ROADWAY DESIGN UNIT
RECEIVED FILE
JUL 22 2013
BENNETT
BREW
GOODNIGHT
HAIRE
HAUSER
LOVERING
B. MOORE
PREPARE REPLY FOR
F.Y.I.
REVIEW/DISCUSS WITH
J. MOORE
MUMFORD
PATEL
SPEER
TAYLOR
THOMAS
TIMMONS
SIGNATURE
K. Moore
CC:

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

July 19, 2013

MEMORANDUM TO: Mohammed Mulla, P.E., C.P.M.
Contracts and Statewide Services Manager

K. J. Kim, Ph.D., P.E.
Eastern Regional Geotechnical Manager

Eric Williams, P.E.
Western Regional Geotechnical Manager

FROM: John Pilipchuk, L.G., P.E.
State Geotechnical Engineer

SUBJECT: Standard Concrete Ditch Behind Wall Details

The Technical Support Group of the Support Services Section has completed the new Standard Concrete Ditch Behind Wall Details. These details are included in a new geotechnical design cell library entitled "Geotechnical_Design_English_new" that has been added to the geotechnical workspace. The current geotechnical design cell library has been renamed "Geotechnical_Design_English_old" and will remain in the workspace.

For retaining walls with concrete ditches above and behind walls, contact the respective Hydraulics Engineer to determine which geotechnical design cell library to use to develop retaining wall plans. In general, the new cell library will be used if drainage design is not complete. However, it may be necessary to use the old cell library if drainage design is not complete but close to being completed.

The new geotechnical design cell library includes 2 new cells for concrete ditch behind wall with back slope or concrete slope protection for concrete facing and coping. Details for coping include 3 details for different wall and facing element types. Only the applicable ditch details should be placed on the retaining wall plans. Also, the existing cells and drawings with back slopes for anchored, CIP gravity, MSE, soil nail and soldier pile wall typical sections have been updated to show the new concrete ditch behind wall. These new and revised items are attached to this memorandum for your reference.

These new Standard Concrete Ditch Behind Wall Details and revised retaining wall typical sections are dated January 21, 2014, the first letting in 2014. However, this date is only for reference. Projects let in 2014 and later may still have retaining wall plans developed from the old geotechnical design cell library based on the status of the drainage design when the wall

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
1589 MAIL SERVICE CENTER
RALEIGH NC 27699-1589

TELEPHONE: 919-707-6850
FAX: 919-250-4237
connect.ncdot.gov/resources/Geological

LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

plans are developed. If there are any questions, please contact Scott Hidden, P.E. at (919) 707-6856.

Attachments: New Concrete Ditch Behind Wall with Back Slope for Concrete Facing and Coping Cell
New Concrete Ditch Behind Wall with Slope Protection for Concrete Facing and Coping Cell
Revised Anchored Wall with or without Back Slope Cell
Revised MSE Wall with Panels and Back Slope Cell
Revised Non-critical MSE Wall with SRW Units and Back Slope Cell
Revised Soil Nail Wall with or without Back Slope Cell
Revised Soldier Pile Wall with or without Back Slope Cell
Revised Standard CIP Gravity Retaining Wall Drawing

cc: Jay Bennett, P.E., State Roadway Design Engineer
David Chang, Ph.D., P.E., State Hydraulics Engineer
Allan Raynor, P.E., Assistant State Structures Engineer
Rodger Rochelle, P.E., Transportation Program Management Director
Division Engineers
Lamar Sylvester, P.E., State Roadway Construction Engineer
Mike Robinson, P.E., State Bridge Construction Engineer
Cynthia Terrell, P.E., Plans and Standards Engineer

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www.ncdot.gov/doh/preconstruct/highway/geotech

LOCATION:
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1020 BIRCH RIDGE DRIVE
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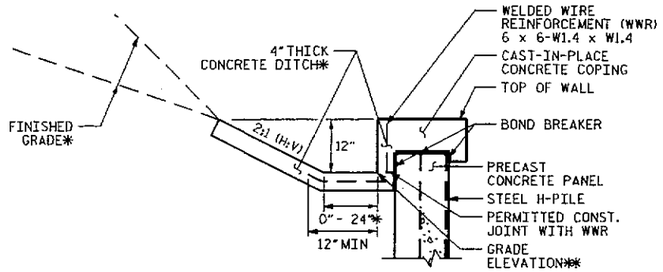
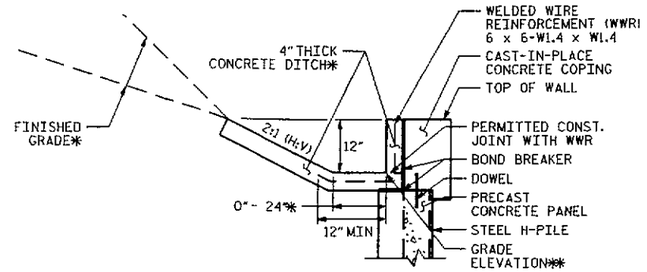
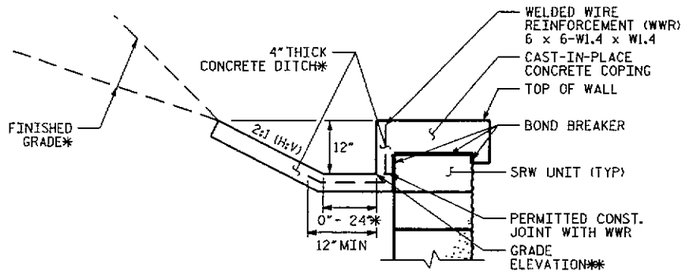
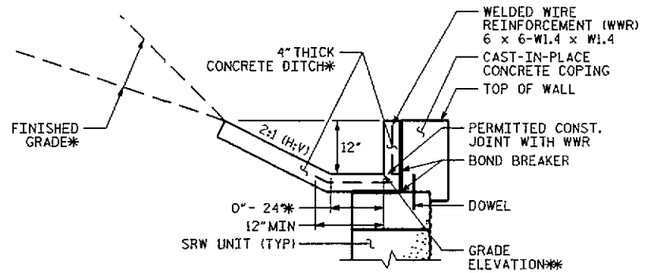


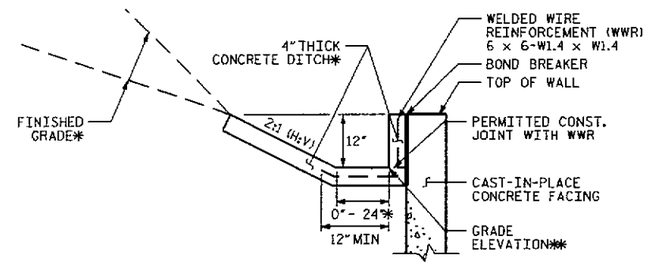


SOLDIER PILE WALL WITH PRECAST PANELS



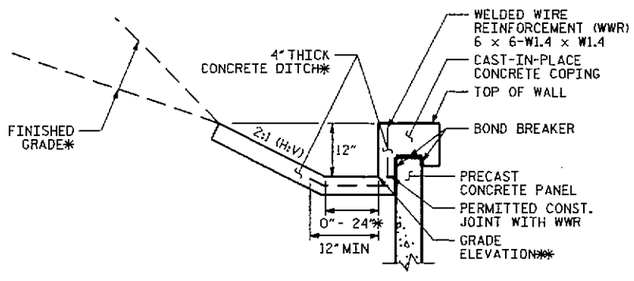


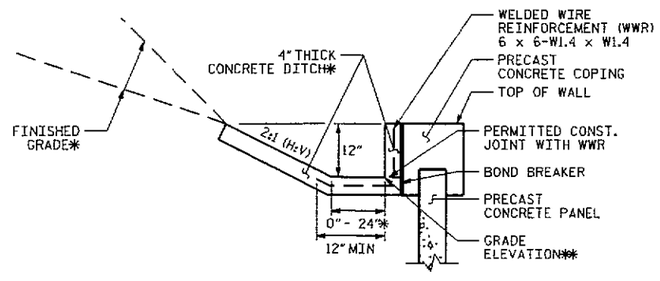
MSE WALL WITH SRW UNITS



CONCRETE DITCH BEHIND
WALL WITH CONCRETE FACING

*SEE ROADWAY PLANS FOR FINISHED GRADE AND DITCH DETAILS.
**SEE WALL ENVELOPE FOR GRADE ELEVATIONS.





MSE WALL WITH PRECAST PANELS

CONCRETE DITCH BEHIND
WALL WITH CONCRETE COPING

*SEE ROADWAY PLANS FOR FINISHED GRADE AND DITCH DETAILS.
**SEE WALL ENVELOPE FOR GRADE ELEVATIONS.

FOR CONCRETE DITCHES, SEE SECTION 850 OF THE STANDARD SPECIFICATIONS.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

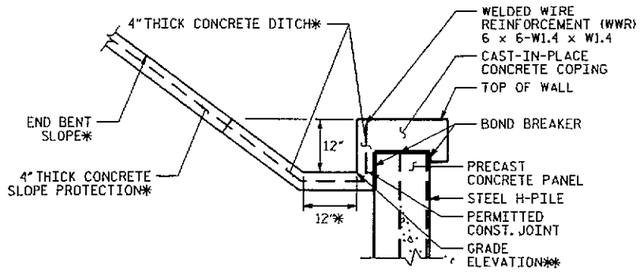
GEOTECHNICAL ENGINEERING UNIT

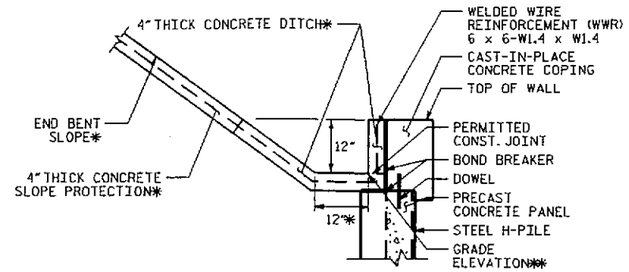
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STD CELL Wall_Ditch_Slope

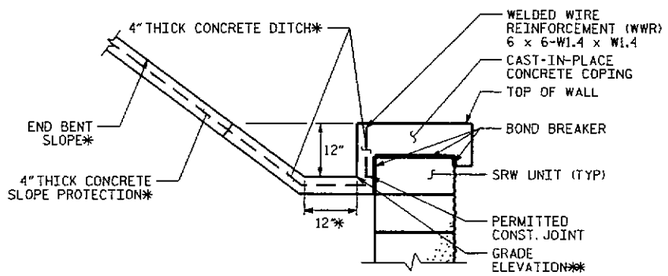
CONCRETE DITCH BEHIND WALL
WITH BACK SLOPE FOR
CONCRETE FACING AND COPING

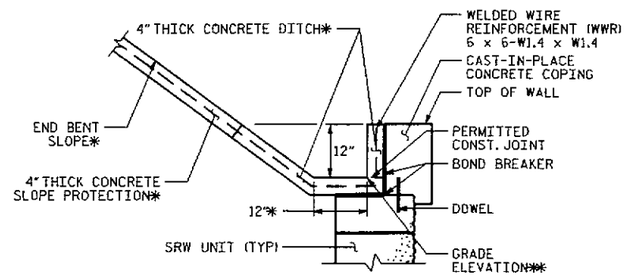
DATE: 1-21-14



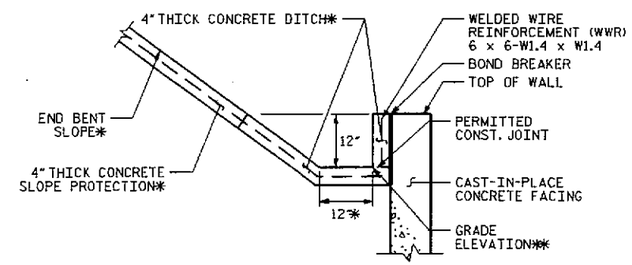


SOLDIER PILE WALL WITH PRECAST PANELS



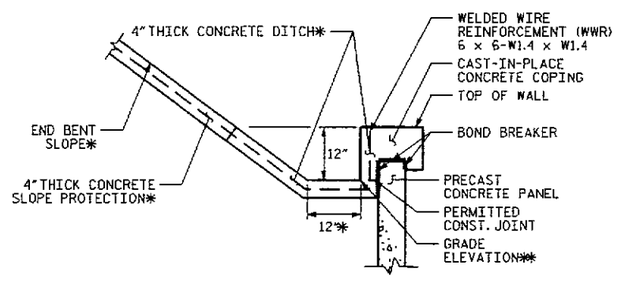


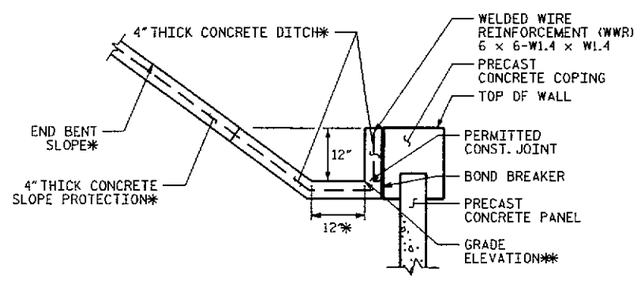
MSE WALL WITH SRW UNITS



CONCRETE DITCH BEHIND WALL WITH CONCRETE SLOPE PROTECTION AND FACING

*SEE PLANS FOR END BENT SLOPE AND DITCH DETAILS.
**SEE WALL ENVELOPE FOR GRADE ELEVATIONS.





MSE WALL WITH PRECAST PANELS

CONCRETE DITCH BEHIND WALL WITH CONCRETE SLOPE PROTECTION AND COPING

*SEE PLANS FOR END BENT SLOPE AND DITCH DETAILS.
**SEE WALL ENVELOPE FOR GRADE ELEVATIONS.

FOR CONCRETE DITCHES, SEE SECTION 850 OF THE STANDARD SPECIFICATIONS.
FOR CONCRETE SLOPE PROTECTION, SEE SECTION 462 OF THE STANDARD SPECIFICATIONS.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GEOTECHNICAL ENGINEERING UNIT

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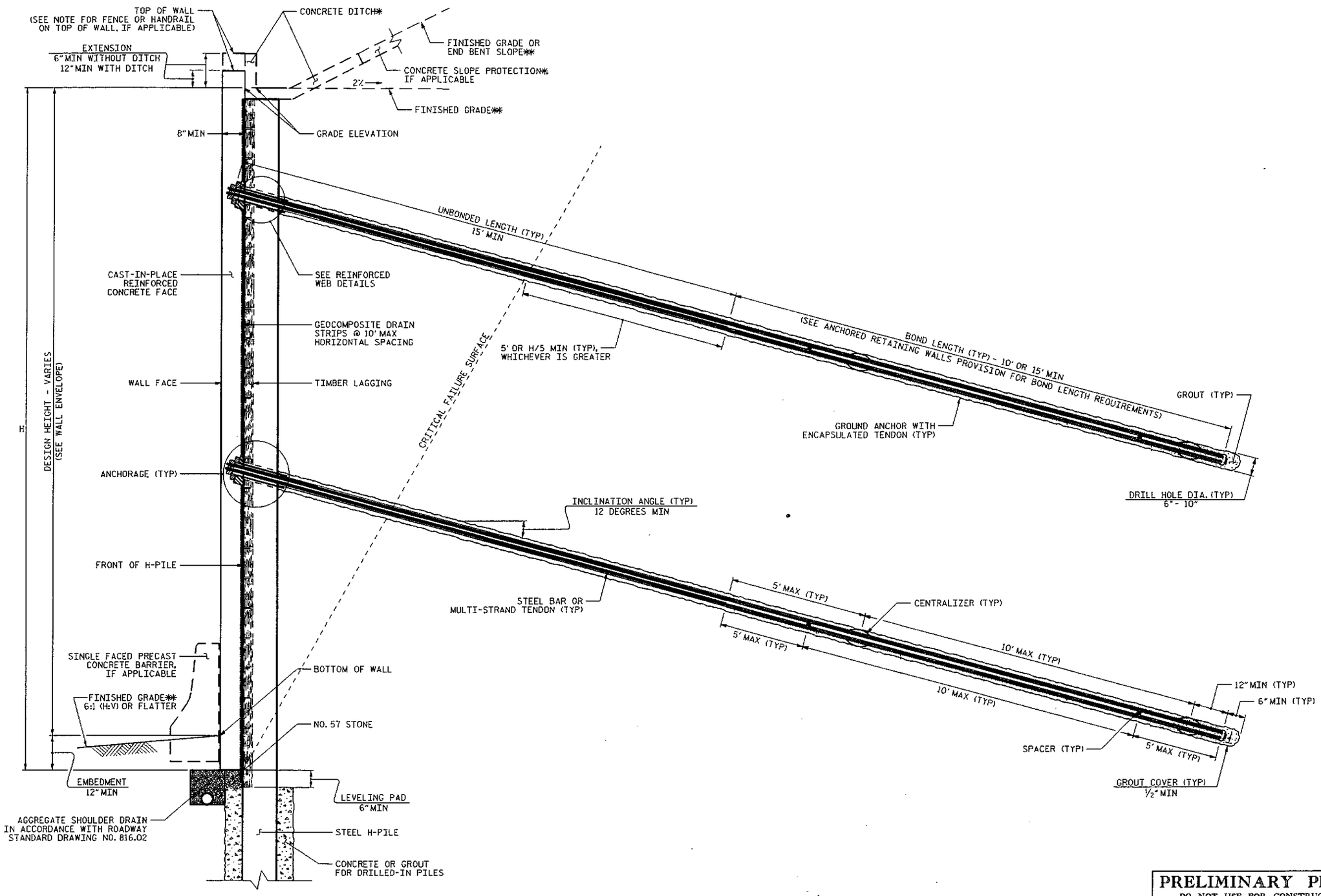
DEPARTMENT OF TRANSPORTATION
RALEIGH

STD CELL Wall_Ditch_SlopeProtection

CONCRETE DITCH BEHIND WALL WITH SLOPE PROTECTION FOR CONCRETE FACING AND COPING

DATE: 1-21-14



ANCHORED WALL - TYPICAL SECTION

(DOUBLE ROW OF GROUND ANCHORS SHOWN, AS NEEDED)
*SEE CONCRETE DITCH BEHIND WALL DETAILS.
**SEE PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

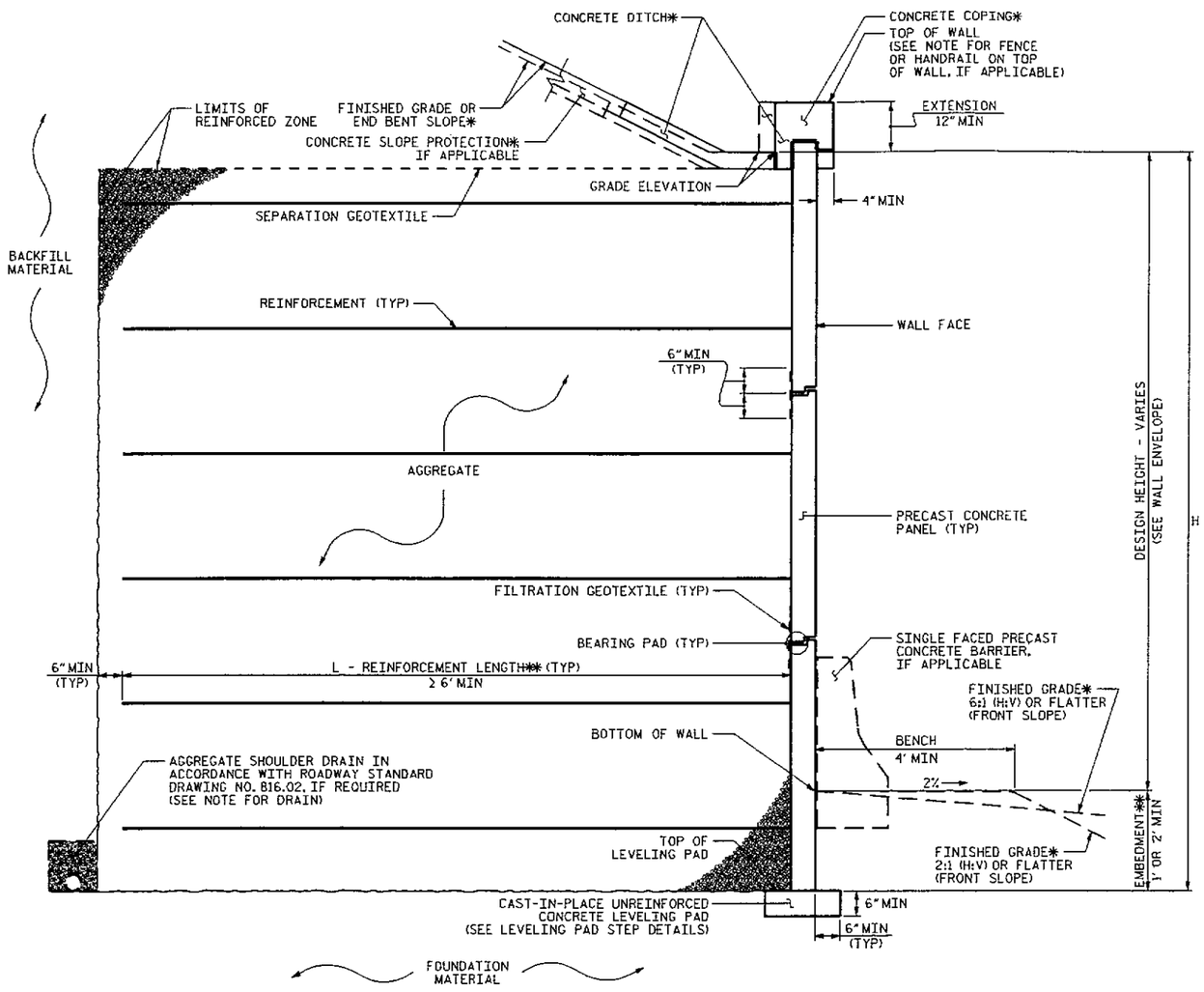
GEOTECHNICAL ENGINEERING UNIT

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH

STD CELL Wall_Anchored

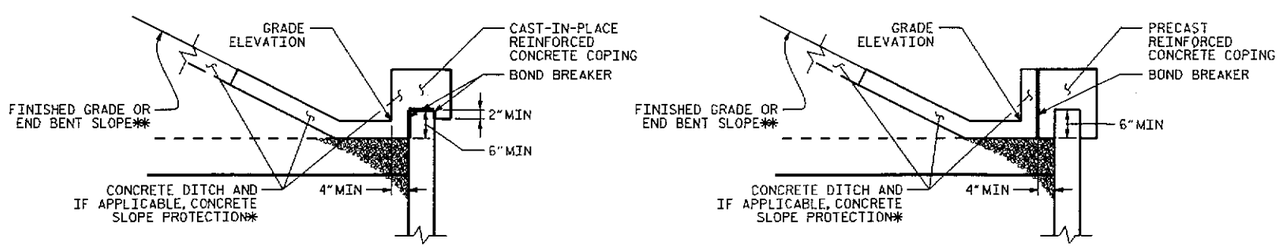
ANCHORED WALL WITH OR WITHOUT BACK SLOPE - TYPICAL

DATE: 1-21-14



MSE WALL WITH PRECAST PANELS - TYPICAL SECTION

*SEE COPING DETAILS AND PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.
**SEE MSE RETAINING WALLS PROVISION FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.



COPING DETAILS

*SEE CONCRETE DITCH BEHIND WALL DETAILS.
**SEE PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

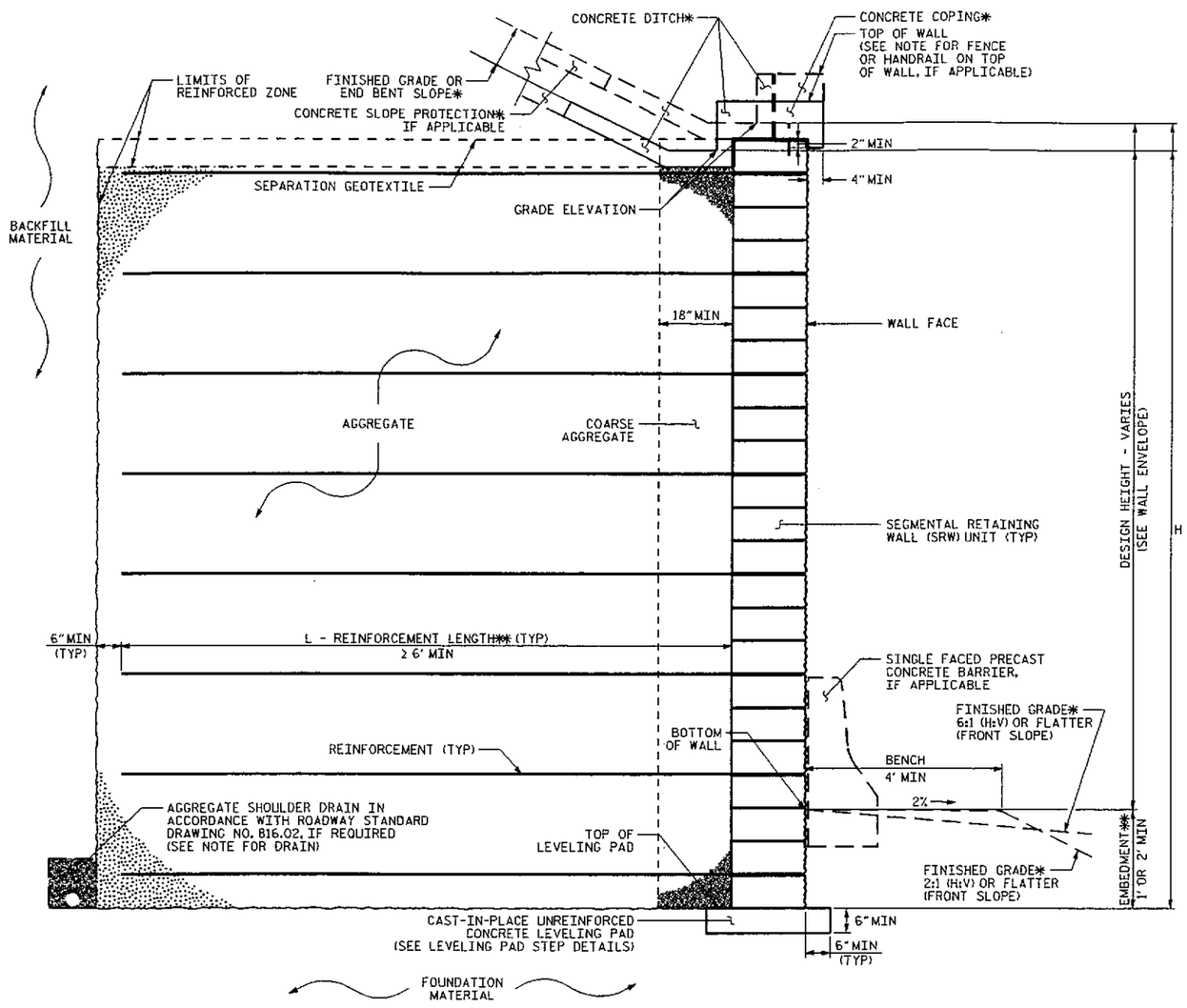
GEOTECHNICAL ENGINEERING UNIT

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH

STD CELL Wall_MSE_Panels_Slope

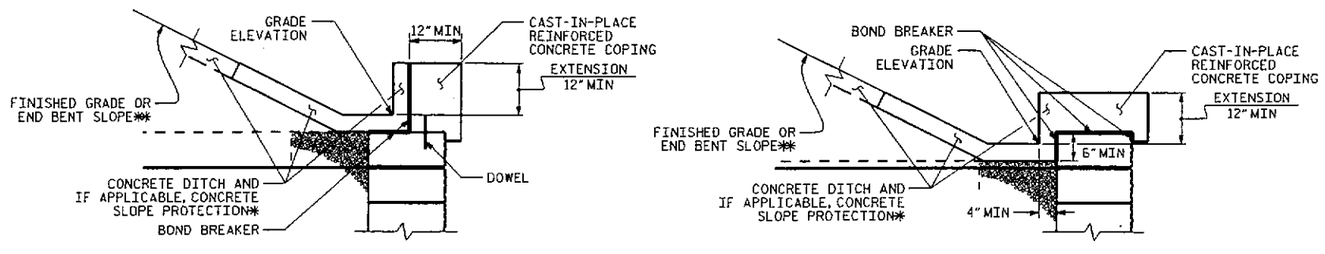
MSE WALL WITH PANELS AND BACK SLOPE - TYPICAL & COPING DETAILS

DATE: 1-21-14



MSE WALL WITH SRW UNITS - TYPICAL SECTION

*SEE COPING DETAILS AND PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.
**SEE MSE RETAINING WALLS PROVISION FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.



COPING DETAILS

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO SRW UNITS WITH DOWELS OR EXTEND COPING DOWN BACK OF SRW UNITS.
*SEE CONCRETE DITCH BEHIND WALL DETAILS.
**SEE PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

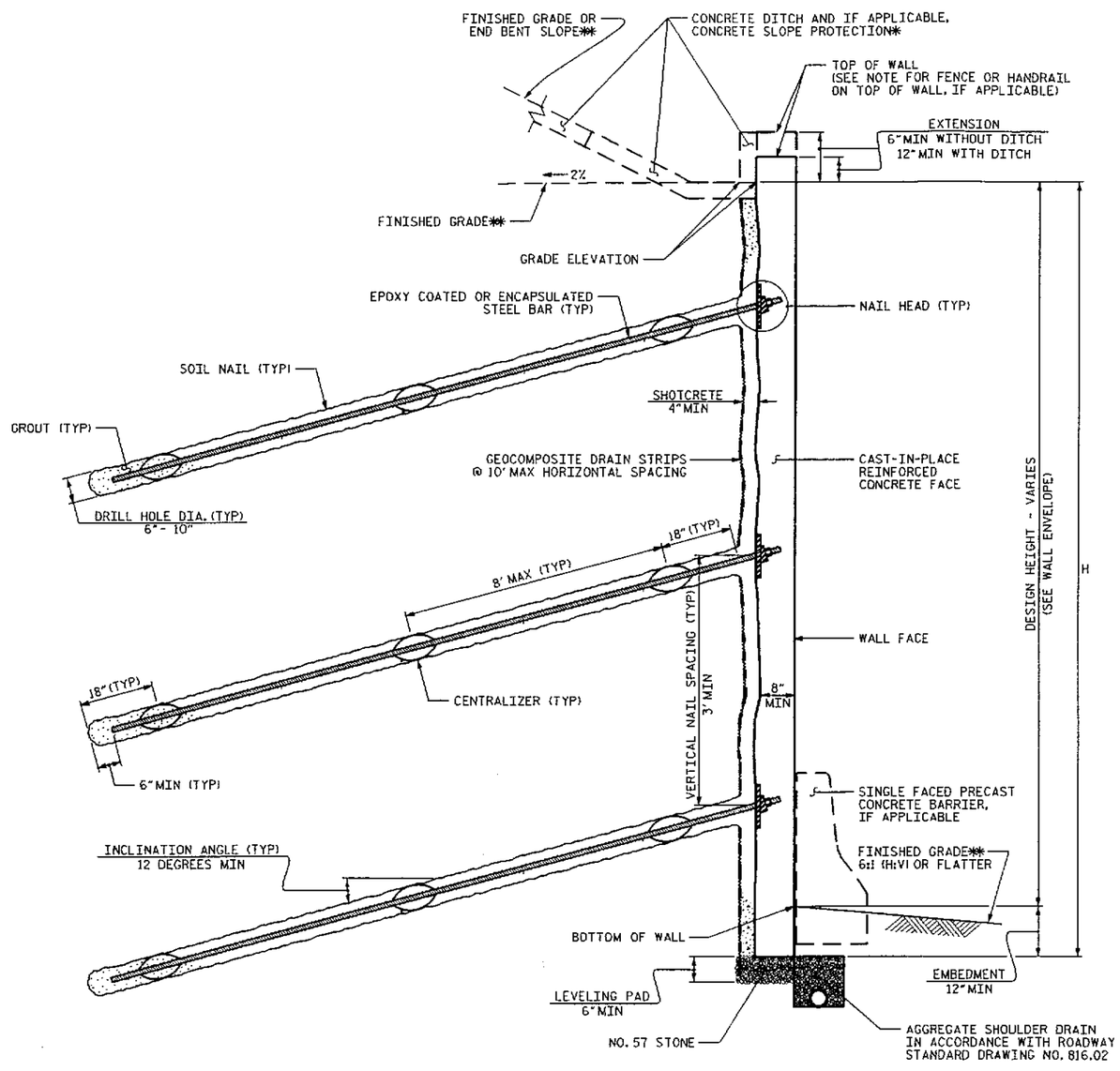
GEOTECHNICAL ENGINEERING UNIT

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH

STD CELL Wall_MSE_SRWUnits_Slope

NON-CRITICAL MSE WALL WITH SRW UNITS AND BACK SLOPE - TYPICAL & COPING DETAILS

DATE: 1-21-14



SOIL NAIL WALL - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL DETAILS.
**SEE PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.

NOTES:

FOR SOIL NAIL RETAINING WALLS, SEE SOIL NAIL RETAINING WALLS PROVISION.

FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

A CONCRETE BARRIER RAIL WITH MOMENT SLAB IS REQUIRED ABOVE RETAINING WALL NO. _. SEE PLANS FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB DETAILS.

A FENCE OR HANDRAIL IS REQUIRED ON TOP OF RETAINING WALL NO. _. SEE ROADWAY PLANS FOR FENCE OR HANDRAIL ATTACHMENT DETAILS.

A _____ ARCHITECTURAL FINISH IS REQUIRED FOR THE CAST-IN-PLACE REINFORCED CONCRETE FACE FOR RETAINING WALL NO. _.

A BRICK VENEER IS REQUIRED FOR RETAINING WALL NO. _ AS SHOWN. SUBMIT BRICK SAMPLES FOR APPROVAL BEFORE BEGINNING SOIL NAIL WALL CONSTRUCTION.

BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR RETAINING WALL NO. _. SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL NO. _ FOR THE FOLLOWING:
1) H = DESIGN HEIGHT + EMBEDMENT
2) DESIGN LIFE = 75 OR 100 YEARS
3) MINIMUM EMBEDMENT ELEVATION = ____ FT
4) IN-SITU ASSUMED MATERIAL PARAMETERS ABOVE ELEVATION _____ FT:
UNIT WEIGHT, γ = ___ LB/CF
FRICTION ANGLE, ϕ = __ DEGREES
COHESION, c = ___ LB/SF
5) IN-SITU ASSUMED MATERIAL PARAMETERS BELOW ELEVATION _____ FT:
UNIT WEIGHT, γ = ___ LB/CF
FRICTION ANGLE, ϕ = __ DEGREES
COHESION, c = ___ LB/SF

THE MINIMUM EMBEDMENT ELEVATION FOR RETAINING WALL NO. _ INCLUDES EMBEDMENT FOR SCOUR.

DESIGN RETAINING WALL NO. _ FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

DESIGN RETAINING WALL NO. _ FOR THE POINT, LINE OR STRIP SURCHARGE LOAD SHOWN.

DESIGN RETAINING WALL NO. _ FOR A PIPE EXTENDING THROUGH THE WALL AS SHOWN. VERIFY PIPE LOCATION AND ELEVATION BEFORE BEGINNING SOIL NAIL WALL DESIGN OR CONSTRUCTION.

FOUNDATIONS FOR SIGNS, LIGHTING OR SIGNALS WILL BE LOCATED BEHIND RETAINING WALL NO. _ AND WILL OR MAY INTERFERE WITH SOIL NAILS. SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS WITH THE SOIL NAIL WALL CONSTRUCTION PLAN.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES WILL OR MAY INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO. _.

FOUNDATIONS FOR END BENT NO. _ LOCATED AT STATION _____ WILL OR MAY INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO. _. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

"TEMPORARY SHORING" IS OR MAY BE REQUIRED FOR RETAINING WALL NO. _ IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE ROADWAY, STRUCTURE OR TRAFFIC CONTROL PLANS.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

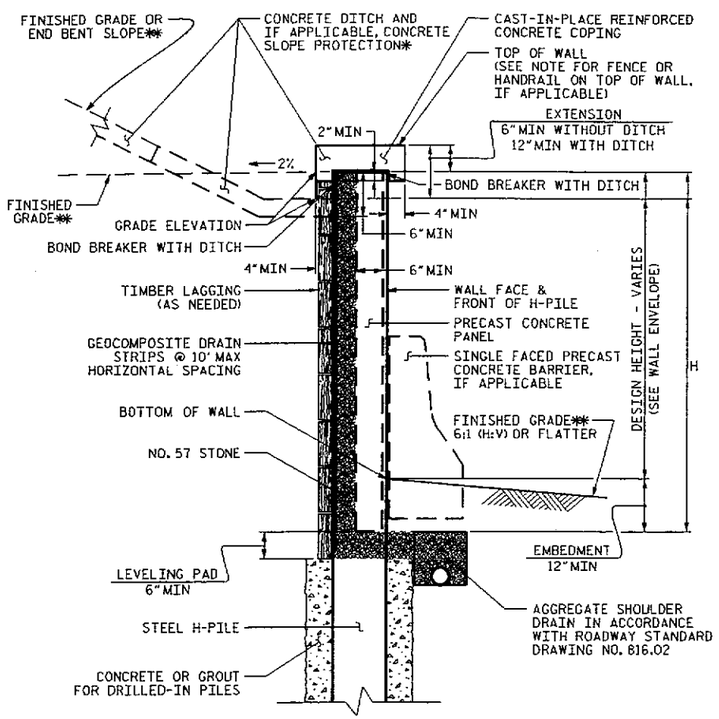
GEOTECHNICAL ENGINEERING UNIT

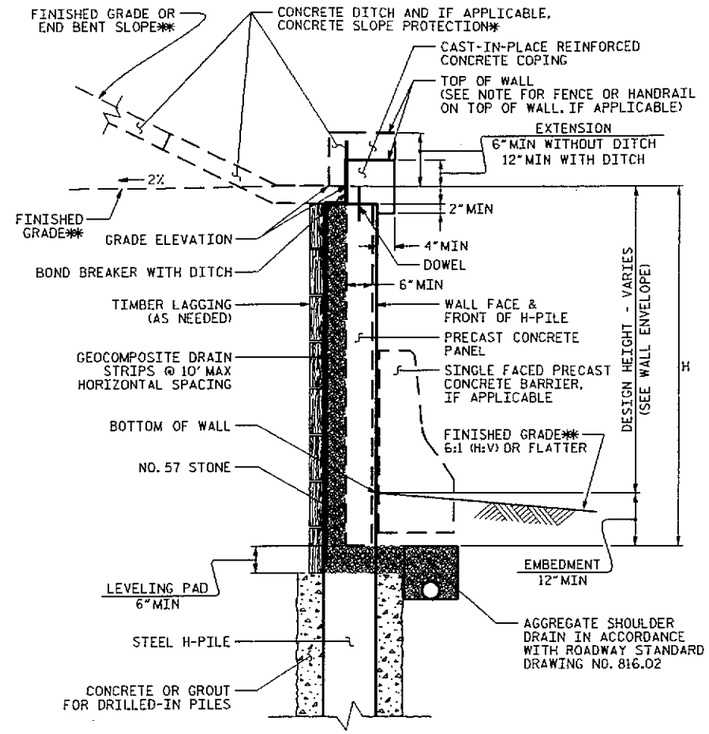
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH

STD CELL Wall_SoilNail

SOIL NAIL WALL
WITH OR WITHOUT BACK SLOPE - TYPICAL & NOTES

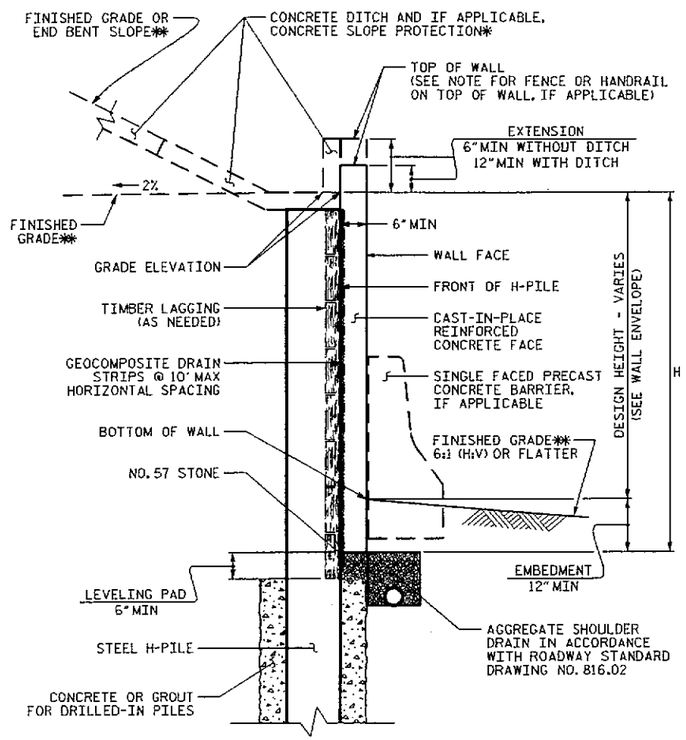
DATE: 1-21-14





SOLDIER PILE WALL WITH PRECAST PANEL - TYPICAL SECTIONS

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS AND PILES.
*SEE CONCRETE DITCH BEHIND WALL DETAILS.
**SEE PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.



SOLDIER PILE WALL WITH CAST-IN-PLACE FACE - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL DETAILS.
**SEE PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.

NOTES:

FOR SOLDIER PILE RETAINING WALLS, SEE SOLDIER PILE RETAINING WALLS PROVISION.

FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

A CONCRETE BARRIER RAIL WITH MOMENT SLAB IS REQUIRED ABOVE RETAINING WALL NO. _ SEE PLANS FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB DETAILS.

A FENCE OR HANDRAIL IS REQUIRED ON TOP OF RETAINING WALL NO. _ SEE ROADWAY PLANS FOR FENCE OR HANDRAIL ATTACHMENT DETAILS.

DRILLED-IN H-PILES ARE REQUIRED FOR RETAINING WALL NO. _

AT THE CONTRACTOR'S OPTION, USE DRIVEN H-PILES FOR RETAINING WALL NO. _

USE A SOLDIER PILE RETAINING WALL WITH PRECAST CONCRETE PANELS THAT MEET SECTION 1077 OF THE STANDARD SPECIFICATIONS FOR RETAINING WALL NO. _

AN EXPOSED AGGREGATE FINISH THAT MEETS ARTICLE 1077-12 OF THE STANDARD SPECIFICATIONS IS REQUIRED FOR PRECAST CONCRETE PANELS FOR RETAINING WALL NO. _

PAINT GALVANIZED H-PILES GRAY or BLACK IN ACCORDANCE WITH ARTICLE 442-12 OF THE STANDARD SPECIFICATIONS FOR RETAINING WALL NO. _

USE A SOLDIER PILE RETAINING WALL WITH A CAST-IN-PLACE REINFORCED CONCRETE FACE FOR RETAINING WALL NO. _

A _____ ARCHITECTURAL FINISH IS REQUIRED FOR PRECAST CONCRETE PANELS or THE CAST-IN-PLACE REINFORCED CONCRETE FACE FOR RETAINING WALL NO. _

A BRICK VENEER IS REQUIRED FOR RETAINING WALL NO. _ AS SHOWN. SUBMIT BRICK SAMPLES FOR APPROVAL BEFORE BEGINNING SOLDIER PILE WALL CONSTRUCTION.

BEFORE BEGINNING SOLDIER PILE WALL DESIGN FOR RETAINING WALL NO. _ SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL NO. _ FOR THE FOLLOWING:
1) H = DESIGN HEIGHT + EMBEDMENT
2) DESIGN LIFE = 75 or 100 YEARS
3) MINIMUM EMBEDMENT ELEVATION = ____ FT
4) IN-SITU ASSUMED MATERIAL PARAMETERS ABOVE ELEVATION _____ FT:
UNIT WEIGHT, γ = ___ LB/CF
FRICTION ANGLE, ϕ = __ DEGREES
COHESION, c = ___ LB/SF
5) IN-SITU ASSUMED MATERIAL PARAMETERS BELOW ELEVATION _____ FT:
UNIT WEIGHT, γ = ___ LB/CF
FRICTION ANGLE, ϕ = ___ DEGREES
COHESION, c = ___ LB/SF

THE MINIMUM EMBEDMENT ELEVATION FOR RETAINING WALL NO. _ INCLUDES EMBEDMENT FOR SCOUR.

DESIGN RETAINING WALL NO. _ FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

DESIGN RETAINING WALL NO. _ FOR THE POINT LINE or SIMPLE SURCHARGE LOAD SHOWN.

DESIGN RETAINING WALL NO. _ FOR A PIPE EXTENDING UNDER OR THROUGH THE WALL AS SHOWN. VERIFY PIPE LOCATION AND ELEVATION BEFORE BEGINNING SOLDIER PILE WALL DESIGN OR CONSTRUCTION.

AT THE CONTRACTOR'S OPTION, USE A TEMPORARY SLOPE INSTEAD OF TEMPORARY SUPPORT OF EXCAVATIONS FOR RETAINING WALL NO. _

"TEMPORARY SHORING" IS or MAY BE REQUIRED FOR RETAINING WALL NO. _ IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE ROADWAY, STRUCTURE or TRAFFIC CONTROL PLANS.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GEOTECHNICAL ENGINEERING UNIT

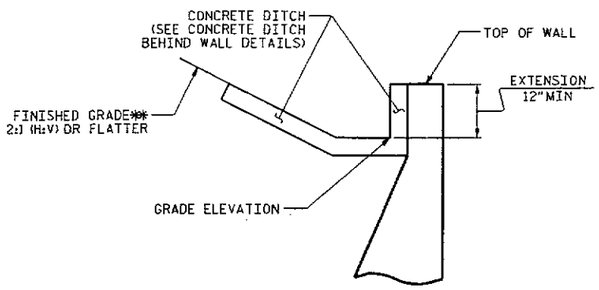
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH

STD CELL Wall_SoldierPile

SOLDIER PILE WALL WITH OR WITHOUT BACK SLOPE - TYPICALS & NOTES

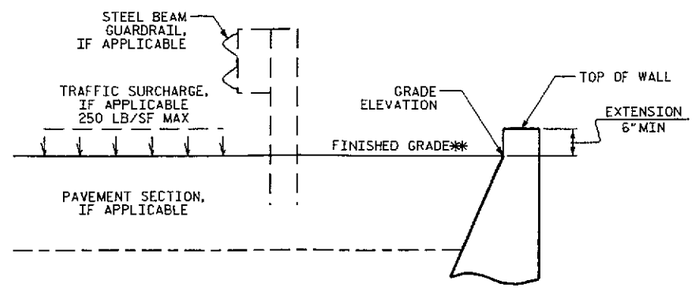
DATE: 1-21-14

GEOTECHNICAL ENGINEER	ENGINEER
SIGNATURE DATE	SIGNATURE DATE



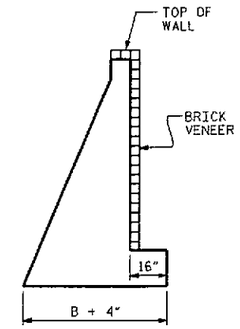
SLOPE CASE

**SEE ROADWAY PLANS FOR FINISHED GRADE AND DITCH DETAILS.



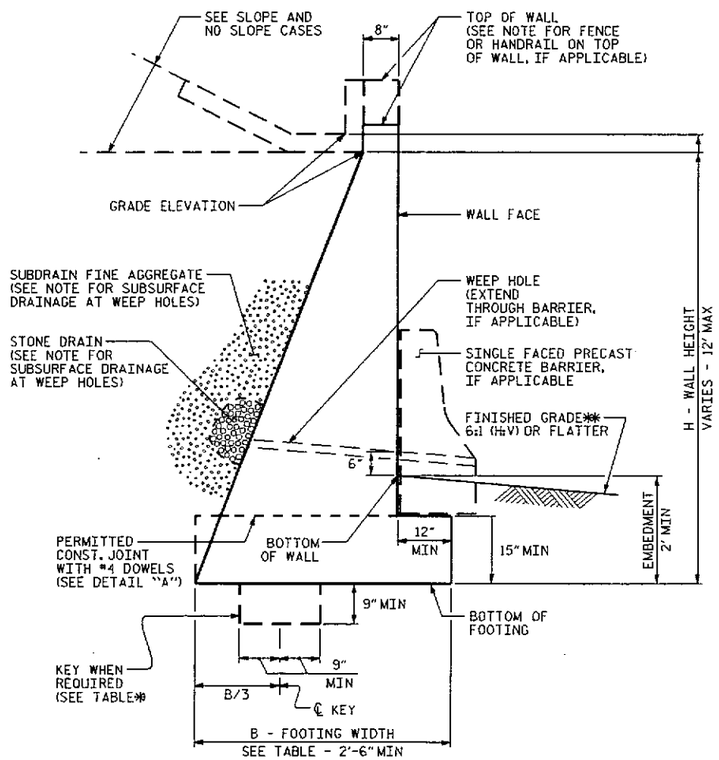
NO SLOPE CASE

**SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.



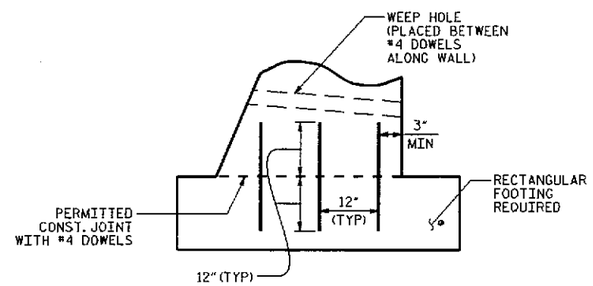
BRICK VENEER DETAIL

(WHEN APPLICABLE)



STANDARD CIP GRAVITY WALL

**SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.



DETAIL "A"

H (FT)	3 - < 6	6 - 9	> 9 - 12
SLOPE CASE	.66	.70*	.75*
NO SLOPE CASE WITH TRAFFIC SURCHARGE	.80	.75*	.70*
NO SLOPE CASE WITHOUT TRAFFIC SURCHARGE	.60	.60	.60

B/H RATIO (B = 2'-6" MIN)

*KEY IS REQUIRED FOR "SLOPE CASE" OR "NO SLOPE CASE WITH TRAFFIC SURCHARGE" WHEN H IS 6' OR GREATER.

NOTES:

FOR STANDARD CAST-IN-PLACE (CIP) GRAVITY RETAINING WALLS, SEE CAST-IN-PLACE GRAVITY RETAINING WALLS PROVISION.

FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

FOR FENCES OR HANDRAILS ON TOP OF WALLS, SEE ROADWAY PLANS FOR FENCE OR HANDRAIL ATTACHMENT DETAILS.

FOR SUBSURFACE DRAINAGE AT WEEP HOLES, SEE ARTICLE 414-8 OF THE STANDARD SPECIFICATIONS.

STANDARD CIP GRAVITY WALLS ARE BASED ON THE FOLLOWING IN-SITU ASSUMED SOIL PARAMETERS:
- UNIT WEIGHT, γ = 120 LB/CF
- FRICTION ANGLE, ϕ = 35 DEGREES (GROUNDWATER WITHIN 7' OF BOTTOM OF FOOTING)
- FRICTION ANGLE, ϕ = 30 DEGREES (GROUNDWATER MORE THAN 7' BELOW BOTTOM OF FOOTING)
- COHESION, c = 0 LB/SF

DO NOT USE STANDARD CIP GRAVITY WALLS IF ASSUMED SOIL PARAMETERS ARE NOT APPLICABLE OR GROUNDWATER IS ABOVE BOTTOM OF FOOTING.

DO NOT USE STANDARD CIP GRAVITY WALLS WHEN VERY LOOSE OR SOFT SOIL OR MUCK IS BELOW WALLS.

BEFORE BEGINNING STANDARD CIP GRAVITY WALL CONSTRUCTION, SURVEY WALL LOCATIONS AND SUBMIT WALL PROFILE VIEWS (WALL ENVELOPES) FOR REVIEW. FOR WALL ENVELOPES, INCLUDE BOTTOM OF WALL, EXISTING GROUND AND GRADE ELEVATIONS AND OTHER ELEVATIONS AS NEEDED AT INTERVALS OF 25' OR LESS ALONG WALLS. DO NOT START WALL CONSTRUCTION UNTIL WALL ENVELOPES ARE ACCEPTED.

FOR BRICK VENEERS, SUBMIT BRICK SAMPLES FOR APPROVAL BEFORE BEGINNING STANDARD CIP GRAVITY WALL CONSTRUCTION.

DO NOT PLACE CONCRETE FOR FOOTINGS UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

WHEN CONSTRUCTING STANDARD CIP GRAVITY WALLS WITH A CONSTRUCTION JOINT AS SHOWN IN DETAIL "A", PROVIDE A MINIMUM OF 3 EQUALLY SPACED #4 DOWELS AT INTERVALS OF 1'-6" ALONG WALLS.

PROJECT NO.: _____

_____ ***COUNTY***

STATION: _____

SHEET _ OF _

GEOTECHNICAL ENGINEERING UNIT

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD DRAWING NO. 453.01

STANDARD
CAST-IN-PLACE (CIP)
GRAVITY RETAINING WALL

DATE: 1-21-14

SHEET NO. _
TOTAL SHEETS