

TOWN OF KNIGHTDALE
STANDARD DETAILS

PHYSICAL CHARACTERISTICS
SINGLE LANE ROUNDABOUT
(GEOMETRY)

3.33

STD. NO.

1 of 8

DATE REVISIONS DESCRIPTION

SUBMITTAL REQUIREMENTS:

IN ACCORDANCE WITH THE GUIDANCE AND PROVISIONS OF THESE DISPLAYS, THE TOWN REQUIRES THE SUBMISSION OF A SET OF DESIGN CHECKS THAT INCLUDES:

- HORIZONTAL GEOMETRY
- GEOMETRIC SPEED CHECKS (FASTEST PATH CALCULATIONS)
- DESIGN VEHICLE AND CHECK VEHICLE SWEEP PATHS
- SIGHT DISTANCE CHECKS

PRINCIPLES:

THE DESIGN OF A SINGLE LANE ROUNDABOUT SHOULD HAVE ENOUGH ENTRY PATH DEFLECTION TO CREATE BALANCED SPEEDS THROUGH THE ROUNDABOUT. THE USE OF LEFT OFFSET HELPS IN REDUCING SPEEDS IN ADVANCE OF THE ENTRY LINE; THIS IS ESPECIALLY IMPORTANT FOR COMPACT ROUNDABOUTS.

GEOMETRY DEFINITIONS:

- INSCRIBED CIRCLE DIAMETER:** MEASURE OF THE SIZE OF A ROUNDABOUT. GOVERNED BY NUMBER OF ENTRY AND EXIT LANES, SIZE OF DESIGN VEHICLE, AND PROPERTY CONSTRAINTS.
- CIRCULATORY ROAD:** SHALL BE 16'-18' FROM EDGE OF TRAVEL TO EDGE OF TRAVEL (EOT-TO-EOT), OR 18'-20' TO OUTSIDE FACE OF CURB (FOC).
- LANDSCAPED CENTRAL ISLAND:** A CENTRAL NON-TRAVERSABLE AREA. SIGHTLINES SHALL BE MAINTAINED AROUND THE OUTSIDE, BUT MAY BE OBSTRUCTED THROUGH THE CENTRAL ISLAND BY LANDSCAPING.
- TRUCK APRON:** A TRAVERSABLE AREA FOR TRUCKS. SEE STANDARD DETAIL 3.33, SHEET 8 OF 8 FOR COLORED AND STAMPED CONCRETE GUIDANCE.
- ENTRY RADIUS:** THE SMALLEST CURB RADIUS BEFORE OR AT THE YIELD LINE. NOT THE SAME AS ENTRY PATH RADIUS OR DEFLECTION.
- ENTRY/EXIT WIDTH:** AT THE ROUNDABOUT ENTRANCE/EXIT. SHALL BE 16'-18' MEASURED FROM SPLITTER ISLAND STRIPE TO EOT (18'-20' TO FOC). TAPER FROM TYPICAL APPROACH LANE WIDTHS TO ENTRY/EXIT WIDTHS OVER A DISTANCE OF 75'-100'.
- CONCRETE SPLITTER ISLAND:** DIRECTS DRIVERS TO CIRCULATE AROUND THE ROUNDABOUT AND PROVIDES REFUGE AREA FOR PEDESTRIANS. CONSTRUCT USING NCDOT STD. 852.01. SEE STANDARD DETAIL 3.33, SHEET 8 OF 8 FOR COLORED AND STAMPED CONCRETE GUIDANCE.
- PEDESTRIAN CROSSING:** TWO-STAGE CROSSING LOCATED ONE TO TWO CAR LENGTHS (20'-25') BEHIND THE YIELD LINE. CROSSINGS SHOULD BE PERPENDICULAR TO THE TRAVEL LANE.
- EXTERNAL TRUCK APRON:** MAY BE USED AS NEEDED TO ACCOMMODATE LARGE DESIGN VEHICLES RIGHT TURN SWEEP PATH. TRANSITION FROM 2'-6" C&G TO MODIFIED 1'-6" C&G OVER 10'. CONSTRUCT CONCRETE EXTERNAL TRUCK APRON TO BE THE SAME DEPTH AS THE TRUCK APRON. EXTERNAL TRUCK APRONS SHOULD NOT PASS THROUGH CROSSWALKS. SEE STANDARD DETAIL 3.33, SHEET 8 OF 8 FOR COLORED AND STAMPED CONCRETE GUIDANCE.

1. INSCRIBED CIRCLE DIAMETER (ICD) 110' TO 150'

BIKE RAMP > 50' TO CROSSWALK OR < 100' TO YIELD LINE (TYP.)

BIKE RAMP (TYP.)

LOCAL STREET, MAIN STREET, OR AVENUE APPROACH

BIKE RAMP > 50' TO CROSSWALK OR < 100' TO YIELD LINE (TYP.)

5. ENTRY RADIUS 40' TO 90'
2'-6" CURB AND GUTTER (TYP.) (NCDOT STD. 846.01)

LIGHTING IN COMPLIANCE WITH IES RP-8-14, IES DG-19-08, AND TOWN OF KNIGHTDALE LIGHTING GUIDELINES

6. 16'-18' EXIT WIDTH (18' TO FOC)

R = 3' TYP.

14' MIN. DEPARTURE WIDTH (16' TO FOC)
12' IF IN A PAVED SHOULDER SECTION

AVENUE APPROACH

GENERAL NOTES:

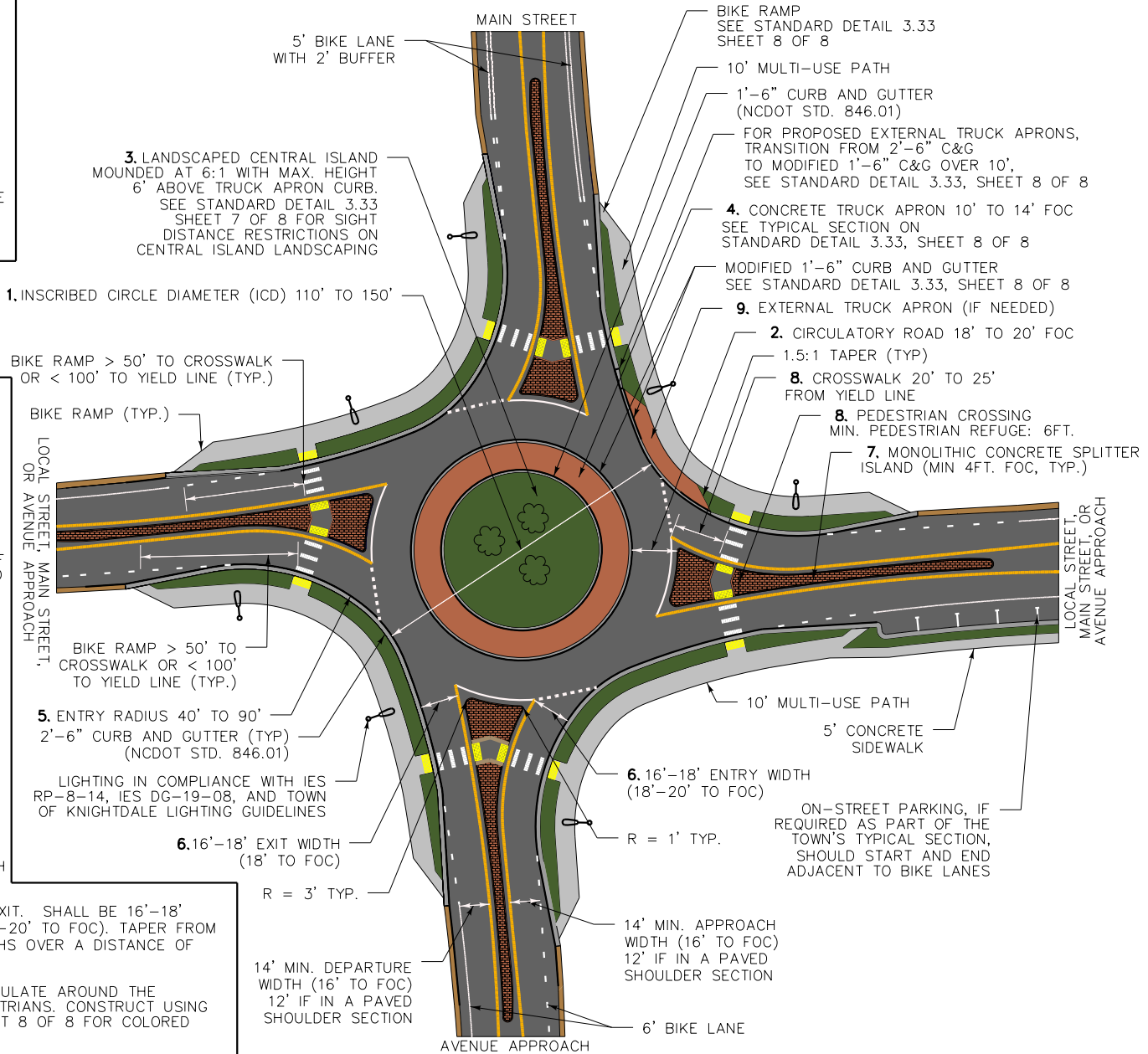
SHIFT FROM TOWN TYPICAL SECTION DIMENSIONS TO THE DIMENSIONS SHOWN IN THIS DETAIL USING THE APPROACH AND DEPARTURE TAPER LENGTHS AS SHOWN IN NCDOT ROADWAY DESIGN MANUAL (RDM) FIGURE 8-11

USE $A = WS^2/60$ (WHEN S LESS THAN/EQUAL TO 40 MPH)
USE $A = WS$ (WHEN S GREATER THAN 40 MPH)
A = APPROACH OR DEPARTURE TAPER LENGTH
W = WIDTH OF LATERAL SHIFT
S = DESIGN SPEED

FOR ROUTES MAINTAINED BY NCDOT, AN ENCROACHMENT AGREEMENT FROM NCDOT DIVISION OFFICE IS REQUIRED. COORDINATE WITH NCDOT DIVISION OFFICE FOR DESIGN REVIEW.

REFER TO NCDOT ROADWAY DESIGN MANUAL SECTION 8.10.3 FOR STORM DRAIN DESIGN GUIDANCE.

REFER TO NCHRP REPORT 1043 FOR ADDITIONAL ROUNDABOUT DESIGN GUIDANCE.



TOWN OF KNIGHTDALE
STANDARD DETAILS

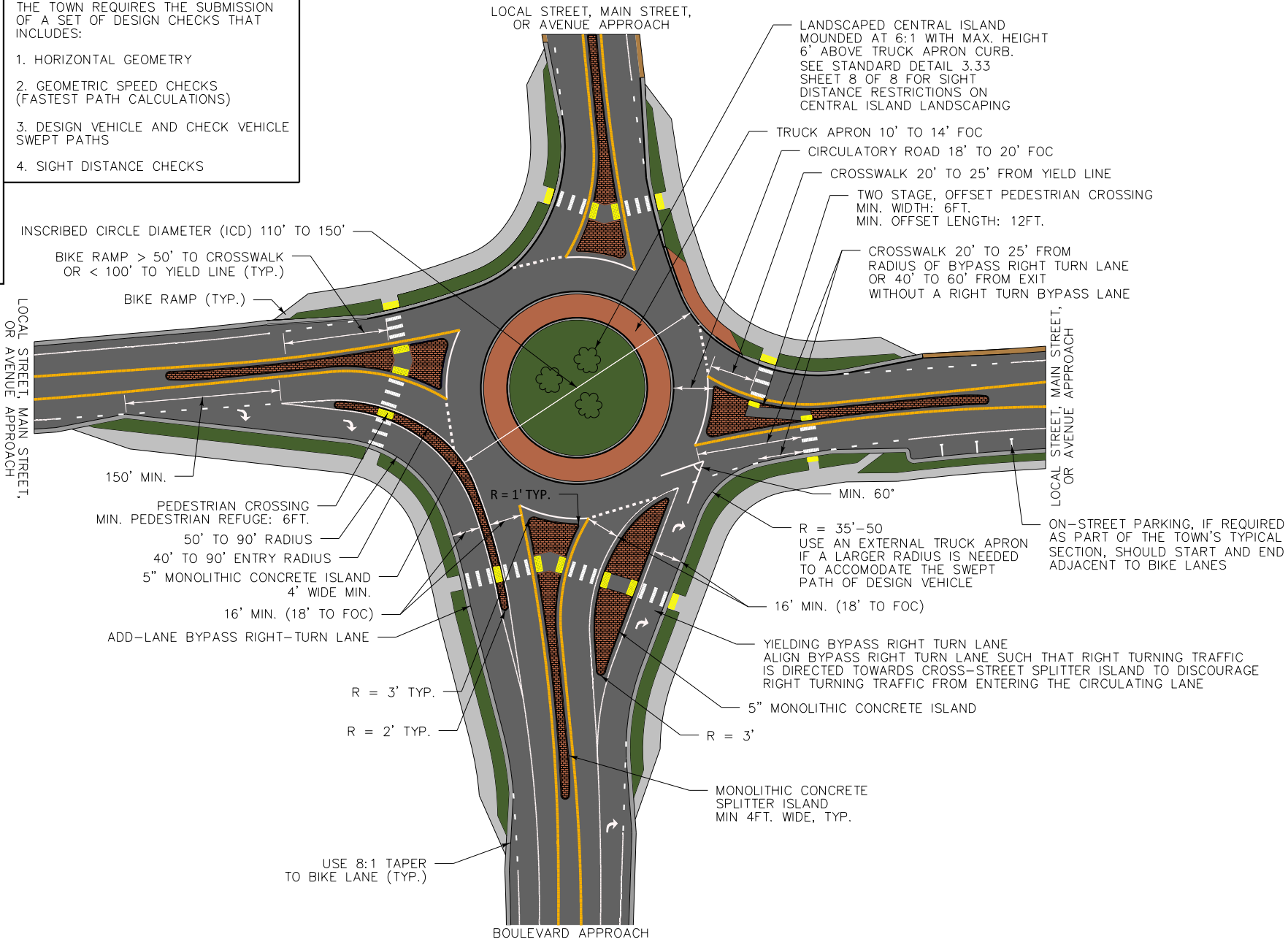
PHYSICAL CHARACTERISTICS
SINGLE LANE ROUNDABOUT WITH BYPASS LANES
(GEOMETRY)

| DATE | REVISIONS |
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| | DESCRIPTION |

SUBMITTAL REQUIREMENTS:

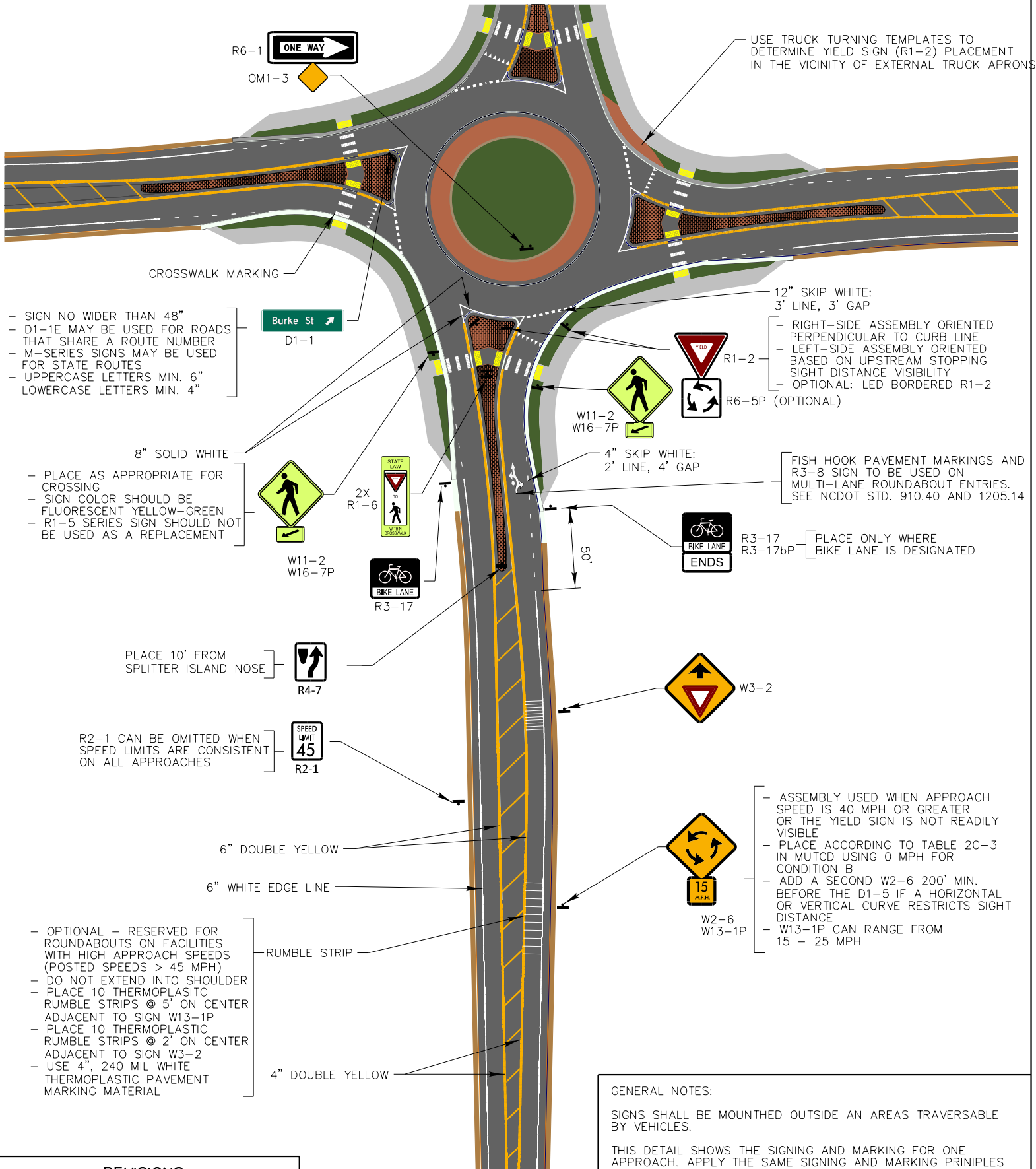
IN ACCORDANCE WITH THE GUIDANCE AND PROVISIONS OF THESE DISPLAYS, THE TOWN REQUIRES THE SUBMISSION OF A SET OF DESIGN CHECKS THAT INCLUDES:

1. HORIZONTAL GEOMETRY
2. GEOMETRIC SPEED CHECKS (FASTEST PATH CALCULATIONS)
3. DESIGN VEHICLE AND CHECK VEHICLE SWEEP PATHS
4. SIGHT DISTANCE CHECKS



GENERAL NOTES:

SEE STANDARD DETAIL 3.33, SHEET 1 OF 8 FOR DESIGN PRINCIPLES, GEOMETRY DEFINITIONS, SUBMITTAL REQUIREMENTS, AND ADDITIONAL ROUNDABOUT DESIGN GENERAL NOTES



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TOWN OF KNIGHTDALE
STANDARD DETAILS

PHYSICAL CHARACTERISTICS
MINI-ROUNDBABOUT

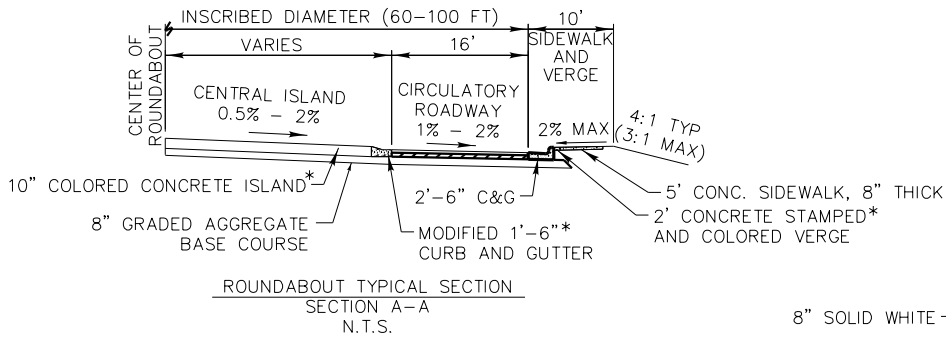
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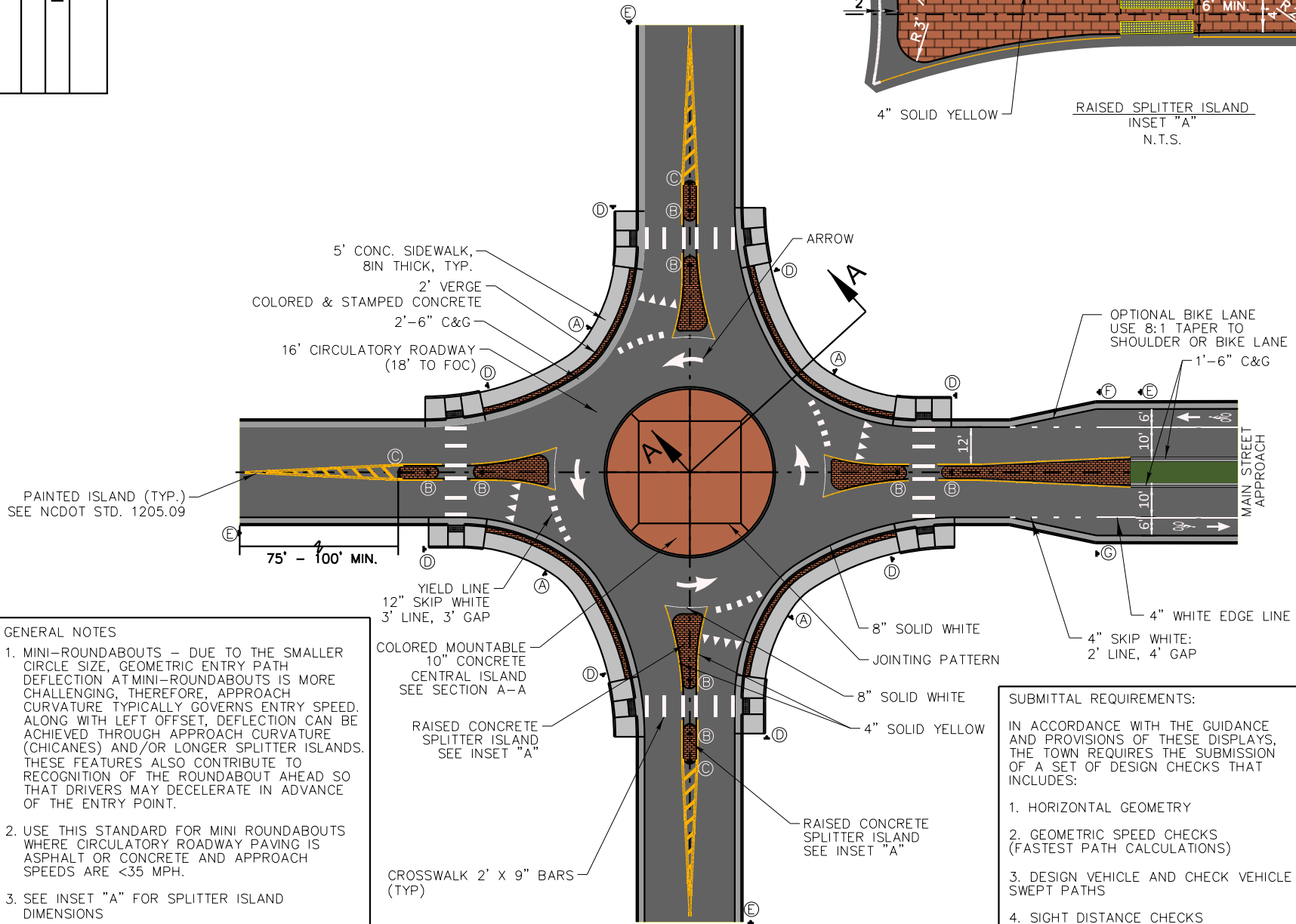
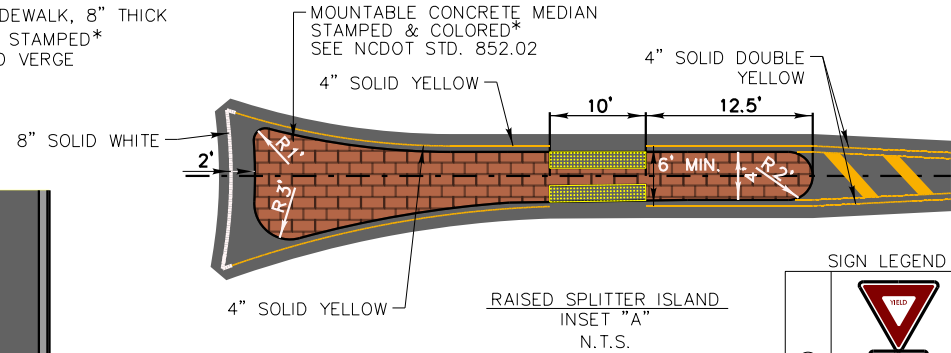
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DESCRIPTION



* NOTE: SEE STANDARD DETAIL 3.33, SHEET 8 OF 8 FOR COLORED AND STAMPED CONCRETE SPECIFICATIONS AND MODIFIED 1'-6" CURB AND GUTTER DETAILS



GENERAL NOTES

1. MINI-ROUNDBABOUTS - DUE TO THE SMALLER CIRCLE SIZE, GEOMETRIC ENTRY PATH DEFLECTION AT MINI-ROUNDBABOUTS IS MORE CHALLENGING, THEREFORE, APPROACH CURVATURE TYPICALLY GOVERNS ENTRY SPEED. ALONG WITH LEFT OFFSET, DEFLECTION CAN BE ACHIEVED THROUGH APPROACH CURVATURE (CHICANES) AND/OR LONGER SPLITTER ISLANDS. THESE FEATURES ALSO CONTRIBUTE TO RECOGNITION OF THE ROUNDBABOUT AHEAD SO THAT DRIVERS MAY DECELERATE IN ADVANCE OF THE ENTRY POINT.
2. USE THIS STANDARD FOR MINI ROUNDBABOUTS WHERE CIRCULATORY ROADWAY PAVING IS ASPHALT OR CONCRETE AND APPROACH SPEEDS ARE <35 MPH.
3. SEE INSET "A" FOR SPLITTER ISLAND DIMENSIONS

SUBMITTAL REQUIREMENTS:

- IN ACCORDANCE WITH THE GUIDANCE AND PROVISIONS OF THESE DISPLAYS, THE TOWN REQUIRES THE SUBMISSION OF A SET OF DESIGN CHECKS THAT INCLUDES:
1. HORIZONTAL GEOMETRY
 2. GEOMETRIC SPEED CHECKS (FASTEST PATH CALCULATIONS)
 3. DESIGN VEHICLE AND CHECK VEHICLE SWEEP PATHS
 4. SIGHT DISTANCE CHECKS

SIGN LEGEND

| | | |
|-----|--|---|
| (A) | | R1-2, R6-5P 36"x36"x36" 30"x30" |
| (B) | | R1-6 12"x36" FLUORESCENT YELLOW-GREEN |
| (C) | | R4-7c 18"x30" |
| (D) | | W11-2, W16-7p 30"x30", 24"x12" |
| (E) | | W2-6 30"x30" |
| (F) | | R3-17, R3-17bP 24"x18", 24"x8" |
| (G) | | R3-17 24"x18" |

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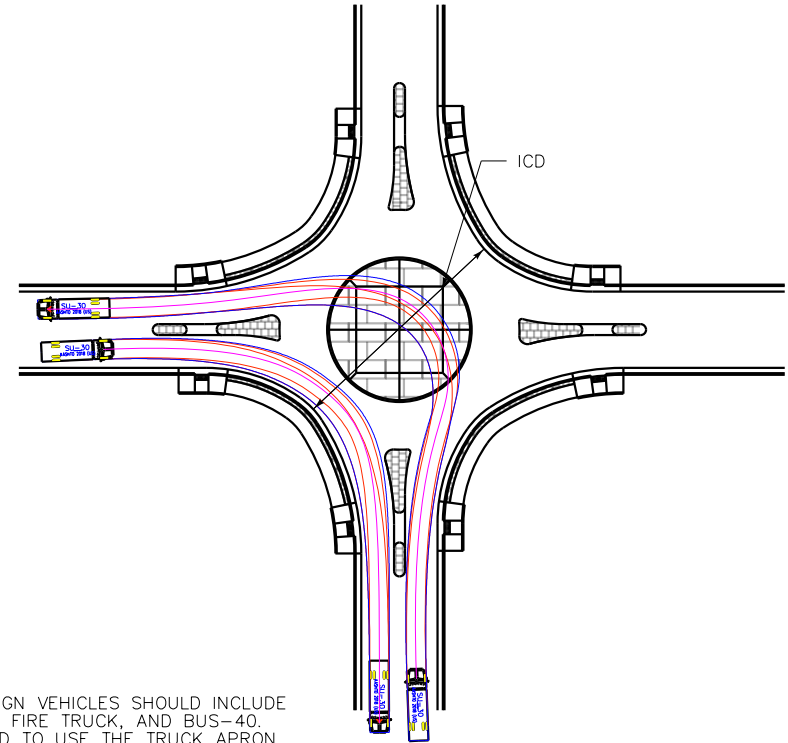
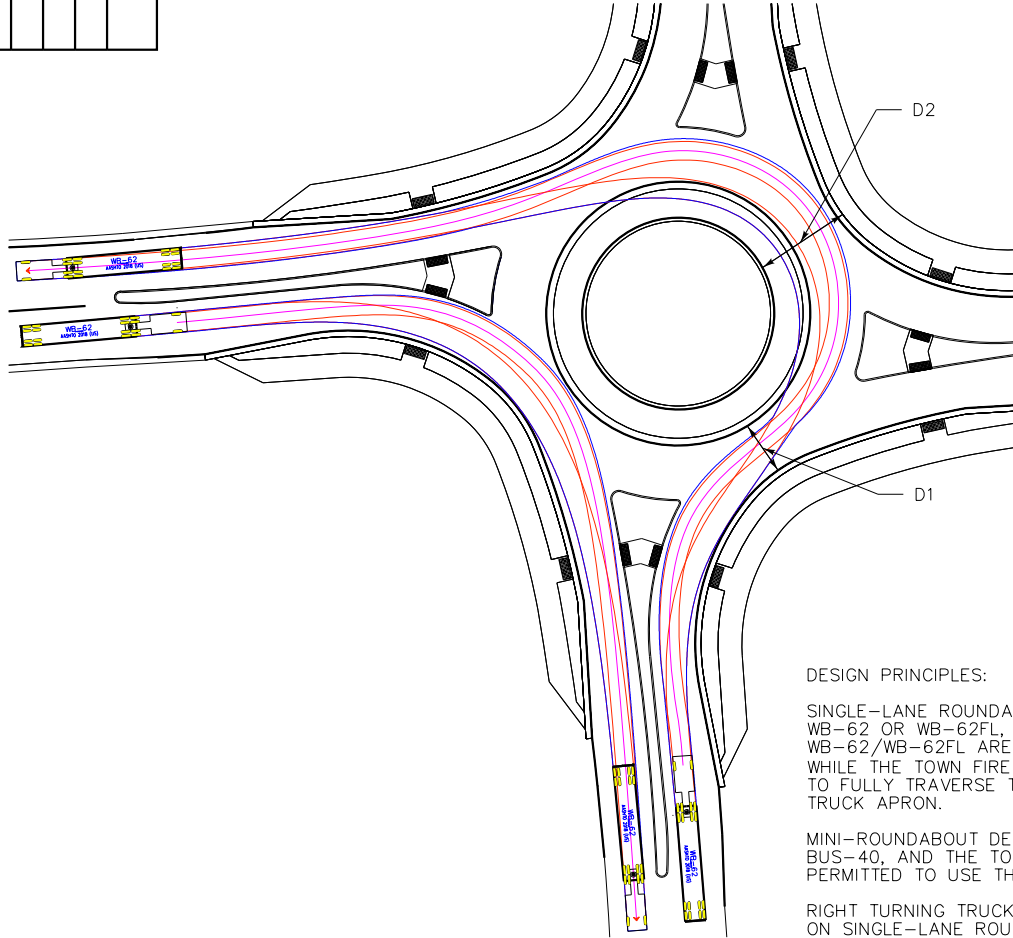
| INSCRIBED CIRCLE DIAMETER | DESIGN VEHICLES | | | | |
|---------------------------------|-----------------|--------|------------|----------|---------|
| | D1 (EOP) | | | D2 (FOC) | |
| | SU-30 | BUS-40 | FIRE TRUCK | WB-62 | WB-62FL |
| 110 | 14* | 15 | 14 | 32 | 39 |
| 120 | 14* | 15 | 14 | 30 | 36 |
| 130 | 14* | 14 | 14* | 27 | 33 |
| 140 | 14* | 14 | 14* | 26 | 30 |

NOTE: THE VALUES PROVIDED ABOVE ARE FOR GENERAL GUIDANCE.
*14 FT MINIMUM EOP/18 FT FOC

| MIN. RIGHT TURN RADIUS | |
|---------------------------|---------------------------|
| SU-30 | 30 FT |
| BUS-40 | 25 FT |
| FIRE TRUCK | 16 FT |
| WB-62 | DETERMINED BY AUTOTURN |
| WB-62FL | DETERMINED BY AUTOTURN |

| MINI-ROUNDBOULT ICD REQUIREMENTS FOR VEHICLE U-TURNS AND LEFT TURNS (LT) | | | | |
|---|-----------------|---------|------------|---------|
| INSCRIBED CIRCLE DIAMETER | DESIGN VEHICLES | | | |
| | SU-30 | BUS-40 | FIRE TRUCK | WB-62 |
| 60 | LT-ONLY | NO | LT-ONLY | NO |
| 65 | LT-ONLY | LT-ONLY | LT-ONLY | NO |
| 70 | LT-ONLY | LT-ONLY | YES | NO |
| 80 | LT-ONLY | LT-ONLY | YES | LT-ONLY |
| 90 | YES | YES | YES | YES |
| 100 | YES | YES | YES | YES |

TABLE NOTE: SPLITTER ISLANDS SHOULD BE MOUNTABLE OR TRIMMED AS NEEDED BASED ON SWEEP PATHS



DESIGN PRINCIPLES:

SINGLE-LANE ROUNDABOUT DESIGN VEHICLES SHOULD INCLUDE WB-62 OR WB-62FL, THE TOWN FIRE TRUCK, AND BUS-40. WB-62/WB-62FL ARE PERMITTED TO USE THE TRUCK APRON, WHILE THE TOWN FIRE TRUCK AND BUS-40 SHOULD BE ABLE TO FULLY TRAVERSE THE ROUNDABOUT WITHOUT USING THE TRUCK APRON.

MINI-ROUNDBOULT DESIGN VEHICLES SHOULD INCLUDE SU-30, BUS-40, AND THE TOWN FIRE TRUCK, ALL OF WHICH ARE PERMITTED TO USE THE TRUCK APRON.

RIGHT TURNING TRUCKS ARE NOT TO USE THE TRUCK APRON ON SINGLE-LANE ROUNDABOUTS. WHERE ENTRY, EXIT, OR CIRCULATING WIDTHS BECOME EXCESSIVE FOR RIGHT TURNS, CONSIDER USING AN EXTERNAL TRUCK APRON. EXTERNAL TRUCK APRONS SHOULD NOT PASS THROUGH CROSSWALKS.

GENERAL NOTES:

1. CHECK LEFT, THROUGH, AND RIGHT TURN MOVEMENTS FOR EACH RELEVANT DESIGN VEHICLE.
2. D1: CIRCULATORY ROADWAY SHOULD BE 18FT TO 20FT MEASURED FROM THE FACE OF CURB

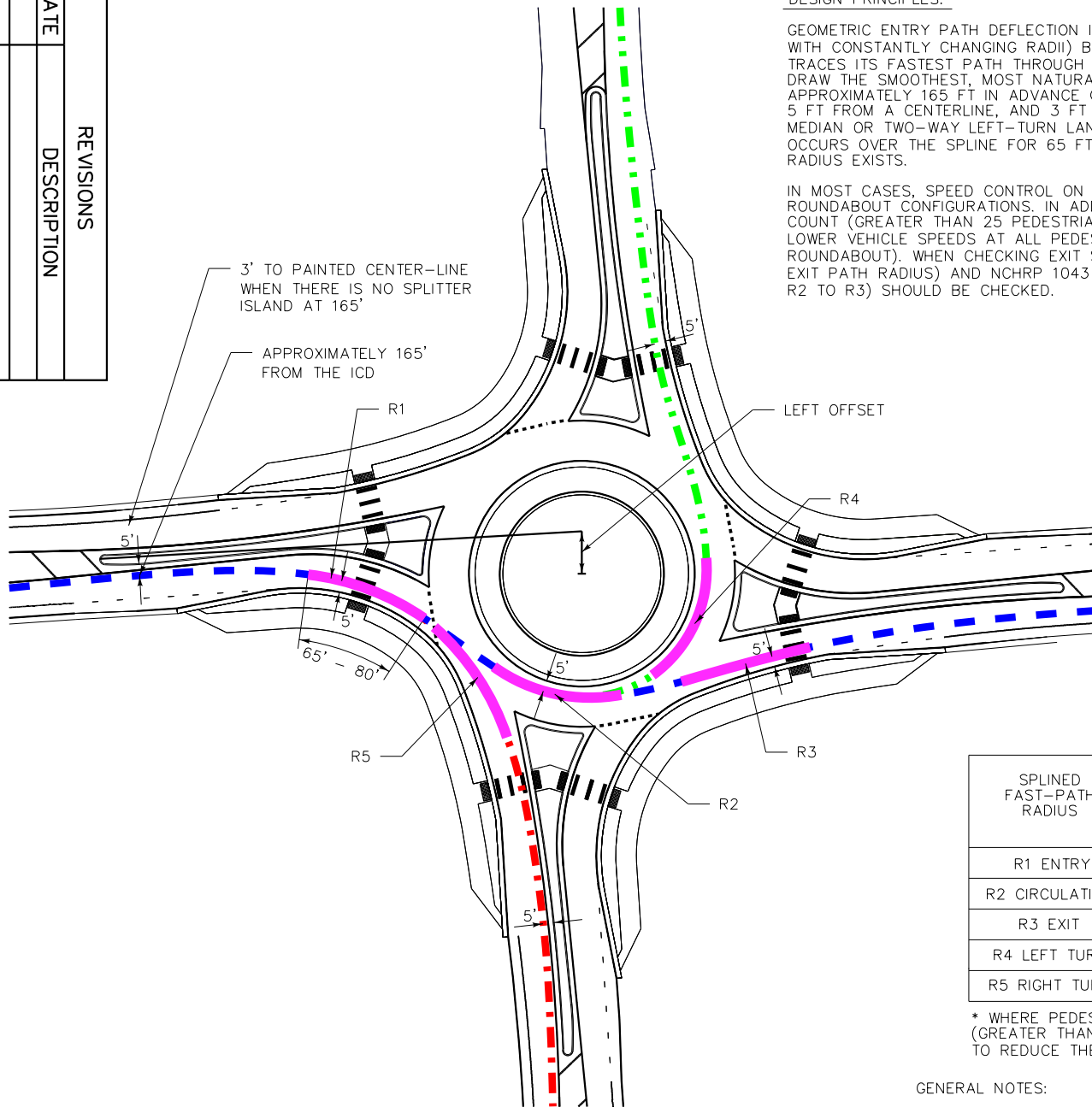
TRUCK MOVEMENTS
SINGLE-LANE ROUNDABOUT
AND MINI-ROUNDBOULT

STD. NO.

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DESCRIPTION



DESIGN PRINCIPLES:

GEOMETRIC ENTRY PATH DEFLECTION IS BEST REPRESENTED BY A CONTINUOUS SPLINE (A CURVE WITH CONSTANTLY CHANGING RADII) BECAUSE THIS MOST CLOSELY APPROXIMATES HOW A VEHICLE TRACES ITS FASTEST PATH THROUGH A ROUNDABOUT. A SPLINE ALSO ALLOWS ANALYSTS TO DRAW THE SMOOTHEST, MOST NATURAL VEHICULAR PATH. IT IS DRAWN FROM A STARTING POINT APPROXIMATELY 165 FT IN ADVANCE OF THE ENTRY LINE, WITH AN OFFSET OF 5 FT FROM CURBS, 5 FT FROM A CENTERLINE, AND 3 FT FROM OTHER PAVEMENT MARKINGS (SUCH AS A PAINTED MEDIAN OR TWO-WAY LEFT-TURN LANE). THE CRITICAL ENTRY PATH RADIUS, REFERRED TO AS R1, OCCURS OVER THE SPLINE FOR 65 FT TO 80 FT, NEAR THE YIELD POINT, WHERE THE TIGHTEST RADIUS EXISTS.

IN MOST CASES, SPEED CONTROL ON ENTRY IS THE MOST IMPORTANT FASTEST PATH CRITERIA FOR ROUNDABOUT CONFIGURATIONS. IN ADDITION, IF A LOCATION HAS A SIGNIFICANT PEDESTRIAN COUNT (GREATER THAN 25 PEDESTRIANS PER HOUR), STEPS SHOULD BE TAKEN TO FACILITATE LOWER VEHICLE SPEEDS AT ALL PEDESTRIAN CONFLICT AREAS (INCLUDING EXIT SPEEDS FROM THE ROUNDABOUT). WHEN CHECKING EXIT SPEEDS, BOTH THE PREDICTIVE METHOD (BASED ON THE R3 EXIT PATH RADIUS) AND NCHRP 1043 EQUATION 9.7 (WHICH ACCOUNTS FOR ACCELERATION FROM R2 TO R3) SHOULD BE CHECKED.

| SPLINED FAST-PATH RADIUS | RECOMMENDED RADIUS FOR SINGLE-LANE ROUNDABOUT (FT) | RECOMMENDED RADIUS FOR MINI-ROUNDABOUT (FT) |
|--------------------------|--|---|
| R1 ENTRY | 120FT TO 165FT | 100FT TO 165FT |
| R2 CIRCULATING | 70FT TO 120FT | 70FT TO 100FT |
| R3 EXIT | 120FT TO 300FT* | 90FT TO 150FT |
| R4 LEFT TURN | TRUCK APRON R.+5FT | CENTER ISLAND R.+5FT |
| R5 RIGHT TURN | 70FT TO 100FT | 50FT TO 90FT |

* WHERE PEDESTRIAN USE OF AN EXIT CROSSWALK IS FREQUENT (GREATER THAN 25 PEDESTRIANS PER HOUR), ADJUST EXIT RADII TO REDUCE THE R3 TO <200FT.

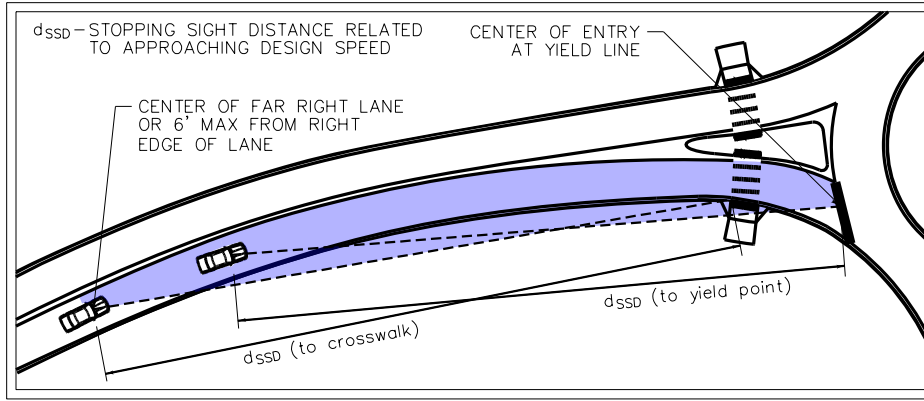
GENERAL NOTES:

- R1, R2, R3 PATH TO FOLLOW NATURAL SPLINE.
- GEOMETRIC ENTRY SPEED USUALLY GOVERNED BY R1 RADIUS, BUT MAY BE GOVERNED BY R5 RADIUS.
- ON DESIGNS THAT CANNOT ACHIEVE DEFLECTION USING CENTRAL ISLAND AND APPROACH ALIGNMENT OFFSET TO THE LEFT OF CENTER-LINE, ADD REVERSE CURVES ON THE APPROACH SPLITTER ISLAND, SEPARATED BY A SHORT TANGENT 50FT TO 100FT. APPROACH CURVE RADII TO BE SIZED USING AASHTO GREEN BOOK TABLE 3-13. MINIMUM RADII AND SUPERELEVATION FOR LOW-SPEED STREETS IN URBAN AREAS TO MAINTAIN NORMAL CROWN.

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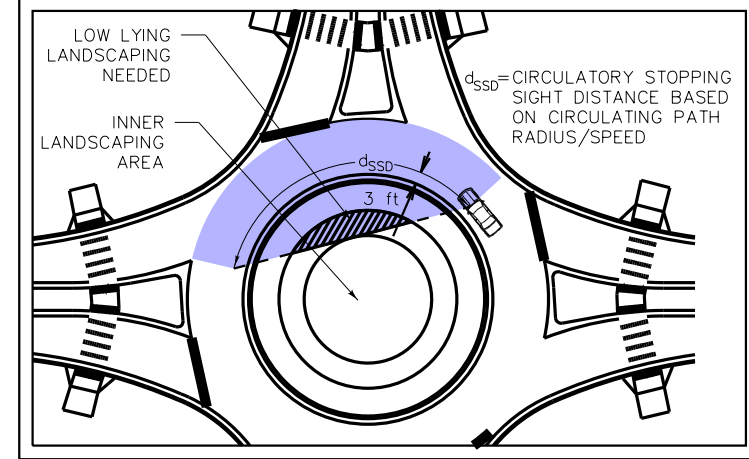
REVISIONS
DESCRIPTION

APPROACH STOPPING SIGHT DISTANCE



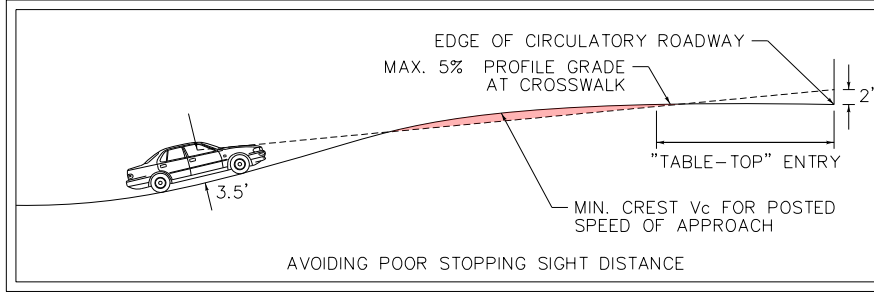
* SSD VALUES BASED ON APPROACH POSTED SPEED AND AASHTO GREEN BOOK CHAPTER 3.2 - SIGHT DISTANCE

CIRCULATING STOPPING SIGHT DISTANCE

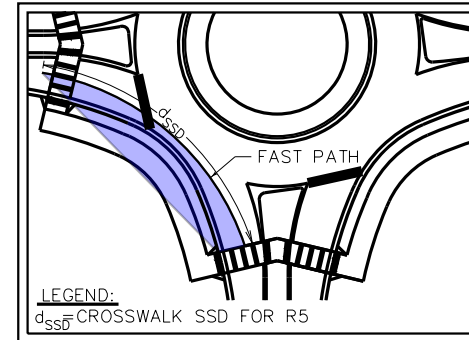


* SSD VALUES BASED ON APPROACH POSTED SPEED AND AASHTO GREEN BOOK CHAPTER 3.2 - SIGHT DISTANCE

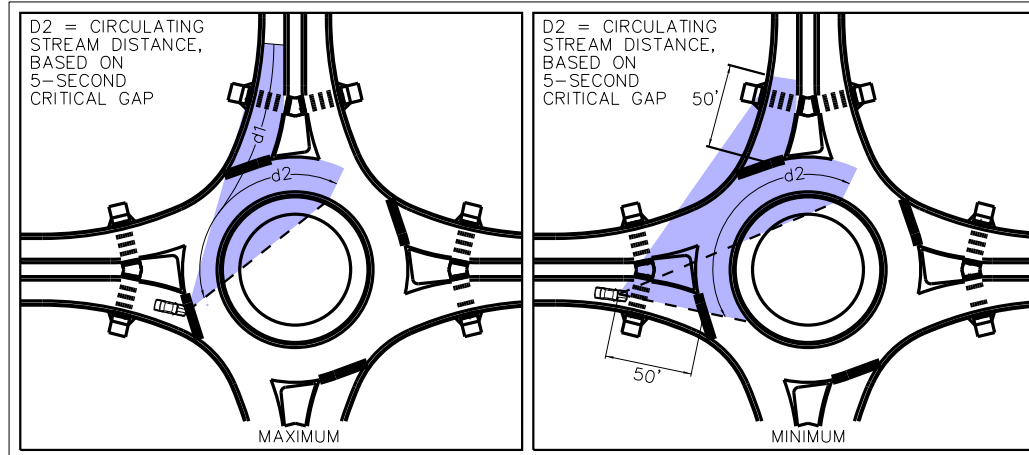
VERTICAL SIGHT DISTANCE



STOPPING SIGHT DISTANCE TO THE DOWNSTREAM CROSSWALK

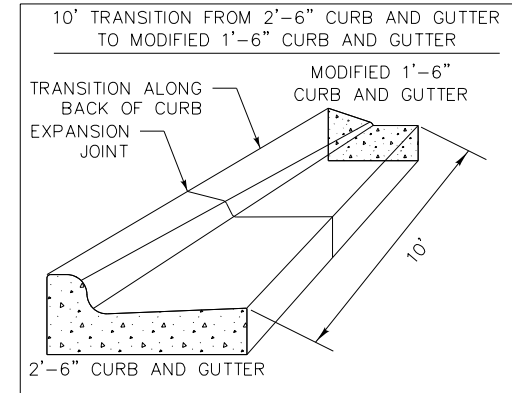
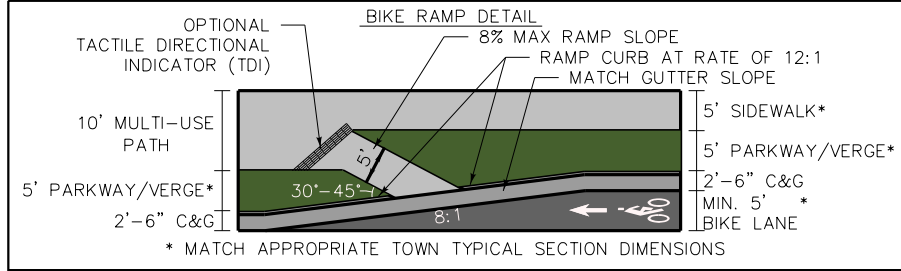
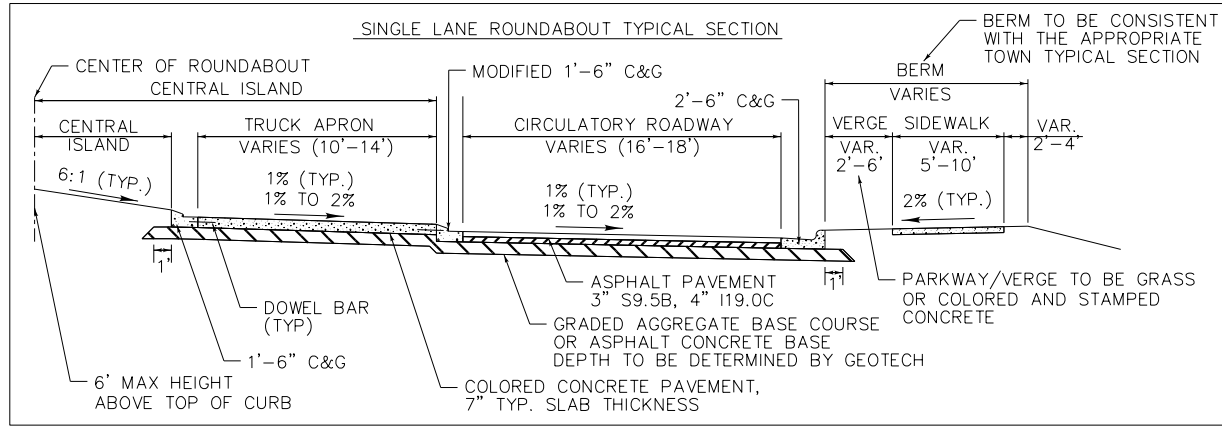


ENTERING AND CIRCULATING INTERSECTION SIGHT DISTANCE



TOWN OF KNIGHTDALE
STANDARD DETAILS

| DATE | REVISIONS |
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| | DESCRIPTION |



COLORED AND STAMPED CONCRETE SPECIFICATIONS:

ALL CONCRETE TRUCK APRONS SHOULD BE COLORED CONCRETE BUT NOT STAMPED.

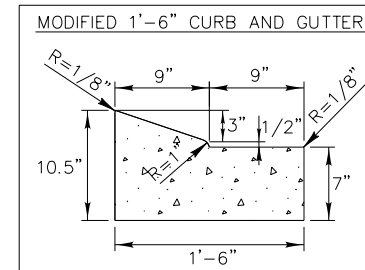
ALL CONCRETE SPLITTER ISLANDS AND CONCRETE VERGES BETWEEN CURB AND PEDESTRIAN SURFACES SHOULD BE COLORED AND STAMPED.

ALL CONCRETE SURFACES THAT ACCOMODATE PEDESTRIAN TRAFFIC (SIDEWALK, MULTI-USE PATH) SHOULD NOT BE COLORED OR STAMPED.

CONCRETE COLOR SHOULD BE FEDERAL STANDARD COLOR 10076 ACCORDING TO AEROSPACE MATERIAL SPECIFICATION STANDARD 595 (AMS-STD-595).

STAMPED CONCRETE SHOULD BE RUNNING BOND OR HERRINGBONE AND IS SUBJECT TO APPROVAL BY THE TOWN OF KNIGHTDALE.

COLORED CONCRETE SHOULD BE AN INTEGRAL CONCRETE MIX (MIXED IN THE TRUCK). SUBMIT COLORED CONCRETE SPECS AND PATTERN SHOP DRAWINGS TO THE TOWN OF KNIGHTDALE FOR REVIEW.



MISCELLANEOUS
ROUNDABOUT DETAILS

3.33

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