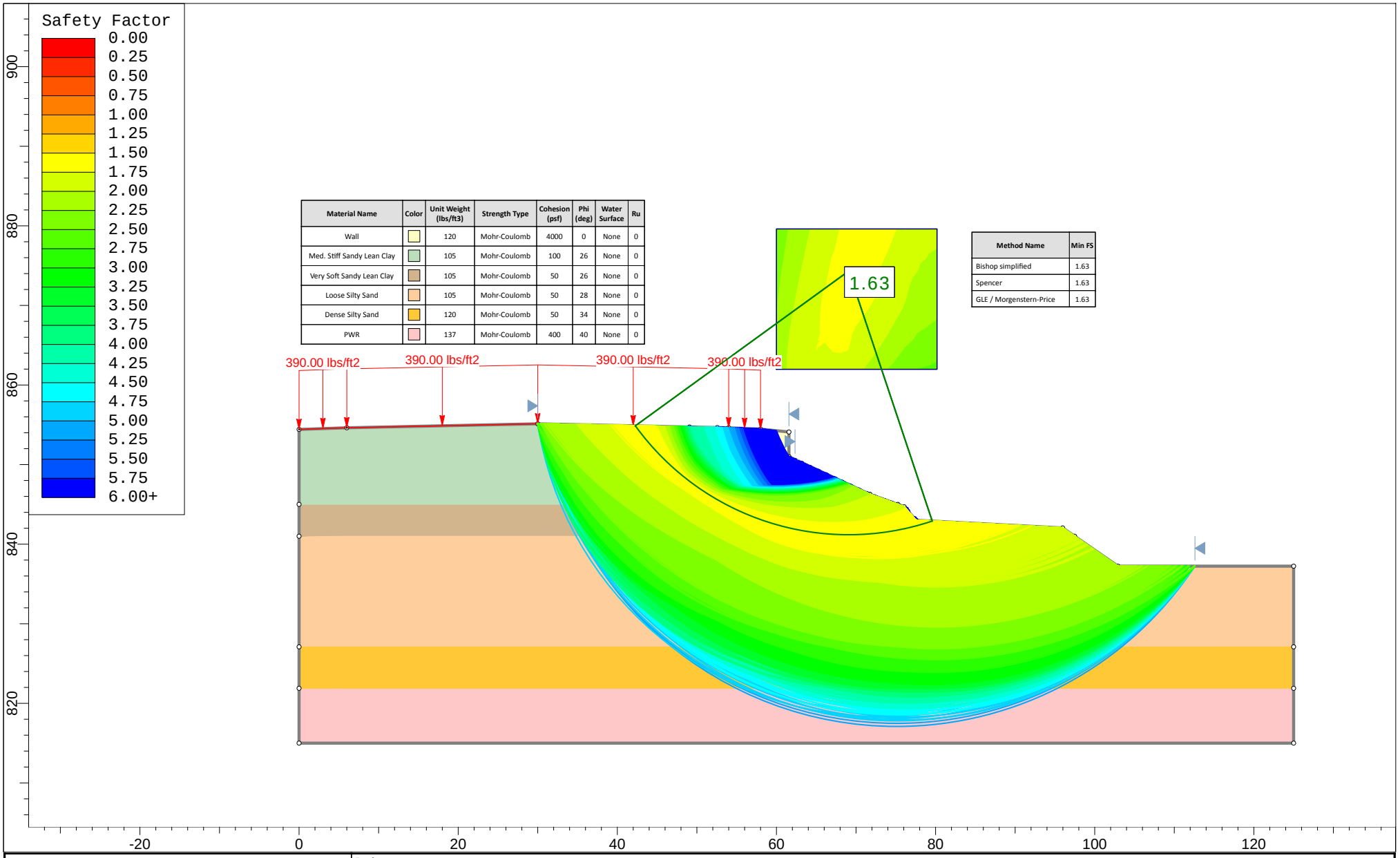
e_B = Eccentricity for Bearing = 0.85 ft

$$\sigma_{V\text{-}F} = \frac{(\ 1.00\ )(\ 10.50\ \text{kips}\ )(\ \text{ft}\ ) + (\ 1.00\ )(\ 0.250\ \text{ksf}\ )(\ 12.50\ \text{ft}\ )}{12.5\ \text{ft} - 2(\ 0.85\ \text{ft}\ )}$$

$= 1.424$ ksf

Calculated Resistance Factor

$\sigma_{V\text{-}F}/q_n$ = **0.17**

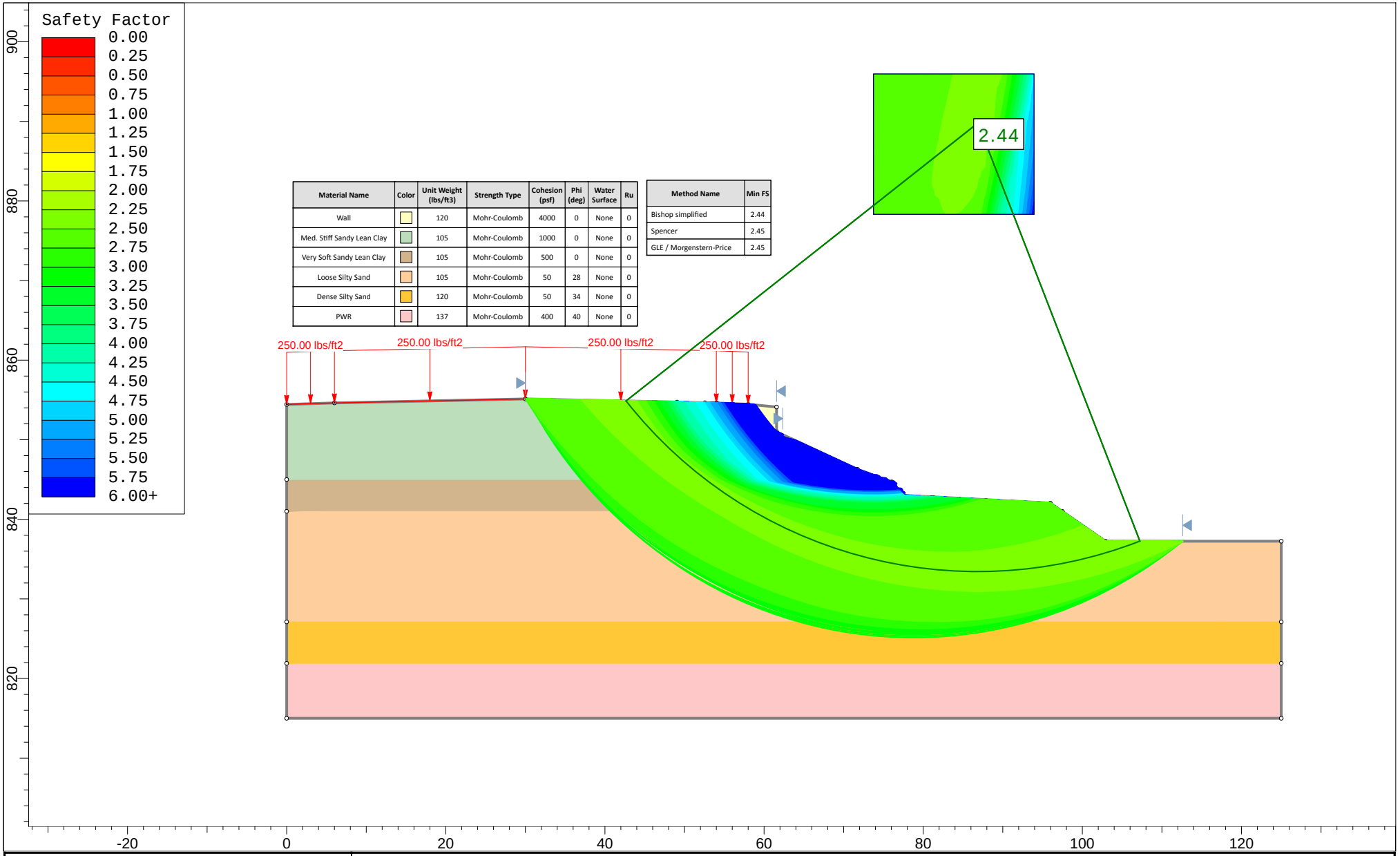


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Wall		120	Mohr-Coulomb	4000	0	None	0
Med. Stiff Sandy Lean Clay		105	Mohr-Coulomb	100	26	None	0
Very Soft Sandy Lean Clay		105	Mohr-Coulomb	50	26	None	0
Loose Silty Sand		105	Mohr-Coulomb	50	28	None	0
Dense Silty Sand		120	Mohr-Coulomb	50	34	None	0
PWR		137	Mohr-Coulomb	400	40	None	0

Method Name	Min FS
Bishop simplified	1.63
Spencer	1.63
GLE / Morgenstern-Price	1.63

Project	I-85/385 Interchange Improvements - Project ID: 003811; ECS Project No. 9283		
Analysis Description	Rocky Mountain Creek Roadway and Retaining Walls - Wall 18 Sta 414+00		
Drawn By	JEE	*Scale* 1:200	*Company* ECS Southeast LLP
Date	05-22-2018	*File Name*	STA 414+00 ESA.slim

SLIDEINTERPRET 8.010

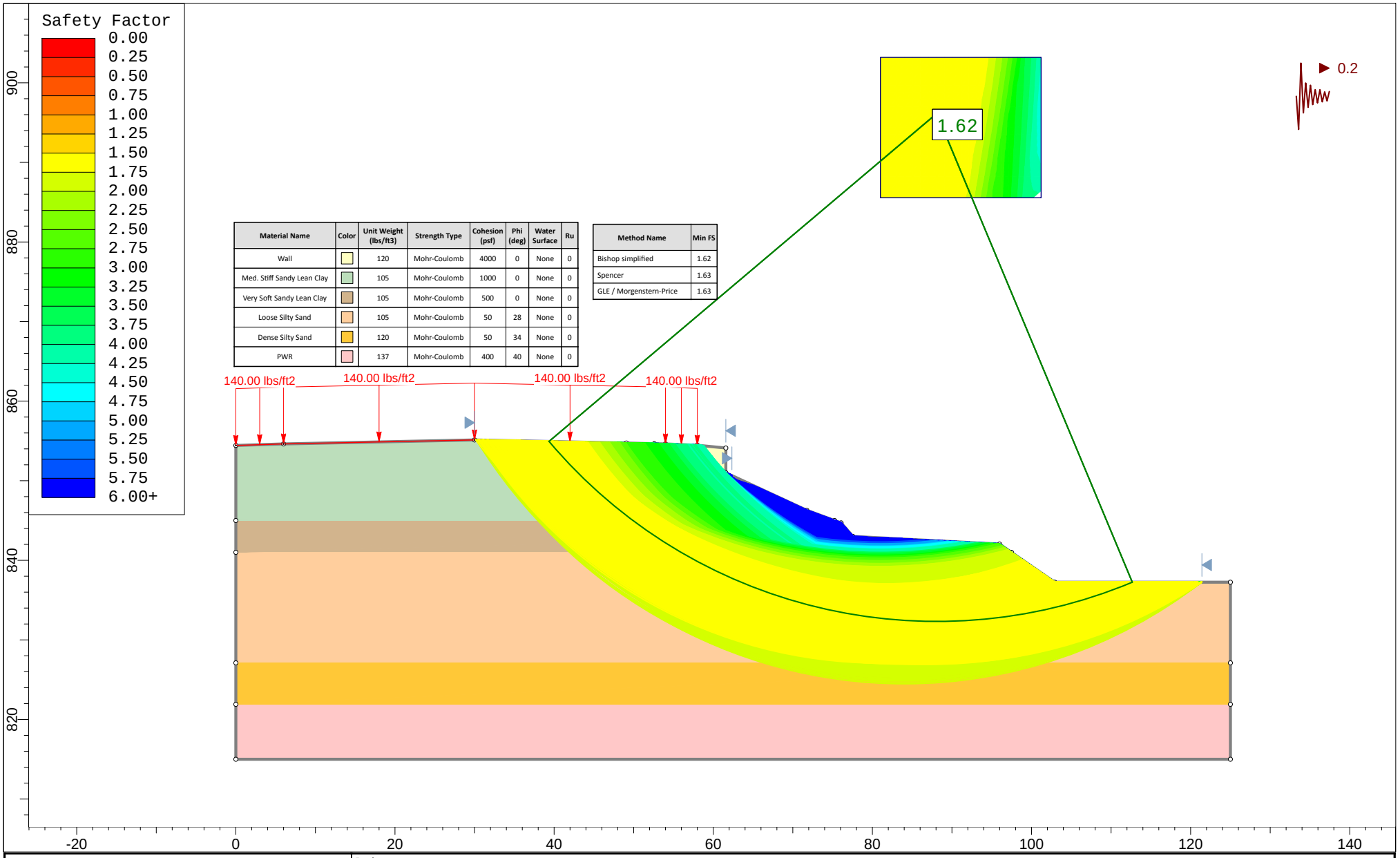


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Wall		120	Mohr-Coulomb	4000	0	None	0
Med. Stiff Sandy Lean Clay		105	Mohr-Coulomb	1000	0	None	0
Very Soft Sandy Lean Clay		105	Mohr-Coulomb	500	0	None	0
Loose Silty Sand		105	Mohr-Coulomb	50	28	None	0
Dense Silty Sand		120	Mohr-Coulomb	50	34	None	0
PWR		137	Mohr-Coulomb	400	40	None	0

Method Name	Min FS
Bishop simplified	2.44
Spencer	2.45
GLE / Morgenstern-Price	2.45

Project	I-85/385 Interchange Improvements - Project ID: 003811; ECS Project No. 9283		
Analysis Description	Rocky Mountain Creek Roadway and Retaining Walls - Wall 18 Sta 414+00		
Drawn By	JEE	*Scale* 1:200	*Company* ECS Southeast LLP
Date	05-22-2018		*File Name* STA 414+00 TSA.slim

SLIDEINTERPRET 8.010



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Wall		120	Mohr-Coulomb	4000	0	None	0
Med. Stiff Sandy Lean Clay		105	Mohr-Coulomb	1000	0	None	0
Very Soft Sandy Lean Clay		105	Mohr-Coulomb	500	0	None	0
Loose Silty Sand		105	Mohr-Coulomb	50	28	None	0
Dense Silty Sand		120	Mohr-Coulomb	50	34	None	0
PWR		137	Mohr-Coulomb	400	40	None	0

Method Name	Min FS
Bishop simplified	1.62
Spencer	1.63
GLE / Morgenstern-Price	1.63

Project	I-85/385 Interchange Improvements - Project ID: 003811; ECS Project No. 9283		
Analysis Description	Rocky Mountain Creek Roadway and Retaining Walls - Wall 18 Sta 414+00		
Drawn By	JEE	Scale 1:200	Company ECS Southeast LLP
Date	05-22-2018		File Name STA 414+00 TSA -EQ.slim

SLIDEINTERPRET 8.010

NOTES ON PLANS

The following notes apply to borrow materials:

Provide borrow materials meeting the following minimum requirements:

- **A sandy material (35% or less passing 0.075 mm) with a minimum total soil unit weight, γ_{total} of 110 pcf, with a maximum dry density exceeding 100 pcf.**
- **Minimum friction angle, φ, of 30° and cohesion, c, of 50 psf for embankment fill, alternatively embankment fill may consist of a minimum friction angle (φ) of 34° with zero cohesion.**
- **No. 57 Stone backfill for Mechanically Stabilized Earth Walls**

In addition, determine the moisture-density relationship and classification of the material. Test and submit the classification, moisture-density relationship, and soil strength parameters of the material to the Engineer for acceptance. An AASHTO certified laboratory is required to perform the testing. Contact the RPG Geotechnical Engineer for a list of locally available AASHTO certified laboratories. The Department may perform independent testing to assure quality.

Determine the friction angle and cohesion using either direct shear testing or consolidated-undrained triaxial shear testing with pore pressure measurements. Direct Shear testing shall only be performed on soils with a fines content of less than 25 percent. Classification testing includes grain-size distribution with wash #200 sieve, moisture plasticity testing and natural moisture content. Use the Standard Proctor test to determine the moisture-density relationship. Remold all samples used in shear strength testing to 95 percent of the Standard Proctor density. Conduct shear strength testing at the initial selection of the borrow pit, any subsequent changes in borrow pits, and for every 10,000 cy of materials placed. Perform classification testing for every 50,000 cy of materials placed, including the material used for the shear strength testing. Additional shear testing may be required if, in the opinion of the RCE, the materials being placed are different from those originally tested.

If these minimum criteria cannot be met, provide the soil parameters for the intended borrow excavation material for the project site to the Engineer for review and acceptance. After acceptable borrow material is obtained, compact the fill to the required finish grade line using the compactive effort indicated in the Standard Specifications for Highway Construction, Section 205 (Embankment Construction).

The following notes apply to muck excavation:

Any areas identified on the plans and any additional areas that are discovered to deflect or settle may require corrective action as directed by the RCE. This may include undercutting; placing No. 57 stone aggregate that is separated from other borrow materials by a geotextile for separation of sub-grade and sub-base, and/or additional compactive effort to the approval of the RCE.

In areas that require mucking or undercutting, borrow material soil may be placed as a bridge lift as long as the grade on which the material is being placed is at least 2 feet above ground water level. In the event that groundwater does not allow backfilling with a

borrow material soil, use a No. 57 stone as the bridge lift material. Borrow material bridge lifts may not exceed a 2-foot thickness. The depth at which mucking or undercutting is required is dependent upon encountering a suitable bearing material within the excavation or if a predetermined elevation or depth is required. In most cases, do not undercut more than 3 to 5 feet. The RCE will determine the final mucking or undercutting thickness, unless otherwise specified in the project plans and/or specifications. If a suitable bearing soil is not encountered within this depth range, place a P1 biaxial geogrid with an aperture size of less than or equal to 1 inch and in accordance with the project special provisions beneath a 2-foot thick bridge lift of No. 57 stone. If additional compacted borrow material soil is needed to reach grade, place a geotextile for separation of sub-grade and sub-base between the No. 57 stone and the overlying compacted soil. A bridge lift consisting of borrow material soil may not be placed within 3 feet of the base of the pavement section. Place only compacted borrow material soil or No. 57 stone within this zone. Reference the Standard Specifications for Highway Construction, Earthwork Section, Division 200.

The following notes apply for MSE Wall Subgrades:

Prior to construction of the leveling pad and MSE fill, the RCE shall verify that the retaining wall is founded on subgrade materials possessing the minimum allowable bearing capacity noted on wall plan and elevation sheets. If the RCE determines that the subgrade is unacceptable for placement of MSE fill, the contractor shall undercut the subgrade to the limits directed by the RCE. Unacceptable subgrade materials include, but are not limited to, all high plasticity clays and elastic silts (CH, MH), low plasticity clays and silts (CL, ML) with an unconfined compressive strength less than 2,000 psf, and deleterious debris. Replacement of undercut material will be with Backfill Material, meeting requirements outlined in the SCDOT Standard Specifications for Highway Construction.

The foundation area for the MSE walls might have scattered pockets of soft soils that might be present at the surface or just below the surface for the base of the MSE fill. These soft pockets are only expected to extend a few feet below the base of the MSE fill. The quality assurance representative shall proofroll the subgrade in this area and/or conduct dynamic cone tests at regular intervals to determine that the subgrade meets the requirements of the paragraph above.

There are several locations along the roadway alignment where proposed drainage structures are situated in front of (i.e. parallel) MSE walls, or where new and existing draining structures pass beneath the MSE walls. Where new pipes are parallel to the proposed wall, the pipe should be installed prior to the proposed wall or the wall design should account for the temporary reduction in passive resistance. Where pipes pass beneath walls, the pipes should be designed to account for the increased loading associated with the wall backfill. We recommend the top of each pipe be situated a minimum of 1 foot below the bottom of retaining.

The following notes apply for settlement and displacement monitoring:

The contractor shall establish a monitoring program consisting of settlement instruments. The settlement monitoring program must include establishing settlement monitoring instruments on the subgrade soils prior to fill placement, and at design

pavement subgrade elevation. Settlement monitoring instruments are required at a spacing of every 100 feet along MSE Walls and every 500 feet along embankments with new fill thicknesses exceeding 20 feet. Instruments shall be established at the centerline of road and edge of pavement. Settlement monitoring shall continue until three consecutive measurements demonstrate the rate of settlement is less than 0.1 inches per year. No more than one measurement shall be obtained on a single day.

A minimum of 2 measurements shall be obtained on monuments prior to fill placement, and instruments shall be measured weekly during fill placement. Instrumentation measurements shall be provided to the Geotechnical Engineer within 24 hours of measurements for interpretation. Interpreted results shall be provided to the RCE.

The following notes apply to slope construction:

Where the new fill meets the existing slope, the existing slope shall be benched to limit the potential for a preferential failure surface and to allow compaction at the interface. Benches shall have a minimum horizontal length of 8 feet and a vertical rise of no more than 3 feet. Fill slopes of 2H:1V or steeper shall be overbuilt (i.e. fill should temporarily extend beyond the final slope face) to allow compaction at the slope face. After compaction is complete, the slope may be regraded to the final inclination.

Should seeps or thick lenses of highly plastic soils be observed in the planned fill and cut slopes that are steeper than 2H:1V, ECS must be contacted to determine if the steeper slopes may be constructed as planned or if slope flattening or reinforcing is required. Similarly, if soft or wet ground conditions are observed at the base of planned fill embankments, the QA representative must determine the limits of undercutting required or required in-situ treatment.

The following Plan Notes apply to Mechanically Stabilized Earth walls:

Reinforced Backfill (Granular Fill or stone.)

Internal Friction Angle (deg) = 36
Total Unit Weight = 120 pcf
Surcharge Dead Load for Pavement Overlay = 140 psf
Active Earth Pressure Coefficient = 0.26

Retained Backfill

Internal Friction Angle (deg) = 30
Total Unit Weight = 117 pcf
Active Earth Pressure Coefficient = 0.33

Wall 17 – I-85 Station
Foundation Soils
Total – Internal Friction Angle (deg) = 26
Total – Cohesion = 0 psf
Effective – Internal Friction Angle (deg) = 26
Effective – Cohesion = 0 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
0 < H ≤ 7.5	14.5 ft	2,000 psf	3,100 psf

Wall 18 – I-85 Station 413+00 to 415+00
Foundation Soils
Total – Internal Friction Angle (deg) = 0
Total – Cohesion = 1000 psf
Effective – Internal Friction Angle (deg) = 26
Effective – Cohesion = 100 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
3 < H ≤ 7	12.5 ft	5,400 psf	8,400 psf

Stantec Consulting Services Inc.
4969 Centre Pointe Drive Suite 200, North Charleston SC 29418-6952

April 26, 2015
Revised April 26, 2015
Revised March 29, 2018

File: 171001537

Attention: Rocque Kneece
CECS, Inc
2000 Part Street, Suite 201
Columbia SC, 29201

Dear Rocque,

Reference: I-85 / I-385 Interchange – FEMA No-Rise Study – SCDOT Review

Introduction
Stantec performed a FEMA No-Rise analysis for an approximately 5000 foot reach of Rocky Creek at Interstate 85 in Greenville, South Carolina. Per FEMA regulations (44 CFR 60.3(d)(3)), a No-Rise analysis must demonstrate a zero-increase (0.00 feet) in the base flood elevation (BFE), floodway elevations, or floodway widths through hydrologic and hydraulic analysis before land development occurs within a floodway. A No-Rise analysis was performed due to proposed interstate modifications within the effective floodway.

The No-Rise analysis utilized the effective FEMA hydraulic model (HEC-RAS version 4.0) which provided cross sections, surveyed structures, and hydrology (steady-state flow rates). Detailed design of the proposed conditions were provided to Stantec and then incorporated into the hydraulic model using HEC-RAS version 4.1. Water surface profiles were produced for the 2-, 10-, 25-, 50-, 100-, and 500-year storm events.

Effective Model
The Flood Insurance Rate Maps for Greenville County became effective in August 18, 2014, and the project area is located in FEMA Map Number 45045C0407E. The Rocky Creek hydraulic model is comprised of the main channel and 6 additional tributaries. There are 2 areas of interest for this No-Rise study. The first location is at the I-85 culvert bridge crossing, and the second location is approximately 2500 feet upstream of the culvert bridge where Rocky Creek meanders back towards I-85. This location was included into the study because of the close proximity between the 100-year floodplain, floodway, and proposed I-85 modifications.

Duplicate Effective Model
The duplicate effective model is a truncated reproduction of the effective model for the specific project area. The two areas of interest described above are located between cross sections 24541 and 28374. However, the actual project limits for the No-Rise analysis are extended to 3 additional upstream cross sections and 1 additional downstream cross section. The project limits

for the No-Rise analysis are defined from cross section 24314 to 28944 as seen in the main channel of the hydraulic model. Boundary conditions for each water surface profile are known water surface elevations from the results of the original effective model. Results of the duplicate effective model come within 0.1 feet of the effective model.

Corrected Effective Model

A corrected effective model includes any significant corrections or errors to the effective model. For this study, no corrections or errors were discovered in the effective model.

Existing Conditions Model

The existing conditions model reflects any modifications or updated topography within the project area since the date of the effective model. Because the effective model was dated August 2014, no modifications or topography were incorporated into the model.

Proposed Conditions

Land development activity within the floodway includes I-85 road widening for portions of the north bound and south bound lanes. No modifications to the existing box culverts are proposed. All proposed modifications described in this report are within the 300 foot I-85 right-of-way.

The hydraulic methodologies for the proposed conditions model match the effective model. For instance, no additional cross sections were created, contraction/expansion coefficients were not revised, the jersey barrier was disregarded, and the bridge modeling approach was not adjusted. However, Manning's n values were adjusted as necessary to match proposed conditions.

The proposed conditions were the result of an iterative process to add or reduce modifications to reach zero increase (0.00) in the BFE, floodway elevation, and floodway width. For instance, retaining walls are proposed to limit the embankment impact to the BFE. There is approximately1400 LF of retaining wall proposed in the southbound lane, and approximately 800 LF of retaining wall proposed in the north bound lane. The proposed modifications were represented in the hydraulic model by overlaying the effective model cross sections, proposed road design stationing centerline, and ESRI aerial imagery in ArcGIS software. The proposed roadway design was the foundation to the proposed conditions hydraulic model. However, the No-Rise analysis is iterative in nature and additional revisions to the proposed roadway design were made. The additional revisions were agreed upon during phone conversations and are not reflected in the original roadway design plans. Upon approval of this report, the intent is to update the roadway design plans with the additional revisions. Proposed conditions within the No-Rise project area are more specifically described by the following:

1. I-85 Northbound lane widening between Station 387+00 to Station 422+00
    a. Proposed conditions incorporated from roadway design plans

Reference: I-85 / I-385 Interchange – FEMA No-Rise Study – SCDOT Review

~~b. Additional revisions include the off-ramp taper beginning at Station 414+00 was shifted north to Station 421+00. Stantec was instructed to maintain 17 feet between existing edge of pavement and outside edge of guardrail from Station 414+00 to Station 421+00, then maintain 21 feet starting at STA422+00~~

c. Additional revisions include off ramp taper starting at 421+00. Revisions also include a reduction in the earthen shoulder from approximately 410+00 to 426+00 per the revised plans.

~~2. I-85 Southbound lane widening between Station 387+00 to Station 412+00~~

~~a. Proposed conditions incorporated from roadway design plans~~

~~b. Additional revisions include:~~

~~i. Reduced embankment impact to 10 feet from existing edge-of-pavement at Station 410+00~~

~~ii. Southbound lane extended 18 additional feet between Station 386+00 and Station 400+00~~

3. I-85 Northbound retaining wall between Station 414+00 to ~~Station 422+00~~ Station 416+00

~~a. A retaining wall was incorporated as an additional revision at Cross Section 24541 and Cross Section 24668 with embankment cuts~~

b. Additional revisions include embankment cuts at Cross Sections 24541 and 24668 per the proposed plans.

~~4. I-85 Southbound retaining wall between Station 387+00 to Station 401+00~~

~~a. A retaining wall was incorporated as an additional revision at Cross Sections 28374, 28216, 27999, 27809, 27572, and 27339~~

Reference: I-85 / I-385 Interchange – FEMA No-Rise Study – SCDOT Review

Results

Since there was no corrected effective model and no modifications to topography/structures needed, the existing conditions model would be a replica of the duplicate effective model. Therefore, the proposed conditions model results were compared against the duplicate effective model. The difference between the two models resulted in a 0.00 feet (or less) increase in the BFE, floodway elevations, and floodway widths thus satisfying the FEMA No-Rise requirement.

Table 1 – No-Rise Analysis Results (BFE)

	100-yr Water Surface Elevations (feet NAVD88)				
Cross Section	**Effective**		**Existing***	**Proposed**	**Delta**
					(Proposed - Existing)
Rocky Creek_24314.4			848.25	848.25	0.00
Rocky Creek_24541.44			849.51	849.5	-0.01
Rocky Creek_24668.16	AQ	849.9	849.94	849.77	-0.17
Rocky Creek_25380.96			851.44	851.23	-0.21
Rocky Creek_25539.36			853.49	853.43	-0.06
Rocky Creek_25687.2	AR	853.6	853.56	853.5	-0.06
Rocky Creek_25893.12			853.58	853.53	-0.05
Rocky Creek_26083.2			853.6	853.54	-0.06
Rocky Creek_26220.48			853.6	853.55	-0.05
Rocky Creek_26400	AS	853.6	853.64	853.58	-0.06
Rocky Creek_26574.24			853.72	853.67	-0.05
Rocky Creek_26806.56			853.74	853.69	-0.05
Rocky Creek_27033.6	AT	853.9	853.85	853.8	-0.05
Rocky Creek_27155.04			853.95	853.94	-0.01
Rocky Creek_27339.84			854.11	854.1	-0.01
Rocky Creek_27572.16	AU	854.2	854.19	854.18	-0.01
Rocky Creek_27809.76			854.49	854.48	-0.01
Rocky Creek_27999.84			854.91	854.91	0.00
Rocky Creek_28216.32	AV	856.5	856.48	856.48	0.00
Rocky Creek_28374.72			857.19	857.19	0.00
Rocky Creek_28570.08			857.42	857.42	0.00
Rocky Creek_28707.36	AW	857.4	857.46	857.45	-0.01
Rocky Creek_28944.96			857.59	857.59	0.00

*Results from duplicate effective model

Reference: I-85 / I-385 Interchange – FEMA No-Rise Study – SCDOT Review

Table 2 – No-Rise Analysis Results (Floodway)

		Floodway Elevations (feet NAVD88)				Floodway Widths (feet)			
Cross Section		Effective	Existing*	Proposed	Delta	Effective	Existing*	Proposed	Delta
					(Proposed - Existing)				(Proposed - Existing)
Rocky Creek_24314.4			848.98	848.98	0.00		160	160	0.00
Rocky Creek_24541.44			849.95	849.95	0.00		160	160	0.00
Rocky Creek_24668.16	AQ	850.3	850.28	850.20	-0.08	160	160	160	0.00
Rocky Creek_25380.96			851.58	851.50	-0.08		382	382	0.00
Rocky Creek_25539.36			854.35	854.32	-0.03		350	350	0.00
Rocky Creek_25687.2	AR	854.5	854.52	854.49	-0.03	350	350	350	0.00
Rocky Creek_25893.12			854.53	854.50	-0.03		300	300	0.00
Rocky Creek_26083.2			854.53	854.50	-0.03		225	225	0.00
Rocky Creek_26220.48			854.53	854.50	-0.03		225	225	0.00
Rocky Creek_26400	AS	854.6	854.59	854.56	-0.03	225	225	225	0.00
Rocky Creek_26574.24			854.68	854.65	-0.03		270	270	0.00
Rocky Creek_26806.56			854.69	854.66	-0.03		270	270	0.00
Rocky Creek_27033.6	AT	854.8	854.81	854.79	-0.02	270	270	270	0.00
Rocky Creek_27155.04			854.92	854.86	-0.06		270	270	0.00
Rocky Creek_27339.84			855.03	854.97	-0.06		230	230	0.00
Rocky Creek_27572.16	AU	855.2	855.22	855.16	-0.06	215	215	215	0.00
Rocky Creek_27809.76			855.43	855.38	-0.05		155	155	0.00
Rocky Creek_27999.84			855.88	855.84	-0.04		155	155	0.00
Rocky Creek_28216.32	AV	856.9	856.87	856.85	-0.02	155	155	155	0.00
Rocky Creek_28374.72			857.93	857.91	-0.02		235	235	0.00
Rocky Creek_28570.08			858.33	858.32	-0.01		250	250	0.00
Rocky Creek_28707.36	AW	858.3	858.39	858.38	-0.01	250	250	250	0.00
Rocky Creek_28944.96			858.58	858.58	0.00		250	250	0.00
*Results from duplicate effective model									

Regards,
STANTEC CONSULTING SERVICES INC.

Shaun Cavey, PE
Project Engineering Specialist
Phone: (843) 740-6345
shaun.cavey@stantec.com

sc u:\1710\active\171001537 - i-85 & i-385 interchange\design\drainage\fema\20150301-no_rise_analysis\report\20180329-norise-resubmittal\20180329-norise-report.docx

Legend

- FEMA Cross Section
- Tax_Parcel
- Stream Centerline

FEMA Floodplain

Flood Zones

- A,
- AE,
- AE, FLOODWAY
- X, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD

PREPARED BY:
Stantec Consulting Services Inc.
4969 Centre Pointe Drive, Suite 200
North Charleston, SC 29418
Tel. 843.740.7700
www.stantec.com

Stantec

ROCKY CREEK
NO-RISE STUDY
GREENVILLE, SOUTH CAROLINA

DATE:
3/10/2015

PAGE:
1 of 1

PROJECT NO:
-

SCALE:
1 inch = 300 feet

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	IL1

INDEX OF SHEETS

SHEET NO.	DESCRIPTION	TOTAL SHEETS
1	TITLE SHEET	1
1A	RIGHT OF WAY TITLE SHEET	1
IL1	INDEX OF SHEETS	1
IL2 - IL34	PLAN SHEET/REVISION LOGS	33
2	SUMMARY OF ESTIMATED QUANTITIES	OMITTED
3 - 3D	TYPICAL SECTIONS	5
3E	GEOTECHNICAL NOTES	1
3F	DRAINAGE DETAIL SHEET	1
3G	PCCP JOINT DETAILS	1
4 - 4A	RIGHT OF WAY DATA SHEETS	2
4B - 4F	PROPERTY STRIP MAPS	5
5	GENERAL CONSTRUCTION NOTES	OMITTED
5A	PLAN SHEET LAYOUT	1
5B- 5L	REFERENCE DATA SHEETS	11
6 - 34	PLAN SHEETS	31
35 - 120	PROFILE SHEETS	86
121	CURB PROFILES	1
D1 - D33	DRAINAGE SHEETS	35
TC1 - TC18.2	TEMPORARY TRAFFIC CONTROL PLANS	287
TS1 - TS164	TEMPORARY SIGNING PLANS	167
TA - TAX235	TEMPORARY ROADWAY PLANS	290
PM1 - PM29	PAVEMENT MARKING PLANS	29
SN1 - SN 96	SIGNING PLANS	96
SL1 - SL29	SIGN LIGHTING PLANS	29
S01 - SC9	ROADWAY STRUCTURE SHEETS	117
EC1 - EC10	EROSION CONTROL PLANS	10
I-85 X1 - I-85 X113	I-85 CROSS SECTIONS	113
I-85 NBCD X1 - I-85 NBCD X24	I-85 NBCD CROSS SECTIONS	24
PELHAM X1 - PELHAM X6	PELHAM RAMP CROSS SECTIONS	6
I-385 X1 - I-385 X103	I-385 CROSS SECTIONS	105
I-385 NBCD X1 - I-385 NBCD X37	I-385 NBCD CROSS SECTIONS	39
I-385 SBCD X1 - I-385 SBCD X31	I-385 SBCD CROSS SECTIONS	31
RAMP 1 X1 - RAMP 1 X36	RAMP 1 CROSS SECTIONS	36
RAMP 1A X1 - RAMP 1A X34	RAMP 1A CROSS SECTIONS	34
RAMP 1B X1 - RAMP 1B X13	RAMP 1B CROSS SECTIONS	13
RAMP 2 X1 - RAMP 2 X10	RAMP 2 CROSS SECTIONS	10
RAMP 2A X1 - RAMP 2A X50	RAMP 2A CROSS SECTIONS	50
RAMP 2B X1 - RAMP 2B X25	RAMP 2B CROSS SECTIONS	25
RAMP 3 X1 - RAMP 3 X20	RAMP 3 CROSS SECTIONS	20
RAMP 3A X1 - RAMP 3A X17	RAMP 3A CROSS SECTIONS	17
RAMP 4 X1 - RAMP 4 X33	RAMP 4 CROSS SECTIONS	33
RAMP 4B X1 - RAMP 4B X28	RAMP 4B CROSS SECTIONS	28
RAMP 5 X1 - RAMP 5 X14	RAMP 5 CROSS SECTIONS	14
RAMP 7 X1 - RAMP 7 X5	RAMP 7 CROSS SECTIONS	5
RAMP 8 X1 - RAMP 8 X12	RAMP 8 CROSS SECTIONS	12
RAMP 8A X1 - RAMP 8A X10	RAMP 8A CROSS SECTIONS	10
RAMP 9 X1 - RAMP 9 X4	RAMP 9 CROSS SECTIONS	6
RAMP 10 X1 - RAMP 10 X9	RAMP 10 CROSS SECTIONS	9
RAMP 11 X1 - RAMP 11 X12	RAMP 11 CROSS SECTIONS	12
DRAIN X1 - DRAIN X22	DRAINAGE CROSS SECTIONS	22
	TOTAL SHEETS	1917

8 ADDED SHEETS 3G, TA-X63A TO TA-X63E, TA-X145A TO TA-X145D, TA-X151A, TA-X157A, TA-X157B, TA-X182 TO TA-X210, I-385 X52A, I-385 X52B, I-385 NBCD X34A, I-385 NBCD X12A, RAMP 9 X0, RAMP 9 X5.

9 10/21/16 - ADDED SHEETS IL33, TA-24, TA-X211 TO TA-X220.

10 10/28/16 - ADDED SHEETS IL34, D33, TC4.2AA TO TC4.2AC, TC4.2BA TO TC4.2BC, TC4.2CA TO TC4.2CH, TC4.2Q, TA-2C, TA-25, TA-X221 TO TA-X235, S0-40 TO S0-43, S17-1, S18-1 TO S18-4, S55-1 TO S55-5, EC8 TO EC10.

11 1/12/17 - ADDED SHEET S32-7

12 2/2/17 - ADDED SHEETS TA-26, TA-X236 TO TA-X241

13 3/16/17 - ADDED SHEET D32A

14 12/18/17 - ADDED SHEETS TC4.2A.1A AND TC4.2A.1B

15 1/9/18 - ADDED SHEET SC9

16 5/3/18 - REMOVED SHEETS S18-2, S18-3, S18-4, S55-1, S55-2, S55-3, S55-4, S55-5

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	1/27/16	ADDED SHEET TC2H TO TC SERIES	D.R.R.	B.G.N.
2	4/29/16	PLAN SHEET/ REVISION LOGS ADDED	D.P.M.	B.G.N.
3	5/12/16	TAX84A-C ADDED	D.R.R.	B.G.N.
4	6/17/16	SHEET S0-39 ADDED	D.R.R.	R.L.K.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
5	7/8/16	TC/TA SERIES SHTS ADDED,IL32 ADDED	D.R.R.	B.G.N.
6	8/9/16	ADDED SHT TC4.2G.1	D.R.R.	R.L.K.
7	8/18/16	ADDED SHEET S0-44	D.R.R.	R.L.K.
8	9/28/16	ADDED SHEETS	B.G.N.	R.L.K.

DRAWN BY : A.W.F DATE : 6/10/15

REVIEWED BY : B.A.H. DATE : 09/04/15

APPROVED BY : B.G.N. DATE : 09/20/15

FLATIRON ZACHRY

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 32591

6/7/2018 12:33:47 PM

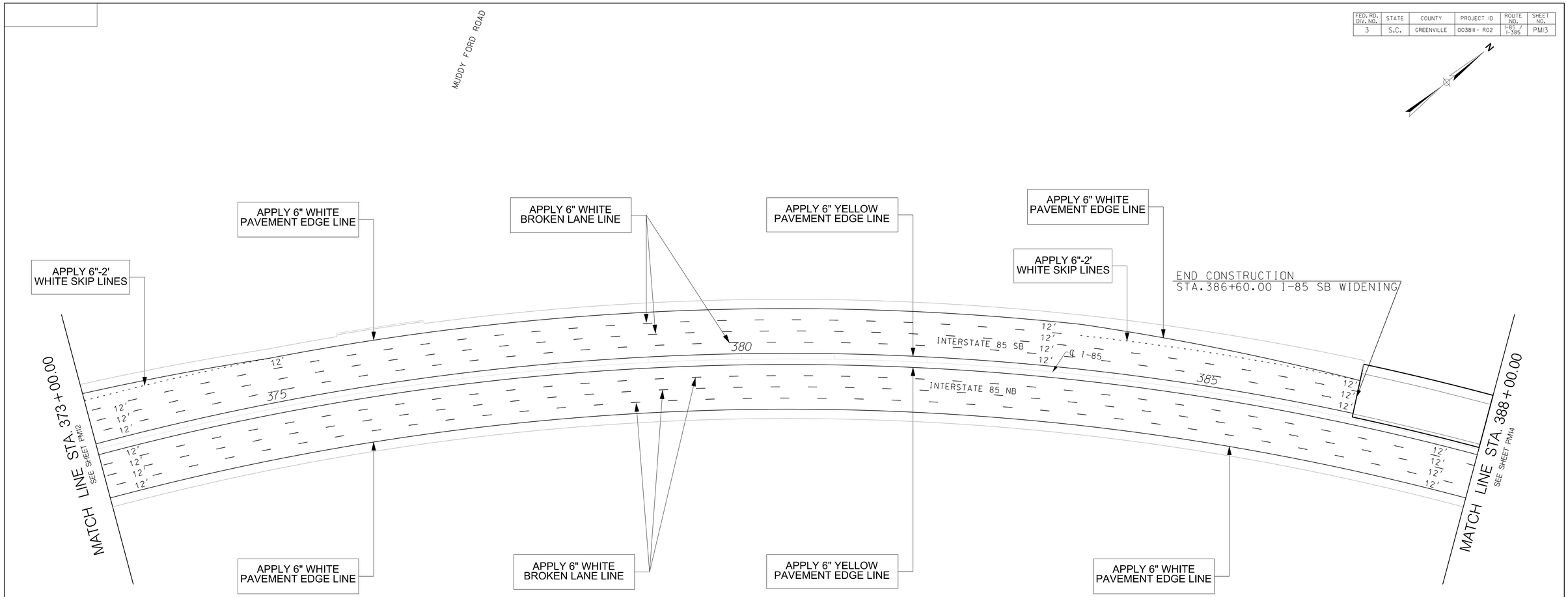
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

INDEX OF SHEETS

S:\Proj\2011471IA\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\sht_IL1_Index.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	PMI3



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	05/02/18	REMOVED I85 SB PAVEMENT MARKINGS STA. 386+60.00 TO STA. 388+00.00	R.L.D.	B.G.N.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F. DATE : 9/4/15

REVIEWED BY : D.B.R. DATE : 9/4/15

APPROVED BY : B.G.N. DATE : 9/4/15

FLATIRON ZACHRY

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER NO. 29889 BRIAN G. NICKERSON

6/6/2018 11:30:44 AM EDT

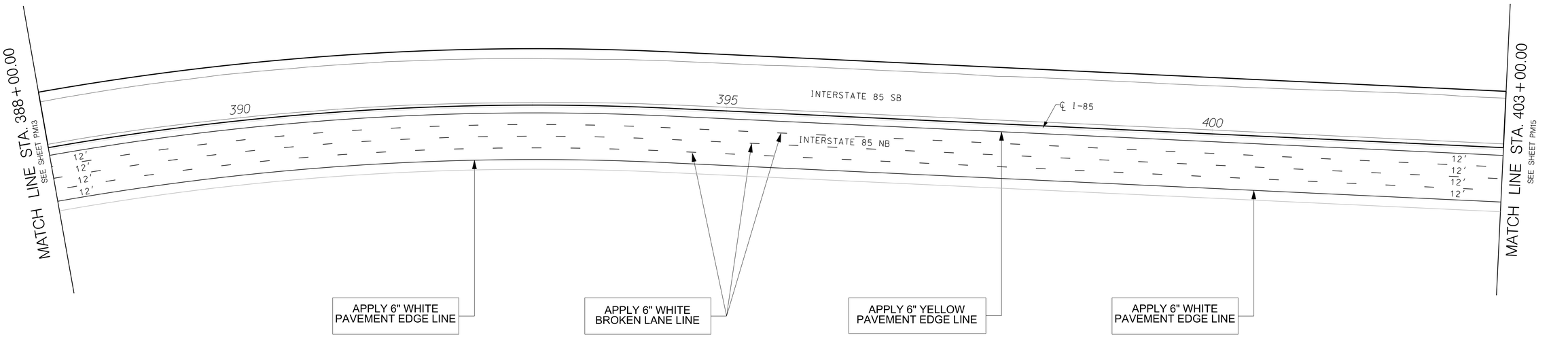
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

PAVEMENT MARKING PLAN SHEET STA. 373+00.00 TO STA. 388+00.00

S:\Proj\2011\471IA\Design\Project PIN Number\Traffic\Pavement Markings\Interchange\PAVEMARK SHEETS\PMI3.dgn 5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - RO2	I-85 / I-385	PMI4



REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED
1	05/02/18	REMOVED I85 SB PAVEMENT MARKINGS STA. 388+00.00 TO STA. 403+00.00	R.L.D.	B.G.N.

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : A.W.F. DATE : 9/4/15

REVIEWED BY : D.R.R. DATE : 9/4/15

APPROVED BY : B.G.N. DATE : 9/4/15

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER No. 23889 BRIAN G. NICKERSON 6/6/2018 11:30:41 AM EDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

PAVEMENT MARKING PLAN SHEET
STA. 388+00.00 TO STA. 403+00.00

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5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	PM15

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	05/16/16	ADJUSTED PAVEMENT MARKINGS FOR PELHAM ROAD EXIT	R.L.D.	B.G.N.					
2	05/02/18	REMOVED I85 SB PAVEMENT MARKINGS STA. 403+00.00 TO STA. 414+30.20	R.L.D.	B.G.N.					

DRAWN BY : A.W.F.
DATE : 9/4/15

REVIEWED BY : D.R.R.
DATE : 9/4/15

APPROVED BY : B.G.N.
DATE : 9/4/15

FLATIRON / ZACHRY

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 23889

6/6/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

PAVEMENT MARKING PLAN SHEET
STA. 403+00.00 TO STA. 418+00.00

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5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	S0-1

INTERCHANGE WALL SUMMARY

WALL #	WALL TYPE	FROM STA.	TO STA.	ALIGNMENT
1	MSE	1+00.00	3+63.51	WALL 1
1	MSE	-	-	SEE BRIDGE 10 PLANS
1	MSE	8+31.02	12+09.78	WALL 1
2	MSE	-	-	SEE BRIDGE 10 PLANS
2A	MSE	4+74.09	8+13.33	WALL 2A
2B	BARRIER	8+13.33	61+43.24	WALL 2B
3	MSE	-	-	SEE BRIDGE 7/9 PLANS
4	MSE	-	-	SEE BRIDGE 9 PLANS
5	MSE	-	-	SEE BRIDGE 12 PLANS
6	MSE	-	-	SEE BRIDGE 12 PLANS
7	MSE	-	-	SEE BRIDGE 6 PLANS
8	MSE	-	-	SEE BRIDGE 8 PLANS
9	MSE	-	-	SEE BRIDGE 8 PLANS
10	SOIL NAIL	10+00.00	14+68.53	WALL 10
11	BARRIER	10+00.00	14+83.98	WALL 11
12	PILE AND PANEL	9+98.70	17+50.70	WALL 12
12	MSE/SOIL NAIL	-	-	SEE BRIDGE 11 PLANS
12	PILE AND PANEL	18+57.39	30+81.39	WALL 12
12	MSE	30+81.39	39+04.30	WALL 12
12	MSE			SEE BRIDGE 5 PLANS
13	MSE	10+50.00	18+85.45	WALL 13
14	R. CONCRETE	10+00.00	15+84.09	WALL 14
15	BARRIER	1+00.00	32+38.27	WALL 15
16A	BARRIER	10+00.00	17+70.00	WALL 16A
16B	SOIL NAIL	17+74.84	19+34.84	WALL 16B
16B	PILE AND PANEL	19+34.84	21+58.84	WALL 16B
16B	MSE/SOIL NAIL	-	-	SEE BRIDGE 11 PLANS
16B	SOIL NAIL	22+75.00	26+51.00	WALL 16B
17	MSE	10+30.00	11+25.00	WALL 17
18	WIRE FACED MSE	413+00.00	415+00.00	I85
19	OMITTED			
20	56" RIGID SLOPE BARRIER	327+50.37	329+27.97	I385/I 385 NBCD
21	PILE AND PANEL	10+00.00	19+28.00	WALL 21
22	BARRIER	10+00.00	104+49.65	WALL 22
23	BARRIER	0+33.82	11+53.89	WALL 23
24	BARRIER	1+00.00	38+99.60	WALL 24
25	BARRIER	1+00.00	6+39.83	WALL 25
26	SOIL NAIL	10+00.00	12+70.00	WALL 26
27	SOIL NAIL	10+10.00	12+16.00	WALL 27
27	SOIL NAIL	12+16.00	16+09.30	WALL 27
28	MSE	-	-	SEE BRIDGE 4 PLANS
29	MSE	-	-	SEE BRIDGE 4 PLANS
30	MOMENT SLAB BARRIER	374+25.00	375+42.02	I385 NBCD
31A	BARRIER	10+00.00	18+75.60	WALL 31A
31B	MSE	18+75.60	21+30.57	WALL 31B
32	MSE	-	-	SEE BRIDGE 3 PLANS
32	MSE	10+15.75	24+34.33	WALL 32
33	MSE	-	-	SEE BRIDGE 7 PLANS
33	MSE	11+62.10	21+56.10	WALL 33
34	BARRIER	10+00.00	15+12.17	WALL 34
35	MSE	-	-	SEE BRIDGE 5/7 PLANS
36A	BARRIER	10+00.00	13+48.33	WALL 36A
36B	MSE	13+48.33	17+10.00	WALL 36B
37	MSE	-	-	SEE BRIDGE 6 PLANS
38	SOIL NAIL	10+00.00	33+52.00	WALL 38
39	BARRIER	9+97.93	23+92.04	WALL 39
40A	MOMENT SLAB BARRIER	110+53.13	110+74.86	RAMP 5
40B	MOMENT SLAB BARRIER	258+78.00	258+99.86	I-85
41	56" RIGID SLOPE BARRIER	36+30.00	36+90.00	RAMP 3
42	56" RIGID SLOPE BARRIER	37+47.81	38+15.35	RAMP 3
43	MOMENT SLAB BARRIER	80+70.03	81+28.36	RAMP 2A
44	BARRIER	285+99.60	286+68.15	I85 NBCD
45	56" RIGID SLOPE BARRIER	293+68.75	294+25.95	I85 NBCD
46	56" RIGID SLOPE BARRIER	400+34.77	401+60.00	I385
47	56" RIGID SLOPE BARRIER	113+61.84	114+49.21	RAMP 1
48	56" RIGID SLOPE BARRIER	300+54.58	301+20.00	RAMP 3A
49	BARRIER	283+64.53	291+57.42	I-85
50	BARRIER	296+05.48	298+26.76	I-85
51	BARRIER	289+80.65	291+04.92	RAMP 3A
52	BARRIER	319+15.71	321+32.21	I-85
53	56" RIGID SLOPE BARRIER	78+33.85	79+89.60	RAMP 2A
54	56" RIGID SLOPE BARRIER	293+92.54	294+68.88	RAMP 3A
56	MSE	-	-	SEE BRIDGE2A,2B,3

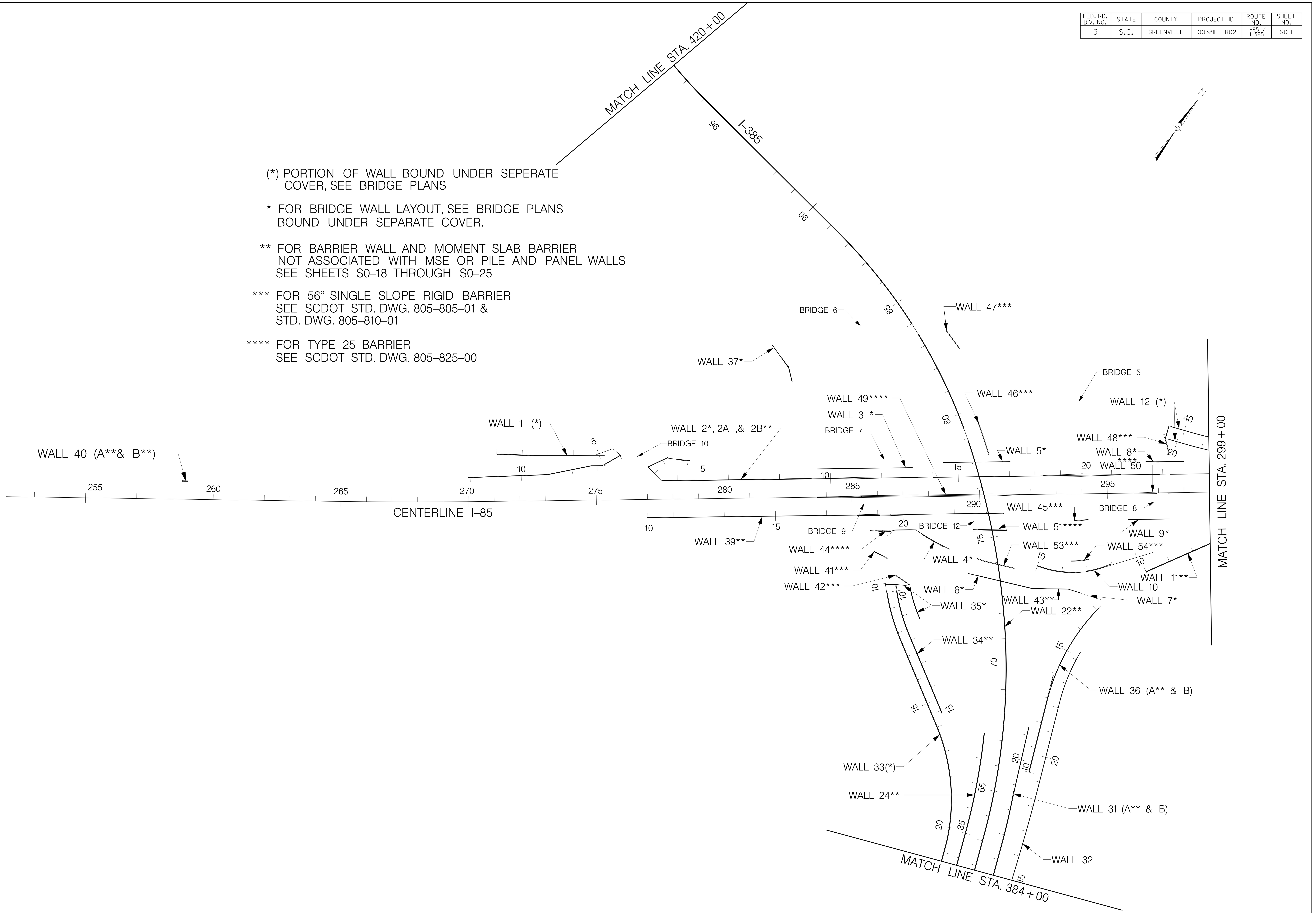
(*) PORTION OF WALL BOUND UNDER SEPERATE COVER, SEE BRIDGE PLANS

* FOR BRIDGE WALL LAYOUT, SEE BRIDGE PLANS BOUND UNDER SEPARATE COVER.

** FOR BARRIER WALL AND MOMENT SLAB BARRIER NOT ASSOCIATED WITH MSE OR PILE AND PANEL WALLS SEE SHEETS S0-18 THROUGH S0-25

*** FOR 56" SINGLE SLOPE RIGID BARRIER SEE SCDOT STD. DWG. 805-805-01 & STD. DWG. 805-810-01

**** FOR TYPE 25 BARRIER SEE SCDOT STD. DWG. 805-825-00



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/16/16	REVISED WALL 27 TYPE AND BEGIN STA.	D.R.R.	B.G.N.	5	10/20/17	REVISED WALL 23	B.G.N.	R.L.K.
2	7/22/16	REVISED WALLS 17, 18,38, & 55	D.R.R.	B.G.N.	6	5/3/18	REVISED WALL 18, REMOVED WALL 55	B.G.N.	P.H.R.
3	11/1/16	REVISED WALL 16B	B.G.N.	R.L.K.					
4	1/19/17	REVISED WALL 10	B.G.N.	R.L.K.					

DRAWN BY : D.M.
DATE : 06/19/15

REVIEWED BY : J.C.
DATE : 06/24/15

APPROVED BY : M.A.
DATE : 06/26/15

FLATIRON ZACHRY

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 200 400 600 800

SCALE: 1" = 200' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 15591

6/7/2018 12:43:17 PM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

WALL LAYOUT SHEET

S:\Proj\2011\471IA\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\Sht_S0-1_Geometry.dgn
5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	SO-2

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	7/22/16	REVISED WALLS 17, 18, & 55	D.R.R.	B.G.N.					
2	5/3/18	REVISED WALL 18, REMOVED WALL 55	B.G.N.	P.H.R.					

DRAWN BY : D.M.
DATE : 06/19/15

REVIEWED BY : J.C.
DATE : 06/24/15

APPROVED BY : M.A.
DATE : 06/26/15

FLATIRON ZACHRY

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 200 400 600 800

SCALE: 1" = 200' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER PAUL HANNA RAAD No. 13591

6/18/2018 12:05

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

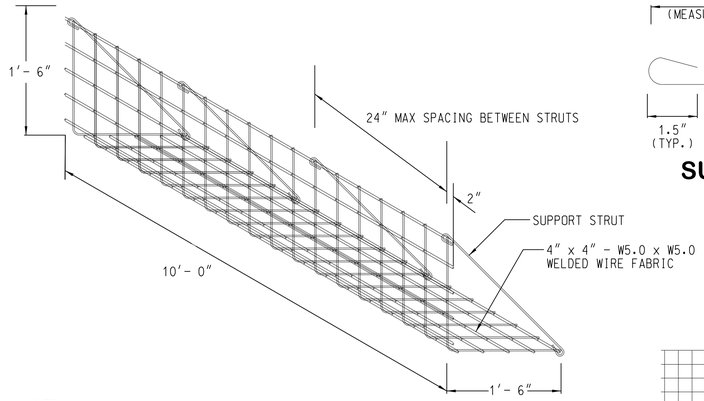
SCDOT

I-85 / I-385 INTERCHANGE

WALL LAYOUT SHEET

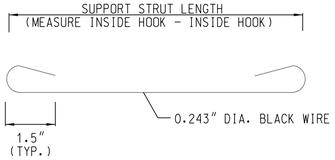
S:\Proj\2014\4711A\Design\Project PIN Number\Roadway\Dgn\Plan Sheets\Interchange\Sht_SO-2_Geometry.dgn 5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SO-40

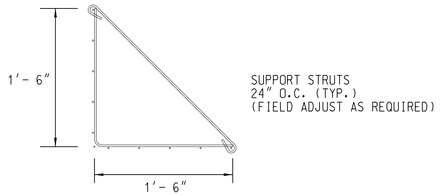


NOTES:

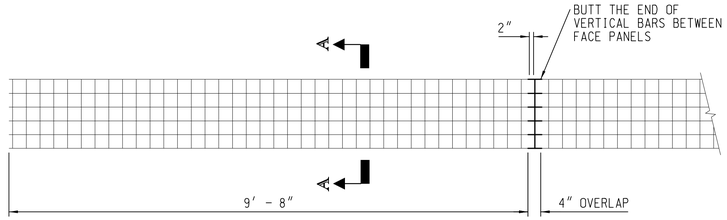
1. Facing to consist of fabricated Welded Wire Forms 4" X 4" - W5.0 X W5.0 forms.
2. All forms and struts shall be fabricated with black wire.
3. Overall length of wire forms shall be 10'- 0". Effective constructed width is 9'- 8" with a 4" overlap at ends.



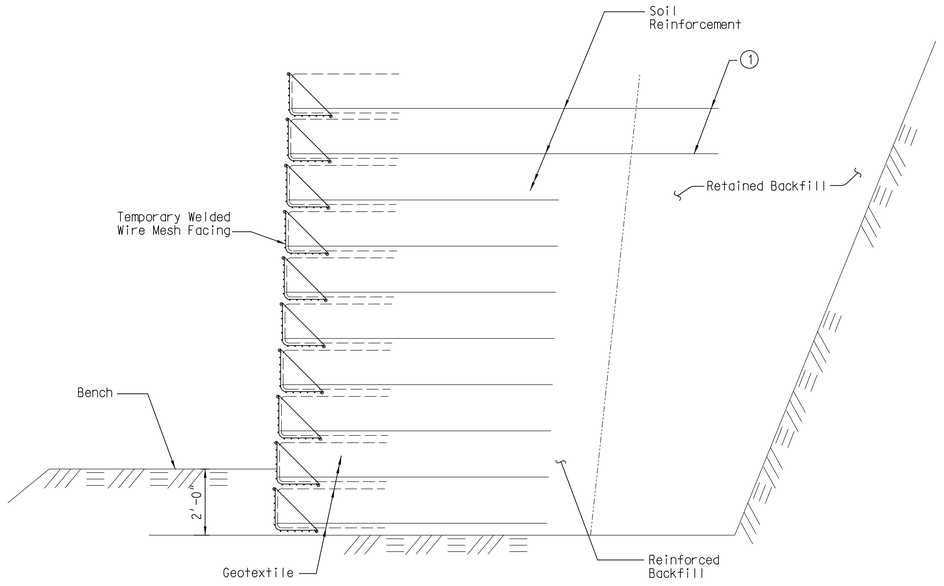
SUPPORT STRUT



SECTION A-A

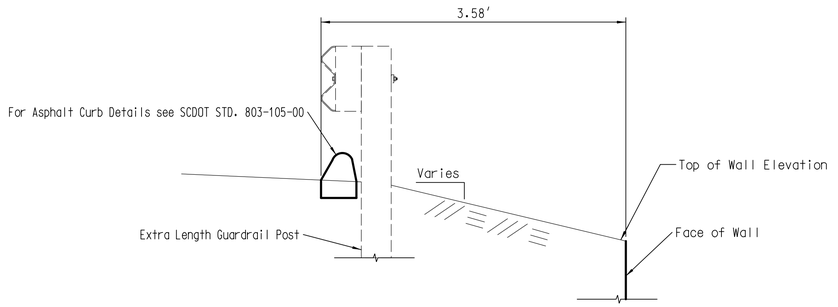


WELDED WIRE FORM FACING UNIT



TEMPORARY MSE WALL TYPICAL SECTION

(1) Extend top two layers of soil reinforcement 5 feet beyond the end of the lower layers of soil reinforcement.



WALL FACE AND GUARDRAIL DETAIL

Notes:

Extra Length Guardrail post to be used. Contractor shall take the necessary measures needed to avoid conflict between guardrail post and wire wall soil reinforcements.

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED WALL FACE/GUARDRAIL DETAIL REMOVED MOMENT SLAB DETAIL REMOVED MSE WALL INTERACTION DETAIL	D.P.M.	M.S.A.

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED

DRAWN BY : D.P.M.
DATE : 07/26/16

REVIEWED BY : M.S.A.
DATE : 07/26/16

APPROVED BY : R.R.C
DATE : 07/26/16

FLATIRON ZACHRY a joint venture

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION 6/6/2018 12:48:11 PM EDT

SOUTH CAROLINA PROFESSIONAL ENGINEER NO. 11904 RANDY R. RAM CANNON

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT South Carolina Department of Transportation

I-85 / I-385 INTERCHANGE

WALL DETAILS

$$$$$$path$$$$$$$$$$filename$$$$$$$$
$$$date$$$$

The following notes apply to borrow materials:

Provide borrow materials meeting the following minimum requirements:

- **A sandy material (35% or less passing 0.075 mm) with a minimum total soil unit weight, γ_{total} of 110 pcf, with a maximum dry density exceeding 100 pcf.**
- **Minimum friction angle, φ, of 30° and cohesion, c, of 50 psf for embankment fill, alternatively embankment fill may consist of a minimum friction angle (φ) of 34° with zero cohesion.**
- **No. 57 Stone backfill for Mechanically Stabilized Earth Walls**

In addition, determine the moisture-density relationship and classification of the material. Test and submit the classification, moisture-density relationship, and soil strength parameters of the material to the Engineer for acceptance. An AASHTO certified laboratory is required to perform the testing. Contact the RPG Geotechnical Engineer for a list of locally available AASHTO certified laboratories. The Department may perform independent testing to assure quality.

Determine the friction angle and cohesion using either direct shear testing or consolidated-undrained triaxial shear testing with pore pressure measurements. Direct Shear testing shall only be performed on soils with a fines content of less than 25 percent. Classification testing includes grain-size distribution with wash #200 sieve, moisture plasticity testing and natural moisture content. Use the Standard Proctor test to determine the moisture-density relationship. Remold all samples used in shear strength testing to 95 percent of the Standard Proctor density. Conduct shear strength testing at the initial selection of the borrow pit, any subsequent changes in borrow pits, and for every 10,000 cy of materials placed. Perform classification testing for every 50,000 cy of materials placed, including the material used for the shear strength testing. Additional shear testing may be required if, in the opinion of the RCE, the materials being placed are different from those originally tested.

If these minimum criteria cannot be met, provide the soil parameters for the intended borrow excavation material for the project site to the Engineer for review and acceptance. After acceptable borrow material is obtained, compact the fill to the required finish grade line using the compactive effort indicated in the Standard Specifications for Highway Construction, Section 205 (Embankment Construction).

The following notes apply to muck excavation:

Any areas identified on the plans and any additional areas that are discovered to deflect or settle may require corrective action as directed by the RCE. This may include undercutting; placing No. 57 stone aggregate that is separated from other borrow materials by a geotextile for separation of sub-grade and sub-base, and/or additional compactive effort to the approval of the RCE.

In areas that require mucking or undercutting, borrow material soil may be placed as a bridge lift as long as the grade on which the material is being placed is at least 2 feet above ground water level. In the event that groundwater does not allow backfilling with a borrow material soil, use a No. 57 stone as the bridge lift material. Borrow material bridge lifts may not exceed a 2-foot thickness. The depth at which mucking or undercutting is required is dependent upon encountering a suitable bearing material within the excavation or if a predetermined elevation or depth is required. In most cases, do not undercut more than 3 to 5 feet. The RCE will determine the final mucking or undercutting thickness, unless otherwise specified in the project plans and/or specifications. If a suitable bearing soil is not encountered within this depth range, place a P1 biaxial geogrid with an aperture size of less than or equal to 1 inch and in accordance with the project special provisions beneath a 2-foot thick bridge lift of No. 57 stone. If additional compacted borrow material soil is needed to reach grade, place a geotextile for separation of sub-grade and sub-base between the No. 57 stone and the overlying compacted soil. A bridge lift consisting of borrow material soil may not be placed within 3 feet of the base of the pavement section. Place only compacted borrow material soil or No. 57 stone within this zone. Reference the Standard Specifications for Highway Construction, Earthwork Section, Division 200.

Additional Notes:

See S0-16 and S0-17 for additional MSE Wall Design Parameters.

The following notes apply for MSE Wall Subgrades:

Prior to construction of the leveling pad and MSE fill, the RCE shall verify that the retaining wall is founded on subgrade materials possessing the minimum allowable bearing capacity noted on wall plan and elevation sheets. If the RCE determines that the subgrade is unacceptable for placement of MSE fill, the contractor shall undercut the subgrade to the limits directed by the RCE. Unacceptable subgrade materials include, but are not limited to, all high plasticity clays and elastic silts (CH, MH), low plasticity clays and silts (CL, ML) with an unconfined compressive strength less than 2,000 psf, and deleterious debris. Replacement of undercut material will be with Backfill Material, meeting requirements outlined in the SCDOT Standard Specifications for Highway Construction.

The foundation area for the MSE walls might have scattered pockets of soft soils that might be present at the surface or just below the surface for the base of the MSE fill. These soft pockets are only expected to extend a few feet below the base of the MSE fill. The quality assurance representative shall proofroll the subgrade in this area and/or conduct dynamic cone tests at regular intervals to determine that the subgrade meets the requirements of the paragraph above. There are several locations along the roadway alignment where proposed drainage structures are situated in front of (i.e. parallel) MSE walls, or where new and existing draining structures pass beneath the MSE walls. Where new pipes are parallel to the proposed wall, the pipe should be installed prior to the proposed wall or the wall design should account for the temporary reduction in passive resistance. Where pipes pass beneath walls, the pipes should be designed to account for the increased loading associated with the wall backfill. We recommend the top of each pipe be situated a minimum of 1 foot below the bottom of retaining.

The following notes apply for settlement and displacement monitoring:

The contractor shall establish a monitoring program consisting of settlement instruments. The settlement monitoring program must include establishing settlement monitoring instruments on the subgrade soils prior to fill placement, and at design pavement subgrade elevation. Settlement monitoring instruments are required at a spacing of every 100 feet along MSE Walls and every 500 feet along embankments with new fill thicknesses exceeding 20 feet. Instruments shall be established at the centerline of road and edge of pavement. Settlement monitoring shall continue until three consecutive measurements demonstrate the rate of settlement is less than 0.1 inches per year. No more than one measurement shall be obtained on a single day.

A minimum of 2 measurements shall be obtained on monuments prior to fill placement, and instruments shall be measured weekly during fill placement. Instrumentation measurements shall be provided to the Geotechnical Engineer within 24 hours of measurements for interpretation. Interpreted results shall be provided to the RCE.

The following notes apply to slope construction:

Where the new fill meets the existing slope, the existing slope shall be benched to limit the potential for a preferential failure surface and to allow compaction at the interface. Benches shall have a minimum horizontal length of 8 feet and a vertical rise of no more than 3 feet. Fill slopes of 2H:1V or steeper shall be overbuilt (i.e. fill should temporarily extend beyond the final slope face) to allow compaction at the slope face. After compaction is complete, the slope may be regraded to the final inclination.

Should seeps or thick lenses of highly plastic soils be observed in the planned fill and cut slopes that are steeper than 2H:1V, ECS must be contacted to determine if the steeper slopes may be constructed as planned or if slope flattening or reinforcing is required. Similarly, if soft or wet ground conditions are observed at the base of planned fill embankments, the QA representative must determine the limits of undercutting required or required in-situ treatment.

The following Plan Notes apply to Mechanically Stabilized Earth walls:

Reinforced Backfill (Granular Fill or stone.)

Internal Friction Angle (deg) = 36
Total Unit Weight = 120 pcf
Surcharge Dead Load for Pavement Overlay = 140 psf
Active Earth Pressure Coefficient = 0.26

Retained Backfill

Internal Friction Angle (deg) = 30
Total Unit Weight = 117 pcf
Active Earth Pressure Coefficient = 0.33

Wall 17 I-85 Station
Foundation Soils
Total Internal Friction Angle (deg) = 26
Total Cohesion = 0 psf
Effective Internal Friction Angle (deg) = 26
Effective Cohesion = 0 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
0 < H ≤ 7.5	14.5 ft	2,000	3,100

Wall 18 I-85 Station 413+00 to 415+00
Foundation Soils
Total Internal Friction Angle (deg) = 0
Total Cohesion = 1000 psf
Effective Internal Friction Angle (deg) = 26
Effective Cohesion = 100 psf

Wall Height	Min. Breq	Factored Bearing (Static)	Factored Bearing (Seismic)
3 < H ≤ 7	12.5 ft	5,400	8,400

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED WALL 18, REMOVED WALL 55	D.P.M.	M.S.A.					

DRAWN BY : D.P.M. DATE : 07/26/16
REVIEWED BY : M.S.A. DATE : 07/26/16
APPROVED BY : R.R.C. DATE : 07/26/16

FLATIRON ZACHRY

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER RANDY RAY CANNON
DocuSigned by: Cannon, Randy 849B9D8D21514E3...
6/6/2018 12:48:34 PM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

GEOTECH & MSE WALL NOTES FOR ROCKY CREEK

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	S18-1

WALL STATION	413+00	413+25	413+50	413+75	414+00	414+25	414+50	414+75	415+00
I-85 STATION	413+00	413+25	413+50	413+75	414+00	414+25	414+50	414+75	415+00
TOP OF WALL	855.37	855.08	854.75	854.43	854.10	853.78	853.42	853.06	852.71
FINISHED GRADE @ BACK FACE	855.37	855.08	854.75	854.43	854.10	853.78	853.42	853.06	852.71
FINISHED GRADE @ FRONT FACE	853.61	852.25	851.07	851.10	851.00	851.54	851.71	851.50	851.06
BOTTOM OF WALL	851.00	849.50	848.00	848.00	848.00	849.50	849.50	849.50	849.50
WALL HEIGHT	4.37	5.58	6.75	6.43	6.10	4.28	3.92	3.56	3.21

413+00 414+00 415+00

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5/3/18	REVISED WALL 18 LOCATION AND TYPE	D.P.M.	R.R.C.					

DRAWN BY : D.P.M. DATE : 04/24/18
REVIEWED BY : R.R.C. DATE : 04/26/18
APPROVED BY : R.R.C. DATE : 04/26/18

FLATIRON / ZACHRY a joint venture

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 10 20 30 40
SCALE: 1" = 10' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 7904 RANDY RAY CANNON
6/6/2018 12:48:35 PM

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
SCDOT

I-85 / I-385 INTERCHANGE

WALL 18
PLAN & PROFILE

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	SL13

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5/30/2018

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED
1	05/02/18	MOVED SIGN LIGHTING STRUCTURE NO. 21 TO STA. 382+50	R.L.D.	B.G.N.					

DRAWN BY : A.W.F.
DATE : 9/4/15

REVIEWED BY : D.R.R.
DATE : 9/4/15

APPROVED BY : B.G.N.
DATE : 9/4/15

FLATIRON / ZACHRY a joint venture

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED ... ROBERT ... DRUMMOND ... No. 20942

6/6/2018 1:00:31 PM PDT

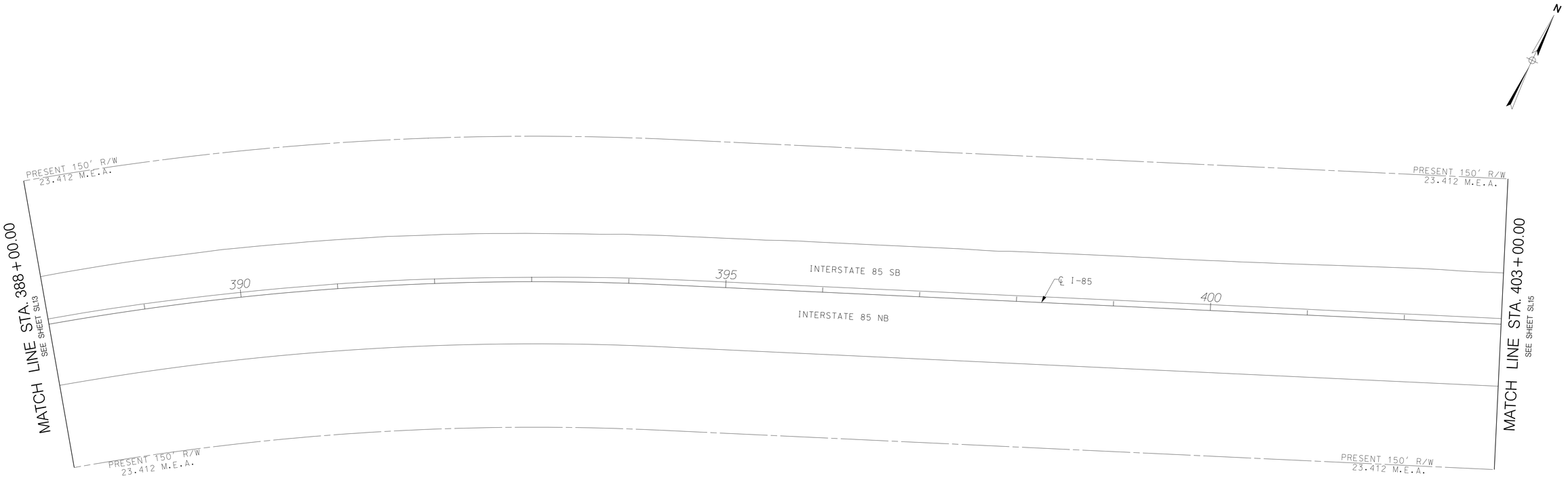
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCDOT

I-85 / I-385 INTERCHANGE

SIGN LIGHTING PLAN SHEET
STA. 373+00.00 TO STA. 388+00.00

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038III - R02	I-85 / I-385	SL14



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	05/02/18	REVISED SOUTHBOUND EDGE LINE	R.L.D.	B.G.N.					

DRAWN BY : A.W.F. DATE : 9/4/15

REVIEWED BY : D.R.R. DATE : 9/4/15

APPROVED BY : B.G.N. DATE : 9/4/15

FLATIRON ZACHRY a joint venture

CE CS CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER ROBERT L. DRUMMOND

6/6/2018 1:00:31 PM EDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION SCDOT

I-85 / I-385 INTERCHANGE

SIGN LIGHTING PLAN SHEET
STA. 388+00.00 TO STA. 403+00.00

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5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 / I-385	SL15

REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED	REVISIONS NO.	REVISIONS DATE	DESCRIPTION	BY	CHECKED
1	04/07/16	MOVED SIGN LIGHTING STRUCTURE TO STA. 408+00	R.L.D.	B.G.N.					
2	05/02/18	MOVED SIGN LIGHTING STRUCTURE NO. 21 TO STA. 382+50	R.L.D.	B.G.N.					

DRAWN BY : A.W.F. DATE : 9/4/15
REVIEWED BY : D.R.R. DATE : 9/4/15
APPROVED BY : B.G.N. DATE : 9/4/15

FLATIRON ZACHRY a joint venture

CIVIL ENGINEERING CONSULTING SERVICES, INC.

0 50 100 150 200

SCALE: 1" = 50' HORIZ

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION CIVIL ENGINEERING CONSULTING SERVICES, INC. ENGINEERING NO. C00387

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER ROBERT LEE DRUMMOND NO. 30342

DocuSigned by: 3C7471D6DB4A4Q3...

6/6/2018 1:00:31 PM PDT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

I-85 / I-385 INTERCHANGE

SIGN LIGHTING PLAN SHEET
STA. 403+00.00 TO STA. 418+00.00

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5/30/2018

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC3

I-85
SERIES 4 SHEETS

STEP 1: **SHEETS TC4.1 – 4.1A**

- PREPARE EX 85NB/SB OUTSIDE SHOULDERS FOR STEP 2 I-85 MEDIAN BENT WORK (85NB STA. 279+00 TO 293+40 & 85SB STA. 280+00 TO 303+50).

STEP 2: **SHEETS TC4.2 – 4.2P**

I-85 WIDENING SOUTH OF INTERCHANGE (TC4.2 – 4.2D)

- SHIFT 85NB/SB TRAFFIC TO THE INSIDE, AND COMPLETE OUTSIDE WIDENING (85NB STA. 203+00 TO 249+13 & 85SB STA. 211+80 TO 268+00).
  - ***CONCURRENT CONSTRUCTION:***
    - **R5 STEP 1** (TC14.1)
    - **R5 STEP 2** (TC14.2)

I-85 MEDIAN BENTS (TC4.2E – 4.2G)

- SHIFT 85NB/SB TRAFFIC TO OUTSIDE SHOULDERS.
  WITH 85 TRAFFIC ON OUTSIDE SHOULDERS, COMPLETE MEDIAN BRIDGE BENTS (BR5 BENT 7, BR7 BENT 2, BR8 BENT 2, BR9 BENT 3, BR12 BENT 4).

I-85 WIDENING NORTH OF INTERCHANGE (TC4.2G – 4.2Q)

- SHIFT 85NB/SB TRAFFIC TO THE INSIDE, AND COMPLETE OUTSIDE WIDENING OF 85 TOWARDS PELHAM RD (85NB STA. 304+00 TO 428+25 & 85SB STA. 302+50 TO 386+60).
  - ***CONCURRENT CONSTRUCTION:***
    - **R1**
    - **R1A**
    - **R2A**
    - **CHROME DR.**

- CONSTRUCT WALLS ALONG 85 NEAR ROCKY CREEK.

- SHIFT PELHAM EXIT RAMP TRAFFIC TO THE INSIDE AND COMPLETE TEMP. PELHAM AND OUTSIDE WIDENING (PELHAM STA. 54+79 TO 61+25).

STEP 2A: **SHEETS TC4.2AA – 4.2AC**

- COMPLETE 85NB OUTSIDE WIDENING (85NB STA. 415+50 TO 428+20). SHIFT PELHAM EXIT RAMP TRAFFIC TO THE OUTSIDE (TEMP. PELHAM) AND COMPLETE 85NB/PELHAM GORE AREA, TEMP PVMT, AND PELHAM LEFT SIDE.

STEP 2B: **SHEETS TC4.2BA – 4.2BC**

- SHIFT PELHAM EXIT RAMP TRAFFIC TO THE INSIDE/TEMP PVMT AND COMPLETE PELHAM RIGHT SIDE (PELHAM STA. 50+00 TO 54+79).

**UPON SWITCHING TRAFFIC TO THE LEFT SIDE OF PELHAM RAMP, WORK IN A CONTINUOUS AND EXPEDITIOUS MANNER TO BREAK UP AND REMOVE EXISTING RAMP PAVEMENT ON THE RIGHT SIDE SUCH THAT WATER ENTRAPMENT DOES NOT OCCUR.*

STEP 2C: **SHEETS TC4.2CA – 4.2CH**

- SHIFT 85NB/SB TRAFFIC TO THE OUTSIDE, AND COMPLETE MEDIAN FOUNDATIONS FOR OVERHEAD SIGN STRUCTURES AND MEDIAN DRAINAGE WORK (85 STA. 350+60 TO 428+50).

- REMOVE TEMP PVMT ALONG LEFT SIDE PELHAM (PELHAM STA. 53+88 TO 57+00).

STEP 3: **SHEETS TC4.3 – 4.3B**

- UPON COMPLETION OF MEDIAN BENT WORK, REMOVE TEMP BARRIER, REVISE PVMT MARKINGS, AND SHIFT 85NB/SB OFF OF OUTSIDE SHOULDERS.

- REVISE 85NBCD MARKINGS AT ENTRANCE RAMP TO 85NB AND COMPLETE 85/85NBCD OUTSIDE WIDENING (STA. 295+00 TO 301+50).
  - ***PREREQUISITE CONSTRUCTION:***
    - **85NBCD STEP 3** (TC5.3)
    - **R2A/R4 STEP 3** (TC9.3)

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	10-17-16	PHASING UPDATED TO ADD STEP 2A - 2C	CEO	BLW
2	5-4-18	85 STEP 2 NORTH OF INTERCHANGE 85SB END WIDENING STA. REVISED TO 386+60	CEO	BLW

FLATIRON ZACHRY a joint venture

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SOUTH CAROLINA STANTEC CONSULTING SERVICES, INC. No. C02310 CERTIFICATE OF AUTHORIZATION

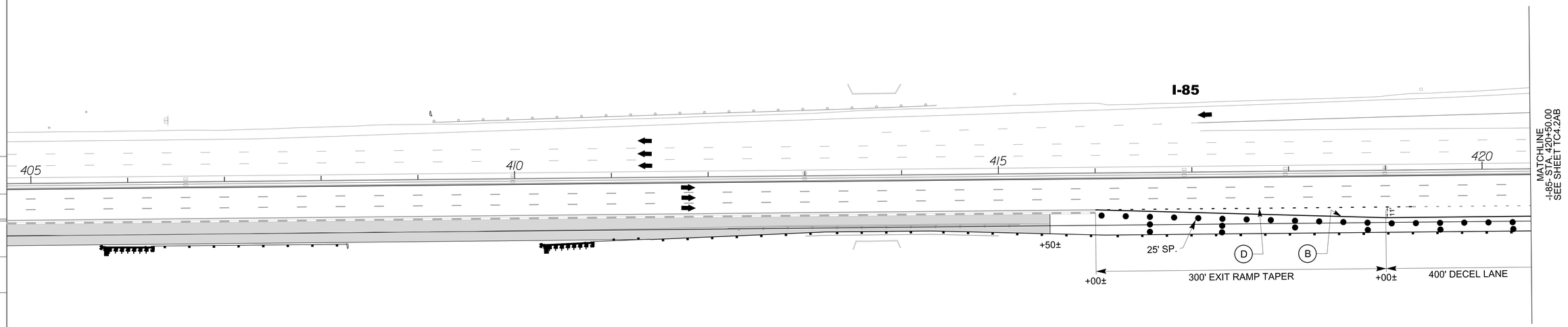
SOUTH CAROLINA PROFESSIONAL ENGINEER Documents Prepared by: Betsy L. Watson No. 27345 BETSY L. WATSON 6/15/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

I-85 / I-385 INTERCHANGE

STAGING NARRATIVE

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2AA



REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY; NO WORK ON 85SB	CEO	BLW

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SOUTH CAROLINA PROFESSIONAL ENGINEER
Document signed by: Betsy L. Watson
No. 27345
BETSY L. WATSON 6/15/2018

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SCDOT South Carolina Department of Transportation

I-85 / I-385 INTERCHANGE

I-85
STEP 2A

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
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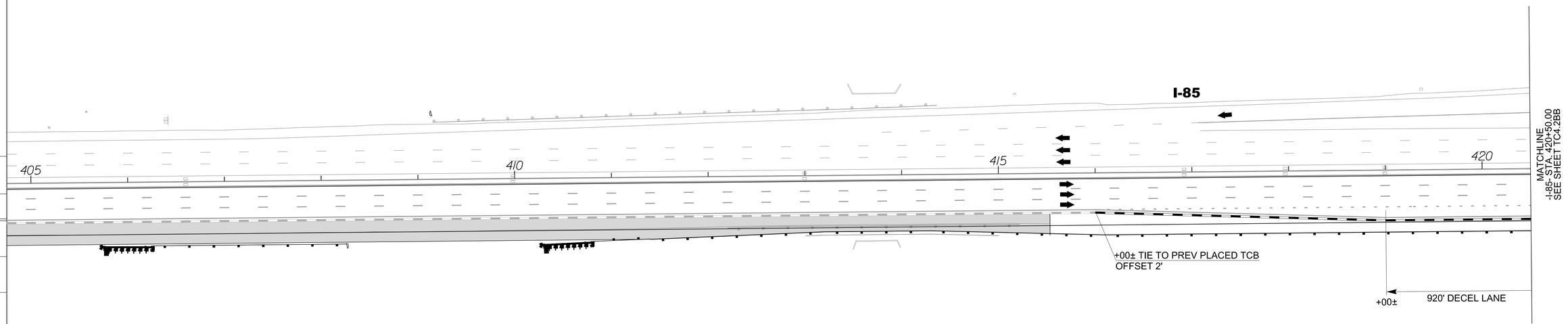

REVISIONS

NO.	DATE	DESCRIPTION
1	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY; NO WORK ON 85SB

BY	CHECKED
CEO	BLW

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I-85 / I-385 INTERCHANGE

I-85
STEP 2B

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
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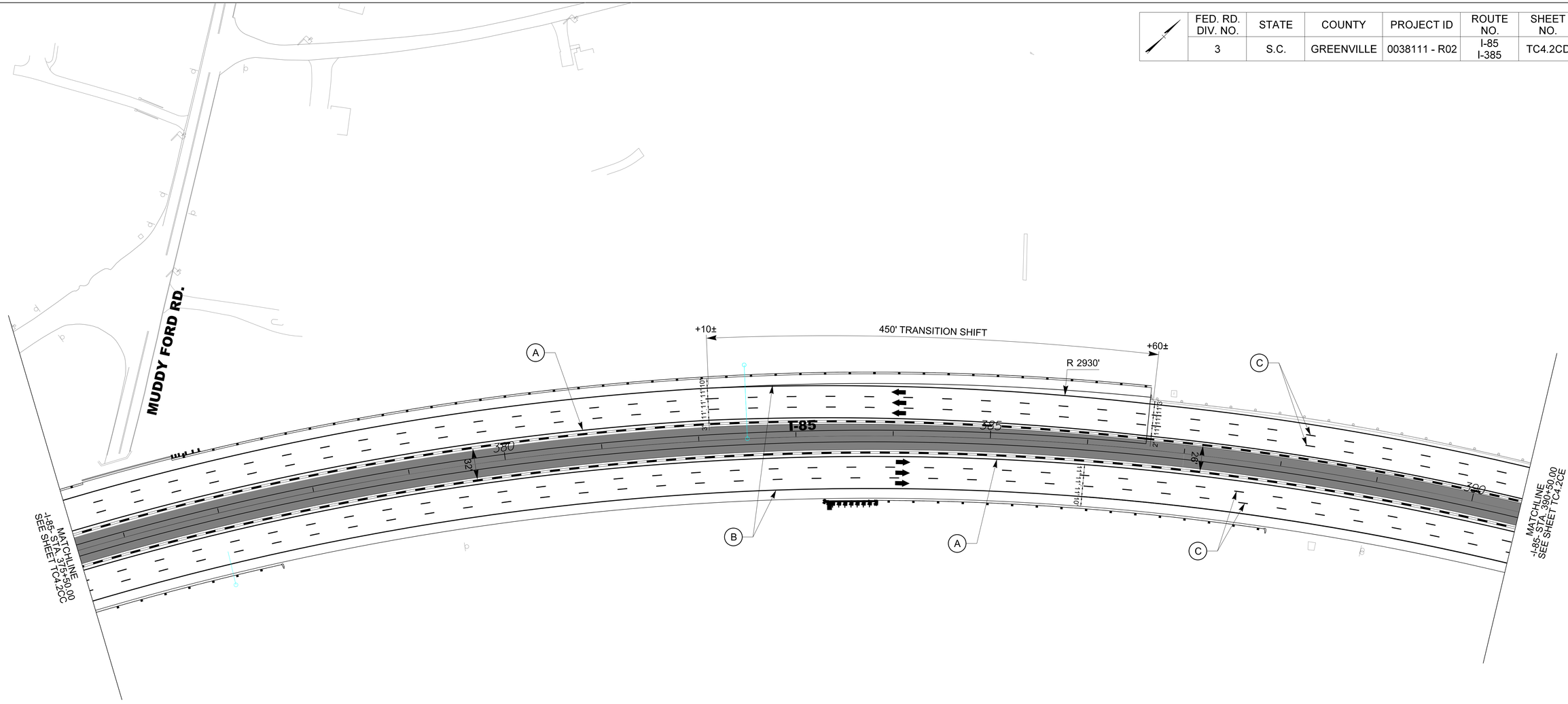

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
			CEO	BLW
1	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS		

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SOUTH CAROLINA PROFESSIONAL ENGINEER
Documents prepared by
Betsy L. Watson
No. 27345
BETSY L. WATSON
6/15/2018

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I-85 / I-385 INTERCHANGE

I-85
STEP 2C

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
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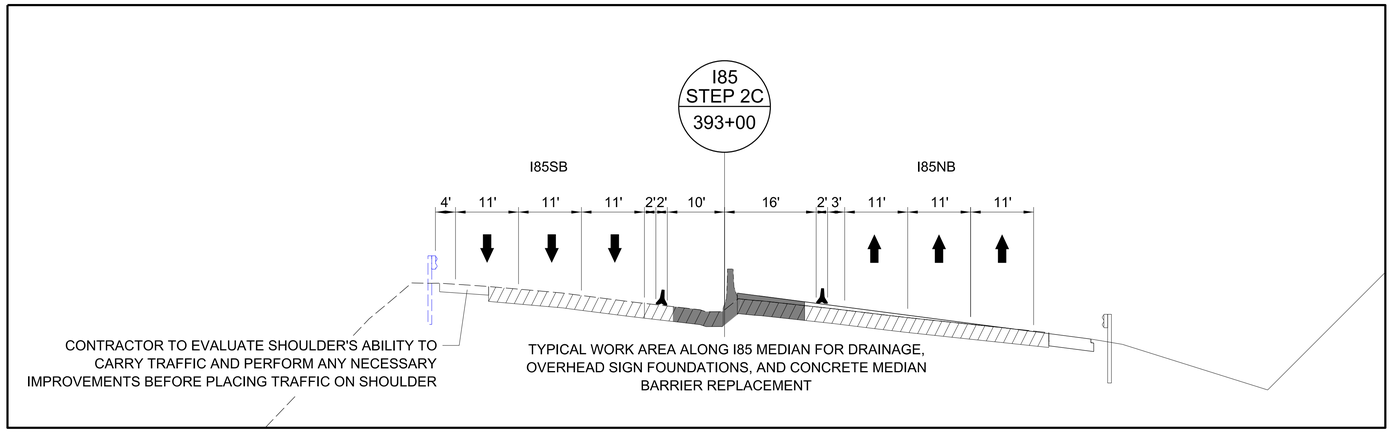

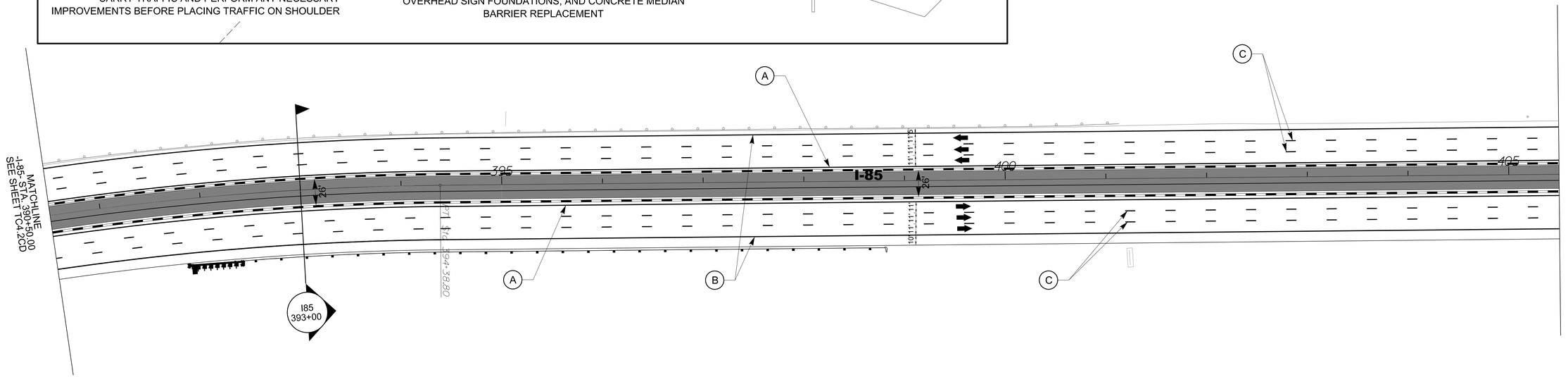

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SOUTH CAROLINA PROFESSIONAL ENGINEER Betsy L. Watson No. 27345 BETSY L. WATSON 6/15/2018

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I-85 / I-385 INTERCHANGE

I-85
STEP 2C

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
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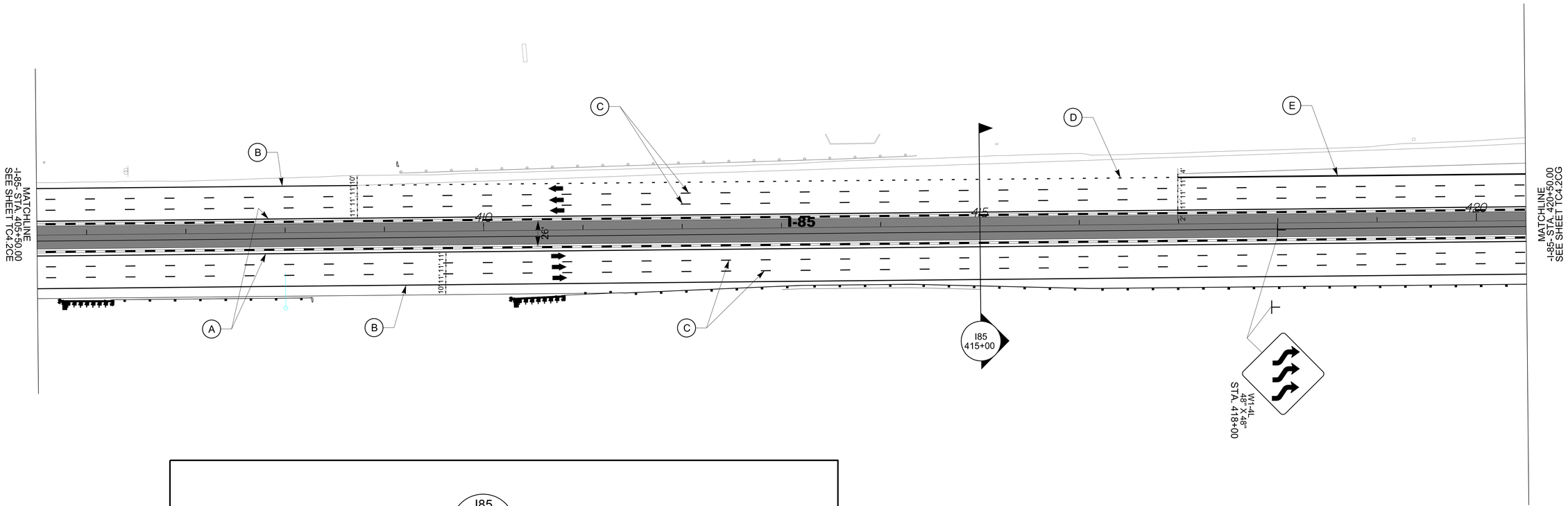

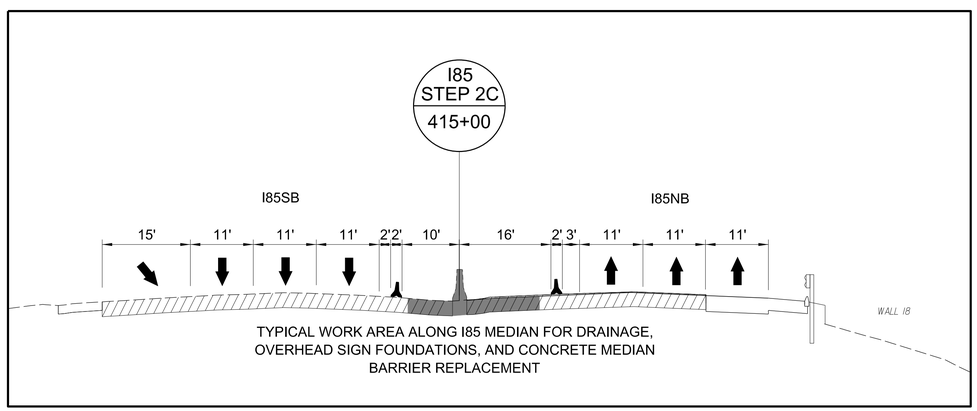

TYPICAL WORK AREA ALONG I85 MEDIAN FOR DRAINAGE, OVERHEAD SIGN FOUNDATIONS, AND CONCRETE MEDIAN BARRIER REPLACEMENT

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
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I-85 / I-385 INTERCHANGE

I-85
STEP 2C

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
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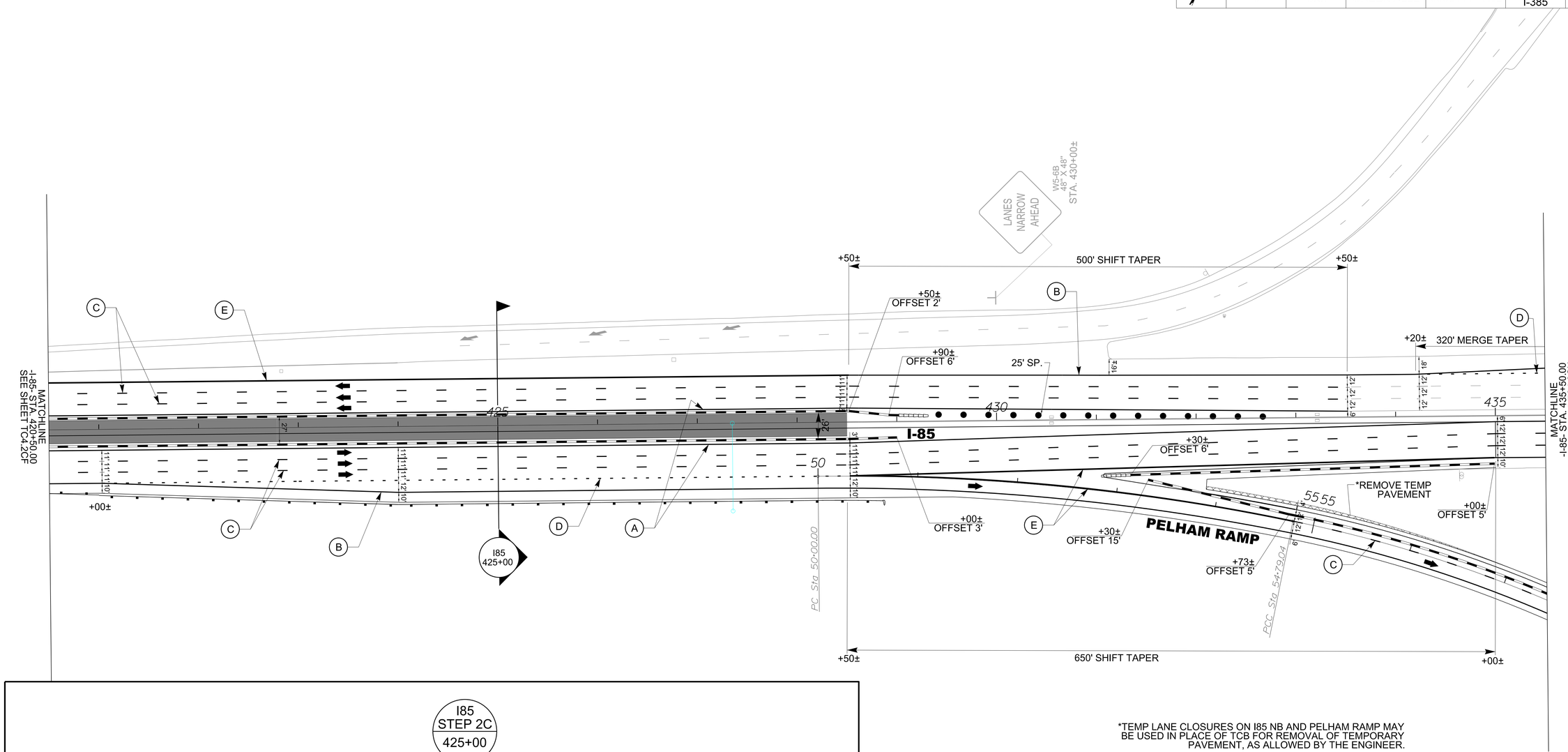

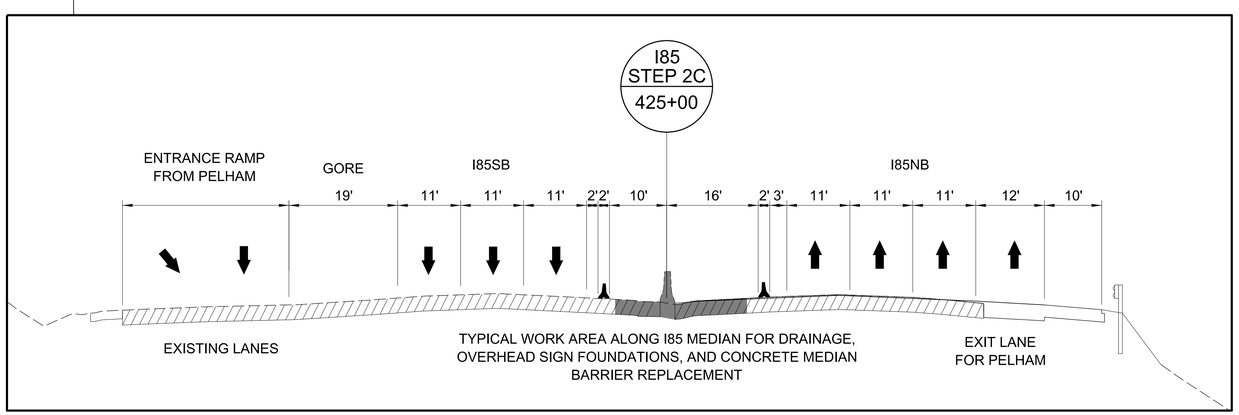

*TEMP LANE CLOSURES ON I85 NB AND PELHAM RAMP MAY BE USED IN PLACE OF TCB FOR REMOVAL OF TEMPORARY PAVEMENT, AS ALLOWED BY THE ENGINEER.

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	6-13-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

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Document signed by: Betsy L. Watson
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BETSY L. WATSON
6/15/2018

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I-85 / I-385 INTERCHANGE

I-85
STEP 2C

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FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
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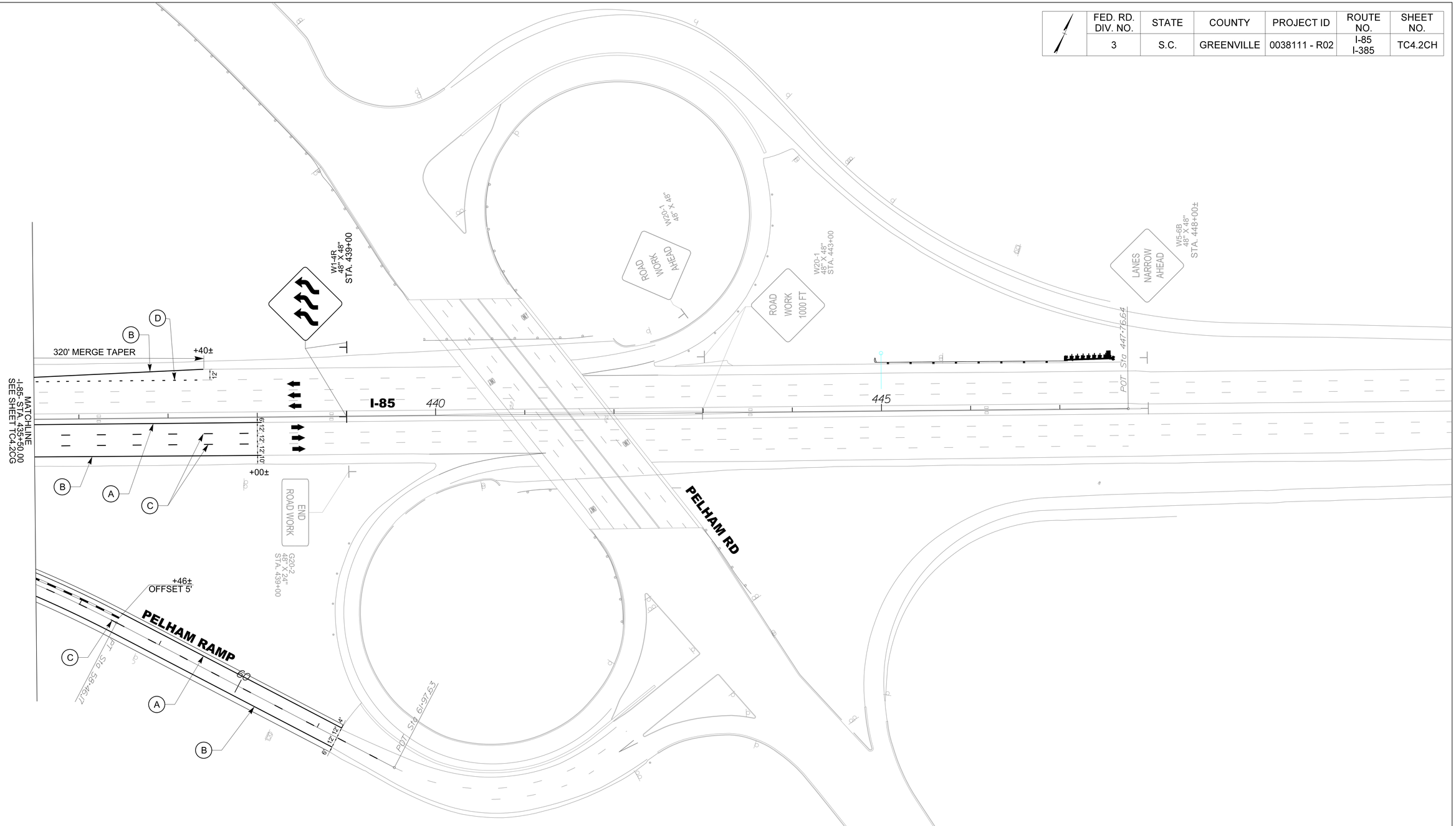

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	6-13-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

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I-85 / I-385 INTERCHANGE

I-85
STEP 2C

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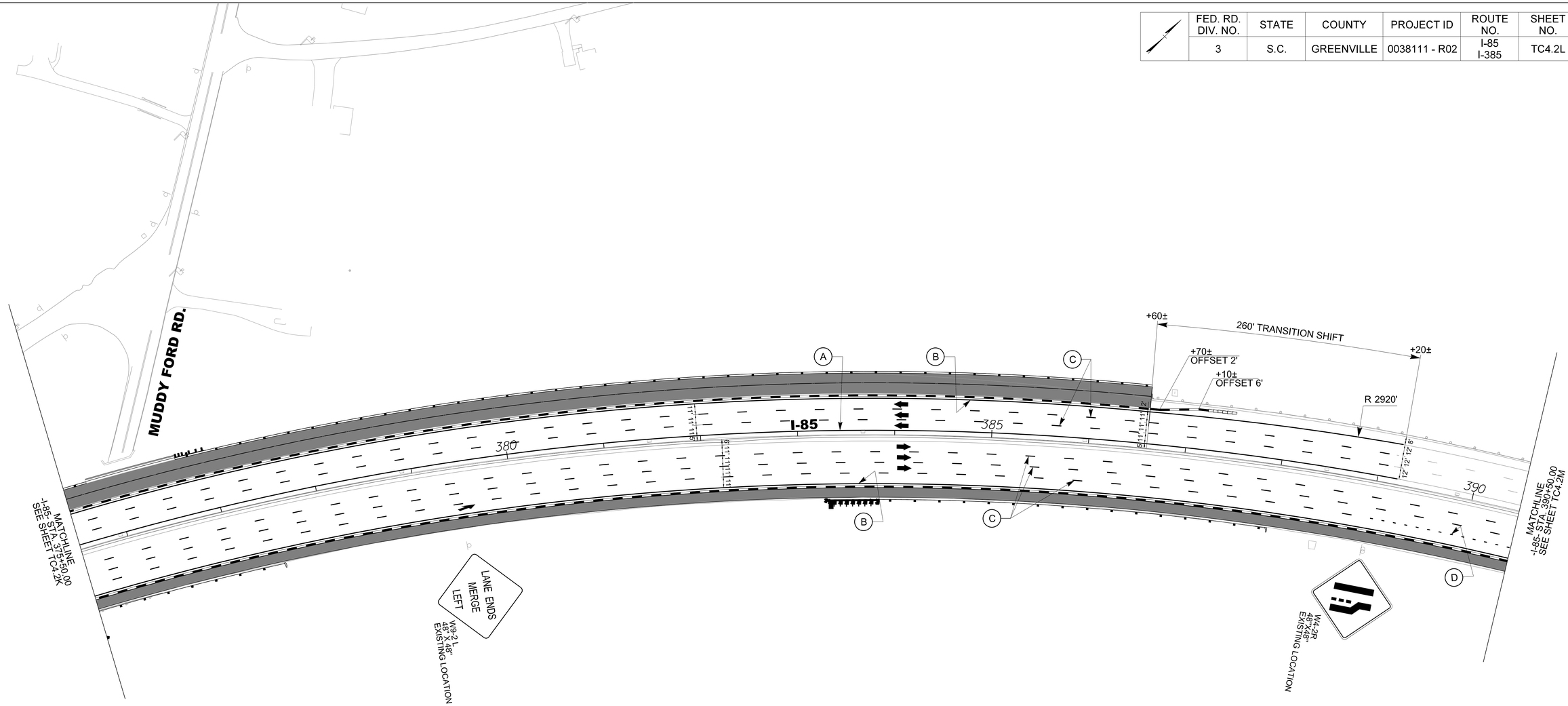
FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC4.2L



NO.	DATE	DESCRIPTION	BY	CHECKED
1	10-17-16	REVISED TO INCORPORATE ROCKY CREEK ROADWAY REVISIONS	CEO	BLW
2	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

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I-85 / I-385 INTERCHANGE

I-85
STEP 2

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FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
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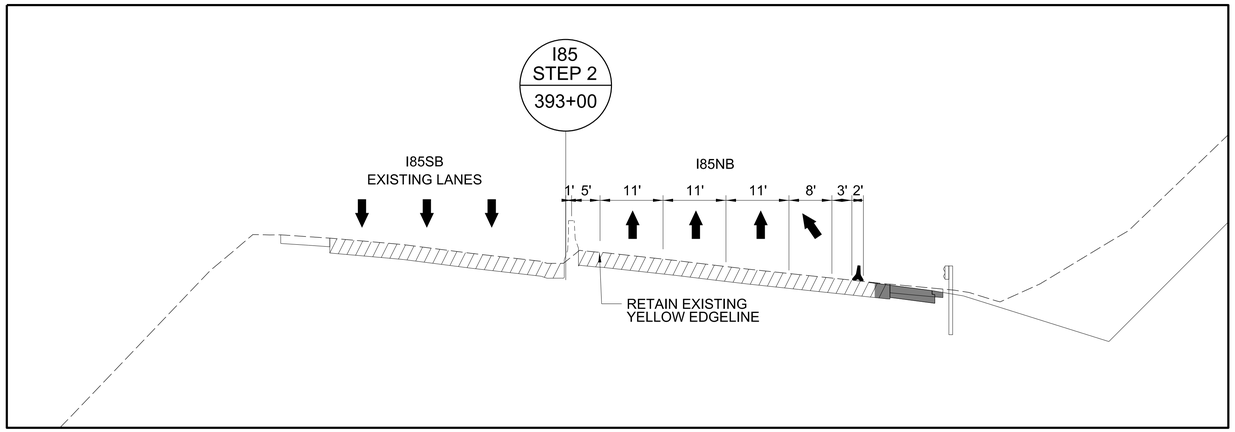

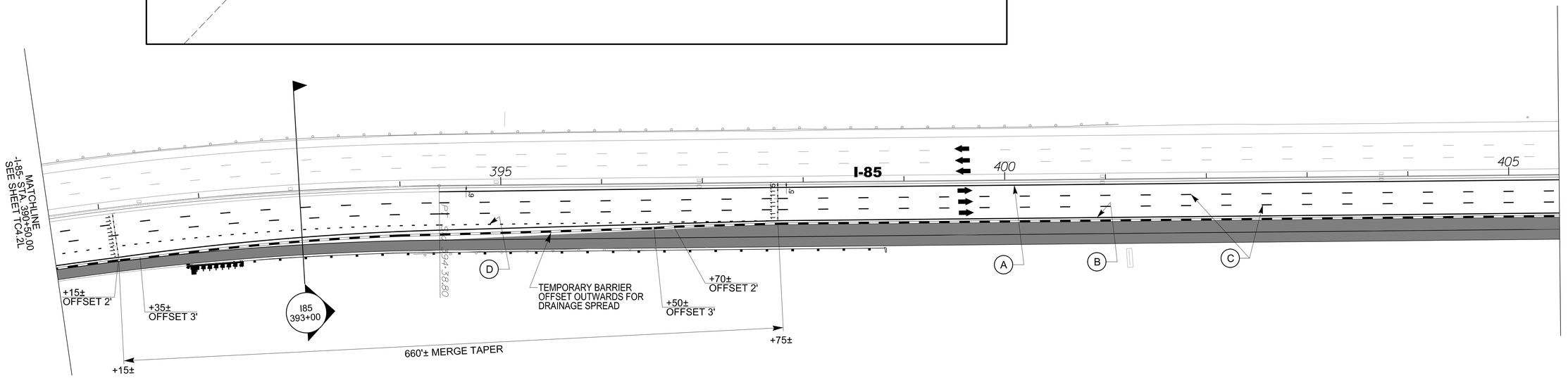

REVISIONS NO.	DATE	DESCRIPTION	BY	CHECKED
1	10-17-16	REVISED TO INCORPORATE ROCKY CREEK ROADWAY REVISIONS	CEO	BLW
2	6-13-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

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SOUTH CAROLINA PROFESSIONAL ENGINEER
Digitally signed by Betsy L. Watson
No. 27345
BETSY L. WATSON
6/15/2018

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

I-85 / I-385 INTERCHANGE

I-85
STEP 2

	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
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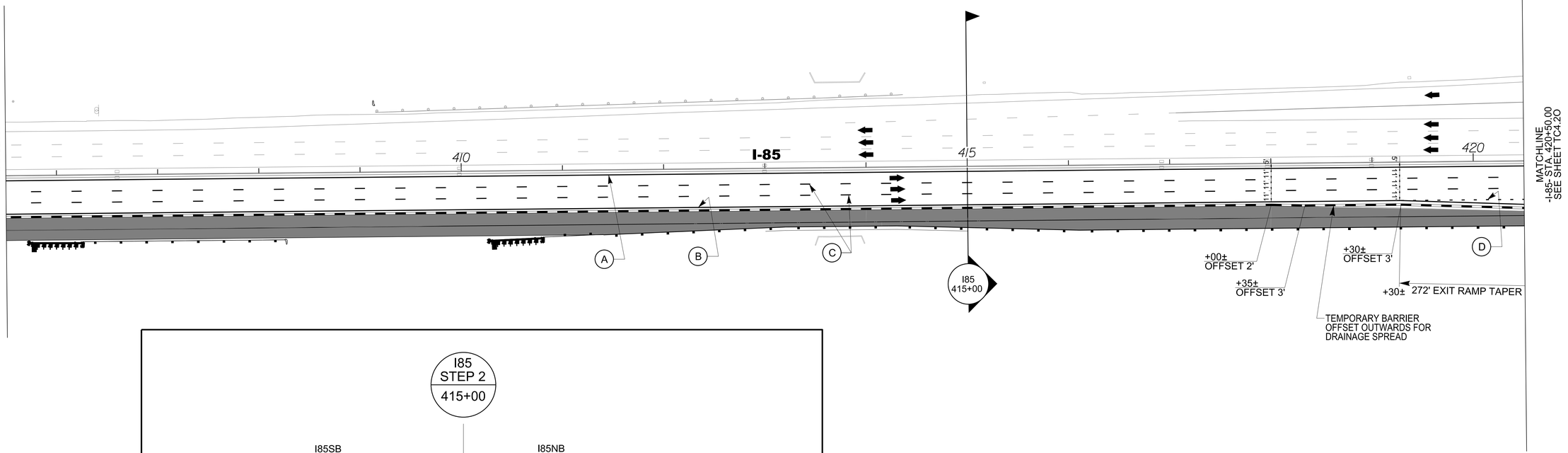

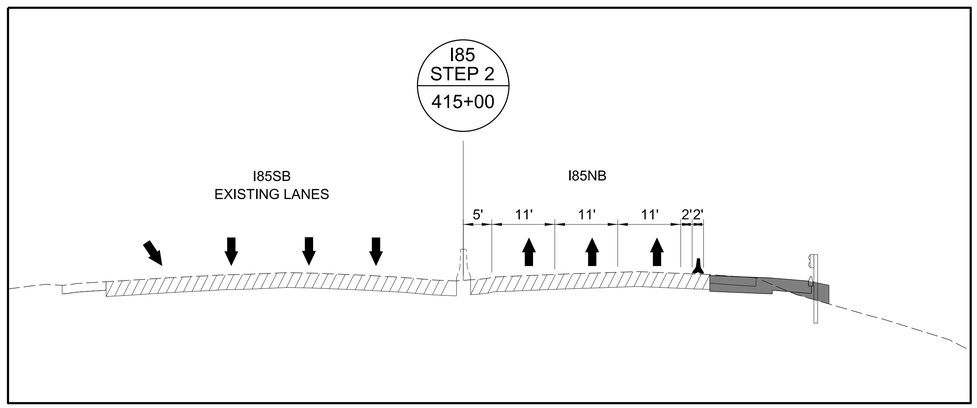

NO.	DATE	DESCRIPTION	BY	CHECKED
1	10-17-16	REVISED TO INCORPORATE ROCKY CREEK ROADWAY REVISIONS	CEO	BLW
2	5-24-18	REVISED TO REFLECT UPDATED ROCKY CREEK ROADWAY REVISIONS	CEO	BLW

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BETSY L. WATSON
6/15/2018

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I-85 / I-385 INTERCHANGE

I-85
STEP 2

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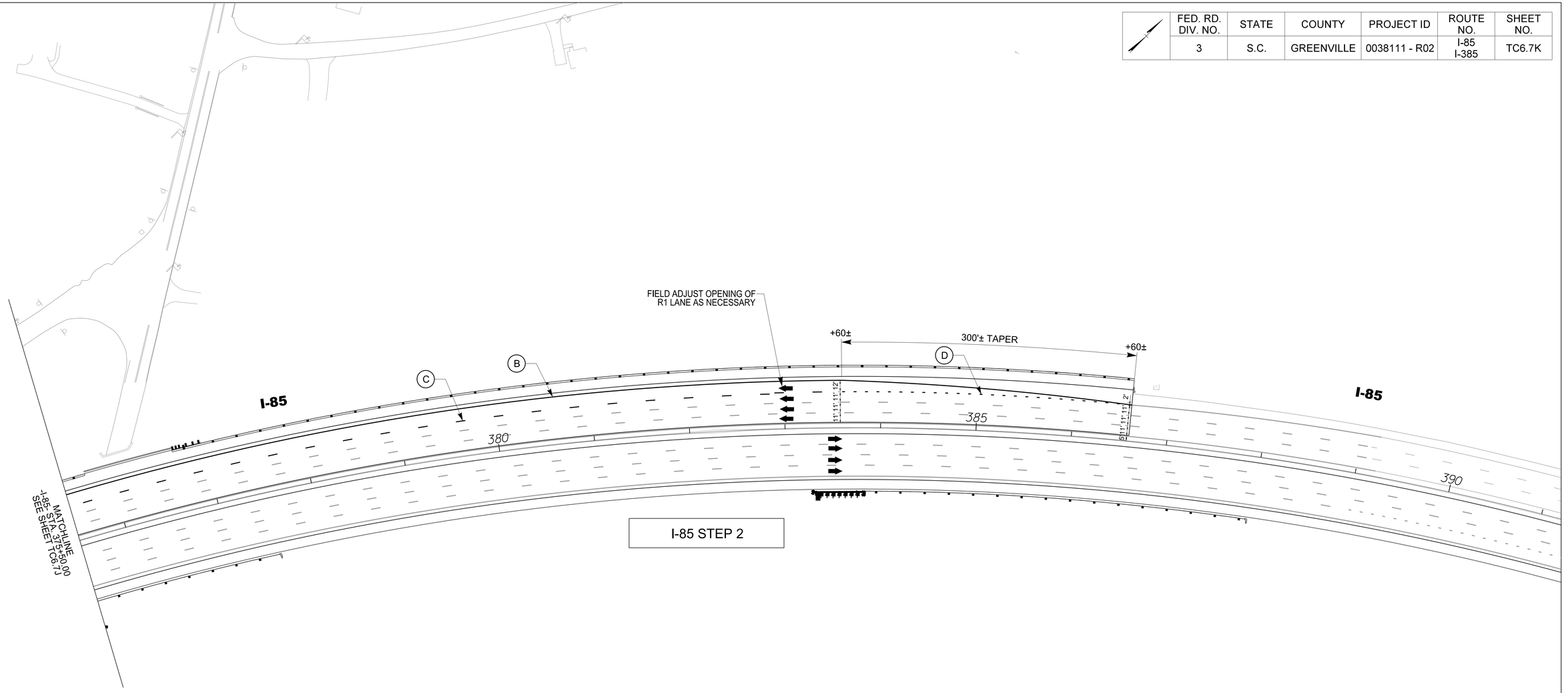
	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
	3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC6.7K



I-85 STEP 2

NO.	DATE	DESCRIPTION
1	5-24-18	PROPOSED 85SB CONSTRUCTION LIMITS ADJUSTED IN ROCKY CREEK REVISIONS

BY: CEO — CHECKED: BLW

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SOUTH CAROLINA PROFESSIONAL ENGINEER Betsy L. Watson No. 27345 BETSY L. WATSON 6/15/2018

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I-85 / I-385 INTERCHANGE

I-385
STEP 7

5/30/2018 4:29:30 PM U:\1710-Transportation Management Plan MOT\DESIGN\AREA 0102 INTERCHANGE TMP\TMP_PLAN_SHEETS\TC06.7K_I385_STEP 07.DGN

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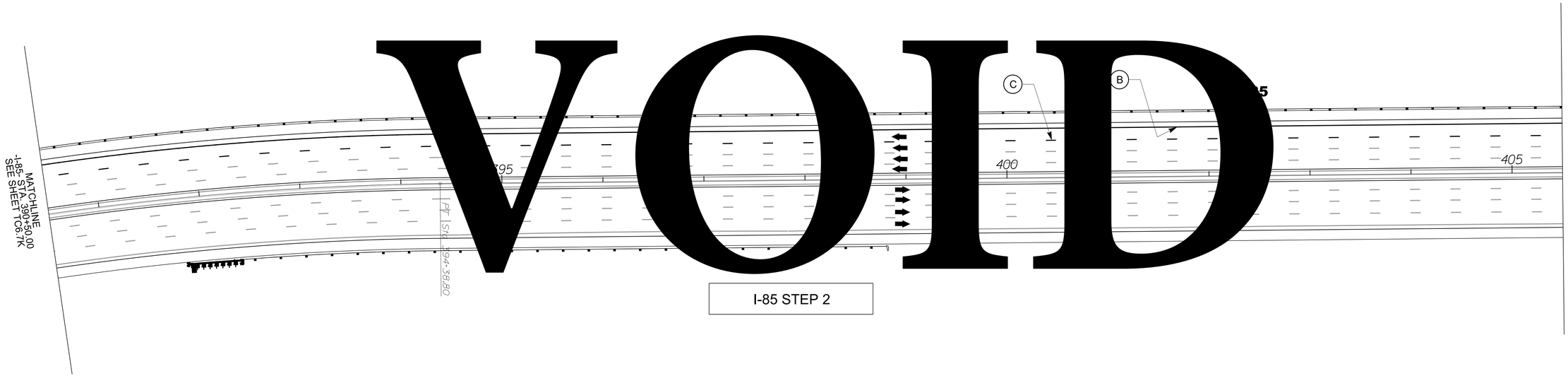

I-85 STEP 2

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I-85 / I-385 INTERCHANGE

I-385
STEP 7

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R02	I-85 I-385	TC6.7M

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I-385
STEP 7