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PAVEMENT DESIGN

MAJOR COLLECTOR STREET 8” - ABC, 2.5” - I19.0C, 2.5” - S9.5B
NOTES:
1) LOCAL STREET WITHOUT CURB & GUTTER SHALL BE IN 60' R/W.
2) GRADES SHALL NOT EXCEED 8%.
3) PAVEMENT DESIGN TO BE 8" – ABC, 2.5" – S9.5B
PAVEMENT DESIGN

THOROUGHFARE STREET 10” – ABC, 4” – I19.OC, 3” – S9.5B
TOWN OF GARNER, N.C.

ALLEY CROSS SECTION

PUBLIC

R/W

25'

Q

2' CURB

10' 10'

1/4" PER FT.

PAVEMENT DESIGN

ALLEY 8" – ABC, 2.5" – S9.5B

PRIVATE

R/W

25'

Q

2' SHOULDER

10' 10'

1/4" PER FT.

2' SHOULDER

1/4" PER FT.

PAVEMENT DESIGN

ALLEY 8" – ABC, 2" – S9.5B

DRAWN BY:
C. NIX

APPROVED BY:
C. JOHNSON

REVISED
5/2019

STD. NO. 3.06
COMPACTED BACKFILL (25% ASTM C-698)
6" LAYERS MAX.

7" 1900 ASPHALT

2" S9.5B ASPHALT

MATCH EXISTING LINE & GRADE

12"

NEAT SAW CUT

12"

NOTE: ALL VERTICAL ASPHALT SURFACES SHALL BE TACK COATED.
NOTES:

1) RESIDENTIAL DRIVEWAY TO BE MAXIMUM 12' IN WIDTH UNLESS A VARIANCE IS GRANTED BY THE TOWN ENGINEER

2) COMMERCIAL AND INDUSTRIAL DRIVEWAYS TO BE A MAXIMUM OF 30' IN WIDTH

3) IF DISTANCE BETWEEN DRIVEWAY CUT & EXISTING CURB JOINT IS LESS THAN 5’, REMOVE CURB TO EXISTING JOINT & REPLACE WITH MONOLITHIC POUR. IF DISTANCE IS GREATER THAN 5’, THE EXISTING GUTTER SHALL BE SAWCUT.

PROPOSED DRIVEWAY

EXISTING CURB & GUTTER JOINT

1/2” EXPANSION JOINT

EXISTING GUTTER

COMPACTED BACKFILL

6” MIN

6” MIN

SIIDWALK (IF APPLICABLE)

PROPOSED CONCRETE DRIVEWAY (3000 P.S.I.)

TYPICAL SECTION

SIIDWALK – SEE 2012 NCDOT STANDARDS FOR RAMPS AND ADDITIONAL INFO (IF APPLICABLE)

1/2” EXPANSION JOINT

30” RADIUS MIN

42” RADIUS MAX

PROPOSED CONCRETE DRIVEWAY (3000 P.S.I. MIN.)

SAW CUT LINE

10’ MIN

EXISTING CURB AND GUTTER TO BE SAW CUT

PLAN VIEW
NOTES:
1) CONTRACTION JOINTS SHALL BE SPACED 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 BY THE TOWN ENGINEER TO PREVENT UNCONTROLLED CRACKING.

2) CONTRACTION JOINTS SHALL BE INSTALLED BY THE USE OF TEMPLATES OR FORMED BY OTHER APPROVED METHODS. WHERE SUCH JOINTS ARE NOT FORMED BY TEMPLATES, A MINIMUM DEPTH OF 1.5” SHALL BE OBTAINED.

3) ALL CONTRACTION JOINTS SHALL BE FILLED WITH JOINT SEALER. EXPANSION JOINTS SHALL BE SPACED AT 90’ INTERVALS AND ADJACENT TO ALL RIGID OBJECTS.

4) WHEN REPAIRING CRACKED OR DAMAGED CURB AND GUTTER, THE MINIMUM LENGTH OF SECTIONS TO BE REMOVED AND REPLACED ARE 10’ FOR FORMED CURB AND 7.5’ FOR MACHINE PLACED CURB. NO SAW-CUT REPAIR OF CRACKS ALLOWED.

5) MINIMUM CONCRETE STRENGTH SHALL BE 3000 PSI.

STANDARD CURB & GUTTER

TOWN OF GARNER, N.C.
NOTES:
CONTRACTION JOINTS SHALL BE SPACED 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 BY THE ENGINEER TO PREVENT UNCONTROLLED CRACKING.

CONTRACTION JOINTS MAY BE INSTALLED BY THE USE OF TEMPLATES OR
FORMED BY OTHER APPROVED METHODS. WHERE SUCH JOINTS ARE NOT
FORMED BY TEMPLATES, A MINIMUM DEPTH OF 1.5’ SHALL BE OBTAINED.

ALL CONTRACTION JOINTS SHALL BE FILLED WITH JOINT SEALER.
EXPANSION JOINTS SHALL BE SPACED AT 90’ INTERVALS AND
ADJACENT TO ALL RIGID OBJECTS.
MINIMUM CONCRETE STRENGTH SHALL BE 3000 PSI.
NOTES:

1. ROLLED CURB IS INTENDED FOR USE IN PRIVATE STREETS AND/OR PUBLIC STREETS WITHIN SENIOR LIVING DEVELOPMENTS.

2. CONTRACTION JOINTS SHALL BE SPACED 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 BY THE TOWN ENGINEER TO PREVENT UNCONTROLLED CRACKING.

3. CONTRACTION JOINTS MAY BE INSTALLED BY THE USE OF TEMPLATES OR FORMED BY OTHER APPROVED METHODS. WHERE SUCH JOINTS ARE NOT FORMED BY TEMPLATES, A MINIMUM DEPTH OF 1.5” SHALL BE OBTAINED.

4. ALL CONTRACTION JOINTS SHALL BE FILLED WITH JOINT SEALER. EXPANSION JOINTS SHALL BE SPACED AT 90’ INTERVALS AND ADJACENT TO ALL RIGID OBJECTS.

5. TRANSITION FROM 24” WIDTH ROLL CURB TO 30” STANDARD CURB AT CATCH BASINS A MINIMUM OF 5’ EITHER SIDE OF CATCH BASIN. PROVIDE EXPANSION JOINT AT TRANSITION POINT. THE TRANSITION SHALL MAINTAIN THE EDGE OF THE ASPHALT WITH THE CURB AND GUTTER, WITH THE 8” SHIFT MOVING AWAY FROM THE PAVEMENT TOWARDS THE BACK OF CURB.

6. MINIMUM CONCRETE STRENGTH SHALL BE 3000 PSI.
NOTE: A 30’ RADIUS MAY BE USED ON CUL–DE–SAC STREETS LESS THAN 150’ IN LENGTH
1. Barricade(s) to be erected across entire roadway including curb & gutter.

2. Advance warning sign W14-1 (Dead End) shall be placed just after last intersecting street.

3. Markings for barricade rails shall be reflective and alternate red & white strips.

4. "Road Closed" sign shall meet specifications of M.U.T.C.D. R11-2 and be required atop each barricade used.

5. Call 811 for underground utility locate prior to installation.

NOTES:

7' U - Channel posts (1.12 lb/ft)

Pavement

LOCAL & MIXED USE

3 Markers Minimum

6' TYP. 6' TYP.

Red TYP.

4' MIN.

FOR USE AT FOUR LANE STREET AND > 40 MPH, OTHERWISE THREE RED OBJECT MARKERS.

6' TYP.

5' MIN. 6' TYP.

Red & white reflectORIZED panels to meet NC DOT standards & specifications

4' x 4' TREATED POST OR OTHER NC DOT APPROVED SUPPORT

GROUND

5' 0" MINIMUM

4'0" MINIMUM

5' 0" MINIMUM

FUTURE ROAD EXTENSION

ROAD CLOSED

WHITE ON GREEN INFORMATIONAL SIGN TO BE ADDED WHEN APPLICABLE

MAJOR STREET

BARRICADE FOR DEAD END STREETS

TOWN OF GARNER, N.C.

C. NIX

C. JOHNSON

4/2019

STD. NO. 3.17

REvised
NOTES:
CLASS "B" CONCRETE TO BE USED THROUGHOUT.

OPTIONAL CONSTRUCTION—MONOLITHIC POUR, 2" KEYWAY, OR 4 BAR DOWELS AT 12" CENTER AS DIRECTED BY ENGINEER.

TWO 2" PIPE WEEP HOLES TO BE PLACED AS DIRECTED BY ENGINEER.

FORMS ARE TO BE USED FOR CONSTRUCTION OF THE BOTTOM SLAB.

A STONE DRAIN CONSISTING OF 1 CUBIC FOOT OF NO. 78M STONE CONTAINED IN A BAG OF POUROUS FABRIC SHALL BE PLACED AT EACH WEEP HOLE.

ALL DROP INLETS OVER 3' - 6" IN DEPTH TO BE PROVIDED WITH STEPS 1" -2" ON CENTER STEPS SHALL BE IN ACCORDANCE WITH STD. 1.02.

DIMENSIONS AND QUANTITIES FOR DROP INLET

| PIPE | SPAN | WIDTH | HEIGHT | CUBIC YARDS \n| FLOOR COPI NG | WALL FEET | H | BOX & COVER | TOTAL QUANTITIES | DEDUCTIONS FOR ONE PIPE |
|------|------|-------|-------|-------------|-----------------|---------------------|
| 12"  | 3'   | 2'    | 2'-8" | 0.262       | 0.222           | 0.855               |
| 15"  | 3'   | 3'-6" | 3'-5" | 0.262       | 0.222           | 0.855               |
| 18"  | 3'   | 4'-0" | 4'-3" | 0.262       | 0.222           | 0.855               |
| 30"  | 3'   | 2'    |       | 0.262       | 0.222           | 0.855               |

C.M. | B.C.
---|---
0.15 | 0.024
0.023 | 0.036
1.021 | 0.049
1.151 | 0.085
1.207 | 0.127

DIMENSIONS FOR CHANNELS

<table>
<thead>
<tr>
<th>NO.</th>
<th>SIZE</th>
<th>LENGTH</th>
<th>TOTAL LIN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>FEET</td>
<td>FEET</td>
</tr>
<tr>
<td>2</td>
<td>3&quot;x4.1&quot;</td>
<td>4'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>2</td>
<td>3&quot;x4.1&quot;</td>
<td>2'-6&quot;</td>
<td>5'-0&quot;</td>
</tr>
</tbody>
</table>
NOTES:
ALL DROP INLET OVER 3'-6" IN DEPTH TO BE PROVIDED WITH STEPS 1'-2" ON CENTERS. STEPS SHALL BE IN ACCORDANCE WITH STD. NO. 1.02
CLASS "B" CONCRETE TO BE USED.
ALL MORTAR JOINTS ARE TO BE 1/2" +- 1/8"
FORMS ARE TO BE USED FOR THE CONSTRUCTION OF THE BOTTOM SLAB
BRICK MASONRY DROP INLET NOT TO BE USED IN LOCATIONS SUBJECT TO TRAFFIC.
JUMBO BRICK WILL BE PERMITTED. CONCRETE BLOCK OR 4 SOLID CONCRETE BLOCKS MAY BE USED IN LIEU OF CLAY BRICK.
FOR 8'-0" IN HEIGHT OR LESS USE 8" WALL, OVER 8'-0" IN HEIGHT, USE 12" WALL TO 6'-0" FROM TOP OF WALL, AND 8" WALL FOR THE REMAINING 6'-0". QUANTITIES TO BE ADJUSTED ACCORDINGLY.

<table>
<thead>
<tr>
<th>PIPE</th>
<th>SPAN</th>
<th>WIDTH</th>
<th>HEIGHT</th>
<th>CONCRETE IN BASE</th>
<th>CONCRETE PER FT COPING</th>
<th>BRICK COPING</th>
<th>TOTAL BRICK MASONRY</th>
<th>DEDUCTIONS FOR ONE PIPE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12&quot;</td>
<td>3'-0&quot;</td>
<td>2'-0&quot;</td>
<td>2'-8&quot;</td>
<td>0.267</td>
<td>0.313</td>
<td>0.037</td>
<td>0.871</td>
<td>0.020</td>
</tr>
<tr>
<td>15&quot;</td>
<td>3'-0&quot;</td>
<td>3'-5&quot;</td>
<td>3'-8&quot;</td>
<td>0.896</td>
<td>0.976</td>
<td>0.074</td>
<td>1.049</td>
<td>0.031</td>
</tr>
<tr>
<td>18&quot;</td>
<td>3'-5&quot;</td>
<td>4'-0&quot;</td>
<td>4'-3&quot;</td>
<td>1.206</td>
<td>1.106</td>
<td>0.106</td>
<td>1.376</td>
<td>0.047</td>
</tr>
<tr>
<td>24&quot;</td>
<td>3'-0&quot;</td>
<td>2'-0&quot;</td>
<td>4'-3&quot;</td>
<td>0.267</td>
<td>0.313</td>
<td>0.037</td>
<td>1.367</td>
<td>0.078</td>
</tr>
<tr>
<td>30&quot;</td>
<td>3'-0&quot;</td>
<td>2'-0&quot;</td>
<td>4'-3&quot;</td>
<td>0.267</td>
<td>0.313</td>
<td>0.037</td>
<td>1.367</td>
<td>0.122</td>
</tr>
</tbody>
</table>

DIMENSIONS AND QUANTITIES

PLAN WITH COPING REMOVED

SECTION XX

SECTION YY

BRICK COPING

DEWEY BROS. CH-BN-4 OR APPROVED EQUAL
NOTES:

CLASS "B" CONCRETE TO BE THROUGHOUT.

ALL CATCH BASIN OVER 3'-6" IN DEPTH TO BE PROVIDED ACCORDANCE WITH STD. NO. 1.02

OPTIONAL CONSTRUCTION—MONOLITHIC POUR. 2" KEYWAY OR 4 BAR DOWELS AT 12 CENTERS AS DIRECTED BY ENGINEERS.

FORM ARE TO BE USED FOR THE CONSTRUCTION OF THE BOTTOM SLAB

FOR 8' IN HEIGHT OR LESS USE 6" WALLS AND BOTTOM SLABS OVER 8' AND UP TO 16' IN HEIGHT USE 8" WALLS AND BOTTOM SLAB. QUANTITIES TO BE ADJUSTED ACCORDINGLY

VIEW WHEN 8" X 6"
CURB IS USED IN PLACED OF HOOD

STD. STEPS 102

DEWEY BROS. CH-BN-2000 OR APPROVED EQUAL

END ELEVATION
WHERE 30" TO 36" PIPE IS USED
SECTION JJ

SECTION XY

SECTION XX
TOWN OF GARNER, N.C.

STANDARD BRICK CATCH BASIN

DEWEY BROS. CH-BN-2000 OR APPROVED EQUAL

NOTES:

ALL MORTAR JOINTS ARE TO BE 1/2"± 1/8" THICK
CLASS "B" CONCRETE TO BE USED
FORMS ARE TO BE USED FOR THE CONSTRUCTION OF
THE BOTTOM SLAB
DEDUCT FOR PIPE OR PIPES FROM TOTAL CU.YD. OF BRICK
MASONRY
JUMBO BRICK WILL BE PREMINTED. CONCRETE BRICK OR
4" SOLID CONCRETE BLOCKS MAY BE USED IN LIEU
OF CLAY BRICK.

ALL CATCH BASIN OVER 3'-6" IN DEPTH SHALL BE
PROVIDED WITH STEPS 1'-2" ON CENTER. STEPS SHALL
BE IN ACCORDANCE WITH STD. NO. 1.02

FOR OVER 8' IN HEIGHT, USE 12" WALL TO 6' FROM TOP OF
WALL.
- The pipe shall be corrugated exterior/smooth interior pipe (Type S), conforming to the requirements of AASHTO Specifications M294 (latest edition) for Corrugated Polyethylene Pipe.

- Bell and spigot joints shall be required on all pipe. Bells shall cover at least two full corrugations on each section of pipe. The bell and spigot joint shall have "O"-ring rubber gaskets meeting ASTM F477 with the gasket factory installed, placed on the spigot end of the pipe. Pipe joints shall meet all requirements of AASHTO M294.

- All HDPE pipe installation shall be in accordance with the manufacturer’s recommendations.

- Backfill material used to install HDPE pipe shall be Select Material, Class I–III, as defined by ASTM D2321 (Latest Edition) or AASHTO M145 Granular Materials:
  - A–1 and A–3 AASHTO Soils
  - A–2 AASHTO with the exception of A–2–7
  - A–4 and A–6 soil based on greater than (> ) 30% retained on the No. 200 sieve
  - Upon submittal of written certification of material suitability by a licensed geotechnical engineer, select material may be used. All backfill shall be approved by the Town inspector prior to placement.

- No HDPE end treatments allowed. All end treatments should be reinforced concrete pipe or headwalls. Transitions from HDPE to concrete pipe shall be made with the appropriate adapter.

- Minimum bury depth of 18” from the outside wall of the pipe and maximum bury depth of 20” unless specific approval is obtained from the Town Engineer.
### Recommended Minimum Trench Widths

<table>
<thead>
<tr>
<th>Pipe Dia. (mm)</th>
<th>Min. Trench Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>24&quot; (610mm)</td>
</tr>
<tr>
<td>150</td>
<td>26&quot; (660mm)</td>
</tr>
<tr>
<td>300</td>
<td>30&quot; (762mm)</td>
</tr>
<tr>
<td>450</td>
<td>34&quot; (864mm)</td>
</tr>
<tr>
<td>600</td>
<td>39&quot; (991mm)</td>
</tr>
<tr>
<td>900</td>
<td>42&quot; (1067mm)</td>
</tr>
<tr>
<td>1200</td>
<td>46&quot; (1219mm)</td>
</tr>
<tr>
<td>1500</td>
<td>50&quot; (1270mm)</td>
</tr>
</tbody>
</table>

### Minimum Recommended Cover Based on Vehicle Loading Conditions

<table>
<thead>
<tr>
<th>Pipe Dia. (mm)</th>
<th>Surface Live Loading</th>
<th>Heavy Construction (75 T-Axle Load) *</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot; - 48&quot;</td>
<td>H-25</td>
<td>12&quot; (305mm)</td>
</tr>
<tr>
<td>300 - 1200 mm</td>
<td></td>
<td>48&quot; (1219mm)</td>
</tr>
<tr>
<td>60&quot; - 1500 mm</td>
<td>24&quot; (610mm)</td>
<td>60&quot; (1524mm)</td>
</tr>
</tbody>
</table>

#### Notes:
1. All pipe systems shall be installed in accordance with ASTM D2331, "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications," Latest Addition
2. Measures should be taken to prevent migration of native fines into backfill material when required.
3. Foundation: Where the trench bottom is unstable, the contractor shall excavate to a depth required by the engineer and replace with suitable material as specified by the engineer. As an alternative and at the discretion of the design engineer, the trench bottom may be stabilized using a geotextile material.
4. Bedding: Suitable material shall be Class I, II or III. The contractor shall provide documentation for material specification to engineer. Unless otherwise noted by the engineer, minimum bedding thickness shall be 4" (100mm) for 4"-24" (100mm-600mm); 6" (150mm) for 24"-60" (750mm-1500mm).
5. Initial Backfill: Suitable material shall be Class I, II or III in the pipe zone extending not less than 6" above crown of pipe. The contractor shall document for material specification to engineer. Material shall be installed as required in ASTM D2331, Latest Edition.
6. Minimum Cover: Minimum Cover, H, in non-traffic applications (grass or landscape areas) is 12" from the top of pipe to ground surface. Additional cover may be required to prevent flotation. For traffic applications, minimum cover, H, is 12" up to 48" diameter pipe and 24" of cover for 60" diameter pipe, measured from top of pipe to bottom of flexible pavement or to top of rigid pavement. For traffic applications with less than four feet of cover, embedment of the pipe shall be using only a Class I or Class II backfill.

### Maximum Recommended Cover Based on Vehicle Loading Conditions

<table>
<thead>
<tr>
<th>Pipe Dia. (mm)</th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot; (100mm)</td>
<td>37 (11.3m)</td>
<td>18 (5.5m)</td>
<td>18 (5.5m)</td>
</tr>
<tr>
<td>6&quot; (150mm)</td>
<td>44 (13.4m)</td>
<td>20 (6.1m)</td>
<td>20 (6.1m)</td>
</tr>
<tr>
<td>10&quot; (250mm)</td>
<td>52 (16.5m)</td>
<td>22 (6.6m)</td>
<td>22 (6.6m)</td>
</tr>
<tr>
<td>12&quot; (300mm)</td>
<td>59 (19.3m)</td>
<td>26 (8.1m)</td>
<td>26 (8.1m)</td>
</tr>
<tr>
<td>15&quot; (375mm)</td>
<td>66 (19.9m)</td>
<td>30 (9.1m)</td>
<td>30 (9.1m)</td>
</tr>
<tr>
<td>18&quot; (450mm)</td>
<td>73 (23.0m)</td>
<td>34 (10.5m)</td>
<td>34 (10.5m)</td>
</tr>
<tr>
<td>24&quot; (600mm)</td>
<td>80 (25.4m)</td>
<td>40 (12.1m)</td>
<td>40 (12.1m)</td>
</tr>
<tr>
<td>30&quot; (750mm)</td>
<td>87 (27.1m)</td>
<td>44 (13.4m)</td>
<td>44 (13.4m)</td>
</tr>
<tr>
<td>36&quot; (900mm)</td>
<td>94 (27.8m)</td>
<td>48 (15.1m)</td>
<td>48 (15.1m)</td>
</tr>
</tbody>
</table>

#### Fill Height Table
Generated using AASHTO Section 12 Load Resistance Factor Design (LRFD) procedure with the following assumptions:
- No Hydrostatic Pressure
- Unit Weight of Soil (γ) = 120 PCF
- The pipe and fittings shall be an annular corrugated wall and an essentially smooth interior wall (double wall), or an annular corrugated wall and an essentially smooth interior and exterior wall (triple wall) conforming to the requirements of:
  - ASTM F2764 and
  - AASHTO Specifications M330 (latest edition) for Corrugated Polypropylene Pipe.
- Bell and spigot joints shall be required on all pipe. Bells shall cover at least two full corrugations on each section of pipe. The bell and spigot joint shall have "O"—ring rubber gaskets meeting ASTM F477 with the gasket factory installed, placed on the spigot end of the pipe. Pipe joints shall meet all requirements of AASHTO M330.
- All PP pipe installation shall be in accordance with the manufacturer’s recommendations.
- Backfill material used to install PP pipe shall be Select Material, Class I–IV, as defined by ASTM D2321 (Latest Edition) or AASHTO M145 Granular Materials:
  - A–1 and A–3 AASHTO Soils (Class II)
  - A–2 AASHTO (Class III) with the exception of A–2–7
  - A–4 and A–6 soil based on greater than (> 30% retained on the No. 200 sieve (Class III)
  - A–2–7: A–4 and A–6 soil based on less than (<) 30% retained on the No. 200 sieve. (Class IV)
  - Upon submittal of written certification of material suitability by a licensed geotechnical engineer, select material may be used. All backfill shall be approved by the Town inspector prior to placement.
- No PP end treatments allowed. All end treatments should be reinforced concrete pipe or headwalls. Transitions from PP to concrete pipe shall be made with the appropriate adapter.
- Minimum bury depth of 18” from the outside wall of the pipe and maximum bury depth of 25” unless specific approval is obtained from the Town Engineer.
POLYPROPYLENE TRENCH INSTALLATION DETAIL

NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2231, "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS". LATEST ADDITION, WITH THE EXCEPTION THAT THE INITIAL BACKFILL MAY EXTEND TO THE CROWN OF THE PIPE. SOIL CLASSIFICATIONS ARE PER THE LATEST VERSION OF ASTM D2231. CLASS I/II MATERIALS (MH, CH) AS DEFINED IN PREVIOUS VERSIONS OF ASTM D2231 ARE NOT APPROPRIATE BACKFILL MATERIALS.

2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.


4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II, III, OR IV. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. COMPACTION SHALL BE SPECIFIED BY THE ENGINEER IN ACCORDANCE WITH TABLE 3 FOR THE APPLICABLE FILL HEIGHTS LISTED, UNLESS OTHERWISE NOTED BY THE ENGINEER. MINIMUM BEDDING THICKNESS SHALL BE 4" (100mm) FOR 12"-48" (300mm-1200mm) DIAMETER PIPE; 6" (150mm) FOR 24"-48" (600mm-1200mm) DIAMETER PIPE; THE MIDDLE 1/3 BENEATH THE PIPE INVERT SHALL BE LOOSELY PLACED. PLEASE NOTE, CLASS IV MATERIAL HAS LIMITED APPLICATION AND CAN BE DIFFICULT TO PLACE AND COMPACT; USE ONLY WITH THE APPROVAL OF A SOIL EXPERT.

5. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II, III, OR IV IN THE PIPE ZONE EXTENDING TO THE CROWN OF THE PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2231, LATEST EDITION. COMPACTION SHALL BE SPECIFIED BY THE ENGINEER IN ACCORDANCE WITH TABLE 3 FOR THE APPLICABLE FILL HEIGHTS LISTED. PLEASE NOTE, CLASS IV MATERIAL HAS LIMITED APPLICATION AND CAN BE DIFFICULT TO PLACE AND COMPACT; USE ONLY WITH THE APPROVAL OF A SOIL EXPERT.

6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" (300mm) FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOTTATION. FOR TRAFFIC APPLICATIONS: CLASS I OR II MATERIAL, COMPACTED TO 90% SP (600mm) AND CLASS III OR IV, COMPACTED TO 95% SP (489mm) IS REQUIRED. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS 12" (300mm) UP TO 48" (1200mm) DIAMETER PIPE AND 24" (600mm) OF COVER FOR 60" (1500mm) DIAMETER PIPE. MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT.

7. FOR ADDITIONAL INFORMATION SEE PRODUCT MANUFACTURER'S TECHNICAL GUIDANCE.

TABLE 1: RECOMMENDED MINIMUM TRENCH WIDTHS

<table>
<thead>
<tr>
<th>PIPE DIAM.</th>
<th>MIN. TRENCH WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot; (300mm)</td>
<td>18&quot; (457mm)</td>
</tr>
<tr>
<td>24&quot; (600mm)</td>
<td>25&quot; (635mm)</td>
</tr>
<tr>
<td>36&quot; (914mm)</td>
<td>28&quot; (711mm)</td>
</tr>
</tbody>
</table>

TABLE 2: MINIMUM RECOMMENDED COVER BASED ON VEHICLE LOADING CONDITIONS

<table>
<thead>
<tr>
<th>SURFACE LIVE LOADING CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEAVY CONSTRUCTION (75T AXLE LOAD)*</td>
</tr>
<tr>
<td>PIPE DIAM.</td>
</tr>
<tr>
<td>12&quot; (300mm)</td>
</tr>
<tr>
<td>24&quot; (600mm)</td>
</tr>
<tr>
<td>36&quot; (914mm)</td>
</tr>
</tbody>
</table>

TABLE 3: MAXIMUM COVER FOR POLYPROPYLENE PIPE, II

<table>
<thead>
<tr>
<th>CLASS I</th>
<th>CLASS II</th>
<th>CLASS III</th>
<th>CLASS IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPE DIA</td>
<td>COMPACTED</td>
<td>95%</td>
<td>90%</td>
</tr>
<tr>
<td>12&quot; (300mm)</td>
<td>(12.5&quot;)</td>
<td>8.0%</td>
<td>8.0%</td>
</tr>
<tr>
<td>24&quot; (600mm)</td>
<td>(15.0&quot;)</td>
<td>12.0%</td>
<td>12.0%</td>
</tr>
<tr>
<td>36&quot; (914mm)</td>
<td>(18.0&quot;)</td>
<td>16.0%</td>
<td>16.0%</td>
</tr>
<tr>
<td>48&quot; (1200mm)</td>
<td>(21.0&quot;)</td>
<td>20.0%</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

FILL HEIGHT TABLE GENERATED USING AASHTO SECTION 12, LOAD RESISTANCE FACTOR DESIGN (LRFD) PROCEDURE WITH THE FOLLOWING ASSUMPTIONS:

- NO HYDROSTATIC PRESSURE
- UNIT WEIGHT OF SOIL (yd³) = 120 PCF
NOTE:

1. WHEN CONNECTING REINFORCED CONCRETE PIPE (RCP) TO HIGH DENSITY POLYETHYLENE (HDPE) OR POLYPROPYLENE (PP) PIPE, THE PREFERRED CONNECTION METHOD IS A MODIFIED BELL TO PLAIN OR CUT END PIPE.
2. THE CONNECTION IS SECURED WITH A MARMAC DISSIMILAR PIPE COUPLER, THAT IS SIZED TO FIT THE LARGEST OUTSIDE DIAMETER (O.D.) IN THE CONNECTION.
3. THE PIPE AND CONNECTION SHOULD BE BACKFILLED PER ASTM D2321 OR LOCAL GUIDELINES, FOLLOWING THE MORE STRINGENT INSTALLATION REQUIREMENT.
4. MARMAC DISSIMILAR PIPE COUPLER'S JOINT PERFORMANCE IS OBTAINED THROUGH A PROPER INSTALLATION. IT IS IMPORTANT THAT MARMAC'S INSTALLATION INSTRUCTIONS ARE CLOSELY FOLLOWED (JOINT PERFORMANCE PER MAR MAC).
5. RCP VARIES PER MANUFACTURER. IT IS IMPORTANT THE MATING END MEETS A PRESCRIBED CONFIGURATION WHEN CONNECTION TO HDPE OR PP PIPE.

INSTALLATION INSTRUCTIONS:

1. BEFORE JOINING RCP TO HDPE/PP USING THE COUPLER, VERIFY THE BEDDING IS GRADED TO ENSURE THE PIPE, COUPLER AND RCP ARE FULLY SUPPORTED BY THE BEDDING. A BELL HOLE IS NORMALLY REQUIRED FOR THE MODIFIED BELL.
2. THOROUGHLY CLEAN ALL MATING SURFACES ON HDPE/PP PIPE AND RCP, INCLUDING EXTERIOR SURFACES WHERE THE COUPLER WILL BE PLACED.
3. PEEL THE MAIN PROTECTIVE FILM FROM THE COUPLER (TAKING GREAT CARE TO NOT TOUCH IT ON ITSELF) AND POSITION IT IN PLACE UNDER THE ELEVATED RCP, SO AT MINIMUM BANDS WILL WRAP AROUND THE RCP AND AT MINIMUM TWO BANDS WILL EVENTUALLY BE WRAPPED AROUND THE HDPE/PP PIPE. IT WILL BE CRITICAL TO ENSURE THAT THE BANDS FOR THE HDPE/PP PIPE ARE CENTERED OVER THE VALLEYS FOR THE FIRST TWO FULL CORRUGATIONS.
4. WHILE ELEVATED OR WITH THE RCP IN PLACE, CONNECT THE CLEAN HDPE/PP PIPE INTO THE RCP CONNECTION AND ALIGN THE CONNECTION. THEN, WHILE WRAPPING THE COUPLER AROUND THE CONNECTION, PRESS THE COUPLER IN PLACE.
5. INSERT THE COUPLER'S BANDS INTO THE TIGHTENING MECHANISMS (HOSE CLAMP OR RATCHET) AND THEN THREAD THE BAND'S END INTO THE BAND SHEATHS.
6. BEFORE TIGHTENING BANDS, TAKE CARE TO ENSURE THEY ALIGN WITH THE CORRUGATION VALLEYS. DO NOT ALLOW THE BANDS TO CROSS OVER CORRUGATIONS DURING THE TIGHTENING PROCESS.
7. TIGHTEN HOSE CLAMPS WITH AN IMPACT DRILL AND THE RATCHETS BY HAND.
8. WHEN TIGHTENING BANDS, FIRST PARTIALLY TIGHTEN THE OUTER BANDS, THEN PARTIALLY TIGHTEN THE INNER BANDS, TO SECURE THE COUPLER IN PLACE, ALTERNATE TIGHTENING THE BANDS UNTIL EACH IS FULLY TIGHTENED.
9. THE HDPE/PP AND RCP SHOULD BE ALIGNED WHEN THE COUPLER IS IN PLACE.
10. FINALLY, PEEL THE PROTECTIVE FILM FROM THE HOSE CLAMP OR RATCHET COVER AND HAND PRESS INTO PLACE.
DETAIL SHOWING TYPICAL LOCATION OF SIDEWALK ACCESS RAMPS, PEDESTRIAN CROSSWALKS AND STOP BARS.

DETAIL SHOWING TYPICAL LOCATION OF SIDEWALK ACCESS RAMPS PEDESTRIAN CROSSWALKS AND STOP BARS FOR TEE INTERSECTION.

FOR RAMPS AT ASPHALT TO ASPHALT STREET TYPE DRIVEWAYS OR PRIVATE STREET TIE IN.
CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP OR TRANSITION TO STREET.

NOTE: USE SMALL FLARES ONLY WHEN A CURB TYPE DIRECTLY CONFLICTS WITH APPROACHING VEHICULAR TURNING MOVEMENTS.

TYPE N-1 (CURB TYPE)

1. 8.33% (12:1) MAX RAMP SLOPE
2. CROSS SLOPE: 2.00%
3. CURB RAMPS REQUIRE A (4'-0") MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.
4. RAMPS AND DOMES SHALL BE INSTALLED THE SAME WIDTH AS THE SIDEWALK.
5. IF LENGTH EXCEEDS 5', TRUNCATED DOMES SHALL BE INSTALLED ALONG THE BACK OF THE CURB COVERING THE FULL WIDTH OF THE RAMP.

TYPE N-1A (FLARE TYPE)

NOTE: USE SMALL FLARES ONLY WHEN A CURB TYPE DIRECTLY CONFLICTS WITH APPROACHING VEHICULAR TURNING MOVEMENTS.

TYPE N-2 (RADIUS)

TYPE N-2 (TEE INTERSECTION)
NOTE: * USE SMALL FLARE ONLY WHEN A CURB WOULD DIRECTLY CONFlict WITH approaching VEHICLE TURNING MOVEMENTS.

**TYPE N-3**

1. 8.33% (12:1) MAX RAMP SLOPE
2. CROSS SLOPE: 2.00%
3. CURB RAMPS REQUIRE A (4'-0") MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.
4. RAMPS AND DOMES SHALL BE INSTALLED THE SAME WIDTH AS THE SIDEWALK.

**TYPE N-3A**

(COMMERCIAL/RETAIL USE)
CURB RAMPS REQUIRE A (4'-0") MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.

CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP OR TRANSITION TO STREET.

TYPE N-4

1. SLOPE TO MEET GRADE, 15' MAXIMUM.
2. CROSS SLOPE: 2.00%
3. CURB RAMPS REQUIRE A (4'-0") MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.
4. RAMPS AND DOMES SHALL BE INSTALLED THE SAME WIDTH AS THE SIDEWALK.
5. IF LENGTH EXCEEDS 9', TRUNCATED DOMES SHALL BE INSTALLED ALONG THE BACK OF THE CURB COVERING THE FULL WIDTH OF THE RAMP.

TYPE N-4A

CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP OR TRANSITION TO STREET.
TYPE R-1

1. 8.33% (12:1) MAX RAMP SLOPE
2. CROSS SLOPE: 2.00%
3. CURB RAMPS REQUIRE A (4'-0") MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.
4. RAMPS AND DOMES SHALL BE INSTALLED THE SAME WIDTH AS THE SIDEWALK.
5. IF LENGTH EXCEEDS 5', TRUNCATED DOMES SHALL BE INSTALLED ALONG THE BACK OF THE CURB COVERING THE FULL WIDTH OF THE RAMP.

TYPE R-2

(USE ONLY WHERE WATER WILL NOT POND WITHIN LANDING)

TYPE R-2A

TYPE R-2B

Curb Ramps – Retrofit

Town of Garner, N.C.
1. 8.33% (12:1) MAX RAMP SLOPE
2. CROSS SLOPE: 2.00%
3. CURB RAMPS REQUIRE A (4'-0") MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.
4. RAMPS AND DOMES SHALL BE INSTALLED THE SAME WIDTH AS THE SIDEWALK.

CONCRETE DEPTH

<table>
<thead>
<tr>
<th>SIDE RAMPS</th>
<th>4&quot;</th>
</tr>
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<tbody>
<tr>
<td>LANDING &amp; OPENINGS</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>

TYPE R-3

CONCRETE DEPTH

<table>
<thead>
<tr>
<th>SIDE RAMPS</th>
<th>4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANDING &amp; CURB RAMPS</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>

TYPE R-4
SIDE RAMPS

LANDING & CURB RAMPS

CROSS SLOPE: 2.00%

8.33% (12:1) MAX RAMP SLOPE

CURB RAMPS REQUIRE A (4'-0") MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.

RAMPS SHALL BE INSTALLED THE SAME WIDTH AS THE SIDEWALK.

DEPRESSED 2'-6" CURB & GUTTER

DETECTABLE WARNING SURFACE (TYP)

1/2" EXPANSION JOINT (TYP)

6" W X 12" D CONCRETE CURB

SIDEWALK

SIDEWALK

CONCRETE DEPTH

SIDE RAMPS 4"
LANDING & CURB RAMPS 6"

SMALL RADIUS LESS THAN 15'

LARGER RADIUS 15' OR GREATER

SMALL RADIUS LESS THAN 15'

LARGER RADIUS 15' OR GREATER

TOWN OF GARNER, N.C.
CURB RAMPS
GENERAL NOTES

1. STANDARD CURB RAMPS HAVE BEEN DEVELOPED IN ACCORDANCE WITH THE AMERICANS WITH DISABILITIES ACT (ADA) AND PUBLIC RIGHT OF WAY ACCESS GUIDELINES (PROWAG).

2. CURB RAMPS SHALL BE PROVIDED AT LOCATIONS AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. SIDEWALK ACCESS RAMPS SHALL BE LOCATED AS INDICATED IN THE DETAIL, HOWEVER, THE LOCATION MAY BE ADJUSTED IN COORDINATION WITH EXISTING LIGHT POLES, FIRE HYDRANTS, DROP INLETS, ETC. AFFECT PLACEMENT.

3. DOUBLE WHEELCHAIR RAMPS ARE TO BE INSTALLED AT ALL PUBLIC STREET INTERSECTIONS WHERE SIDEWALK IS REQUIRED.

4. THE WALKING SURFACE SHALL BE SLIP RESISTANT. THE COLOR FOR THE DETECTABLE WARNING AREA SHALL BE YELLOW, GRAY, CHARCOAL, OR BLACK FOR CONTRAST.

5. NO SLOPE ON THE SIDEWALK ACCESS RAMP SHALL EXCEED 1”/FT (12:1) IN RELATIONSHIP TO THE GRADE OF THE STREET.

6. IN NO CASE SHALL THE WIDTH OF THE SIDEWALK ACCESS RAMP BE LESS THAN 48” ALL RAMPS SHALL BE INSTALLED THE SAME WIDTH AS THE SIDEWALK.

7. USE CLASS A (3000 PSI) CONCRETE WITH A SIDEWALK FINISH IN ORDER TO OBTAIN A ROUGH NONSKID SURFACE.

8. A 1/2” EXPANSION JOINT INSTALLED FULL DEPTH WILL BE REQUIRED WHERE THE CONCRETE SIDEWALK ACCESS RAMP JOINS THE CURB AND ALSO WHERE NEW CONCRETE ABUTS EXISTING CONCRETE.

9. CURB RAMPS SHOULD BE PLACED PARALLEL TO THE DIRECTION OF TRAVEL.
TRIANGULAR ISLANDS MAY BE CONSTRUCTED WITH ONLY 2 POINTS OF ENTRY AND EXIT AS SHOWN IN THE ROADWAY PLANS.

MEDIAN ISLAND CURB RAMPS

(MEDIANS WIDER THAN 20')

MEDIAN ISLAND WITH CUT THROUGH

(MEDIANS ≤ 20')

TABERN OF GARNER, N.C.
4" CONCRETE MONOLITHIC ISLAND

CONCRETE PEDESTRIAN REFUGE

1/2" EXPANSION JOINT (TYP)

ISOMETRIC VIEW

5:1 SLOPE

(SEE PLANS)

VARIABLE (6' MIN)

5" CONCRETE

MONOLITHIC ISLAND

USE 12" X 12" PAVERS

DETECTABLE WARNING SURFACE

CROSS SECTION VIEW

6" (TYP)

4' MIN

5:1 SLOPE

1/2" EXPANSION JOINT (TYP)

PROFILE VIEW

6' (TYP)

4' MIN

5:1 SLOPE

C. NIX

4/2019

C. JOHNSON

5.09

PEDESTRIAN REFUGE

TOWN OF GARNER, N.C.
LOCATIONS OF DETECTABLE WARNING SURFACES

TOWN OF GARNER, N.C.

DRAWN BY: C. NIX

REvised 4/2019

APPROVED BY: C. JOHNSON

STD. NO. 5.10
NOTES:
1. DETECTABLE WARNING DOMES SHALL COVER 2'-0" LENGTH AND FULL WIDTH OF THE RAMP FLOOR AS SHOWN ON DETAIL. SIZE OF PAVER SHALL BE 1' X 1'.

2. THE COLOR FOR THE DETECTABLE WARNING AREA SHALL BE YELLOW, GRAY, CHARCOAL, OR BLACK FOR CONTRAST.
SECTION "A-A"
WITH DETECTABLE WARNING PAVERS

1. DETECTABLE WARNING DOMES SHALL COVER 2'-0" LENGTH AND FULL WIDTH OF THE RAMP FLOOR AS SHOWN ON DETAIL.

2. THE COLOR FOR THE DETECTABLE WARNING AREA SHALL BE YELLOW, GRAY, CHARCOAL, OR BLACK FOR CONTRAST.

NOTE:
THIS APPLICATION ONLY TO BE USED WHEN RETRO FITTING EXISTING BARRIER FREE RAMPS

NOTES:
1. DETECTABLE WARNING DOMES SHALL COVER 2'-0" LENGTH AND FULL WIDTH OF THE RAMP FLOOR AS SHOWN ON DETAIL.
2. THE COLOR FOR THE DETECTABLE WARNING AREA SHALL BE YELLOW, GRAY, CHARCOAL, OR BLACK FOR CONTRAST.

RETOFIT ONLY

DETECTABLE WARNING SURFACE—SURFACE APPLIED

TOWN OF GARNER, N.C.
RAMP SECTION
WITH DETECTABLE WARNING SURFACE
CAST-IN-PLACE SYSTEM

SLOPE 12:1 MAX (5'-4" MIN.)

(4' MIN LANDING)

2' DETECTABLE WARNING DOMES
SEE NOTE #1

2" DEPRESSED CURB

STANDARD 2'-6" CURB & GUTTER

EXPANSION JOINT

6" CONC. SIDEWALK ACCESS RAMP

CAST-IN-PLACE DETECTABLE WARNING SURFACE SYSTEM

NOTES:
1. DETECTABLE WARNING DOMES SHALL COVER 2'-0" LENGTH AND FULL

2. THE COLOR FOR THE DETECTABLE WARNING AREA SHALL BE YELLOW, GRAY, CHARCOAL, OR BLACK FOR CONTRAST.