GENERAL NOTES:
- PLACE CONTRACTION JOINTS AT 10' INTERVALS, EXCEPT THAT A 15' SPACING MAY BE USED WHEN A MACHINE IS USED OR WHEN SATISFACTORY SUPPORT FOR THE FACE FORM CAN BE OBTAINED WITHOUT THE USE OF TEMPLATES AT 10' INTERVALS.
- JOINT SPACING MAY BE ALTERED IF REQUIRED BY THE ENGINEER.
- CONTRACTION JOINTS MAY BE INSTALLED WITH THE USE OF TEMPLATES OR FORMED BY OTHER APPROVED METHODS.
- CONSTRUCT NON-TEMPLATE FORMED JOINTS A MIN. OF 1½" DEEP.
- FILL ALL CONSTRUCTION JOINTS, EXCEPT IN 8"x6" MEDIAN CURB, WITH JOINT FILLER AND SEALER.
- SPACE EXPANSION JOINTS AT 90' INTERVALS AND ADJACENT TO ALL RIGID OBJECTS.

SECTION VIEW OF JOINTS

SECTION VIEW OF CURBS OR CURBS AND GUTTERS

FILL 3½" x 1" DEEP GROOVED OR SAWN JOINT WITH JOINT SEALER

LONGITUDINAL JOINT

TRANSVERSE EXPANSION JOINT IN CURB AND GUTTER

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH, N.C.
PLAN VIEW OF TRANSITION
EXPRESSWAY GUTTER TO 2'-6" CURB AND GUTTER

NOTES:
- IN THE TRANSITION FROM 4'-0" CONCRETE EXPRESSWAY GUTTER TO 2'-6" CONCRETE CURB AND GUTTER, PLACE 1/8" EXPANSION JOINTS AT 25' INTERVALS.
- PLACE GROOVE JOINTS 1" DEEP AT 12'-6" INTERVALS BETWEEN EXPANSION JOINTS.
- FILL AND SEAL THE TOP 1/2" OF THE EXPANSION JOINTS AND 1" OF CONTRACTION JOINTS WITH APPROVED JOINT SEALING COMPOUND.
DROP INLET INSTALLATION IN EXPRESSWAY GUTTER

GENERAL NOTES:
- PAY FOR TRANSITION SECTION AS CONCRETE EXPRESSWAY GUTTER.
- GUARDRAIL OPTIONAL

SEE STD. 862.02 FOR GUARDRAIL POST AND OFFSET BLOCKS

EXPRESSWAY GUTTER SEE STANDARD 846.01

FRAME, GRATE AND DROP INLET (PLACE AND SEAL 1/2" EXPANSION JOINT AROUND FRAME)

PERMISSIBLE CONSTRUCTION JOINT

PERMISSIBLE CONSTRUCTION JOINT

PLANT

FLOW LINE

FLOW LINE

SECTION X-X

SECTION Y-Y

SEE TYPICAL SECTION FOR SHOULDER COMPOSITION

SEE TYPICAL SECTION FOR SHOULDER COMPOSITION

SEE STD.'S 840.20, 840.29 AND 840.37 FOR FRAME AND GRATE AS INDICATED BY THE ROADWAY PLANS.

SEE STD.'S 840.20, 840.29 AND 840.37 FOR FRAME AND GRATE AS INDICATED BY THE ROADWAY PLANS.

SEE STD.'S 840.17, 840.18, 840.19, 840.26, 840.27, 840.28, 840.35 AND 840.36 FOR DROP INLETS AS INDICATED BY THE ROADWAY PLANS. BUILD DROP INLETS WITHOUT APRON.
FUNNEL INSTALLATION IN SHOULDER BERM GUTTER

PLAN

SECTION Y-Y

GUIDE FOR PLACING FUNNELS IN MINIMUM LENGTHS OF SHOULDER BERM GUTTER

25'-0" 'NESTED' GUARDRAIL (ONE RAIL INSIDE ANOTHER)

6'-3"
12'-6"
6'-3"

GUARDRAIL POST SPACING

FLOW LINE

FUNNEL DRAIN

SEE STD. 820.01 FOR METAL FUNNEL AND CONCRETE APRON

* CENTER FUNNEL DRAIN AND APRON IN THIS LOCATION.
SHOULDER BERM, SHOULDER BERM GUTTER AND FUNNEL DRAIN INSTALLATION IN SHOULDER BERM GUTTER

SECTION A-A
SHOULDER BERM WITH SHOULDER BERM GUTTER

SECTION B-B
SHOULDER BERM WITH MATTING FOR EROSION CONTROL

SHOULDER BERM GUTTER STANDARD 846.01

SHOULDER BERM GUTTER

1" OFFSET FROM BACK OF CURB TO FACE OF GUARDRAIL POST.

3' MIN.

2' 4" MIN.

EARTH MATERIAL

SHOULDER

POST

OFFSET BLOCK

MATTING FOR EROSION CONTROL

SHOULDER BERM GUTTER

5' 5' 6" MIN. 10' CTS 5'-6" 5'-6" MIN.

SHOULDER BERM GUTTER STD. 846.01

SHOULDER BERM GUTTER

5'-6" MIN.

EARTH MATERIAL

MATTING FOR EROSION CONTROL

METAL FUNNEL

STD. 820.01

12" FUNNEL DRAINS

(SEE PLANS)

PLAN VIEW
CONTINUOUS SHOULDER BERM GUTTER

MIN. SHOULDER BERM GUTTER

SYMBOLS

SHOULDER BERM GUTTER

MATTING FOR EROSION CONTROL

PAVED SHOULDER

FLOW

DOWN GRADE

VARIABLE LENGTH

EXPANSION JOINT REQ'D

MIN.

5'-6"

60'

5'-6"

5'-6"

105'-6"

E.O.L.

MATTING FOR EROSION CONTROL

FLOW

FLOW

E.O.L.

FLOW

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GUIDE FOR PLACING DROP INLETS IN MINIMUM LENGTHS OF SHOULDER BERM GUTTER

SECTION X-X

SECTION Y-Y

DROP INLET INSTALLATION IN SHOULDER BERM GUTTER

DROP INLET INSTALLATION IN SHOULDER BERM GUTTER (SEE STD. NO. 846.01)

SEE STD. 862.02 FOR GUARDRAIL POST AND OFFSET BLOCKS

* CENTER DROP INLET IN THIS LOCATION.

FRAME, GRATE(S) AND DROP INLET (PLACE AND SEAL 1/3") EXPANSION JOINT AROUND FRAME

SHOULDER BERM GUTTER (SEE STD. NO. 846.01)

MINIMUM LENGTHS OF SHOULDER BERM GUTTER

GUIDE FOR PLACING DROP INLETS IN

P.I.

(_AG VERTICAL CURVE)

P.I.

(CREST VERTICAL CURVE)

5'-6"

50'

5'-6"

50'

2'-5'6"

2'-5'6"

5'

6'-3"

6'-3"

6'-3"

GUARDRAIL POST SPACING

GUARDRAIL OFFSET BLOCK

FLOW LINE

FLOW LINE

P.I.

(AG VERTICAL CURVE)

P.I.

(CREST VERTICAL CURVE)

TOP OF SHOULDER BERM GUTTER

FLOW LINE

SEE TYPICAL SECTION FOR SHOULDER COMPOSITION

SEE STD.'S 840.20, 840.29 AND 840.37 FOR FRAMES AND GRATE AS INDICATED BY THE ROADWAY PLANS.

SEE STD.'S 840.17, 840.18, 840.19, 840.26, 840.27, 840.28, 840.35 AND 840.36 FOR DROP INLETS AS INDICATED BY THE ROADWAY PLANS. BUILD DROP INLETS WITHOUT APRON.

SECTION X-X

TOTAL SHOULDER WIDTHS

MATTING FOR EROSION CONTROL

1" OFFSET FROM BACK OF CURB TO FACE OF GUARDRAIL POST

FLOW LINE

DROP INLET

PIECE" COMPOSITION SHOULDER SECTION FOR SEE TYPICAL

EXPANSION JOINT AND SEAL " DROP INLET (PLACE FRAME, GRATE(S) AND CONTROL EROSION FOR MATTING Offset Block)

GUARDRAIL POST AND SEE STD.'S 862.02 FOR GUARDRAIL POST AND OFFSET BLOCKS
NOTES:

CONSTRUCT STANDARD SIDEWALK 5' WIDE AND 4" THICK UNLESS OTHERWISE DENOTED ON PLANS.

PLACE A GROOVE JOINT 1" DEEP WITH 1/8" RADII IN THE CONCRETE SIDEWALK AT 5' INTERVALS.
ONE 1/2" EXPANSION JOINT WILL BE REQUIRED AT 50' INTERVALS. A 1/2" EXPANSION JOINT WILL BE REQUIRED WHERE THE SIDEWALK JOINS ANY RIGID STRUCTURE.

SEE STD. DWG. 848.05 FOR CURB RAMP LOCATION REQUIREMENTS AND CONSTRUCTION GUIDELINES.

TRANSVERSE EXPANSION JOINT IN SIDEWALK

DETAILS SHOWING JOINTS IN CONCRETE SIDEWALK
**Method of Tie In**

*When existing driveway pavement is concrete, saw cut 2" deep joint at the point of tie-in. Saw joint perpendicular to edge of existing driveway pavement.*

**Plan**

**Detail of Driveway**

Build this portion of driveway pavement only at locations when directed.

*Sidewalk tapers down 5' back from driveway.*

**Section C-C**
**Desirable Driveway Grades**

- **BERM**
  - A: +2% grade when this is sidewalk location
  - B: +2% grade when this is sidewalk location

**Desirable or Maximum Driveway Grades**

<table>
<thead>
<tr>
<th>BERM WIDTH</th>
<th>DIST.</th>
<th>GRADE</th>
<th>DIST.</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>8' OR LESS</td>
<td>5'-0&quot;</td>
<td>-2%*</td>
<td>2'-6&quot;</td>
<td>+5%</td>
</tr>
<tr>
<td>8' OR LESS</td>
<td>2'-0&quot;</td>
<td>+6%</td>
<td>5'-6&quot;</td>
<td>+2%*</td>
</tr>
<tr>
<td>10'</td>
<td>4'-0&quot;</td>
<td>+4%</td>
<td>5'-6&quot;</td>
<td>-2%*</td>
</tr>
<tr>
<td>12' &amp; OVER</td>
<td>4'-6&quot;</td>
<td>+4%</td>
<td>7'-0&quot;</td>
<td>+2%*</td>
</tr>
</tbody>
</table>

**Maximum Driveway Grades**

- **BERM**
  - A: +2% grade when this is sidewalk location
  - B: +2% grade when this is sidewalk location

**Notes:**
- Sidewalk location (do not place sidewalk on berms less than 6' wide.)
**METHOD OF TIE IN**

When existing driveway pavement is concrete, saw cut 2" deep joint at the point of tie-in. Saw joint perpendicular to edge of existing driveway pavement.

**GENERAL NOTES:**

- **No construction joint** will be permitted if forms are used to cast driveway. Slip forming of curb and gutter permits the use of construction joint.

**SECTION A-A**

- **Build this portion of driveway pavement only at locations when directed.**
- **Driveway width**
- **Top of curb**
- **1'-6" 12"**
- **Grass area**
- **Gutter**
- **Bevel curb to meet roadway pavement**
- **Expansion joint**
- **Sidewalk (optional)**
- **Permissible construction joint when slip formed**

**SECTION B-B**

- **Build this portion of driveway pavement only at locations when directed.**
- **Driveway width**
- **Top of curb**
- **1'-6" 12"**
- **Grass area**
- **Gutter**
- **Bevel curb to meet roadway pavement**
- **Expansion joint**
- **Sidewalk (optional)**
- **Permissible construction joint when slip formed**

**TOP OF CURB**

- **20" 2'-0"**
- **2'-6"**
- **2'-6"**
- **2'-6"**
- **2'-6"**
- **2'-6"**

**SECTION A-A**

- **Driveway width**
- **Top of curb**
- **1'-6" 12"**
- **Grass area**
- **Gutter**
- **Bevel curb to meet roadway pavement**
- **Expansion joint**
- **Sidewalk (optional)**
- **Permissible construction joint when slip formed**

**SECTION B-B**

- **Build this portion of driveway pavement only at locations when directed.**
- **Driveway width**
- **Top of curb**
- **1'-6" 12"**
- **Grass area**
- **Gutter**
- **Bevel curb to meet roadway pavement**
- **Expansion joint**
- **Sidewalk (optional)**
- **Permissible construction joint when slip formed**

**TOP OF CURB**

- **20" 2'-0"**
- **2'-6"**
- **2'-6"**
- **2'-6"**
- **2'-6"**
- **2'-6"**

**GENERAL NOTES:**

- **No construction joint** will be permitted if forms are used to cast driveway. Slip forming of curb and gutter permits the use of construction joint.
### Desirable Driveway Grades

**BERM**

- **A**
  - 6" BERM
  - +2% GRADE WHEN THIS IS SIDEWALK LOCATION

- **B**
  - 5'-0" BERM
  - +2% GRADE WHEN THIS IS SIDEWALK LOCATION

**ROADWAY PAVEMENT**

#### DESIRABLE OR MAXIMUM DRIVEWAY GRADES

<table>
<thead>
<tr>
<th>BERM WIDTH</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>12' &amp; OVER</td>
<td>4'-6&quot;</td>
<td>-4%</td>
</tr>
</tbody>
</table>

*SIDEWALK LOCATION

(Do not place sidewalk on berms less than 6' wide.)

### Maximum Driveway Grades

**BERM**

- **A**
  - 6" BERM
  - +2% GRADE WHEN THIS IS SIDEWALK LOCATION

- **B**
  - 5'-0" BERM
  - +2% GRADE WHEN THIS IS SIDEWALK LOCATION

**ROADWAY PAVEMENT**
PARTIAL PLAN OF PAVED STREET TURNOUT

USE ON PROPOSED AND EXISTING STREET INTERSECTIONS OR MAJOR TYPE COMMERCIAL ENTRANCES.
ISOMETRIC VIEW

Pay limits for curb ramp

Ramp width area is variable

Detectable warning domes

Notes:
1. Detectable warning domes will cover 2'-0" length and full width of the ramp floor as shown on the details.
2. Detectable warning domes will contrast visibility with adjoining surface, either light-on-dark, or dark-on-light sequence covering the entire ramp.
DETAIL SHOWING TYPICAL LOCATION OF CURB RAMPS, PEDESTRIAN CROSSWALKS AND STOP LINES FOR TEE INTERSECTIONS

PROPOSED CURB RAMP

PROPOSED CURB RAMP W/ LANDING

PROPOSED OR FUTURE SIDEWALK

ALLOWABLE LOCATIONS

DUAL RAMP RADII........ANY
NOTES:

1. Construct the ramp surface to be stable, firm, and slip resistant. Construct the curb ramp type as shown in the pavement marking plans or as directed by the engineer.

2. Locate curb ramps and place pedestrian crosswalk markings as shown in the pavement marking plans. When field adjustments require moving curb ramps or markings as shown, contact the signing and delineation unit or locate as directed by the engineer.

3. Coordinate the curb ramp and the pedestrian crosswalk markings so a 4'x4' clear space at the base of the curb ramp will fall within the pedestrian crosswalk lines.

4. Set back distance from inside crosswalk marking to nearest edge of travel lane is 4' minimum.

5. Refer to the pavement marking plans for stop bar locations at signalized intersections. If a pavement marking plan is not provided, contact the signal design section for the stop bar locations or locate as directed by the engineer.

6. Terminate parking a minimum of 20' back of a pedestrian crosswalk.

7. Construct curb ramps a minimum of 4' wide.

8. Construct the running slope of the ramp 8.33% maximum.

9. Allowable cross slope on sidewalks and curb ramps will be 2% maximum.

10. Construct the side flare slope a maximum of 10% measured along the curb line.

11. Construct the counter slope of the gutter or street at the base of the curb ramp a maximum of 5% and maintain a smooth transition.

12. Construct landings for sidewalk a minimum of 4'x4' with a maximum slope of 2% in any direction. Construct landings for median islands a minimum of 5'x5' with a maximum slope of 2% in any direction.

13. To use a median island as a pedestrian refuge area, median islands will be a minimum of 6' wide. Construct median islands to provide passage over or through the island.

14. Small channelization islands that can not provide a 5'x5' landing at the top of a ramps, will be cut through level with the surface street.

15. Curb ramps with returned curbs may be used only where pedestrians would not normally walk across the ramp. The adjacent surface is planting or other non-walking surface or the side approach is substantially obstructed.

16. Place a ½" expansion joint where the concrete curb ramp joins the curb as shown in roadway standard drawing 848.01.

17. Place all pedestrian push button actuators and crossing signals as shown in the plans or as shown in the MUTCD.

18. Curb ramps through median islands, single ramps at dual crosswalks or limited r/w situations, will be handled by special details. Contact the contract standards and development unit for the details or for a special design.
CURB RAMP AND EXISTING SIDEWALK WITH GRASS STRIP

ISOMETRIC VIEW

PAY LIMITS OF CURB RAMP

RAMP WIDTH AREA IS VARIABLE

NOTE:
1. PLACE DETECTABLE WARNING DOMES TO COVER 2'-0" LENGTH AND FULL WIDTH OF THE RAMP FLOOR AS SHOWN ON THE DETAILS.
2. OBTAIN VISIBLE CONTRAST WITH ADJOINING SURFACE, EITHER LIGHT-ON-DARK, OR DARK-ON-LIGHT SEQUENCE COVERING THE ENTIRE RAMP.

DETECTABLE WARNING DOMES

PLAN VIEW

DUAL RAMPS
ANY RADII
(40° MIN. FLOOR WIDTH)

SECTION A-A

SECTION B-B

1. PLACE DETECTABLE WARNING DOMES TO COVER 2'-0" LENGTH AND 2, 9 & 14

NOTES:
A
SEE NOTES
B
蚕
C
1.4"
D
0.65"
E
0.9"R TOP DIAMETER OF NO LESS THAN 50% TO NO MORE THAN 65% OF THE BASE DIAMETER

1.4"
D
0.65"
E
0.9"R TOP DIAMETER OF NO LESS THAN 50% TO NO MORE THAN 65% OF THE BASE DIAMETER

EXPANSION JOINT
(SEE STD. 846.01)

NOTE: A PORTION OF ONE OR BOTH RAMPS MAY EXTEND OUTSIDE THE RETURN.

EXPANSION JOINT
(SEE STD. 846.01)

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

PAY LIMITS

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

EXPANSION JOINT
(SEE STD. 846.01)

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

PAY LIMITS

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

EXPANSION JOINT
(SEE STD. 846.01)

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

PAY LIMITS

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

EXPANSION JOINT
(SEE STD. 846.01)

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

PAY LIMITS

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

EXPANSION JOINT
(SEE STD. 846.01)

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

PAY LIMITS

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

EXPANSION JOINT
(SEE STD. 846.01)

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

PAY LIMITS

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

EXPANSION JOINT
(SEE STD. 846.01)

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

PAY LIMITS

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.

EXPANSION JOINT
(SEE STD. 846.01)

NOTE: A PORTION OF ONE OR BOTH
RAMPS MAY EXTEND OUTSIDE
THE RETURN.
DETACHABLE WARNING DOMES

Curb ramps and existing sidewalk adjacent to curb

**Sections**
- **Section A-A**
- **Section B-B**

Pay Limits of Curb Ramp

Base Diameter: 0.80 ft to 1.20 ft

Top Diameter: 0.05 ft to 0.09 ft

Ramp Width Area is Variable

Width: 0.80 ft to 1.00 ft

Length: 2.0 ft to 3.0 ft

Pay Limits: 2.4 ft to 1.6 ft

Detectable Warning Domes

Pay Limits: 2.0 ft to 0.8 ft

Notes:
1. Place detectable warning domes to cover 2'-0" length and full width of the ramp floor as shown on the details.
2. Obtain visible contrast with adjacent surface, either light-on-dark, or dark-on-light sequence covering the entire ramp.

**Notes**
- See note 1
- See Note 2, 9 & 14
- See Notes 8, 9 & 14

Expansion Joint

Existing Sidewalk

Sidewalk Transition

Elevation

Warning Domes

**Plan View**

Dual Ramps

Any Radii (40" Min. Floor Width)

**Section**

Ramp Width Area is Variable

Pay Limits: 2.4 ft to 1.6 ft

Existing Curb

Drop Curb

Sidewalk Transition

Top of Curb

Existin Gutter

Retrofit Curb Ramp

Chop Curb (Existing Curb & Gutter Shown)

Existing Sidewalk

Transition

Drop Curb

Crosswalk Limits: Must fall within this portion of ramp

Noted Elevation

Sidewalk Transition

6" O.D.

6" O.D.

Expansion Joint

(SEE STD. 846.01)

(SEE NOTE 10)

Note 1:

1. Please detectable warning domes to cover 2'-0" length and full width of the ramp floor as shown on the details.
2. Obtain visible contrast with adjacent surface, either light-on-dark, or dark-on-light sequence covering the entire ramp.

Note 2:

See notes 2, 9 & 14.
DETECTABLE WARNING DOMES

- Place detectable warning domes to cover 2'-0" length and full width of the ramp floor as shown on the details.
- Obtain visible contrast with adjoining surface, either light-on-dark, or dark-on-light sequence covering the entire ramp.

NOTES:

1. USE DETECTABLE WARNING DOMES TO COVER 2'-0" LENGTH AND FULL WIDTH OF THE RAMP FLOOR AS SHOWN ON THE DETAILS.
2. OBTAIN VISIBLE CONTRAST WITH ADJOINING SURFACE, EITHER LIGHT-ON-DARK, OR DARK-ON-LIGHT SEQUENCE COVERING THE ENTIRE RAMP.

ISOMETRIC VIEW

SECTION A-A

SECTION B-B

PLAN VIEW

DUAL RAMPS
ANY RADII
(40" MIN. FLOOR WIDTH)

PAY LIMITS OF RETROFIT CURB RAMP
CURB RAMP

EXISTING CURB AND GUTTER

ROADWAY STANDARD DRAWING FOR

CURB RAMP

EXISTING CURB AND GUTTER

Details showing typical location of curb ramps, pedestrian crosswalks, and stop lines.

- Proposed curb ramp with landing.
- Existing sidewalk for resurfacing projects.
- Existing curb and gutter.
- State of North Carolina Department of Transportation Raleigh, N.C.

ALLOWABLE LOCATIONS:
- Dual ramp radii
- Any

NOTE 3
SEE NOTE 10

NOTE 4
SEE NOTE 12

DRIVE SIDEWALK

SIDEWALK

4'-0" (TYP)

SIDEWALK

4'-0" (TYP)

SIDEWALK

6' MIN. CROSSWALK

SEE NOTE 12

SIDEWALK

6' MIN. CROSSWALK

SEE NOTE 13

NOTE 10
SEE NOTE 10

NOTE 5
SEE NOTE 4

CURB RAMPS AND EXISTING SIDEWALK

EXISTING CURB AND GUTTER

DETAIL SHOWING TYPICAL LOCATION OF CURB RAMPS, PEDESTRIAN CROSSWALKS AND STOP LINES FOR TEE INTERSECTIONS

RESURFACING PROJECTS

EXISTING SIDEWALK
CURB RAMP AND EXISTING SIDEWALK

NOTES:

1. CONSTRUCT THE RAMP SURFACE TO BE STABLE, FIRM, AND SLIP RESISTANT. CONSTRUCT THE CURB RAMP TYPE AS SHOWN IN THE PAVEMENT MARKING PLANS OR AS DIRECTED BY THE ENGINEER.

2. LOCATE CURB RAMPS AND PLACE PEDESTRIAN CROSSWALK MARKINGS AS SHOWN IN THE PAVEMENT MARKING PLANS. WHEN FIELD ADJUSTMENTS REQUIRE MOVING CURB RAMPS OR MARKINGS AS SHOWN, CONTACT THE SIGNING AND DELINEATION UNIT OR LOCATE AS DIRECTED BY THE ENGINEER.

3. COORDINATE THE CURB RAMP AND THE PEDESTRIAN CROSSWALK MARKINGS SO A 4'x4' CLEAR SPACE AT THE BASE OF THE CURB RAMP WILL FALL WITHIN THE PEDESTRIAN CROSSWALK LINES.

4. SET BACK DISTANCE FROM INSIDE CROSSWALK MARKING TO NEAREST EDGE OF TRAVEL LANE IS 4' MINIMUM.

5. REFER TO THE PAVEMENT MARKING PLANS FOR STOP BAR LOCATIONS AT SIGNALIZED INTERSECTIONS. IF A PAVEMENT MARKING PLAN IS NOT PROVIDED, CONTACT THE SIGNAL DESIGN SECTION FOR THE STOP BAR LOCATIONS OR LOCATE AS DIRECTED BY THE ENGINEER.

6. TERMINATE PARKING A MINIMUM OF 20' BACK OF A PEDESTRIAN CROSSWALK.

7. CONSTRUCT CURB RAMPS A MINIMUM OF 4' WIDE.

8. CONSTRUCT THE RUNNING SLOPE OF THE RAMP 8.33% MAXIMUM.

9. ALLOWABLE CROSS SLOPE ON SIDEWALKS AND CURB RAMPS WILL BE 2% MAXIMUM.

10. CONSTRUCT THE SIDE FLARE SLOPE A MAXIMUM OF 10% MEASURED ALONG THE CURB LINE.

11. CONSTRUCT THE COUNTER SLOPE OF THE GUTTER OR STREET AT THE BASE OF THE CURB RAMP A MAXIMUM OF 5% AND MAINTAIN A SMOOTH TRANSITION.

12. CONSTRUCT LANDINGS FOR SIDEWALK A MINIMUM OF 4'x4' WITH A MAXIMUM SLOPE OF 2% IN ANY DIRECTION. CONSTRUCT LANDINGS FOR MEDIAN ISLANDS A MINIMUM OF 5'x5' WITH A MAXIMUM SLOPE OF 2% IN ANY DIRECTION.

13. TO USE A MEDIAN ISLAND AS A PEDESTRIAN REFUGE AREA, MEDIAN ISLANDS WILL BE A MINIMUM OF 6' WIDE. CONSTRUCT MEDIAN ISLANDS TO PROVIDE PASSAGE OVER OR THROUGH THE ISLAND.

14. SMALL CHANNELIZATION ISLANDS THAT CAN NOT PROVIDE A 5'x5' LANDING AT THE TOP OF A RAMPS, WILL BE CUT THROUGH LEVEL WITH THE SURFACE STREET.

15. CURB RAMPS WITH RETURNED CURBS MAY BE USED ONLY WHERE PEDESTRIANS WOULD NOT NORMALLY WALK ACROSS THE RAMP. THE ADJACENT SURFACE IS PLANTING OR OTHER NON-WALKING SURFACE OR THE SIDE APPROACH IS SUBSTANTIALLY OBSTRUCTED.

16. PLACE A 3/2" EXPANSION JOINT WHERE THE CONCRETE CURB RAMP JOINS THE CURB AS SHOWN IN ROADWAY STANDARD DRAWING 848.01

17. PLACE ALL PEDESTRIAN PUSH BUTTON ACTUATORS AND CROSSING SIGNALS AS SHOWN IN THE PLANS OR AS SHOWN IN THE MUTCD.

18. CURB RAMPS THROUGH MEDIAN ISLANDS, SINGLE RAMPS AT DUAL CROSSWALKS OR LIMITED R/W SITUATIONS, WILL BE HANDLED BY SPECIAL DETAILS. CONTACT THE CONTRACT STANDARDS AND DEVELOPMENT UNIT FOR THE DETAILS OR FOR A SPECIAL DESIGN.
GENERAL NOTES:

IN THE 4" CONC. PAVED DITCHES, PLACE 1/2" EXPANSION JOINTS AT 30' INTERVALS AND AT ALL OTHER POINTS WHERE PROPOSED DITCHES ABUT RIGID OBJECTS. PLACED GROOVED JOINTS 1" DEEP AT 10' INTERVALS BETWEEN EXPANSION JOINTS.

CONSTRUCT WIDTH AND SHAPE OF PROPOSED 4" CONCRETE PAVED DITCHES AS SHOWN OR AS DIRECTED BY THE ENGINEER.

FOR DITCH GRADES ABOVE 2% EROSION CONTROL, INSTALL MATTING ON BOTH SIDES OF THE PAVING FOR A MINIMUM WIDTH OF 36" OR AS DIRECTED BY THE ENGINEER.

CONSTRUCT WIDTH AND SHAPE OF PROPOSED 4" CONCRETE PAVED DITCHES AS SHOWN OR AS DIRECTED BY THE ENGINEER.

IN THE 4" CONC. PAVED DITCHES, PLACE 1/2" EXPANSION JOINTS AT 30' INTERVALS AND AT ALL OTHER POINTS WHERE PROPOSED DITCHES ABUT RIGID OBJECTS. PLACED GROOVED JOINTS 1" DEEP AT 10' INTERVALS BETWEEN EXPANSION JOINTS.

CONSTRUCT WIDTH AND SHAPE OF PROPOSED 4" CONCRETE PAVED DITCHES AS SHOWN OR AS DIRECTED BY THE ENGINEER.

GENERAL NOTES:

IN THE 4" CONC. PAVED DITCHES, PLACE 1/2" EXPANSION JOINTS AT 30' INTERVALS AND AT ALL OTHER POINTS WHERE PROPOSED DITCHES ABUT RIGID OBJECTS. PLACED GROOVED JOINTS 1" DEEP AT 10' INTERVALS BETWEEN EXPANSION JOINTS.

CONSTRUCT WIDTH AND SHAPE OF PROPOSED 4" CONCRETE PAVED DITCHES AS SHOWN OR AS DIRECTED BY THE ENGINEER.

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IN THE 4" CONC. PAVED DITCHES, PLACE 1/2" EXPANSION JOINTS AT 30' INTERVALS AND AT ALL OTHER POINTS WHERE PROPOSED DITCHES ABUT RIGID OBJECTS. PLACED GROOVED JOINTS 1" DEEP AT 10' INTERVALS BETWEEN EXPANSION JOINTS.

CONSTRUCT WIDTH AND SHAPE OF PROPOSED 4" CONCRETE PAVED DITCHES AS SHOWN OR AS DIRECTED BY THE ENGINEER.

GENERAL NOTES:

IN THE 4" CONC. PAVED DITCHES, PLACE 1/2" EXPANSION JOINTS AT 30' INTERVALS AND AT ALL OTHER POINTS WHERE PROPOSED DITCHES ABUT RIGID OBJECTS. PLACED GROOVED JOINTS 1" DEEP AT 10' INTERVALS BETWEEN EXPANSION JOINTS.

CONSTRUCT WIDTH AND SHAPE OF PROPOSED 4" CONCRETE PAVED DITCHES AS SHOWN OR AS DIRECTED BY THE ENGINEER.

FOR DITCH GRADES ABOVE 2% EROSION CONTROL, INSTALL MATTING ON BOTH SIDES OF THE PAVING FOR A MINIMUM WIDTH OF 36" OR AS DIRECTED BY THE ENGINEER.

CONSTRUCT WIDTH AND SHAPE OF PROPOSED 4" CONCRETE PAVED DITCHES AS SHOWN OR AS DIRECTED BY THE ENGINEER.

GENERAL NOTES:

IN THE 4" CONC. PAVED DITCHES, PLACE 1/2" EXPANSION JOINTS AT 30' INTERVALS AND AT ALL OTHER POINTS WHERE PROPOSED DITCHES ABUT RIGID OBJECTS. PLACED GROOVED JOINTS 1" DEEP AT 10' INTERVALS BETWEEN EXPANSION JOINTS.

CONSTRUCT WIDTH AND SHAPE OF PROPOSED 4" CONCRETE PAVED DITCHES AS SHOWN OR AS DIRECTED BY THE ENGINEER.

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GENERAL NOTES:

IN THE 4" CONC. PAVED DITCHES, PLACE 1/2" EXPANSION JOINTS AT 30' INTERVALS AND AT ALL OTHER POINTS WHERE PROPOSED DITCHES ABUT RIGID OBJECTS. PLACED GROOVED JOINTS 1" DEEP AT 10' INTERVALS BETWEEN EXPANSION JOINTS.

CONSTRUCT WIDTH AND SHAPE OF PROPOSED 4" CONCRETE PAVED DITCHES AS SHOWN OR AS DIRECTED BY THE ENGINEER.

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GENERAL NOTES:

IN THE 4" CONC. PAVED DITCHES, PLACE 1/2" EXPANSION JOINTS AT 30' INTERVALS AND AT ALL OTHER POINTS WHERE PROPOSED DITCHES ABUT RIGID OBJECTS. PLACED GROOVED JOINTS 1" DEEP AT 10' INTERVALS BETWEEN EXPANSION JOINTS.

CONSTRUCT WIDTH AND SHAPE OF PROPOSED 4" CONCRETE PAVED DITCHES AS SHOWN OR AS DIRECTED BY THE ENGINEER.

FOR DITCH GRADES ABOVE 2% EROSION CONTROL, INSTALL MATTING ON BOTH SIDES OF THE PAVING FOR A MINIMUM WIDTH OF 36" OR AS DIRECTED BY THE ENGINEER.

CONSTRUCT WIDTH AND SHAPE OF PROPOSED 4" CONCRETE PAVED DITCHES AS SHOWN OR AS DIRECTED BY THE ENGINEER.
GENERAL NOTES:

WHERE NECESSARY, ELBOWS MAY BE USED TO SKEW PIPE TO FIT INLETS WHERE THERE IS OFFSET BETWEEN THE INLET END AT BERM AND THE D.I.

LENGTH OF PAVED DITCH AS DIRECTED BY THE ENGINEER (5'-0" MIN.)

ELEVATION FOR SLOPE GREATER THAN 3:1

ELEVATION FOR SLOPE 3:1 OR LESS
GENERAL NOTES:
WHERE NECESSARY, ELBOWS MAY BE USED TO SKEW PIPE
TO FIT INLETS WHERE THERE IS OFFSET BETWEEN THE INLET
END AT BERM AND THE D.I.

LENGTH OF PAVED DITCH AS DIRECTED
BY THE ENGINEER (5' MIN.)

C.S. ELBOW MAY BE USED WHEN
SLOPE IS STEEPER THAN 3:1
PARTIAL LONGITUDINAL SECTIONS OF PAVED ISLANDS

NOTE:
WHEN MONOLITHIC CONCRETE ISLAND IS ON TOP OF SURFACE COURSE, DRIVE 40d SPIKES INTO SURFACE UNDER MONOLITHIC CONCRETE ISLAND. STAGGER SPIKES ON 2' CENTERS EACH WAY.

IN THE CONCRETE PAVEMENT (ISLAND) AND CONCRETE ISLAND (MONOLITHIC) PLACE ½" EXPANSION JOINTS AT 30' INTERVALS AND GROOVED JOINTS 1" DEEP AT 10' INTERVALS BETWEEN EXPANSION JOINTS.

LINE UP THE JOINTS IN THE CONCRETE PAVEMENT (ISLAND) WITH THE JOINTS IN THE CURB OR CURB AND GUTTER.

FILL AND SEAL THE TOP ½" OF THE EXPANSION JOINTS AND THE ENTIRE DEPTH OF GROOVED JOINTS WITH JOINT SEALER.

FOR JOINTS IN THE CURB AND/OR CURB AND GUTTER, SEE STANDARD NO. 846.01
GENERAL NOTES:

PLACE ½" EXPANSION JOINTS AT 30’ INTERVALS AND AT ALL OTHER POINTS WHERE PROPOSED MEDIAN ABUTS RIGID OBJECTS. PLACE GROOVED JOINTS ½" DEEP AT 10’ INTERVALS BETWEEN EXPANSION JOINTS. FILL THE TOP ½" OF EXPANSION JOINTS AND ½" GROOVED JOINTS WITH JOINT SEALER.

SHOWING EXPANSION JOINT

SHOWING GROOVED JOINT

PART LONGITUDINAL SECTIONS OF CONCRETE MEDIAN
NOTES:
- REFER TO STD. NO. 840.14 AND 840.15 FOR DRAINAGE STRUCTURE.
- REFER TO STD. NO. 840.16 FOR GRATE AND FRAME.
4" CONCRETE COVER

VARIABLE GRADE SEPARATIONS

NOTE: SLOPE MEDIAN WIDTHS 10'-0"

AND OVER FROM CENTERLINE
OF MEDIAN TO BACK OF EACH
CONCRETE CURB.

NOTE: GRASS ISLAND CONSTRUCTION
MAY BE APPLICABLE AS
DIRECTED BY THE ENGINEER.
DOUBLE FACED CONCRETE BARRIER

TYPES I, II, III & IV

ROADWAY STANDARD DRAWING FOR

CONSTRUCT CONCRETE BARRIER OF CLASS 'AA' CONCRETE. (SEE SPECIFICATIONS SECTION 854).

CONSTRUCT EXPANSION AND CONTRACTION JOINTS AS SHOWN ON SHEET 2.

SEAL EXPANSION JOINTS WITH JOINT FILLER. (SEE SECTION 1028 OF THE SPECIFICATIONS).

SUBMIT ALTERNATIVE METHODS FOR STEEL FABRICATION PLACEMENT FOR REVIEW.

GENERAL NOTES:

REFER TO PLAN SHEET AND/OR TYPICAL SECTIONS FOR PROPER BARRIER ORIENTATION.

*THE 2" DIMENSION FROM FINISH GRADE TO THE BASE IS A MINIMUM DIMENSION.

REFER TO PLAN TYPICAL SECTIONS AND PAVEMENT SCHEDULE TO DETERMINE KEY-IN DEPTH.

NOTE:

*34" TO 65"*
DOUBLE FACED CONCRETE BARRIER

TOP PLAN VIEW

CONTRACTION JOINTS

EXPANSION JOINT

JOINT FILLER

INSET "A"
SHOWING RADII AND BEVEL

INSET "B"
SHOWING RADII

PARTIAL PLAN VIEW

CONSTRUCTION JOINT

CONTRACTION JOINT

1-1/4" JOINT

PARTIAL ELEVATION VIEW

NOTES:
SEE SHEET 1 FOR GENERAL NOTES.
SEE SHEETS 3 THRU 4 FOR STEEL LAYOUT
OF BARRIERS.
SEE GLARE SCREEN DETAIL FOR TYPES I & II.
NO GLARE SCREEN ALLOWED WITH TYPES III & IV.

EXPANSION JOINT

* THE 2" DIMENSION FROM FINISH GRADE TO THE
BASE IS A MINIMUM DIMENSION. REFER TO
PLAN TYPICAL SECTIONS AND PAVEMENT
SCHEDULE TO DETERMINE KEY-IN DEPTH.
** TYPE II AND III BARRIERS BASE MAY BE
INCREASED BY A MAXIMUM OF 3/4" INCHES.
DOUBLE FACED CONCRETE BARRIER

**NOTES:**
1. EVENLY SPACE HORIZONTAL REBAR 8"±1" UNLESS OTHERWISE NOTED.
2. USE #4 BAR FOR HORIZONTAL STEEL AND #4 OR #5 BAR FOR THE VERTICAL CAGE.
3. SUBMIT CHANGES IN STEEL PLACEMENT OR SIZE TO THE ENGINEER.
4. USE SPLICE LENGTHS EQUAL TO 20 TIMES THE DIAMETER OF THE BAR.
   * REFER TO PLAN TYPICAL SECTIONS AND PAVEMENT SCHEDULE TO DETERMINE KEY-IN DEPTH. DIMENSIONS SHOWN ARE BASED ON A 2" MIN. KEY-IN DEPTH.

STEEL PLACEMENT FOR CAST-IN-PLACE OR SLIP-FORM CONCRETE BARRIER
DOUBLE FACED CONCRETE BARRIER

ELEVATION VIEW

SECTION VIEW

TYPE III
MIN. 2'-0" BASE

TYPE II
MIN. 2'-6" BASE

NOTES:
1. EVENLY SPACE HORIZONTAL REBAR 8"±1" UNLESS OTHERWISE NOTED.
2. USE #4 BAR HORIZONTAL STEEL AND #4 OR #5 FOR VERTICAL CAGE.
3. SUBMIT CHANGES IN STEEL PLACEMENT OR SIZE TO THE ENGINEER.
4. USE SPLICE LENGTHS EQUAL TO 20 TIMES THE DIAMETER OF THE BAR.
   * REFER TO PLAN TYPICAL SECTIONS AND PAVEMENT SCHEDULE TO DETERMINE KEY-IN DEPTH.
   DIMENSIONS SHOWN ARE BASED ON A 2" MIN. KEY-IN DEPTH.

STEEL PLACEMENT FOR CAST-IN-PLACE OR SLIP-FORM CONCRETE BARRIER
SECTION X-X
TYPE - T

SECTION X-X
TYPE - T1

SECTION X-X
TYPE - T2

NOTE:
 REFER TO PLAN SHEET AND/OR TYPICAL SECTIONS FOR PROPER BARRIER ORIENTATION.

*THE 2" OR 5" DIMENSION FROM FINISH GRADE TO THE BASE IS A MINIMUM DIMENSION. REFER TO PLAN TYPICAL SECTIONS AND PAVEMENT SCHEDULE TO DETERMINE KEY-IN DEPTH.

GENERAL NOTES:
CONSTRUCT CONCRETE BARRIER OF CLASS 'AA' CONCRETE. (SEE SECTION 854 OF SPECIFICATIONS).
CONSTRUCT EXPANSION AND CONTRACTION JOINTS AS SHOWN ON SHEET 2.
SEAL ALL EXPANSION JOINTS WITH JOINT FILLER. (SEE SECTION 1028 OF THE SPECIFICATIONS).
SUBMIT ALTERNATIVE METHODS FOR STEEL FABRICATION TO THE ENGINEER.
DOUBLE FACED CONCRETE BARRIER

TOP PLAN VIEW

FRONT ELEVATION VIEW

EXPANSION JOINT
CONTRACTION JOINTS
JOINT FILLER
FINISH GRADE

PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW

CONSTRUCTION DETAILS:

SEE SHEET 1 FOR GENERAL NOTES.
SEE SHEETS 3 THRU 4 FOR STEEL LAYOUT OF BARRIERS.

* THE 2" AND 5" DIMENSION FROM FINISH GRADE TO THE BASE IS A MINIMUM DIMENSION.
REFER TO PLAN TYPICAL SECTIONS AND PAVEMENT SCHEDULE TO DETERMINE KEY-IN DEPTH.
STEEL PLACEMENT FOR CAST-IN-PLACE OR SLIP-FORM CONCRETE BARRIER

DOUBLE FACED CONCRETE BARRIER

TYPE T, T1 AND T2

1. EVENLY SPACE HORIZONTAL REBAR 8"±1" UNLESS OTHERWISE NOTED.
2. USE #5 BAR FOR HORIZONTAL STEEL AND #5 BAR FOR VERTICAL CAGE.
3. SUBMIT CHANGES IN STEEL PLACEMENT OR SIZE TO THE ENGINEER.
4. USE SPLICE LENGTHS EQUAL TO 20 TIMES THE DIAMETER OF THE BAR.

* REFER TO PLAN TYPICAL SECTIONS AND PAVEMENT SCHEDULE TO DETERMINE KEY-IN DEPTH. DIMENSIONS SHOWN ARE BASED ON A MIN. KEY-IN DEPTH.

NOTES:

ELEVATION VIEW

SECTION VIEW

TYPE T

TYPE T-1
DOUBLE FACED CONCRETE BARRIER

TYPE-T2

ELEVATION VIEW

SECTION VIEW

NOTES:
1. EVENLY SPACE HORIZONTAL REBAR 8"±1" UNLESS OTHERWISE NOTED.
2. USE #5 BAR FOR HORIZONTAL STEEL AND #5 BAR FOR THE VERTICAL CAGE.
3. SUBMIT CHANGES IN STEEL PLACEMENT OR SIZE TO THE ENGINEER.
4. USE SPICE LENGTHS EQUAL TO 20 TIMES THE DIAMETER OF THE BAR.
   * REFER TO PLAN TYPICAL SECTIONS AND PAVEMENT SCHEDULE TO DETERMINE KEY-IN DEPTH. DIMENSIONS SHOWN ARE BASED ON A MIN. KEY-IN DEPTH.

STEEL PLACEMENT FOR CAST-IN-PLACE OR SLIP-FORM CONCRETE BARRIER
**REINFORCEMENT DETAIL**

**TOP VIEW**
- S1 Bars
- 3/4" dia. (A36M)

**SIDE VIEW**
- Loop Bar

**VIEW Z-Z**
- 10" RAD.
- 3/4" CHAMFER OR RADIUS
- 7" HK.

**PLAN**
- 10'-0"
- 1 1/4" CLR.
  - TYP.

**END VIEW A-A**
- 3/4" CHAMFER OR RADIUS
- 10" RAD.
- 3/4" CHAMFER OR RADIUS

**ELEVATION**

**SECTION B-B**
- 3/4" CHAMFER OR RADIUS
- 8 x 6.029 x 2.9
- WELDED WIRE FABRIC
- #4 BAR ATTACHED TO FABRIC WITH APPROVED WIRE TIES
- PAVEMENT SURFACE
- ALL 3/4" DIA. LOOPS ATTACHED TO FABRIC

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**Notes**:
- 6" GALVANIZE AFTER BENDING
- MIN. (ENTIRE BAR MAY BE GALV.)

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**State of North Carolina Division of Highways Department of Transportation Raleigh, N.C.**

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**Roadway Standard Drawing for Precast Permanent Concrete Median Barrier**

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**Sheet 1 of 2**

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**854.04**
PLAN OF CONNECTION

CONNECTOR PIN ASSEMBLY

ELEVATION OF CONNECTION
CONCRETE MEDIAN TRANSITION BARRIER

MIN. 25:1 TRANSITION

A → B

CENTER TRANSITION

A → B

VARIABLE

SEE PLANS FOR THIS SECTION OF BARRIER

C → D

NOTE:
See plan typical sections to determine section view direction.

LEFT HAND TRANSITION

A → B

REFERENCE STATION

(SEE PLANS)

C → D

MIN. 25:1 TRANSITION

VARIABLE

SEE PLANS FOR THIS SECTION OF BARRIER

RIGHT HAND TRANSITION

A → B

REFERENCE STATION

(SEE PLANS)

C → D

VARIABLE

SEE PLANS FOR THIS SECTION OF BARRIER

INSET "A"

SHOWING RADIUS AND BEVEL

1' - 0" RADIUS

1' - 0"

OR
NOTES:
1. EVENLY SPACE HORIZONTAL REBAR 8"±1" UNLESS OTHERWISE NOTED.
2. USE #4 BAR FOR HORIZONTAL STEEL AND #4 OR #5 BAR FOR THE VERTICAL CAGE.
3. SUBMIT CHANGES IN STEEL PLACEMENT OR SIZE TO THE ENGINEER.
4. CONSTRUCT THE TRANSITION BARRIER IN ACCORDANCE WITH SECTION 854 OF THE SPECIFICATIONS.
DOUBLE FACE MEDIAN TRANSITION OFFSET BARRIER
(NO GLARE SCREEN PERMITTED)

SECTION VIEW

SECTION VIEW

ELEVATION VIEW
TYPE III - 2'-0" BASE

ELEVATION VIEW
TYPE II - 2'-6" BASE

STEEL VIEW

STEEL VIEW

NOTES: SEE SHEET 2.
NOTE:
1) THIS DRAWING IS NOT INTENDED TO SHOW TYPICAL BARRIER AND GUARDRAIL INSTALLATION.  
   IT DETAILS POSSIBLE BARRIER AND STRUCTURE ANCHOR COMBINATIONS FOR THIS TYPE FACILITY.  

2) USE TRAILING END GUARDRAIL IF WARRANTED
NOTE:
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2) USE TRAILING END GUARDRAIL IF WARRANTED

GUARDRAIL AND BARRIER AT DIVIDED HIGHWAY BRIDGE UNDERPASS
PRECAST REINFORCED CONCRETE BARRIER

857.01

PLANNED MIDDLE BARRIER UNIT

FINISH GRADE

GROOVE END

SEE SHEET 7

CLASS 'AA' CONCRETE

1'-43" 3" MIN. 1'-43"

3'-5"

1'-5"

2" 8" 2"

FINISH GRADE

GROOVE END

SEE SHEET 7

FINISH GRADE

1'-43" 3" MIN. 1'-43"

3'-5"

1'-5"

2" 8" 2"

FINISH GRADE

GROOVE END

SEE SHEET 7

FINISH GRADE

1'-43" 3" MIN. 1'-43"

3'-5"

1'-5"

2" 8" 2"

FINISH GRADE

GROOVE END

SEE SHEET 7

FINISH GRADE

1'-43" 3" MIN. 1'-43"

3'-5"

1'-5"

2" 8" 2"
DETAIL - SHEET 7

PART FRONT ELEVATION

NOTE:
THESE DIMENSIONS APPLY TO THIS END ONLY.

ELEVATION VIEWS
SHOWING PLACEMENT OF EYE BARS AT EACH END

FINISH GRADE
PRECAST REINFORCED CONCRETE BARRIER

DETAIL A
4 BOLT INSERT ASSEMBLY

THREADED STEEL INSERT WITH 3/4" X 2 1/4" SOLID BOTTOM TO FIT BOLT WITH ROUND WASHER

TACK WELD TYPICAL

DETAIL B
4 BOLT HOLD DOWN PLATE

1 1/8" DIA. HOLES FOR 3/4" BOLTS (TYP.)

1/8" HOLD-DOWN PLATE

NOTES FOR 4 BOLT HOLD DOWN PLATE

USE A 1 1/8" HOLD DOWN PLATE AND 4 - 3/4" DIA. BOLTS WITH NUTS AND WASHERS FOR GUARDRAIL ANCHOR ASSEMBLY.

USE HOLD-DOWN PLATE WHICH CONFORMS TO AASHTO M270 GRADE 36. AFTER FABRICATION, HOT DIP GALVANIZE THE HOLD DOWN PLATE IN ACCORDANCE WITH AASHTO M111.

AFTER INSTALLATION, BURR THE EXPOSED THREAD OF THE BOLT.

FORM OR DRILL THE 1 1/8" DIA. HOLES WITH A CORE BIT. IMPACT TOOLS WILL NOT BE PERMITTED. REPAIR ANY CONCRETE DAMAGED BY THIS WORK TO THE SATISFACTION OF THE ENGINEER.

PART SECTION OF BARRIER
THRU END SHOE SECTION AND 4 BOLT INSERT ASSEMBLY

PART SECTION OF BARRIER
THRU END SHOE SECTION AND 4 BOLT HOLD DOWN PLATE
CLASS 'AA' CONCRETE

BACK OF BARRIER

1½"

1" HEX NUT

1½" 3"

BAR (ASTM A-36)

1" DIA. STEEL

THREADS BURIED AFTER ASSEMBLY

PLAIN GALVANIZED STEEL WASHER FOR 1" PIN

CONNECTOR PIN ASSEMBLY 3'-1"

OR

#8 (1" DIA.) STEEL REINF. BAR 3'-3"

CONNECTOR PIN ASSEMBLY

OPTION #1

GALVANIZE ALL PARTS IN ACCORDANCE WITH ASTM A-153 SPEC.

OPTION #2

GALVANIZE ALL PARTS IN ACCORDANCE WITH ASTM A-153 SPEC.

GROOVE END AND PIN & EYE CONNECTION DETAILS

#5 REINF. BAR (EYE CONNECTION)

#8 REINFORCING STEEL BAR CONNECTOR PIN

#5 REINF. BAR 1½" RAD.

578"

GALVANIZE REQUIRED

DETAIL OF REINFORCING EYE BAR
NOTE: SEE SHEET 7 FOR DETAILS OF CONNECTOR PIN ASSEMBLIES.
**GUARDRAIL PLACEMENT**

**DETAIL OF MEDIAN TREATMENT AT UNDERPASS**

- **MEDIAN WIDTH**
- **SHOULDER SLOPE PER PLANS (10:1 OR FLATTER)**
- **SHOULDER (VAR.)**
- **DITCH (VAR.)**
- **MEDIAN HAZARD (TYP.)**
- **SECT. YY**
- **SECT. ZZ**
- **PAVED SHOULDER**
- **SINGLE FACED PRECAST CONCRETE BARRIER SEE STD. DWG. 857.01**

**NOTE:**
- When offset distance from face of obstruction to face of guardrail is between 3'-6" and 5'-6", begin 3'-1½" post spacing at a point 25' before reaching the obstruction and carry throughout its length. If the offset is less than 3'-6" use concrete barrier.

**POST SPACING 6'-0" WHEN OFFSET TO FACE OF GUARDRAIL IS 5'-6" OR GREATER. SEE NOTE.**

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**DETAIL OF RIGHT SIDE GUARDRAIL AT UNDERPASS**

- **MEDIAN WIDTH**
- **SHOULDER (VAR.)**
- **DITCH (VAR.)**
- **OFFSET**
- **SECT. XX**
- **SECT. YY**
- **SECT. ZZ**
- **SINGLE FACED PRECAST CONCRETE BARRIER SEE STD. DWG. 857.01**

**NOTE:**
- When offset distance from face of obstruction to face of guardrail is between 3'-6" and 5'-6", begin 3'-1½" post spacing at a point 25' before reaching the obstruction and carry throughout its length. If the offset is less than 3'-6" use concrete barrier.
NOTE SPECIAL LAYER OF PAVEMENT .......

USE 3'-1½" POST SPACING ON THE 50' OF GUARDRAIL PARALLEL TO Lanes AND 6'-3" POST SPACING ON 15:1 TRANSITION SECTIONS.
GRADE MEDIAN IN THE VICINITY OF THE SIGN SUPPORT AS ILLUSTRATED IN THE ROADWAY STANDARD DRAWINGS (STANDARD 862.01 SHEET 1 OF 12).
GUARDRAIL PLACEMENT

DETAIL OF GUARDRAIL APPROACHING DUAL LANE BRIDGES

DIMENSIONS FOR LENGTH OF GUARDRAIL APPROACHING DUAL LANE BRIDGES

<table>
<thead>
<tr>
<th>MEDIAN WIDTH</th>
<th>-L-****</th>
<th>-L-****</th>
</tr>
</thead>
<tbody>
<tr>
<td>30'</td>
<td>70 MPH</td>
<td>60 MPH</td>
</tr>
<tr>
<td></td>
<td>300.0'</td>
<td>250.0'</td>
</tr>
<tr>
<td></td>
<td>150.0'</td>
<td>150.0'</td>
</tr>
<tr>
<td>36'</td>
<td>300.0'</td>
<td>250.0'</td>
</tr>
<tr>
<td></td>
<td>150.0'</td>
<td>150.0'</td>
</tr>
<tr>
<td>40' &amp; ABOVE</td>
<td>300.0'</td>
<td>250.0'</td>
</tr>
<tr>
<td></td>
<td>150.0'</td>
<td>150.0'</td>
</tr>
<tr>
<td></td>
<td>40.0'</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
- Minor variation to the 25'-0" dimension is permissible to accommodate the 12'-6" in recovery area for the appropriate design speed.
- No guardrail is required on the trailing end when this distance exceeds clear roadside recovery area for the appropriate design speed.
- Based on "X" of 12'
- Use flare rate as the control if the "X" distance is not obtained. ("X" is based on shoulder widths in the Highway Design Branch Manual, Part 1, 1.48, F(A)).
- "N" = Distance from edge of lane to face of guardrail where guardrail is parallel to lane.
- The design layout for lengths shown on this standard are minimum design lengths.
- See sheet 1 of 12 for sections XX, YY
- See STD. 862.03 for structure anchor units

FOR POSTED SPEEDS > 55 mph USE GREU TYPE TL-2
FOR POSTED SPEEDS < 45 mph USE GREU TYPE TL-3

NOTE:
- 8:1 Pavement taper

862.01
**Guardrail Installation at Bridge Approaches**

For Two-Lane, Two-Way Traffic

<table>
<thead>
<tr>
<th>Design Speed (MPH)</th>
<th>&quot;L&quot; Approach Length (FT.)</th>
<th>&quot;L1&quot; Trailing Length (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Over Year Adt</td>
<td>Current Year Adt</td>
</tr>
<tr>
<td>70</td>
<td>382.5' 362.5'</td>
<td>350.0' 287.5'</td>
</tr>
<tr>
<td>60</td>
<td>300.0' 287.5'</td>
<td>275.0' 225.0'</td>
</tr>
<tr>
<td>50</td>
<td>212.5' 212.5'</td>
<td>200.0' 162.5'</td>
</tr>
<tr>
<td>40</td>
<td>175.0' 150.0'</td>
<td>137.5' 112.5'</td>
</tr>
</tbody>
</table>

*Use flare rate as the control if the "X" distance is not obtained. ("X" is based on shoulder widths in the Highway Design Branch Manual, Part 1, 1-4B, F1).

"N"= Distance from edge of lane to face of guardrail where guardrail is parallel to lane.

See Std. 862.03 for structure anchor units.

For posted speeds < 45mph use GREU type TL-3
For posted speeds > 45mph use GREU type TL-2

---

*Note: The graphic diagram shows the placement of guardrails with various lengths and offsets for proposed guardrails at two lane - two way locations.*

The diagram illustrates the guardrail installation at bridge approaches, with a focus on calculating the appropriate lengths and offsets for proposed guardrails at two lane - two way locations.
STANDARD GUARDRAIL PLACEMENT AT BRIDGES WITH 2'-6" CONCRETE CURB AND GUTTER

MINIMUM GUARDRAIL LENGTHS "L" REQUIRED AT BRIDGE APPROACHES ON 2'-6" CONCRETE CURB AND GUTTER ROADWAYS

<table>
<thead>
<tr>
<th>DESIGN SPEED (MPH)</th>
<th>&quot;L&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>150'</td>
</tr>
<tr>
<td>50</td>
<td>225'</td>
</tr>
</tbody>
</table>

NOTE: "L" VALUES ARE BASED ON NO HAZARDS OTHER THAN END OF BRIDGE BEING PRESENT WITHIN THE CLEAR ZONE.

SEE STD. 862.03 FOR STRUCTURE ANCHOR UNITS.

FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2
DETAIL OF BEGINNING OF GUARDRAIL IN CUT OR FILL SECTION

"N" = DISTANCE FROM EDGE OF LANE TO FACE OF GUARDRAIL WHERE GUARDRAIL IS PARALLEL TO LANE.

WARRANT POINT

LENGTH OF NEED

PAY LIMITS GUARDRAIL END UNIT TYPE TL-3 or TL-2

50:1 TAPER

SHOULDER LINE

EDGE OF LANE

28'-0" MIN.

25'-0"

2'-0"

2:1 TAPER

N+1'

FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2

2' OR 4' PAVED SHOULDER
10' PAVED SHOULDER

TRAFFIC

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
RALEIGH, N.C.

DEPARTMENT OF TRANSPORTATION
RALEIGH, N.C.
GUARDRAIL BREAK INTERVALS WITH 30'-36' MEDIANS

FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2

GUARDRAIL BREAK INTERVALS WITH 30'-36' MEDIANS

*GUARDRAIL OPENING MAY BE SPACED AS CLOSE AS 350 FT. FROM STRUCTURE IF NECESSARY TO ALLOW MOWER ACCESS TO MEDIAN

GUARDRAIL BREAK INTERVALS AS SHOWN ON PLANS

DETAIL AT UNDERPASSES

DETAIL AT OVERPASSES

RALEIGH, N.C.
DIVISION OF HIGHWAYS
DEPT. OF TRANSPORTATION
STATE OF NORTH CAROLINA
GUARDRAIL TREATMENT AT INTERSECTIONS

NOTES:

SHOP CURVED GUARDRAIL IS DEFINED AS HAVING A RADIUS OF 150' OR LESS.

WHEN RADIUS IS LESS THAN 20', REFER TO SHEET 9.

WHENEVER SHOP CURVED GUARDRAIL IS USED AS AN ANCHOR AND THE RADIUS IS FROM 20' TO 75', USE A MINIMUM LENGTH OF 50' OF SHOP CURVED GUARDRAIL AND FLARE WITH AN AT-1 ANCHOR UNIT. REFER TO DETAIL 1.

WHENEVER SHOP CURVED GUARDRAIL RADIUS IS MORE THAN 75', REFER TO DETAIL 2.

MAINTAIN CLEAR SIGHT DISTANCE.

FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2
GUARDRAIL TREATMENT AT DRIVEWAYS

**DETAIL-3**
DIVIDED HIGHWAY

NOTE: USE DETAIL 3 & 4 WHENEVER 20' OR LARGER RADIUS CANNOT BE UTILIZED. MAINTAIN CLEAR SIGHT DISTANCE.

FOR POSTED SPEEDS > 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2

**DETAIL-4**
UNDIVIDED HIGHWAY

GUARDRAIL TREATMENT AT DRIVEWAYS
NOTE:

When wooden guardrail posts are used, drill holes through earth material and base course. The post may then be driven to the proper depth. Drill the hole of sufficient size to accommodate the particular post being used. Backfill and tamp holes using the excavated material.
GUARDRAIL AT FACE OF CURB

GUARDRAIL END UNIT TYPE TL-3 or TL-2 (50:1 TAPER)

1 FT. OFFSET FROM FACE OF GUARDRAIL @ TERMINAL

FOR POSTED SPEEDS > 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2

GUARDRAIL 12' OFFSET FROM FACE OF CURB

FOR POSTED SPEEDS > 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2
TRAILING END UNIT ASSEMBLY

C.A.T.-1 SYSTEM
**FLARED ELEVATION VIEW**

* WHEN INSTALLING GUARDRAIL END UNITS THAT ARE 2'-1" MOUNTING HEIGHT TO EXISTING GUARDRAIL, REMOVE THE EXISTING GUARDRAIL TO TRANSITION FROM THE EXISTING HEIGHT TO THE PROPOSED 2'-1" HEIGHT. SEE 862.02, SHEET 4 OF 8 FOR TRANSITION DETAILS.

**TANGENT ELEVATION VIEW**

**APPROACH END UNITS**
15'-7½" W-BEAM GUARDRAIL PANEL

NOTE: USE 9-SPACE 15'-7½" W-BEAM GUARDRAIL PANEL AT THE DOWNSTREAM END OF AN END UNIT OR EXISTING GUARDRAIL THAT DOES NOT OFFSET THE W-BEAM PANEL SPICE TO MIDSPAN.
NOTE: IF EXISTING GUARDRAIL IS LOWER THAN 1'-11", USE AN ADDITIONAL 12'-6" LONG SECTION OF GUARDRAIL, FOR EVERY 1" OF HEIGHT DIFFERENCE, TO TRANSITION FROM EXISTING GUARDRAIL TO PROPOSED 2'-1" GUARDRAIL.

TRANSITION FROM OR 1'-11" TO 2'-1" W-BEAM GUARDRAIL MOUNTING HEIGHT
TYPICAL GUARDRAIL AND GUARDRAIL POST ALTERNATIVES

GUARDRAIL INSTALLATION

862.02

PLAN

ISOMETRIC VIEW

FRONT - MID SPAN SPLICE

NOTES:
A - 3/8" DIA. BUTTON HEAD SPLICE BOLT 1 1/4" LONG (8 REQ. PER SPLICE JOINT).
B - 3/8" DIA. BUTTON HEAD BOLT 7 5/8"/9" LONG WITH NUT FOR BOLTING 6"/8" ROUTED OFFSET BLOCK TO STEEL POSTS.
C - FIELD PUNCHING OF HOLES INTO GUARDRAIL AS DIRECTED BY THE ENGINEER.
ANCHOR PLATE ASSEMBLY

3/8" THICK END PLATE WITH 1 3/8" DIA. HOLE CENTERED IN PLATE. END PLATE TO BE WELDED TO ANCHOR PLATE.

5/8" HEX HEAD BOLT WITH WASHER UNDER NUT (8 REQUIRED PER ASSEMBLY)

SOIL PLATE
1/4" THICK PLATE

BEARING PLATE
9/8" THICK PLATE

BREAKAWAY TERMINAL
POST SLEEVE

DETAIL OF BUTTON HEAD BOLT AND NUT

DETAIL OF STANDARD WASHER

DETAIL OF STANDARD HEX BOLT AND NUT

SWAGED CABLE

CABLE ASSEMBLY

ANCHOR PLATE

STEEL PLATE
11/8" THICK GALV.

3/8" DIA. HOLES

11/16" DIA. x 1/2" DEEP RECESS

3/8" DIA. (6X19) GALV. CABLE
TO BE SWAGED CONNECTED

1" DIA. THREADED ROD

3/4" DIA. (6X19) GALV. CABLE
TO BE SWAGED CONNECTED

STANDARD WASHER: TYPICAL USE UNDER NUT WITH WOOD POST

GUARDRAIL INSTALLATION

SYSTEM PARTS

ROADWAY STANDARD DRAWING FOR GUARDRAIL INSTALLATION

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
RALEIGH, N.C.

DEPT. OF TRANSPORTATION
NORTH CAROLINA
STATE OF RALEIGH, N.C.

ROADOAY STANDARD DRAWING FOR GUARDRAIL INSTALLATION

862.02 SHEET 7 OF 8
GUARDRAIL INSTALLATION

SECTION X-X

TYPICAL END SHOE

BUFFERED END SECTION

NEUTRAL AXIS

3 1/4" DIA. HOLE

11" RADIUS

30"

2' - 6"

1' - 5 1/8"

8 1/2"

2 1/4"

SLOTTED HOLES

3/8" X 1 7/8"

3/4" DIA. HOLES FOR 3/8" DIA. BOLTS

1 1/4" DIA. HOLES FOR 3/8" DIA. BOLTS

TYPICAL END SHOE

SYSTEM PARTS - GENERAL USE

862.02
ELEVATION

NOTE:

**POST NOT REQUIRED FOR SKEW ANGLES GREATER THAN 150° OR LESS THAN 30° UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

*THE DISTANCE FROM END OF BRIDGE RAIL TO CENTER LINE OF THE FIRST POST SHOULD BE 11-3/4" IF CONCRETE BACKWALL IS NOT PRESENT.

- MEASURE GUARDRAIL HEIGHT FROM THE TOP OF ADJACENT SURFACE (SHOULDER, BERM, OR GUTTER).
- LAP JOINTS IN THE DIRECTION OF TRAFFIC FLOW.
- SEE SHEET 5 FOR POST SECTIONS 1 THRU 9.
**NOTE:**

**Post not required for skew angles greater than 15° or less than 30° unless otherwise directed by the engineer.**

- The distance from end of bridge rail to center line of the first post should be 11½" if concrete backwall is not present.
- Shoulder berm gutter must be installed to the limits 6" x 4" lip curb is shown if anchor unit is not adjacent to an approach slab.
- Measure guardrail height from the top of adjacent surface (shoulder, berm, or gutter).
- Lap joints in the direction of traffic flow.
- See Sheet 5 for post sections 1 thru 9.
NOTE: THE MID POST AND OFFSET BLOCK OF THE WTR SECTION WILL REQUIRE SPECIAL BOLT HOLE DRILLING IN THE THRIE BEAM OFFSET BLOCK AND LINE POST.
GENERAL NOTES:
1) POSTS 1 THROUGH 5 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER BLOCKOUTS AND/OR RUBRAIL.
2) RUBRAIL BLOCKOUTS LOCATED ON POSTS 1 THROUGH 4 ARE OFFSET DRILLED AND SECURED WITH 3/8" BUTTONHEAD BOLTS (SEE CHART FOR BOLT LENGTHS). SECURE BLOCKS ONLY TO POSTS 2 AND 4. SECURE RUBRAIL AND BLOCKOUTS TO POSTS 1 AND 3. RUBRAIL IS SECURED TO POST 5 WITH 3/8" x 3/4" BUTTONHEAD BOLTS. RUBRAIL IS FLARED TO BACK OF POST 5 AND NOT SECURED.
3) STEEL SPACER TUBE IS A SCHEDULE 40 GALVANIZED PIPE 6" INSIDE DIAMETER x 9" LONG. ATTACH TUBE TO GUARDRAIL ONLY WITH 3/8" x 1 1/4" LONG BUTTONHEAD BOLT AND RECTANGULAR PLATE WASHER.</p>
NOTE:

** Eliminate Post 3 and shift Posts 1 & 2 on skew angles greater than 150° or less than 30° unless otherwise directed by the Engineer.

* The distance from end of Bridge Rail to center line of the first post should be 11½" if concrete backwall is not present.

- Measure guardrail height from the top of adjacent surface (shoulder, berm, or gutter).
- Use no wood posts within the guardrail anchor unit limits.
- Lap joints in the direction of traffic flow.
- Posts 1 and 2 to be WB x 21 x 8'-0" long steel post and 8" x 8" x 14" wood routed offset block.
- Shoulder beam gutter is required if no curbing exists through anchor unit pay limits.

**Anchor the W-beam end shoe using a 4 bolt hold down plate as shown in Standard 862.04

---

**SIDE**

8" x 8" x 14" routed wood offset block

**PLAN**

15'-7" standard guardrail

**SECTION A-A**

Bridge Deck

**SECTION B-B**

See Standard 820.04 for drainage installation in shoulder berm gutter.

**SECTION C-C**

Transition approach slab curb to shoulder berm gutter

**SECTION D-D**

Guardrail anchor unit type B-83

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State of North Carolina

Department of Transportation

Division of Highways

Raleigh, N.C.

Depto. of Transportation

State of North Carolina

Raleigh, N.C.
ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT

NOTES FOR:
- GUARDRAIL POST ANCHORED TO STRUCTURE:
  - USE FULL LENGTH 1/4" BUTT WELDS AT ALL LOCATIONS OF CONTACT BETWEEN THE BASE PLATE, SUPPORT PLATES AND STEEL POST.
  - USE POST AND POST BASE PLATES CONFORMING TO THE REQUIREMENTS OF A.S.T.M. A-36 AND GALVANIZED AFTER FABRICATION TO CONFORM TO A.S.T.M. A-123.

- EXISTING STRUCTURES:
  - USE CONCRETE ANCHORS CONSISTING OF A STUD BOLT WITH NUT AND WASHER. USE STUDS THREADED ON ONE END AND HAVING AN EXPANDED WEDGE ASSEMBLY POSITIONED AROUND A TAPERED AREA AT THE OTHER END. USE ANCHORS WHICH PROVIDE A MINIMUM SAFE HOLDING POWER OF 2675 LBS. FOR A 3/4" OR 1" DIAMETER BOLT. CALCULATE HOLDING POWER BASED ON 1/4 THE ACTUAL HOLDING POWER OF THE ANCHOR IN 3500 PSI CONCRETE AS DETERMINED BY AN APPROVED COMMERCIAL TESTING LABORATORY.
  - USE ANCHORS GALVANIZED IN ACCORDANCE WITH A.S.T.M. A-153. SIZE HOLES FOR THE CONCRETE ANCHORS IN ACCORDANCE WITH THE ANCHOR MANUFACTURER'S RECOMMENDATIONS. DRILL HOLES WITH A CARBIDE OR DIAMOND TIPPED MASONRY BIT POWERED BY A ROTARY OR ROTARY IMPACT DRILL.
  - NO OTHER IMPACT TOOLS WILL BE PERMITTED. DRILL HOLES VERTICALLY. FURNISH DOCUMENTATION OF HOLE SIZE RECOMMENDED FOR THE SPECIFIED ANCHOR TO THE ENGINEER BEFORE DRILLING HOLES. THOROUGHLY CLEAN HOLES FOR ANCHORS OF ALL CONCRETE CHIPS, DUST, GREASE, OIL, ETC. BEFORE ANCHORS ARE INSTALLED. REPAIR ALL DAMAGE CAUSED BY THIS WORK TO THE SATISFACTION OF THE ENGINEER.

- NEW STRUCTURES:
  - ATTACH POST TO INSERT ASSEMBLY UNITS (USING ANCHOR BOLTS SUPPLIED WITH INSERTS) WHICH HAVE BEEN CAST INTO THE STRUCTURE DURING CONSTRUCTION.

- USE POST AND POST BASE PLATES CONFORMING TO THE REQUIREMENTS OF A.S.T.M. A-36 AND GALVANIZED AFTER FABRICATION TO CONFORM TO A.S.T.M. A-123.

- USE FULL LENGTH 1/2" BUTT WELDS AT ALL LOCATIONS OF CONTACT BETWEEN THE BASE PLATE, SUPPORT PLATES AND STEEL POST.

- USE POST AND POST BASE PLATES CONFORMING TO THE REQUIREMENTS OF A.S.T.M. A-36 AND GALVANIZED AFTER FABRICATION TO CONFORM TO A.S.T.M. A-123.

- USE ANCHORS WHICH PROVIDE A MINIMUM SAFE HOLDING POWER OF 2875 LBS. FOR A 1/2" OR 1" DIAMETER BOLT. CALCULATE HOLDING POWER BASED ON 1/4 THE ACTUAL HOLDING POWER OF THE ANCHOR IN 3500 PSI CONCRETE AS DETERMINED BY AN APPROVED COMMERCIAL TESTING LABORATORY.

- USE ANCHORS GALVANIZED IN ACCORDANCE WITH A.S.T.M. A-153. SIZE HOLES FOR THE CONCRETE ANCHORS IN ACCORDANCE WITH THE ANCHOR MANUFACTURER'S RECOMMENDATIONS. DRILL HOLES WITH A CARBIDE OR DIAMOND TIPPED MASONRY BIT POWERED BY A ROTARY OR ROTARY IMPACT DRILL.

- NO OTHER IMPACT TOOLS WILL BE PERMITTED. DRILL HOLES VERTICALLY. FURNISH DOCUMENTATION OF HOLE SIZE RECOMMENDED FOR THE SPECIFIED ANCHOR TO THE ENGINEER BEFORE DRILLING HOLES. THOROUGHLY CLEAN HOLES FOR ANCHORS OF ALL CONCRETE CHIPS, DUST, GREASE, OIL, ETC. BEFORE ANCHORS ARE INSTALLED. REPAIR ALL DAMAGE CAUSED BY THIS WORK TO THE SATISFACTION OF THE ENGINEER.

ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT
ANCHORING END OF GUARDRAIL

11"
4"
4"
3½"
1½"
10"

1½" DIA. HOLES FOR 3/8" BOLTS (TYP.)

1/4" HOLD-DOWN PLATE

4 BOLT HOLD DOWN PLATE

GUARDRAIL END SHOE
SEE STD. 862.02

6 GUARDRAIL AND BOLT

7/8" BOLTS WITH ROUND WASHERS FOR ATTACHING GUARDRAIL END SHOE TO BARRIER.

SEE DETAIL B FOR 1/4" HOLD-DOWN PLATE

1 1/4" DIA. HOLE (TYP.)

PART SECTION OF BARRIER OR RAIL
THRU END SHOE SECTION AND 4 BOLT HOLD DOWN PLATE

NOTES FOR 4 BOLT HOLD DOWN PLATE
FOR GUARDRAIL ANCHOR ASSEMBLY USE 1/4" HOLD DOWN PLATE AND 4 - 7/8" DIA. BOLTS WITH NUTS AND WASHERS.

USE HOLD-DOWN PLATE THAT CONFORMS TO AASHTO M270 GRADE 36. AFTER FABRICATION, HOT-DIP GALVANIZE THE HOLD-DOWN PLATE IN ACCORDANCE WITH AASHTO M111.

AFTER INSTALLATION, BURR THE EXPOSED THREAD OF THE BOLT WITH A SHARP POINTED TOOL. FORM OR DRILL THE 1 1/4" DIA. HOLES WITH A CORE BIT. IMPACT TOOLS WILL NOT BE PERMITTED. REPAIR ANY CONCRETE DAMAGED BY THIS WORK TO THE SATISFACTION OF THE ENGINEER.
DETAIL OF TREATMENT AT MEDIAN HAZARDS

*OFFSET GUIDERAIL TO EITHER SIDE OF MEDIAN L2.
USE 8'-0" MIN. OFFSET FOR MEDIAN 60' AND OVER.
USE 4'-0" MIN. OFFSET FOR MEDIAN LESS THAN 60'.

<table>
<thead>
<tr>
<th>L2 DIMENSION</th>
<th>MEDIAN WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>30'</td>
<td>80.0'</td>
</tr>
<tr>
<td>36'</td>
<td>60.0'</td>
</tr>
<tr>
<td>40' &amp; ABOVE</td>
<td>40.0'</td>
</tr>
</tbody>
</table>

NOTE: POSTS WILL ONLY BE PLACED IN ONE OF THE TWO OPENINGS AT EACH MEDIAN HAZARD UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

DETAIL 'A'
**NOTES:**

- Based on "X" of 12'
- Use flare rate as the control if the "X" distance is not obtained. ("X" is based on shoulder widths in the Highway Design Branch Manual, Part 1, 1-4B, F1A).
- "N" = Distance from edge of lane to face of guardrail where guardrail is parallel to lane.

The design layout for lengths shown on this standard are minimum design lengths.

See Standard 862.01 Sheet 1 for Sections XX, YY
See STD. 862.03 for structure anchor units

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**DIMENSIONS FOR LENGTH OF GUARDRAIL APPROACHING DUAL LANE BRIDGES**

<table>
<thead>
<tr>
<th>MEDIAN WIDTH</th>
<th>-L-</th>
<th>-L2-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>70 MPH</td>
<td>60 MPH</td>
</tr>
<tr>
<td>46' &amp; ABOVE</td>
<td>300.0'</td>
<td>250.0'</td>
</tr>
</tbody>
</table>
46' MEDIAN GUIDERAIL TRANSITIONS WITH SUPERELEVATION AND/OR FALSE SUMPS

GENERAL NOTES:
1. FALSE SUMP DETAIL IS APPLICABLE TO ALL MEDIAN WIDTHS.
2. DO NOT TRANSITION GUIDERAIL FOR SUPERELEVATION WHEN THE RATE IS 2 PERCENT OR LESS.
3. DO NOT INSTALL GUIDERAIL ON SLOPES STEEPER THAN 8:1.
**CABLE GUIDERAIL**

**CABLE GUIDERAIL APPLICATION**

### Typical Section

**Double Face Guiderail Application**

- Deflection Area on Median Slopes

**Single Face Guiderail Application**

- Deflection Area on Shoulder Only

- Deflection Area on Shoulder and Ditch Slope

*Offset Guiderail to Either Side of Median.*

- Use 8'-0" min. Offset for Medians 60' and over.
- Use 4'-0" min. Offset for Medians less than 60'.

---

**Offset**

- 6:1 or Flatter

**Fill**

- 6:1 or Flatter

---

**Median**

- 12'-0" Min. Deflection Area

*Var.*

- Use 4'-0" min. Offset for Medians less than 60'.

*Var.*

- Use 8'-0" min. Offset for Medians 60' and over.

---

**Travel Lanes**

**Shoulder**

**Guiderail**

**Ditch Slope**

---

**State of North Carolina**

**Department of Transportation**

**Raleigh, N.C.**

**DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS DEPT. OF TRANSPORTATION RALEIGH, N.C.**

---

**Roadway Standard Drawing for**

**Cable Guiderail Design and Placement**

---

**Sheet 4 of 12**
TYPICAL LAYOUT

25'-0" LINEAR OFFSET
OF ANCHORAGE SECTION

25'-0" LINEAR OFFSET
OF ANCHORAGE SECTION
INTERMEDIATE ANCHORAGE SECTION

ANCHOR UNIT PAY LIMITS
GUIDERAIL PAY LIMITS
ANCHOR UNIT PAY LIMITS

PLAN
TYPICAL LAYOUT

4" X 6" WOOD POST
(SEE NOTE BELOW)
ANCHOR UNIT

8'-4"
POSTS
TYPICAL ON TANGENT

16'-0" POSTS
ANCHOR UNIT

16'-0"
ANCHOR POST

2000' MAXIMUM BETWEEN TERMINAL SECTIONS, TERMINAL SECTIONS AND
INTERMEDIATE ANCHORAGE SECTIONS, OR INTERMEDIATE ANCHORAGE SECTIONS

PLAN
TYPICAL APPROACH & TERMINAL SECTIONS

SIDE VIEW SHOWING CABLE WIRE
PLACEMENT ON POST

SIDE VIEW SHOWING CABLE WIRE
PLACEMENT ON POST

WHEN USED AT A DRIVEWAY OR VEHICLE OPENING ONLY PLACE A 4" X 6" X 5'-4"
WOOD POST 30" ABOVE GROUND LINE, PLACE POST 6" AHEAD OF CONCRETE ANCHOR.
*PROVIDE OPENINGS ONLY FOR AREAS AS DESIGNATED ON ROADWAY PLAN SHEETS.

ELEVATION
TYPICAL APPROACH & TERMINAL SECTIONS

ELEVATION
TYPICAL INTERMEDIATE ANCHORAGE SECTION
DOUBLE FACE GUIDERAIL POST

HOLE PLACEMENT DETAIL

INTERMEDIATE POST

HOOK BOLT HOLE

3" x 6" x 24" P

HOOK BOLT (GALV. STEEL OR ALUMINUM)

Approved Tamper-proof lock nut.

3" DIAMETER BUTTON

INTERMEDIATE POST

3" DIAM. HOLES

FOR HOOK BOLTS

3/8" DIA. HOLE DELIN. MOUNTING

(SEE REFLECTOR MOUNT DETAIL)

THE CENTER POST IN THE INTERMEDIATE ANCHORAGE SECTION WILL HAVE CABLE WIRE ON BOTH SIDES OF THE MIDDLE STRAND REQUIRING THE USE OF TWO 13/4" HOOK BOLTS FOR THIS APPLICATION.

REFLECTOR MOUNT DETAIL

PLAN VIEW

REFLECTOR MOUNT DETAIL

ELEVATION VIEW

HOOK BOLT (ALTERNATES)

23/8" TO CENTER OF REFLECTOR

3/8" DIAM. BUTTON REFLECTOR

3/8" DIA.

5/8" DIA. A.S.H. HEX BACKING NUT OR APPROVED SHOULDER. APPROVED SHOULDER MUST EQUAL BEARING AREA OF 3/8" STD. NUT.

25/8" TO CENTER OF REFLECTOR

HOOK BOLT HOLES

5/8" DIA.

APPROVED TAMPER-PROOF LOCK NUT.

SPACER OR APPROVED SHOULDER BOLT (GALV. STEEL OR ALUMINUM)

23/8"

1 1/2"

1 1/2"

3/8"

1"

1"

1 1/2"

1 1/2"

4 1/2"

3 1/2"

4 1/2"

70"
CABLE GUIDERAIL

SINGLE FACE GUIDERAIL POST

HOLE PLACEMENT DETAIL

HOLE BOLT HOLE

3/8" DIA., HOLES FOR HOOK BOLTS

INTERMEDIATE POST

3/8" DIA. HOLE DELIN. MOUNTING

(SEE REFLECTOR MOUNT DETAIL)

SINGLE FACE GUIDERAIL POST

HOLE PLACEMENT DETAIL

HOLE BOLT HOLES

25/32" TO CENTER OF REFLECTOR

3/8" DIAMETER BUTTON REFLECTOR

SINGLE FACE GUIDERAIL INTERMEDIATE POST

HOOK BOLTS

(SEE DETAIL)

3/8" DIA. A.S.H. HEX BACKING NUT OR APPROVED SHOULDER. APPROVED SHOULDER MUST EQUAL BEARING AREA OF 3/8" STD. NUT.

REFLECTOR MOUNT DETAIL

PLAN VIEW

REFLECTOR MOUNT DETAIL

ELEVATION VIEW

HOOK BOLT (ALTERNATES)

Delineator

GROUND LINE

30"
ANCHOR POST SUPPORT PLATE 3/4" PLATE
3/4" DIA. HOLE FOR 3/4" DIA. BRASS ROD
3/4" DIA. BRASS ROD

PLACE 3/8" DIA. BRASS ROD IN HOLES AND BEND OVER ENDS.

SIDE VIEW OF POST TOP
FRONT VIEW OF POST TOP
(ROAD SIDE)

ANCHOR POST DETAIL

CABLES ON ROADSIDE

1-1/8" BOLT 2 5/8" LONG
W/NUTS AND 3 WASHERS
TORQUE TO 25 FT. LBS.

1" WALL BLOCK
6" WALL BLOCK

CONCRETE ANCHOR POST SUPPORT PLATE 3/4" PLATE

S3 X 5.7 POST

3/4" CABLE

KEEPER PLATE

SLIP IMPACT BASE
(KEEPER PLATE NOT SHOWN)
BREAKAWAY ANCHOR ANGLE

NOTE: SUBMIT ALTERNATE METHODS OF FABRICATING ANCHOR ANGLES FOR APPROVAL.

ANCHOR ANGLE DETAILS

EXTERNAL STIFFENER PLATE

INTERNAL STIFFENER PLATE

ANCHOR ANGLES FOR APPROVAL.
ANCHOR UNIT DETAIL
TOP VIEW LEFT HAND
(REINFORCEMENT NOT SHOWN)
TWO PIECE

ANCHOR UNIT DETAIL
TOP VIEW RIGHT HAND
(REINFORCEMENT NOT SHOWN)
TWO PIECE

NOTE: SET THE CONCRETE ANCHOR INTO THE EXCAVATION AS DETAILED. THE BOTTOM OF THE ANCHOR MUST HAVE A FULL AND EVEN BEARING ON THE SURFACE UNDER IT SO THAT IF THE CONTRACTOR ELECTS TO PLACE THE ANCHOR IN TWO SECTIONS, THERE WILL BE LITTLE OR NO DIFFERENTIAL SETTLEMENT. IF THE CONTRACTOR ELECTS TO PLACE THE ANCHOR IN TWO SECTIONS, PLACE THE TOPS OF BOTH SECTIONS ON THE SAME PLANE.

ANCHOR UNIT & RE-BAR INSTALLATION DETAIL
FITTINGS

SPLICES AND CABLE

TYPICAL WEDGE FOR ALL
CABLE

GUIDERAIL

ANCHOR ANGLE DETAIL

CABLE END ASSEMBLY TO
ANCHOR ANGLE DETAIL

TURNBUCKLE CABLE END ASSEMBLY

CABLE END ASSEMBLY
(COMPENSATING DEVICE)

CABLE WEDGE

TYPICAL WEDGE FOR ALL
SPLICES AND CABLE
FITTINGS

CABLE SPLICE

NOTE: USE WITH WEDGE

WASHER

NOTE 5
GENERAL NOTES:

1. PROVIDE ALL S3x5.7 ROLLED STEEL SECTIONS IN ACCORDANCE WITH ASTM A-6. USE POSTS, PLATES AND ANCHOR ANGLES CONFORMING TO THE REQUIREMENTS OF SECTION 862 OF THE STANDARD SPECIFICATIONS. WHERE THE RAIL IS PARALLEL TO THE EDGE OF THE TRAVEL LANE, REFLECTORIZE EVERY 6th POST (96") (SEE STANDARD 1261.02 FOR DELINEATORS). FOR DOUBLE FACE GUIDERAIL, PLACE DELINEATOR VISIBLE ON EVERY 6th POST TO TRAFFIC IN EITHER DIRECTION. DO NOT REFLECTORIZE POSTS IN THE TYPICAL INTERMEDIATE ANCHORAGE SECTION, TYPICAL APPROACH OR TERMINAL SECTIONS.

2. PROVIDE ROUND \( \frac{3}{4}" \) DIAMETER ZINC COATED CABLE WIRE CONSTRUCTED OF THREE STRANDS (7 WIRES PER STRAND) HAVING A MINIMUM TENSILE STRENGTH OF 25000 LBS. IN ACCORDANCE WITH AASHTO M-30 TYPE I CABLE, CLASS 'A' COATING.

3. PROVIDE MATERIALS INDICATED AS 'CAST STEEL' WHICH CONFORM TO AASHTO M103.

4. PROVIDE INSTALLED HOOK BOLTS WHICH DEVELOP AN ULTIMATE PULL OPEN STRENGTH OF 500 LBS TO 1000 LBS. APPLIED IN A DIRECTION NORMAL TO THE LONGITUDINAL AXIS OF THE POST.

5. DESIGN ALL FITTINGS, INCLUDING SPLICES, TO USE THE CABLE WEDGE AND DEVELOP THE FULL STRENGTH OF THE \( \frac{3}{4}" \) CABLE. HOT DIP GALVANIZE ALL FITTINGS, EXCEPT THE CABLE WEDGE, ACCORDANCE WITH AASHTO M-30.

6. CRIMP ONE WIRE OF THE WIRE ROPE OVER THE BASE OF THE WEDGE TO HOLD IT FIRMLY IN PLACE AT ALL LOCATIONS WHERE THE CABLE IS CONNECTED TO A CABLE SPLICE CONNECTION.

7. DESIGNS FOR A COMBINATION OR SINGLE UNIT COMPENSATING DEVICE AND TURNBUCKLE ASSEMBLY MAY BE SUBMITTED FOR APPROVAL. COMPENSATING DEVICES MUST HAVE A SPRING RATE OF 450 LBS. PLUS OR MINUS 50 LBS. PER INCH WITH A MINIMUM TOTAL "THROW" OF 6".

8. APPLY THE FOLLOWING CRITERIA FOR ARRANGEMENT OF SPRING CABLE END ASSEMBLIES (COMPENSATING DEVICES) AND TURNBUCKLE CABLE END ASSEMBLIES:

LENGTH OF CABLE RUNS:

TO 1000' - USE COMPENSATING DEVICE ON ONE END AND TURNBUCKLE ON THE OTHER END OF EACH INDIVIDUAL CABLE.

1000' TO 2000' - USE COMPENSATING DEVICE ON EACH END OF EACH CABLE.

OVER 2000' - START NEW STRETCH BY INTERLACING AT LAST PARALLEL POST (TYPICAL LAYOUT).

PRIOR TO FINAL ACCEPTANCE BY THE STATE, USE THE FOLLOWING VALUES TO TIGHTEN THE TURNBUCKLES BASED ON THE TEMPERATURE AT THE TIME OF ADJUSTMENT.

<table>
<thead>
<tr>
<th>TEMPERATURE (FAHRENHEIT)</th>
<th>SPRING COMPRESSION FROM UNLOADED POSITION IN EACH SPRING</th>
</tr>
</thead>
<tbody>
<tr>
<td>110° - 120°</td>
<td>1&quot;</td>
</tr>
<tr>
<td>100° - 109°</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>90° - 99°</td>
<td>1 1/2&quot;</td>
</tr>
<tr>
<td>80° - 89°</td>
<td>1 3/4&quot;</td>
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<tr>
<td>70° - 79°</td>
<td>2&quot;</td>
</tr>
<tr>
<td>60° - 69°</td>
<td>2 1/4&quot;</td>
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<tr>
<td>50° - 59°</td>
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</tr>
<tr>
<td>40° - 49°</td>
<td>2 3/4&quot;</td>
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<td>30° - 39°</td>
<td>3&quot;</td>
</tr>
<tr>
<td>20° - 29°</td>
<td>3 1/4&quot;</td>
</tr>
<tr>
<td>10° - 19°</td>
<td>3 1/2&quot;</td>
</tr>
<tr>
<td>0° - 9°</td>
<td>3 3/4&quot;</td>
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<td>-10° - -1°</td>
<td>4&quot;</td>
</tr>
<tr>
<td>-20° - -11°</td>
<td>4 1/4&quot;</td>
</tr>
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</table>

TABLE "A"

<table>
<thead>
<tr>
<th>PAVEMENT &amp; CURVATURE</th>
<th>POST SPACING</th>
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<tbody>
<tr>
<td>8° OR LESS</td>
<td>18&quot;</td>
</tr>
<tr>
<td>MORE THAN 8° TO 13°</td>
<td>12&quot;</td>
</tr>
</tbody>
</table>

865.01
SINGLE SWING GATE

**"H" is the height of fence. See pay item description for req'd height for project.**

**NOTE:** Roll formed line post may be driven to a minimum of 3'-0" in lieu of concrete anchor, unless otherwise directed by the engineer.

Double Swing Gate

Maximum wire spacing to be 6".

Maximum clearance between lowest strand and ground to be 6".

Erect brace rails between terminal or gate posts at intervals not exceeding 700' on tangents or 350' on short radius curves.

Erect additional terminal posts if directed by the engineer.

Brace terminal posts from both sides of post.

GRADE IF NECESSARY TO CLEAR WIRES

DETAIL OF DITCH CROSSING

NOTE:

Fence hardware varies due to differing manufacturers supplies.

Placing of fence along right of way (brace all terminal posts as shown above).
**ALLOWABLE COMPONENTS FOR FENCE SYSTEMS**

<table>
<thead>
<tr>
<th>FRAME COMPONENTS</th>
<th>GALV. STEEL OR ALUMINUM COATED STEEL #11 GAUGE</th>
<th>ALUMINUM ALLOY OR ALUMINUM COATED STEEL (#11 GAUGE)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SYSTEM</strong></td>
<td><strong>G1</strong></td>
<td><strong>G2</strong></td>
</tr>
<tr>
<td>LINE POST</td>
<td>1.30&quot; O.D. STEEL PIPE</td>
<td>1.625&quot; X 1.875&quot; STEEL H</td>
</tr>
<tr>
<td>TERMINAL POST</td>
<td>2.375&quot; O.D. STEEL PIPE</td>
<td>2.375&quot; O.D. STEEL PIPE</td>
</tr>
<tr>
<td>GATE POST UP</td>
<td>2.875&quot; O.D. STEEL PIPE</td>
<td>2.875&quot; O.D. STEEL PIPE</td>
</tr>
<tr>
<td>GATE POST 7 THRU 12 LEAF</td>
<td>4.000&quot; O.D. STEEL PIPE</td>
<td>4.000&quot; O.D. STEEL PIPE</td>
</tr>
<tr>
<td>BRACE RAIL</td>
<td>1.660&quot; O.D. STEEL PIPE</td>
<td>1.660&quot; O.D. STEEL PIPE</td>
</tr>
</tbody>
</table>

**FOR 4' AND 5' FENCE SYSTEMS**

**FOR 6' FENCE SYSTEMS**

- **TENSION WIRE - #7 GA.**
- **TENSION WIRE - #7 GA.**
- **TENSION WIRE - #7 GA.**
- **TENSION WIRE - #7 GA.**
- **TENSION WIRE - #7 GA.**
- **TENSION WIRE - #7 GA.**

- **LINE POST - 3'-0" MIN. FOR 6'**
- **LINE POST - 2'-0" FOR 4' & 5'**
- **LINE POST - 1'-0" FOR 4' & 5'**
- **LINE POST - 1'-0" FOR 4' & 5'**

**LINE BRACE DETAIL**

**"H" IS THE HEIGHT OF FENCE, SEE PAY ITEM DESCRIPTION FOR REQ'D HEIGHT FOR PROJECT.**

**VARIATION DUE TO DIFFERING MANUFACTURING DIMENSIONS.**

**THE FABRIC MAY EITHER BE FASTENED TO THE TENSION WIRE BY HOG RINGS SPACED AT 2' INTERVALS, OR THE TENSION WIRE MAY BE WOVEN THROUGH THE FABRIC.**

**USE TIE WIRE (#6 GA.) AT 24" CTRS. TO TIE FABRIC TO BRACE RAIL.**

**WIRE CLIPS/TIES USED TO ATTACH FABRIC TO POST AT 12" CTRS.**

**ROLL FORMED LINE POST MAY BE DRIVEN TO A MINIMUM OF 3'-0" IN LIEU OF CONCRETE ANCHOR, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.**
**WOVEN WIRE FENCE**

**END OR GATE LOCATION**

**LINE BRACES (MAXIMUM SPACING 324')**

*PLACE THE BRACE WIRE AROUND THE POST. DRAW WIRE TAUT BY TWISTING BETWEEN EACH POST. THIS APPLIES TO ALL BRACE WIRES. NOTCH POSTS FOR BRACES.*

*PLACE TWO GALVANIZED 12d OR THREE GALVANIZED 10d ON ALL BRACES AT EACH END.*

**ERECT LINE BRACES BETWEEN END, CORNER OR GATE POSTS AT INTERVALS NOT EXCEEDING 324 FEET.**

**NOTE:**

*THIS MAXIMUM INTERVAL MAY BE REDUCED BY THE ENGINEER ON CURVES WHERE THE DEGREE OF CURVATURE IS GREATER THAN 3 DEGREES. PLACE LINE BRACES AT THE END OF EACH ROLL OR PIECE OF WOVEN WIRE.*

**FENCE CORNER**

*USE WHEN CORNER ANGLE IS 15° OR GREATER*

**POST FOR BLOCKING DRIVEWAYS OR OTHER ENTRANCES**

*INSTALL IN ADDITION TO FENCE WHERE SHOWN IN PLANS OR WHERE DIRECTED BY THE ENGINEER*

**GROUND LINE**

**BRACE POSTS**

**4"x4" HORIZONTAL TOP BRACE**

**5"x5" WOOD BRACE POST**

**5" TWISTED WIRE**

**9" WIRE TWISTED**

**13g" NOMINAL DIAMETER**

**4 PT. BARBED WIRE**

**3" 101⁄2" HORIZONTAL TOP BRACE**

**5"x5" WOOD GROUND LINE**

**12" NOMINAL DIAMETER**

**4 PT. BARBED WIRE**

**9" WIRE TWISTED**

**5" GROUND LINE**

Use latch device approved by the Engineer.

Hinge assembly, as detailed, is suggested. Substitution may be made subject to approval by the Engineer.

Use 13g" diameter galvanized steel pipe gate frame except as shown here.
WOVEN WIRE FENCE

DETAIL OF DITCH CROSSING

4 PT. BARBED WIRE

GRADE IF NECESSARY TO CLEAR WIRES

9'-0" MINIMUM EMBEDMENT AS DIRECTED BY THE ENGINEER

6" MINIMUM SPACING

9" ALLOWABLE SPACING

ALTERNATE TYPES OF STAPLES
USE ONE #9 STAPLE OR TWO #16 STAPLES AT EACH POINT OF ATTACHMENT.

DETAIL SHOWING METHOD OF CONSTRUCTING FENCE ON SHARP BREAK IN GRADE

USE AT GATE POSTS OR WHERE REQUIRED BY SOIL CONDITIONS. MAY ALSO BE USED IN LIEU OF SETTING POSTS TO A DEPTH OF 3'-2".

DETAIL OF POST ANCHOR

ALL POSTS SHOWN ARE BRACE POST

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR
WOVEN WIRE FENCE WITH WOOD POST

SHEET 2 OF 3
866.02

DEPARTMENT OF TRANSPORTATION
DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR
WOVEN WIRE FENCE

SHEET 2 OF 3
866.02
METHOD OF TYING FENCE TO HEADWALL

GENERAL NOTES:

ALL POSTS AND BRACES MAY BE EITHER ROUND OR SQUARE AT THE OPTION OF THE CONTRACTOR, PROVIDED THE SAME TYPE IS USED THROUGHOUT THE PROJECT FOR POST AND BRACE.

DIMENSIONS SHOWN ARE THE DIAMETER OF ROUND POSTS OR EDGE DIMENSIONS OF SQUARE POSTS.

INSTALL THE FENCE FACING THE PROPERTY OWNER EXCEPT THAT ON HORIZONTAL CURVES GREATER THAN THREE DEGREES; INSTALL THE FENCE TO PULL AGAINST ALL POSTS.

VARIABLE - NOT EXCEED 8'

WIRE FENCE NEED NOT BE CUT

CUT AND SPlice OR TIE FENCE WIRE AROUND POST

METHOD OF ERECTING FENCE FOR FILL SLOPE
WOVEN WIRE FENCE
END OR GATE LOCATION

ERECT LINE BRACES BETWEEN END, CORNER OR GATE POSTS AT INTERVALS NOT EXCEEDING 324 FEET.
THIS MAXIMUM INTERVAL MAY BE REDUCED BY THE ENGINEER ON CURVES WHERE THE DEGREE OF CURVATURE IS GREATER THAN 3 DEGREES.
PLACE LINE BRACES AT THE END OF EACH ROLL OR PIECE OF WOVEN WIRE.

LINE BRACES
PLACE THE BRACE WIRE AROUND THE POST. DRAW THE WIRE TAUT BY TWISTING BETWEEN EACH POST. THIS APPLIES TO ALL BRACE WIRES.

POST FOR BLOCKING

FENCE CORNER
USE WHEN CORNER ANGLE IS 15° OR GREATER

STUDED "T" POST W/ ANCHOR PLATE

DEPT. OF TRANSPORTATION
NORTH CAROLINA
STATE OF RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR WOVEN WIRE FENCE WITH STEEL POST
**WOVEN WIRE FENCE**

**DETAIL OF DITCH CROSSING**

- 4 PT. BARBED WIRE
- 2.375" O.D. BRACE POST
- 6" MINIMUM SPACING
- 9" ALLOWABLE SPACING

**DETAIL SHOWING METHOD OF CONSTRUCTING FENCE ON SHARP BREAK IN GRADE**

- 4 PT. BARBED WIRE
- 2'-6" MINIMUM EMERGMENT AS DIRECTED BY THE ENGINEER
- 6" SPACING
- 1.66" O.D. BRACE
- WITH ANCHOR PLATE

**DETAIL OF POST ANCHOR**

- USE CONCRETE FOOTING ON ALL CORNER, END, GATE AND BRACE POSTS.
**Method of Erecting Fence for Fill Slope**

- **Plan View**
  - Wire fence need not be cut.
  - "T" post along this area.

- **Elevation**
  - "T" post 3'-6" min.
  - 2.375" O.D. brace.
  - #9 twisted wire.

**Method of Tieing Fence to Headwall**

- **General Notes:**
  - Install the fence facing the property owner except on horizontal curves greater than three degrees, install the fence to pull against all posts.
  - In lieu of 2.375" O.D. tubular posts, 2½" x 2½" x ⅛" angle sections may be used.
  - In lieu of 1.660" O.D. tubular braces, 2" x 2" x ¼" angle sections may be used.

- **Construction Details:**
  - Variable – not exceed 8'.
  - 4 PT. Barb Wire.
  - 1.660" O.D. Brace.
  - #9 Twisted Wire.
  - "T" Post.
  - Variable - 2'-6" min.
  - 2.375" O.D. Brace Post.
  - 8'-0".
  - 4 PT. Barbed Wire.
  - #9 Twisted Wire.
  - 2.375" O.D. Corner Post.
  - 10" Diameter Concrete Footing.
  - Cut and splice or tie fence wire around post.

- **Other Notes:**
  - "T" Post along this area.
  - Roadside fence wire.
  - See detail.

---

**Concrete Footing**

- 10" Diameter.

---

**Right-of-Way Marker**

- R/W Marker.

---

**Wingwall**

- Fence to corner at right of way.
**BARBED WIRE FENCE CHART**

<table>
<thead>
<tr>
<th>NUMBER OF BARBED WIRE STRANDS</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<th>6</th>
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<td><strong>STRAND SPACING</strong></td>
<td></td>
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<td>C</td>
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<td>11&quot;</td>
<td>8&quot;</td>
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<tr>
<td><strong>BRACE POSTS</strong></td>
<td></td>
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<tr>
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<td>6'-0&quot;</td>
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<td>6'-0&quot;</td>
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<tr>
<td>EXPOSED</td>
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<td>3'-5&quot;</td>
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<td>4'-11&quot;</td>
<td>4'-11&quot;</td>
<td>4'-11&quot;</td>
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<td>EMBEDMENT</td>
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<td>3'-1&quot;</td>
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<tr>
<td><strong>LINE POSTS</strong></td>
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<tr>
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<td>EMBEDMENT</td>
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<td><strong>HORIZONTAL BRACE</strong></td>
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<tr>
<td>LENGTH</td>
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<td>8'-0&quot;</td>
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<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
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</tbody>
</table>

**ALTERNATE TYPES OF STAPLES**

Use one #9 staple or two #16 staples at each point of attachment.

**LINE BRACES**

(Maximum spacing 330')

11/16" Min.

**CORNER BRACE**

Use when corner angle is 15° or greater
**Detail of Gate Post Anchor**

Use Class "B" concrete at Gate Posts or where required by soil conditions. Concrete may also be used in lieu of setting posts to their maximum depth.

**General Notes:**

All posts and braces may be either round or square at the option of the contractor, provided the same type is used throughout the project.

Dimensions shown are the diameter of round or edge dimensions of square posts and braces.

Erect line braces between end, corner or gate posts. Place line braces at intervals not exceeding 330' and at the end of the barbed wire roll.

The 330' interval may be reduced by the engineer on curves where the degree of curvature is greater than 3 degrees.

Notch brace posts 1" minimum for horizontal braces. Place two galvanized 12d or three galvanized 10d nails at each end of all braces.

Place the brace wire around the post. Draw all brace wire taut by twisting between each post.

Install the fence facing the property owner except that on horizontal curves greater than three degrees (3°) install the fence to pull against all posts. See STD. 866.02 for fencing at ditch crossings, breaks in grades and R/W breaks.

Use latch device approved by the engineer. Hinge assembly as shown is suggested. Substitution may be subject to approval by the engineer. Use 1 ½" diameter galvanized steel pipe for gate frame except as shown here.

Any combination of gate and fence type meeting the approval of the engineer is acceptable and is not limited to the examples shown hereon.
**Elevation**

- **U** Bolt see Detail "B"
- **U** Bolt see Detail "A"

**Section A-A**

**Alternate Section A-A**

**Note:**
- Erect Brace Panel between ends at intervals not exceeding 350 ft.
- Erect additional Brace Posts if so directed by the Engineer. Brace the Posts from both sides of Posts.

**Plan of Brace Panel**

**Glare Screen**

- Chain Link Fabric/Guardrail Mounted

**Guaranteed Standard Drawing for**

- Roadway Standard Drawing

**State of North Carolina Division of Highways**

**Raleigh, N.C.**

**Department of Transportation**

**State of North Carolina Division of Highways**

**Raleigh, N.C.**

**Note: Glare Screen**

- Chain Link Fabric/Guardrail Mounted

**Guaranteed Standard Drawing for**

- Roadway Standard Drawing

**State of North Carolina Division of Highways**

**Raleigh, N.C.**

**Department of Transportation**
NOTES: VINYL COATED GLARE SCREEN
1. USE CHAIN LINK FABRIC 48" WIDE, 1½" MESH, 11½ GA.
   HOT DIPPED GALVANIZED STEEL WIRE VINYL COATED SHERWOOD GREEN.
2. USE END (BRACE) POST, LINE POST AND BRACE RAIL
   GALVANIZED STEEL PIPE VINYL COATED SHERWOOD GREEN.
3. USE FITTINGS AND OTHER APPURTENANCES ALUMINUM ALLOY,
   GALVANIZED PRESSED STEEL, MALLEABLE OR CAST STEEL VINYL COATED
   SHERWOOD GREEN. PAINTED FITTINGS ARE NOT ACCEPTABLE.
4. USE TENSION WIRE GALVANIZED STEEL ASTM A752 GRADE 1335
   OR 5140 VINYL COATED SHERWOOD GREEN.
5. USE HOG RINGS 9 GA. AND VINYL COATED SHERWOOD GREEN.
6. USE TIRE WIRE 9 GA. GALVANIZED STEEL WIRE VINYL COATED SHERWOOD GREEN.

NOTES: GALVANIZED GLARE SCREEN
1. USE CHAIN LINK FABRIC 48" WIDE, 1½" MESH, 11½ GA.
   HOT DIPPED GALVANIZED STEEL WIRE.
2. USE END (BRACE) POST, LINE POST AND BRACE RAIL
   GALVANIZED STEEL PIPE.
3. USE FITTINGS AND OTHER APPURTENANCES GALVANIZED PRESSED
   STEEL, MALLEABLE OR CAST STEEL.
4. USE TENSION WIRE GALVANIZED STEEL ASTM A752 GRADE 1335
   OR 5140.
5. USE HOG RINGS 9 GA.
6. USE TIRE WIRE 9 GA. GALVANIZED STEEL WIRE.
GENERAL NOTES:
1. USE RIP-RAP IN CHANNEL BED WHERE SHOWN ON PLANS.
2. IF BEDROCK IS ENCOUNTERED WITHIN THE LIMITS OF THE TOEWALL, BEGIN TOEWALL ON THE BEDROCK OR AS DIRECTED BY THE ENGINEER.
3. WHERE ONLY ONE SIDE REQUIRES RIP-RAP I OR 'II' LIST STATION AND SIDE OF SAME.

**CHANNEL WITH CLASS I RIP RAP**

**CHANNEL WITH CLASS I OR CLASS II RIP RAP**

**LONGITUDINAL SECTION A-A, B-B OR C-C**

**CLASS I**

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<thead>
<tr>
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<th>Side</th>
<th>Width</th>
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<tr>
<td>6'-10'</td>
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<td></td>
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<tr>
<td>11'-20'</td>
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**CLASS II**

<table>
<thead>
<tr>
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<tr>
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<tr>
<td>6'-10'</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>11'-20'</td>
<td>18&quot;</td>
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</tbody>
</table>

*FOR "V" DITCH "W" IS 0'
**OUTLET W/DITCH**

<table>
<thead>
<tr>
<th>D</th>
<th>CLASS 'B' RIP RAP</th>
<th>CLASS I RIP RAP</th>
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<tbody>
<tr>
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</tr>
<tr>
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**OUTLET W/O DITCH**

<table>
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<th>CLASS I RIP RAP</th>
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**NOTE:**

For calculation purposes:

- CLASS 'B' RIP RAP = 100 LBS./FT³
- CLASS I RIP RAP = 105 LBS./FT³

**PLAN**

- SLOPE 1½:1 OR FLATTER
- GEOTEXTILE

**SECTION A-A**

- PIPE OUTLET WITH DITCH

**SECTION B-B**

- PIPE OUTLET WITHOUT DITCH

**PLAN**

- SLOPE 1½:1 OR FLATTER
- GEOTEXTILE

**NOTE:**

- H = RIP RAP TO TOP OF PIPE (MAX. H = D + T)
- T = 15" CLASS I RIP RAP, UNLESS OTHERWISE SHOWN ON PLANS
- T = 12" CLASS 'B' RIP RAP, UNLESS OTHERWISE SHOWN ON PLANS

**GUIDE FOR RIP RAP AT PIPE OUTLETS**

**RALEIGH, N.C.**

**DIVISION OF HIGHWAYS**

**DEPT. OF TRANSPORTATION**

**NORTH CAROLINA**

**STATE OF**
GENERAL NOTES:

- Use Class 'A' Rip Rap.
- Construct width and shape of the ditches as shown or directed by the Engineer.
- Use geotextile under Class 'A' Rip Rap if specified on Plans.

*As specified on Plans.

SLOPE DRAIN, BASE DITCH OR BERM DRAINAGE OUTLET DITCH

12' V.C. ROADWAY DITCH

MEDIAN OR BERM DITCH

SIDE DITCH

NOTE: "D" Varies with length and rate of side slopes.
GENERAL NOTES:

- USE CLASS 'B' RIP RAP.
- CONSTRUCT WIDTH AND SHAPE OF THE DITCHES AS SHOWN OR DIRECTED BY THE ENGINEER.
- USE GEOTEXTILE UNDER CLASS 'B' RIP RAP IF SPECIFIED ON PLANS.
  *AS SPECIFIED ON PLANS.

SIDE DRAINS, BASE DITCH OR OTHER OUTLET DITCHES

BERM DITCH

VEE DITCH

GEOTEXTILE