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Table of Contents

Appendix A : Project Development Checklist | 2
Appendix B: At-Grade Rail Crossings | 8
Appendix C: Maintenance and Operations Examples | 36
Appendix D: Curb Ramps | 40
Appendix E: Drainage Grates | 54
Appendix A
Project Development Checklist
NCDOT Complete Streets Project Development Checklist

Background

Per the 2009 NCDOT Complete Streets Policy, the NCDOT, in its role as stewards over the transportation infrastructure, is committed to:

- Providing an efficient multi-modal transportation network in North Carolina such that the access, mobility, and safety needs of motorists, transit users, bicyclists, and pedestrians of all ages and abilities are safely accommodated;
- Caring for the built and natural environments by promoting sustainable development practices that minimize impacts on natural resources, historic, businesses, residents, scenic and other community values, while also recognizing that transportation improvements have significant potential to contribute to local, regional, and statewide quality of life and economic development objectives;
- Working in partnership with local government agencies, interest groups, and the public to plan, fund, design, construct, and manage complete street networks that sustain mobility while accommodating walking, biking, and transit opportunities safely.

The following is a checklist that reflects Figure 2 and is intended to document how complete streets have been considered in the planning and design of a project. The design input team formed for the project should complete the appropriate portion of this checklist at each project milestone. This checklist should be used for all projects related to the design, construction or modification of streets.
Evaluation of Existing and Future Conditions

Define Land Use Context: Note: refer to Chapter 3 of the Guidelines for a detailed description of area types

Existing conditions

• Is this an urban area, a rural area or an area of transition (urban to rural or rural to urban)?

• What is the jurisdiction land use and zoning for the area?

• What is the existing land use mix and density?

• What are the typical building types, their scale, setbacks, urban design characteristics, relation to the street?

Future conditions

• Are there any development pressures on the area? What is the nature of the emerging land use context?

• What is the jurisdiction’s future land use vision (as identified in a comprehensive plan, corridor plan, policies, or other sources)?

• Does the adopted plan(s) make specific recommendations regarding density, setbacks, urban design, etc. through the project area?

Define Transportation Context:

Existing conditions

• What is the character of the street? What does the area look and feel like?

• How does the street currently function? What are the daily and hourly traffic volumes? Operating and posted speeds?

Future conditions

• Are there any development pressures on the area? What is the nature of the emerging land use context?
• How does this corridor function within the larger transportation network?

• What design features and accommodations for bicyclists, pedestrians and transit users are included on the corridor (number of lanes, sidewalk availability, bicycle facilities, transit service and stops, traffic control, etc.)?

• What is the existing quality of service (safety and accessibility) for each mode? What is the general crash history for motorists, bicyclists, and pedestrians (are there any specific safety issues to be addressed)?

Future conditions
• What are the projected traffic volumes along the corridor?

• What trip generators (existing and future) are in the vicinity of the proposed project that might affect travel patterns and connections in and around the corridor?

• What are the locally adopted multimodal plans or policies affecting bicycle, pedestrian, or transit use?

• Are there any planned transportation projects in the larger area that would affect the street segment?
Establish Goals and Objectives

Identify Issues and Opportunities:

• What are the deficiencies/problems with the street today?
  ◦ Are there gaps in the bicycle or pedestrian network near or along the street?
  ◦ Are there gaps in the overall street network (connectivity, capacity, etc.)?
  ◦ Are there inconsistencies between the amount or type of transit service provided along the street and the types of facilities and/or land uses adjacent to the street?

• What are the key opportunities with this project (i.e. a tool for economic development or improved community health, a missing link in the bicycle, pedestrian, or vehicular system, improving the level or quality of service for a particular mode, etc.)?

Define Objectives:

• How do the local government, community, and all users want the street and neighborhood to change, if at all?

• What are the existing functions that need to remain in place?

• How can those functions be balanced with new users of the street?

• How would this project increase the connectivity of the larger network?

• How would this project improve the mobility and safety of all potential users of the street?

• How would this project meet the needs of the community?

Decision-Making

Develop Alternatives (Note: refer to Chapter 4 of the Guidelines for detailed street typologies):

• How will the proposed project accommodate existing and planned bicycle, pedestrian, and transit facilities?
• What modes does each alternative scenario serve and how?

• How do the alternatives fit within the land use and transportation context and defined objectives?

• How will the alternative scenarios under consideration meet the needs of stakeholders?

Deliberate Trade-Offs:

All of the scenarios identified should be tested against the land use and transportation context and the objectives for the project to determine any inconsistencies or constraints. The solutions within the alternatives will likely vary. An evaluation and description of trade-offs is required prior to the selection of the recommended alternative. Design plans that are under development allow for comparison of trade-offs in street cross-sections and the ability of the alternatives to meet identified objectives, etc. At the end of the deliberation process, the reasons behind the selected cross-section should be transparent and understood. Therefore, describe the trade-offs made, if any, and how they have been evaluated. Items to be considered include but are not limited to:

• Consistency with local context, land use and transportation plans and policies, and project objectives, as defined through this process;
• Balanced modal capability (to achieve functionality for all users);

• Accessibility to achieve functionality for all users;
• Right-of-way availability;
• Environmental (natural and human) considerations;
• Overall costs; and
• Any other considerations specific to this project.

Recommended Alternative:

• Once trade-offs have been evaluated and described among alternatives, the team will come to a recommended alternative. Describe how the recommended alternative reflects the ultimate design for the project:
Appendix B
At-Grade Rail Crossings
COMPLETE STREETS
TYPICAL HIGHWAY SECTIONS AT RAILROAD CROSSING

LEGEND:

SW  - SIDEWALK
BL  - BIKE LANE
EB  - EARTH BERM
C&G - CURB & GUTTER

NOTES:

1. PARKING SHALL NOT BE ALLOWED IN RAILROAD R/W.
   TAPER EXISTING PARKING LANE FROM SECTION A-A TO SECTION B-B.

2. PROVIDE 50'X100' SIGHT TRIANGLES.
   SIGHT TRIANGLES ARE MEASURED FROM CENTERLINE OF TRACK.

3. SIDEWALK WILL BE ASPHALT WITHIN 13' OF RAILROAD CENTERLINE.

4. THE RAILROAD'S REQUIREMENT FOR MAXIMUM GATE LENGTH WILL DETERMINE
   THE LOCATION OF THE SIDEWALK (BACK OF CURB OR BACK OF EB).

5. SIDEWALK TAPER LENGTH SHOULD BE A MINIMUM OF 20:1.

6. TYPICAL SECTIONS SHOULD MATCH THE ROADWAY TYPICAL SECTION.

7. ADA DETECTABLE WARNING DOMES SHALL BE PROVIDED IN THE SIDEWALK
   17' FROM THE RAILROAD CENTERLINE. (SEE DOME SPECIFICATION FOR DIMENSIONS.)
2 LANE HIGHWAY WITH MEDIAN
CURB AND GUTTER WITH BIKE LANES
AND OFFSET SIDEWALK

GRASS MEDIAN
(MATCH ROADWAY TYPICAL)

SECTION A-A

GRASS MEDIAN
(MATCH ROADWAY TYPICAL)

SECTION B-B

SECTION C-C

09/01/2011
SHEET 6 OF 26

Appendix B

North Carolina Complete Streets Planning and Design Guidelines
Appendix B
2 LANE WITH CENTER TURN LANE
CURB AND GUTTER WITH BIKE LANES
AND TAPERED SIDEWALK

5' SW 4' EB 2.5' C&G BL 11' 11' 11' 5' BL C&G EB 5'

RAILROAD RIGHT OF WAY

SEE NOTE 7
WIDTH VARIES
CROSSING SIGNAL

10' CURB TAPER

2'R TYP

TUBULAR MARKER

LANE LINE (TYP.)

EDGE OF PAVEMENT

RAILROAD CENTERLINE

CROSSING SURFACE PER RAILROAD STANDARDS

WIDTH VARIES

10' CURB TAPER

100' MIN

13'

15'

17'

13'

17'

STOP LINE (TYP.)

09/01/2011
Appendix B

NOTE:

1. When railroad tracks cross highways at-grade, they should do so as close to a right angle as possible. As shown to the right, widening the approaching roadway, bike lane, or shoulder will allow the bicyclist/pedestrian to cross at approximately 90 degrees without veering into the path of overtaking traffic.
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Appendix C

Maintenance and Operations Examples
Road Diet with Bicycle Lanes and Adjacent Parking

Project Location: Mint Street, Charlotte

Project Type: Resurfacing with utility relocation and sidewalk

Description: Consistent 4-lane undivided cross-section between West Boulevard and Penman Street was converted to two 11-foot travel lanes along with 5-foot bicycle lanes and 7-foot parking bays on one side only.
Example of Use of New Technology

Project Location: Third Street/Ann Street, Wilmington

Project Type: Pedestrian Crossing Applying New Technology

Description: This project provides a marked crosswalk for pedestrians and bicyclists to cross South 3rd Street at Ann Street, which is midway between the traffic signals at Castle Street and Market Street. The project includes the installation of a Rectangular Rapid Flash Beacon, which is the first in the state to be installed. This beacon has been used in other locations throughout the country including St. Petersburg, Florida and Boulder, Colorado. The funding for this project was a joint effort between the City of Wilmington and the residents of Old Wilmington.

Note: any new and/or experimental traffic control devices need to be approved in coordination with NCDOT and the NCDOT Regional Traffic Engineer.
Example of Exceptions Implemented due to Roadway Restrictions

Project Location: Morganton – two examples

Project Type: Examples of complete streets applications with reduced ROW

Description: In some areas topography would require additional right of way, grading, and significant cost to provide an improvement. In the left example, an edge stripe is used with a reduced shoulder width.

In the right example, there was desire to connect two bicycle routes. Due to topography, however, it was not possible to provide wider roadways with bike allowances. A compromise was used to widen the sidewalk on one side to provide a shared use path with the understanding that the shared use path had driveway crossings.
Appendix D

Curb Ramps
TYPE 1A

1. 8.33% (32.5) MAX RAMP SLOPE
2. CROSS SLOPE: 2.00%
3. CURB RAMPS REQUIRE A (4'-6") MINIMUM LANDING WITH A MAXIMUM CROS SLOPE AND LONGITUDINAL SLOPE OF 10.0%. WHERE PEDESTRIANS PERFORM TURNING MANEUVERS, SLOPE TO DRAIN TO CURB.

TYPE 1

DEPRESS 7'-6" CURB & GUTTER
8.33% (32.5) MAX SLOPE

PAY LIMITS FOR CURB RAMP

 REFER TO ROADWAY STANDARD DRAWING NUMBER 846.05 SHEET 1 OF 3 FOR ALL RAMP NOTES

CONTRACT STANDARDS AND DEVELOPMENT UNIT
OFFICE 919-733-7400 FAX 919-733-4119

CURB RAMPS

Directional Ramps

Appendix D
LARGE ISLAND CURB RAMPS

- SEE ROADWAY DETAIL DRAWING M0305 FOR DETECTABLE WARNING SURFACE AND FOR RAMP NOTES.

- SEE ROADWAY STANDARD DRAWING X5251 FOR CONCRETE ISLAND DIMENSIONS.

SMALL ISLAND WITH CUT THROUGH

MEDIAN ISLAND CURB RAMPS
PAY LIMITS FOR CURB RAMP

1. 8.33% (1:12) MAX RAMP SLOPE
2. CROSS SLOPE: 1.00%
3. CURB RAMPS REQUIRE A (6") MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.

TYPE 2

TYPE 2A

TYPE 3

REFER TO ROADWAY STANDARD DRAWING NUMBER 848.65 SHEET 3 OF 3 FOR ALL RAMP NOTES
ISOMETRIC VIEW

PAY LIMITS FOR CURB RAMP

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 ADJACING SURFACE, EITHER LIGHT-ON-DARK, OR DARK-ON-LIGHT SEQUENCE COVERING THE ENTIRE RAMP.

BASE DIAMETER
O.9' R TO 1.40' R

TOP DIAMETER OF NO LESS THAN 60% TO NO MORE THAN 80% OF THE BASE DIAMETER

W A W+4'+9' X B
5' 0.0' 5.8 5.8 5.0**
6' 0.0' 6.8 6.8 6.0**
7' 0.0' 7.8 7.8 7.0**
8' 0.0' 8.8 8.8 8.0**
9' 2.0' 11.8 11.8 10.0**
10' 3.0' 14.8 14.8 13.0**
15' 5.0' 19.8 19.8 18.0**

DUAL RAMPS ANY RADIUS (4' MIN. FLOOR WIDTH)

PLAN VIEW

EXPANSION JOINT (SEE STD. 846.01)

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

DETECTABLE WARNING DOMES

0.6" TO

4' X 4' CLEAR SPACE

PLAN VIEW

EXPANSION JOINT (SEE STD. 846.01)

NOTE:

4' X 4' CLEAR SPACE

MINIMUM CROSSWALK LIMITS.

SEE NOTE 10

DETECTABLE WARNING DOMES

B = X-(4x9')
B = DISTANCE FROM FRONT EDGE OF SIDEWALK TO BACK POINT OF 12:1 (0.33%) SLOPE.
* BACK OF SIDEWALK DROP REQUIRED FOR ALL SIDEWALK SLOPES.
** BACK OF SIDEWALK DROP REQUIRED FOR SIDEWALK SLOPES 0.04.
Appendix D

North Carolina Complete Streets Planning and Design Guidelines

46
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' x 4' 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' x 4' with a maximum slope of 2% in any direction. Construct landings for median islands a minimum of 5' x 5' 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 cannot provide a 5' x 5' 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 3/4" 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.
**Appendix D**

**North Carolina Complete Streets Planning and Design Guidelines**

**RETFITTING DETECTABLE WARNING DOMES ONTO EXISTING CURB RAMP**

**ISOMETRIC VIEW**

- **PAY LIMITS OF RETROFIT CURB RAMP**

**PLAN VIEW**

- **DUAL RAMPS**
- **ANY RADIUS**
- **(40" MIN. FLOOR WIDTH)**

**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 adjoining surface, either light-on-dark, or dark-on-light sequence covering the entire ramp.

**BASE DIAMETER**
- 0.80' R to 1.40' R

**TOP DIAMETER**
- Not less than 80% of the base diameter

**RAMP WIDTH AREA IS VARIABLE**

**HEIGHT** 0.7'-0"
CURB RAMPS AND EXISTING SIDEWALK

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

RESURFACING PROJECTS

- PROPOSED CURB RAMP W/ LANDING FOR RESURFACING PROJECTS
- EXISTING SIDEWALK

ALLOWABLE LOCATIONS
DUAL RAMP RADII........ANY
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 CURB 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 1-1/2" 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.
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Appendix E
Drainage Grates
GENERAL NOTES:

USE CLASS "B" CONCRETE THROUGHOUT.

PROVIDE ALL CATCH BASINS OVER 1'-6" IN DEPTH WITH STEPS 12" ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

OPTIONAL CONSTRUCTION - MONOLITHIC POUR, 2" KEYWAY, OR #4 BAR DOWELS AT 12" CENTERS AS DIRECTED BY THE ENGINEER.

USE FORMS FOR THE CONSTRUCTION OF THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

USE TYPE "6", "7" AND "8" GRATES UNLESS OTHERWISE INDICATED.

FOR 8'-0" IN HEIGHT OR LESS USE 6" WALLS AND BOTTOM SLAB. OVER 8'-0" TO 16'-0" IN HEIGHT USE 8" WALLS AND BOTTOM SLAB. ADJUST QUANTITIES ACCORDINGLY.

CONSTRUCT WITH PIPE CROWNS MATCHING.

CHAMFER ALL EXPOSED CORNERS 1".

DRAWING NOT TO SCALE.
ENGLISH STANDARD DRAWING FOR
FRAME, GRATES, AND HOOD
FOR USE ON STANDARD CATCH BASIN