

DRAFT

Land Development
Standards Manual

Public Works Director: Wilmer Melton, III

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The following specifications and special provisions are intended to be used in conjunction with the City of Kannapolis Code of Ordinances Land Development Standard Drawings, UDO, NCDOT Roadway Standard Drawings, and Standard Specifications for Roads and Structures.

Chapter 1 SPECIFICATIONS AND SPECIAL PROVISIONS

A. GENERAL NOTES

1. There are supporting specifications from multiple agencies used in conjunction with this manual. The specifications used are listed in Chapter 6 – REFERENCES. All specifications used and noted will be the most current revision for the respective specification and publication. The specifications in this manual shall take precedence over the specifications referenced in Chapter 6. When specifications referenced in Chapter 6 conflict, the more restrictive specification shall be enforced.
2. No work associated with excavations, tie-ins to existing utilities, lane or road closures requiring observation by City personnel will be allowed on weekends and holidays unless written authorization is obtained from the City Engineer.
3. No work will be permitted outside of the hours of 7:00AM to 9:00PM on weekdays and 8:00AM to 9:00PM on weekends without authorization from the City Engineer.
4. Contractors performing work in the City of Kannapolis shall have a North Carolina Contractor License with the appropriate classification for the work being performed.
5. Prior to beginning construction in the City of Kannapolis, a preconstruction meeting with the City Inspector shall be held, and submittals (shop drawings) shall be approved. The submittals should include all materials (roadway, storm and utilities) to be used during construction. Please allow two (2) weeks for the review. The review will be performed by the City Engineer or his/her designee.
6. Prior to grading operations, a grading permit shall be obtained from the City of Kannapolis Planning Department.
7. Erosion control measures shall be installed as required by the erosion control and sediment permit. Maintenance and documentation as required by the erosion control and sediment permit is the responsibility of the contractor and erosion control measures shall not be removed without the permission of NCDEQ or the City Engineer.
8. Sediment leaving a site, regardless of size of project, shall have corrective actions taken immediately by the financially responsible person to avoid further loss of sediment from the site. Methods of conveyance of sediment from the site include water, air, gravity or ice.
9. The use of City water to perform construction activities shall be metered. The City has one (1) fire hydrant for obtaining non-potable water for construction. The hydrant is located at the Public Works Operation Center, 1401 Bethpage Road. Prior to obtaining water from the hydrant, a permit application shall be submitted to the Public Works Department, an inspection of the tanker vehicle shall be performed, and issuance of the permit is obtained. In lieu of using the fire hydrant at the PWOC, a fire hydrant meter may be obtained from the City for specific locations. For details to obtain a fire hydrant meter, contact City of Kannapolis Customer Service at 704-920-4385. The meter applicant is responsible for backflow prevention at the meter and payment for water used.
10. The City of Kannapolis Land Development Standards Manual has been adopted by the City of Kannapolis for use to design and construct infrastructure within the city limits of Kannapolis and the ETJ. The Manual is intended to provide the minimum specifications and standards for development. Additional requirements may be deemed necessary by the Public Works Director, City Engineer or their designee depending on the proposed improvement.

END OF SECTION

B. ACRONYMS

Acronyms to be used throughout this manual:

ACI – American Concrete Institute

AASHTO – American Association of State Highway and Transportation Officials

ANSI – American National Standards Institute

ASTM – American Society for Testing and Materials

CIP – Capital Improvement Projects

CRMPO – Cabarrus-Rowan Metropolitan Planning Organization

CTP – Comprehensive Transportation Plan (Developed by the CRMPO)

DIP – Ductile Iron Pipe

DWQ – North Carolina Department of Environmental Quality, Division of Water Quality

FHA – Federal Highway Administration

IFC – International Fire Code

MUTCD – Manual for Uniform Traffic Control Devices

NACTO – National Association of City Transportation Officials

NPDES – National Pollutant Discharge Elimination System

NCAC – North Carolina Administrative Code

NCDEQ – North Carolina Department of Environmental Quality

NCDOT – North Carolina Department of Transportation

PROWAG – Public Right of Way Accessibility Guidelines

PVC – Polyvinyl Chloride

RCP – Reinforced Concrete Pipe

SCM – Stormwater Control Measure

UDO – Unified Development Ordinance

USACE – United States Army Corps of Engineers

USGS – United States Geological Survey

WSACC – Water and Sewer Authority of Cabarrus County

END OF SECTION

Chapter 2 STREETS

A. GENERAL NOTES

- B. All work and materials shall conform to the latest edition of the NCDOT Standard Specifications for Roads and Structures unless otherwise specified in this manual.
- C. Prior to beginning construction in the City of Kannapolis, a preconstruction meeting with the City Inspector shall be held, and submittals (shop drawings) shall be approved. The submittals should include all materials (roadway, storm and utilities) to be used during construction. The review will be performed by the City Engineer or his/her designee.
- D. Depending on the proposed construction activities, a bond may be required for possible damages to City streets and, shall be in an amount established by the City. The current condition of the existing street shall be established prior to beginning construction and evaluated upon completion of the construction, at which time repairs or release of the bond shall take place. Designation of a construction vehicle route may be required.
- E. The contractor shall do what is necessary to control erosion and to prevent sedimentation damage to all adjacent properties and streams in accordance with the appropriate NCDEQ and the City of Kannapolis Erosion and Sedimentation Control Ordinances, regardless of the size of the project. Methods of conveyance of sediment from the site include water, air, gravity or ice.
- F. The contractor is responsible for installing all erosion control and sediment measures as required by the erosion control permit. Maintenance and documentation as required by the permit is also the contractor's responsibility and the erosion control measures shall not be removed without permission of NCDEQ or the City Engineer.
- G. Construction entrances shall be installed as required by the construction plans and remain functional throughout the project. Construction entrances shall be maintained during construction as required by use and requirements referenced in NCDEQ Erosion and Sediment Control Planning and Design Manual, Chapter 6. Any sedimentation not captured by the construction entrance and tracked into the roadway, shall be cleaned immediately from any adjacent road impacted by the sediment.
- H. The contractor shall maintain two-way traffic at all times when working within existing streets. The contractor shall place and maintain signs, danger lights, and barricades and furnish watchmen or flagmen to direct traffic in accordance with the latest edition Manual for Uniform Traffic Control Devices (MUTCD) and NCDOT, work in the right-of-way of NCDOT streets may require additional traffic control provisions.
- I. Street cuts and sidewalks should be completely repaired in an expedient manner. Cuts must be filled per Standard Details, with flowable fill or suitable material (asphalt, concrete or approved equal) to within one and one-half (1 ½) inches of finished grade within three (3) days of initial work. Finished roadway surfaces, sidewalks and curbs must be restored within thirty (30) days of initial work.
- J. Trench Backfill Requirements
 - 1. All backfill shall be non-plastic in nature, free from roots, vegetative matter, waste, construction material or other objectionable material. Said material shall be capable of being compacted by mechanical means and the material shall have no tendency to flow or behave in a plastic manner under the tamping blows or proof rolling.
 - 2. Materials deemed by the Inspector as unsuitable for backfill purposes shall be removed and replaced with select backfill material.
 - 3. All trenches in the street right-of-way shall be backfilled with suitable material immediately after the pipe is laid. No more trench shall be opened in advance of pipe laying than is necessary to expedite the work. One (1) block or two hundred (200) feet (whichever is the shorter) shall be the maximum length of open trench on any line under construction. All fill including around pipes, shall be placed in layers not to exceed six (6) inches and each layer shall be compacted thoroughly by the use of mechanical compaction methods.
 - 4. Under no circumstances shall water be permitted to rise in un-backfilled trenches after the pipe has been placed.

5. All trench backfill, subgrade and embankment fill, and ABC shall require density tests be performed at a frequency as referenced in each respective section of NCDOT Specifications. Test reports shall be conveyed to the City on a weekly basis.
 6. All subgrade shall be compacted to a depth of eight (8) inches below the finished surface to a density equal to at least one hundred percent (100%) of that obtained by compacting a sample of the material in accordance with AASHTO T 99 as modified by NCDOT. All embankment shall be compacted to a density of nine-five percent (95%) in accordance with AASHTO T 99 as modified by NCDOT for depths greater than eight (8) inches.
 7. Backfilling of trenches, no land disturbing activities shall be allowed until an erosion control permit has been obtained from the NCDEQ. Land disturbing activities include, but are not limited to, grubbing, grading and utility installations.
- K. To utilize the best construction methods possible for grading, compaction and densities, all manholes, junction boxes, water valve boxes and other appurtenances shall be covered at subgrade level with a steel plate until the first lift of surface course asphalt is placed. At that time, the utility may be raised to the finished grade. For methods to raise manholes and valve boxes, see Kannapolis Standard Details
- L. A tolerance for grading the subgrade shall be +/- one-half ($\frac{1}{2}$) inch from the established grade will be permitted after the subgrade has been graded to a uniform surface. A tolerance of +/- one-fourth ($\frac{1}{4}$) inch will be permitted under concrete pavement mainline lanes. Perform the grading operation such that the maximum difference between the established grade and the graded subgrade within any one hundred (100) foot section is one-half ($\frac{1}{2}$) inch for normal subgrade and one-fourth ($\frac{1}{4}$) inch for subgrade for concrete pavement.
- M. A proof roll shall be required prior to placing curb and gutter, ABC and asphalt⁽¹⁾. Equipment to be used for the proof roll is as follows⁽²⁾:
1. Curb and Gutter, ABC⁽³⁾, Asphalt Loaded tandem dump truck or loaded water truck
- (1) Proof rolls will not be performed on frozen subgrades and inclement weather will void any proof roll if the associated work has not been completed.
- (2) Weight requirements for equipment:
- | | |
|--------------|-------------|
| Motor Grader | 30,000 lbs. |
| Water Truck | 30,000 lbs. |
| Tandem Truck | 45,000 lbs. |
- (3) A motor grader may be used in some circumstances for a proof roll on curb and gutter only. Prior approval by the City Engineer is required for use of a motor grader.
- N. Concrete or asphalt shall not be placed in inclement weather. The contractor shall protect freshly placed concrete or asphalt in accordance with Section 420 (Concrete Structures), Division 6 (Asphalt Pavements), and Division 7 (Concrete Pavements and Shoulders) of NCDOT Standard Specifications.
- O. Prior to any concrete being placed, a pre-pour meeting shall be required. Schedule the pre-pour meeting with the inspector.
- P. All concrete used for streets, curb and gutter, sidewalks and drainage structures, etc. shall be approved NCDOT mixes, unless otherwise directed by the City Engineer or project special provisions. The City Engineer may require concrete testing when deemed necessary. Concrete testing shall follow requirements and frequency set forth by NCDOT and ACI.
- Q. The concrete temperature at the time of placement shall be not less than fifty (50) degrees Fahrenheit nor more than ninety-five (95) degrees Fahrenheit except where other temperatures are required by NCDOT Specifications, Section 420. Do not place concrete without permission when the air temperature measured at the location of the concrete operation in the shade away from artificial heat is below thirty-five (35) degrees Fahrenheit. When such permission is granted, uniformly heat the aggregates and/or water to a temperature not higher than one hundred-fifty (150) degrees Fahrenheit. Heated concrete shall be between fifty-five (55) degrees Fahrenheit and eighty (80) degrees Fahrenheit at the time of placement.
- R. All excess concrete on the front edge (lip) of gutter shall be removed when curb and gutter is poured with a machine.
- S. Straight forms shall not be used for forming curb and gutter in curves.

- T. Contraction joints, expansion joints and joint sealer shall follow NCDOT Specifications and Kannapolis Standard Details.
- U. All concrete shall be cured with curing compound. Use white pigmented curing compound which meets ASTM C 309, as required by NCDOT Section 825 and Section 1026, applied at a uniform rate per manufacturer's instructions. Apply the membrane curing compound after the surface finishing is complete and immediately after the free surface moisture disappears, but at no point, more than twenty-four (24) hours of after placement of the concrete.
- V. All curb and gutter shall be backfilled with soil approved by the City Engineer within seven (7) days after construction, but not before three (3) curing days has elapsed. Do not place ABC or pavement adjacent to the curb before the three (3) curing days has elapsed.
- W. Prior to any asphalt being placed, a pre-pave meeting shall be required. Schedule the pre-pave meeting with the inspector.
- X. Asphalt shall not be placed unless the minimum temperatures are met in NCDOT Specifications, Section 610. Do not place surface course material that is to be the final layer of pavement between December 15 and March 16 of the next year if it is one (1) inch or greater in thickness, or between November 15 and April 1 of the next year if it is less than one (1) inch in thickness, unless otherwise approved. Do not place plant mix base course that will not be covered with surface or intermediate course during the same calendar year or within fifteen (15) days of placement if the plant mix is placed in January or February.
- Y. Drainage shall be maintained on the streets between the first lift of S9.5C and the second lift of S9.5C when the street is accepted. Use Kannapolis Standard Details to accommodate drainage in low areas.
- Z. Surfaces shall be tacked when asphalt is being placed over existing asphalt streets or adjoining concrete, storm drain and sanitary sewer structures. In the event more than one (1) lift of asphalt is placed in a single day, tack is still required between lifts.
- AA. All asphalt cuts shall be made with a saw when preparing street surfaces for patching or widening strips. Milling is an acceptable alternative to saw cuts when applicable.
- BB. Paper joints shall be used to seal the ends of an asphalt pour so that future extensions can be made without causing rough joints.
- CC. When placing asphalt against existing surfaces, a straight edge shall be used to provide a smooth and consistent transition between the two surfaces at that location.
- DD. Dead-end streets without cul-de-sacs shall be required to install object signs designating the dead-end.
- EE. The fire apparatus access road shall be constructed of asphalt, concrete or other approved driving surface and shall be capable of supporting the imposed load of fire apparatus weighing at least seventy-five thousand (75,000) pounds in any weather condition. Furthermore, the access road minimum unobstructed width shall be twenty (20) feet, exclusive of shoulders, with a thirteen foot, six inch (13'6") unobstructed vertical height (IFC Section 503.2.1) and shall not exceed a ten percent (10%) grade. In the event a fire hydrant is located on the access road, the minimum width of the road shall be twenty-six (26) feet, exclusive of shoulders (IFC Appendix D). Grades steeper than ten percent (10%) as approved by the fire chief. See Diagram 2A of Appendix B for dead-end access road turnarounds.
- FF. During phasing of residential developments temporary turn arounds are required for fire apparatus access.
- GG. During development street naming signage is required for all roads during construction. (IFC Section 505.2)

END OF SECTION

TABLE 2A STREET CLASSIFICATION STANDARDS

Street Type Average Daily Traffic (ADT)		Alley 100	Local 250	Collector 3000 Major 1000 Minor	Thoroughfare 8000 Major 4000 Minor
Longitudinal Grade	Min	1%	1%	1%	See Thoroughfare Plan
	Max: level/rolling	12 %	10 %	8 %	
	hilly	12 %	12 %	10 %	
	(stop/yield) at intersection	5 %	2 %	2 %	
	(thru movement) at intersection	5 %	5 %	5 %	
Within 100' of an intersection		5 %	5 %	5 %	
Min Horizontal Centerline Curve Radius			150'	230'	
Min Tangent between Reverse Curves			50'	100'	
Driveway Radius⁽⁶⁾	Residential Min	1'		5'	N/A
	Residential Max	3'			N/A
	All others Min	20'	25'	30'	30'
Street Intersection Radius⁽⁶⁾		20'	30'		
Design Speed	Min	15 mph	25 mph	25 mph	
	Max	15 mph	35 mph	35 mph	
Design Vehicle		SU-30	SU-30		WB-62
	Residential			Bus-45 & SU-30	
	Non-Residential			WB-62 or WB-40	
Separation ⁽¹⁾⁽²⁾⁽³⁾	driveway - driveway	40'	40'	120'	400'
	driveway - intersection	25'	60'	120'	250'
	driveway - residential prop. line	5'	5'	5'	5'
	driveway - non-residential prop. line	10'	10'	10'	10'
	intersection - intersection	N/A	200'	200'	600'-1000'
Pavement Schedule ⁽⁴⁾⁽⁵⁾					See NCDOT Roadway Design Standards
surface course (S9.5C)		2"	2"	2"	
intermediate course (I19.0C)		0"	2.5"	2.5"	
base course (residential)		8" ABC or 4" B25.0C			
base course (non-residential)		N/A	10" ABC or 5" B25.0C		
Dead-End Fire Apparatus Access Roads					
Length		0-150'	150'-500'	500'-750'	750'+
Width		20'	20'	26'	Special Approval Required
Vertical clearance		13.5'	13.5'	13.5'	
Maximum grade		10 %	10 %	10 %`	
Turnaround required		None	60' "Y" 96' ø Cul-De-Sac 120' Hammerhead		
Max Cul-de-sac Lengths					
Zoning	RM-1, RM-2, RV	AG, RE, RL	CD, I-1, I-1	B-1, O-1, C-1, C-2, PUD	
	800'	1000'	1500'	500'	
	RC, CC				
	300'				

Notes:

1. Single-family dwellings and duplex dwellings on individual lots shall be exempt from the minimum separation between driveways as shown in the table above. However, such driveways shall maintain a minimum of 5' of side clearance from residential property lines and 10' for all others.
2. City streets: proposed streets which intersect opposite sides of another street (either existing or proposed) shall be laid out to intersect directly opposite each other. Intersections which cannot be aligned shall be separated by a minimum length of **200'** between survey centerlines.
3. State streets: "On most state routes, the minimum distance between the centerlines of full-movement driveways into developments that generate high traffic volumes should be at least **600'**. However, on routes with safety, congestion, or operational problems, 1000' or more may be required between the centerline of any left turn access points and any adjacent street and driveways. The minimum distance between drives does not apply to service drives not used by the general public." Ref: Most recent version of NCDOT Policy on Street and Driveway Access to North Carolina Highways.
4. Non-residential street pavement design shall be evaluated on a case-by-case basis.
5. Prior to substituting B25.0C, approval shall be obtained from the City Engineer.
6. Radius measured from edge of pavement.

B. STANDARDS OF STREET DESIGN

1. Streets (Public and Private): Refer to Table 2A for street classifications.
2. Intersections:
 - a. Maximum Street Grade at Intersections (See Diagram 2B in Appendix B):
 - i. STOP or YIELD Condition: Vertical alignment is two percent (2%) maximum through the crosswalk areas (marked or unmarked). Outside of the crosswalk areas, the vertical alignment is five percent (5%) maximum within one hundred (100) feet of an intersection.
 - ii. THROUGH MOVEMENT Condition: Vertical alignment is five percent (5%) maximum through the crosswalk areas. Where feasible, it is recommended that the vertical alignment for a through-movement street also be set at two percent (2%) maximum through the crosswalk areas (marked or unmarked). Outside of the crosswalk areas.
 - b. Insofar as practical, streets shall intersect at an angle of ninety (90) degrees for a minimum of fifty (50) feet from the roadway intersection. In no case shall the angle be less than seventy-five (75) degrees. Intersections having more than four (4) corners shall be prohibited. Proposed streets which intersect opposite sides of another street (either existing or proposed) shall be laid out to intersect directly opposite each other.
 - c. A roundabout may be constructed at any intersection location where it may be desired in order to enhance intersection capacity, reduce vehicle speeds along a corridor, or enhance intersection aesthetics. Roundabouts shall be designed in accordance with the criteria set forth in Roundabouts: An Informational Guide (Federal Highway Administration Publication No. FHWA-RD-00-067). Care should be taken in order to ensure roundabouts are not located in close proximity to adjacent stop or signal controlled intersections where long queues may back up into the roundabout.
3. Intersection Sight Distance:
 - a. Minimum sight triangles will be provided at each intersection corner. Refer to Standard Details for intersection approach and departure sight triangles.
 - b. Sight Triangle shall contain no fence, structure, earth bank, hedge, planting, wall or other obstruction between a height greater than two (2) feet above the property line grade as established by the City Engineer. The following are exempted from this provision:
 - i. Public utility poles.
 - ii. Trees trimmed (to the trunk) to a height at least nine (9) feet above the level of the intersection.
 - iii. Other plant species of open growth habit that are not planted in the form of a hedge and which are so planted and trimmed as to leave in all seasons a clear and unobstructed cross-view.

- iv. A supporting member or appurtenance to a permanent building lawfully existing on the effective date of this ordinance.
 - v. Official warning signs or signals.
 - vi. Signs which conform to the Sign Ordinance (Article 12 Kannapolis UDO) mounted ten (10) feet or more above the ground with supports that do not encroach on the clear-vision area.
- 4. Stopping sight distance may need to be evaluated and included on the design plans. The minimum sight distances are as follows:
- 5. Cul-de-sac Streets:
 - a. A maximum of twenty (20) equivalent residential units (ERUs) may take access from a cul-de-sac. ERUs are determined in Article 14 of the Kannapolis UDO. Temporary cul-de-sacs on stub streets are exempted from this limitation.
 - b. The preliminary and final site plan shall show a stub connecting the cul-de-sac to adjoining areas or parcels where future roadways are delineated on a recorded subdivision or site plan (provided reasonable connection can be achieved without the need for a bridge or other feature to negate substantial topography). The stub shall be improved as pedestrian walkway, trail or bikeway.
 - c. The radius for the circular terminus, or turnaround, shall be not less than forty-eight (48) feet.
- 6. A Traffic Impact Analysis will be required for developments generating one thousand (1,000) or more trips per day or one hundred (100) trips per peak hours with the following criteria:
 - a. Application for Conditional Zoning Rezoning
 - b. Application for Conditional Use Permit/Major Site Plan
 - c. Application for Minor Site Plan
 - d. Application for Preliminary Subdivision Plat
 - e. Developments with forty (40) or more dwelling units without direct primary access on a major or minor thoroughfare.
- 7. Driveways
 - a. Refer to Diagram 2B.3 for driveway layout and separation requirements.
 - b. Driveway Permits and inspections are required per UDO.

END OF SECTION

C. DESIGN VEHICLES

1. Site designs and/or street designs shall evaluate the minimum turning radius for the vehicular traffic intended for use to support the proposed improvement. The evaluation of the vehicular turning radius shall include, but not be limited to, parcel delivery trucks, garbage trucks, semi-truck and trailers and current Kannapolis Fire Department fire apparatus vehicles. See Table 2A Standards of Street Design (pg. 2-5) for appropriate design vehicles.
2. Review of turning radii for KFD fire apparatus operating in adjacent travel lanes may be approved for emergency situations only. All other approvals of the turning radii shall require the design vehicle to complete the turn safely, without encroaching on adjacent lanes of travel and streetscape elements, including sidewalks and landscaping.
3. A minimum unobstructed width of twenty (20) feet, exclusive of shoulders, is required for access roads. For buildings more than thirty (30) feet in height, access roads with an unobstructed width of twenty-six (26) feet, exclusive of shoulders, are required.

END OF SECTION

D. PARKING

1. Off-street parking spaces shall be provided in accordance with the requirements in Article 8 of the Kannapolis UDO. The Planning Department reviews and approves the parking requirements and the Planning Director shall be authorized to approve any alternate parking plans for developments.
2. Handicapped Spaces – Handicapped parking spaces shall be a minimum of fourteen (14) feet by eighteen (18) feet for a single non-van spaces (nine (9) feet in width in addition to a five (5) foot access aisle); a minimum of seventeen (17) feet by eighteen (18) feet for a single van space (nine (9) feet in width in addition to an eight (8) foot access aisle); or twenty-six (26) feet by eighteen (18) feet for a double van space, or a non-van and van double space (nine (9) feet in width for each space with an eight (8) foot access aisle between spaces). Parking spaces for handicapped or disabled persons shall comply with Chapter 4 of the North Carolina Accessibility Code.
3. Reference Standard Details for parking dimensions.
4. Bumper Overhang dimensions for parking spaces include the front/rear of the parking space.

END OF SECTION

E. STREET LIGHTING

Street lights within the City of Kannapolis shall be installed per the Street Lighting Policy. The policy is included below:

1. Purpose

The purpose of this Policy is to establish standards for the installation and maintenance of street lighting in the City of Kannapolis, North Carolina. All street lighting will be installed and maintained by either Duke Power Company or the City of Landis depending on situs area to be served.

Article I – Existing Streets

2. Standards for Street Lighting

- a. Street lighting for residential and collector streets will ordinarily be 9,500 lumen, high pressure sodium, standard cobra head fixtures mounted at height of approximately twenty-five (25) feet on a wooden pole. Spacing of lighting fixtures shall be approximately 400-500 feet except where warranted by special conditions.
- b. Street lighting for major thoroughfares and the central business district will ordinarily be 20,000 lumen mercury vapor fixtures. High pressure sodium vapor fixtures of appropriate intensity may be used in lieu of mercury vapor fixtures when deemed appropriate. Spacing of fixtures along major thoroughfares and commercial areas will be determined by current engineering standards.
- c. Light fixtures on public right of way for purpose of illuminating the roadway ordered by private citizens will not be permitted.
- d. Private lighting fixtures mounted on the back of poles located on the public right of way for the purpose of illuminating private property will be permitted with permission of the City of Kannapolis. All costs will be borne by the applicant and contractual arrangements made directly with the utility company.
- e. The City of Kannapolis will not be responsible for any lighting fixtures installed for the purpose of illuminating private property.]

3. Requests for Street Lighting

Requests for street lighting may be submitted to the office of the Director of Public Works. Each request will be considered in accordance with approved standards and any special conditions of merit such as pedestrian activity, traffic volumes, accident history, crime rate, vertical and horizontal street alignment and hazardous traffic conditions. Any extensions of the lighting system will be subject to the limitations of appropriation of funds by the City Council.

Article II – New Residential Subdivisions

4. Lighting Plan Required

Lighting plans shall be prepared by a qualified lighting designer. Lighting plans shall be submitted to the City for approval along with subdivision utility plans in accordance with applicable City ordinances, policy and regulations.

5. Standards for Residential Subdivision Lighting

Standards for residential subdivision lighting for the purposes of this article shall be as follows:

- a. Fixtures shall be 9,500 lumen, high pressure sodium, standard cobra head mounted at a height of approximately twenty-five (25) feet on wooden poles.
- b. One fixture shall be placed at each street intersection or cul-de-sac.
- c. The number of additional fixtures to be placed between each adjacent pair as determined by b) shall be determined by the formula, $N=(L/300)-1$, rounded to the nearest whole number where:
 N = number of fixtures
 L = length in feet between intersections or cul-de-sacs as measured along the center line of street
 The resultant number of fixtures shall be spaced evenly except where variance is desirable due to horizontal or vertical curvature of the street.

6. Special Lighting Fixtures

When developers of new subdivisions wish to provide an illumination level along public streets equal or greater than City standard and to provide more decorative lighting fixtures, the City will consider accepting new fixtures for maintenance by the City in accordance with this article.

7. Developer Responsible for Cost

Upon approval of plans and prior to construction, the developer shall pay to the City the sum of a) all initial charges for decorative fixtures and b) a one time maintenance fee.

- a. The initial charge for decorative fixtures shall be in accordance with the schedule of rates payable by the City on the date of approval of the system by the City.
- b. The one time maintenance fee shall be determined by the following formula:

$$F=(M1-M2)(120)$$

F = One time maintenance fee.

M1 = The total monthly maintenance fee for the entire system as determined by the rate schedule payable by the City on the date of approval of the system by the City.

M2 = The total monthly maintenance fee a City standard system designed for the entire subdivision as determined by the rate schedule payable by the City on the date of approval of the system by the City.

8. City to Assume Cost

Upon completion and inspection of new lighting systems, the City will assume responsibility for monthly electrical service and maintenance costs.

9. Effective Date

The effective date of the original Policy is January 27, 1986.

The effective date of this amended Policy is January 1, 1994.

10. The developer is encouraged to submit the lighting plan early in the development process to assist in avoiding delays in the approval of the lighting plan. The City accepts no responsibility of scheduling or construction of the power company.

END OF SECTION

F. GRADING

1. Proposed street rights-of-way shall be graded to their full width for ditch type streets or to a minimum of fifty (50) feet. Finished grade, cross-section and profile of the roadway shall be designed by a professional engineer or registered land surveyor and approved by the city engineer.
2. The maximum slope for cuts shall be two (2) feet horizontal to one (1) foot vertical (2:1) and for fill embankments, two (2) feet horizontal to one (1) foot vertical (2:1). Fill embankments shall be formed of suitable material placed in successive layers not to exceed more than ten (10) inches in depth for the full width of the cross-section, including the width of the slope area. No stumps, trees, brush, rubbish or other unsuitable materials or substances shall be placed in the embankment. Each successive ten (10) inch layer shall be thoroughly compacted by appropriate equipment as required by the work being performed, or other methods approved by the City Engineer. Embankments over and around all pipe culverts shall be of select material, placed and thoroughly tamped and compacted as directed by the City Engineer or his representative.
3. Longitudinal grades shall have a minimum grade of one percent (1.0%) and a maximum grade of twelve percent (12%).
4. Transverse grade or crown shall be one-fourth (1/4) inch to one (1) foot slope.

END OF SECTION

G. ROADWAY BASE

1. All roadways shall be constructed with a base course as described on the appropriate Kannapolis Land Development Standard Detail Drawing.
2. The material for stone base course shall conform to the requirements of Section 1006 (Aggregate Quality Control/Quality Assurance), Section 1010 (Aggregate for Non-Asphalt Type Bases) and Section 520 (Aggregate Base Course) of the NCDOT Standard Specifications for Roads and Structures.
3. The stone base shall be compacted to one hundred percent (100%) of that obtained by compacting a sample of the material in accordance with AASHTOT180 as modified by NCDOT when conventional density test number three (3) is used. When nuclear density testing is performed, a nuclear target density of at least ninety-eight percent (98%) shall be obtained. In addition, the nuclear density of any single test location shall be at least ninety-five percent (95%) of the nuclear target density. Compaction shall be obtained by rolling with ring or tamping roller or with a pneumatic tired roller with a minimum weight of ten (10) tons. When completed, the base course shall be smooth, hard, dense, unyielding and well bonded.
4. ABC will not be allowed within widening strips less than five (5) feet in width.

END OF SECTION

H. ROADWAY INTERMEDIATE AND SURFACE COURSE

1. All public roadways shall be constructed with an intermediate and surface course as described on the appropriate City of Kannapolis Land Development Standard Detail Drawing.
2. The final one (1) inch lift of asphalt surface course for residential subdivision streets shall be withheld until a minimum of eighty-five percent (85%) of the portion platted is occupied (occupied means a certificate of occupancy has been issued) and no conflicts exist between the water and sewer services and the proposed driveways (All documentation to be provided by the developer and approved by the City Inspector). All known base failures shall be repaired prior to application of the final one (1) inch lift of asphalt surface course.
3. Roadway Final Lift Inspection Procedures:
 - a. Owner puts down three and one-half (3.5) inches (2.5" of I19.0C, 1" of S9.5C) asphalt and raises structures to final grade (including concrete collars 1" below final grade). Asphalt is to be placed around structures to prevent damage.
 - b. Owner submits Record Drawings to the City Engineer.
 - c. Upon approval by the City Engineer, Owner may request final inspection for water and/or sanitary sewer. Owner, along with the City inspector, shall then verify the water services and/or sanitary sewer laterals are not in conflict with driveways and/or other proposed infrastructure.
 - d. The final asphalt must be placed before two (2) years have lapsed since the approval of the three and one-half (3.5) inches asphalt layer. Surety must be approved by the City to cover the two (2) year period.
 - e. After placement of the final asphalt, the Owner may request final inspection for the roadway, and upon approval, the one (1) year warranty of the roadway begins.
 - f. After placement of the final asphalt, construction traffic shall be routed to avoid newly paved streets, if possible. In the event construction traffic must be routed on newly paved streets, a bond shall be provided by the developer, to the City, during subsequent construction activities and the bond shall remain active until construction activities are completed. The required bond is intended for possible damages to the newly paved streets and, shall be in an amount established by the City. The current condition of the newly paved streets shall be established prior to continuing further construction and evaluated upon completion of the construction, at which time repairs or release of the bond shall take place. Designation of a construction vehicle route may be required.
4. Prior to placing the final layer of surface course asphalt, the City inspector shall be given a forty-eight (48) hour notification to inspect the roadway for deficiencies. All deficiency repairs are to be monitored by a City Inspector and accepted prior to application of final layer.
5. Placement of any asphalt within City of Kannapolis right of ways shall follow the NCDOT Standard Specifications for Roads and Structures for minimum and maximum lift depths, temperatures and density.
6. A pre-pave meeting shall be required prior to placing any asphalt.
7. An approved NCDOT Job Mix Formula shall be required to be submitted for each mix to be used prior to paving.
8. The contractor shall have a QMS Roadway Technician on-site during the paving operation.
9. Quality Control for density on the asphalt is the responsibility of the contractor per the NCDOT HMA/QMS SuperPave Manual. Cores or nuclear density may be used on base, intermediate and first lift of surface course mixes. Cores will not be permitted on the final lift of surface course. Only nuclear density testing shall be used on the final lift of surface course.
10. Access must be maintained during the paving operation. Residents, emergency vehicles, solid waste collection and mail delivery will need to be addressed during the pre-pave meeting.
11. Failure to meet the above requirements may result in the delay or prevention of street acceptance by the City of Kannapolis or NCDOT.

END OF SECTION

I. SIDEWALKS, RAMPS, AND DRIVEWAYS

1. Where sidewalks and pedestrian routes within street crossings (including marked and unmarked crosswalks) are provided, they must be constructed so they are accessible to all potential users, including those with disabilities and conform to Americans Disability Act.
2. Sidewalks shall be constructed of not less than NCDOT, Class B concrete, and shall be four (4) inches thick, constructed on an adequately graded base, except where a sidewalk crosses a driveway it shall be six (6) inches thick. Subgrade shall be compacted to ninety-five percent (95%) of the maximum density obtainable in accordance with AASHTO T 99 as modified by NCDOT. The surface of the sidewalk shall be steel trowel and light broom finished and cured with an acceptable curing compound. Tooled joints shall be provided at intervals of not less than five (5) feet and one-half (½) inch expansion joints at intervals of not more than fifty (50) feet. One-half (½) inch expansion joints will be required where the sidewalk joins any rigid structure. The sidewalk shall have a maximum lateral slope of two (2) percent toward the street.
3. All expansion joints shall be filled with joint sealer.
4. Planting strip adjacent to sidewalk shall be graded to one-fourth (¼) inch per foot (min.), except where excessive natural grades make this requirement impractical. In such cases, the City Engineer may authorize a suitable grade.
5. Sidewalk widths shall be a minimum of five (5) feet unless otherwise specified.
6. Approval of sidewalk construction plans must be obtained as part of the plan review process. Except in unusual circumstances, the sidewalk must be located a minimum of six (6) feet from the back of the curb or at the back of the right-of-way. A recorded public sidewalk easement is required for all sidewalk located outside public right-of-way; the width shall be equal to the distance from the right-of-way line to the back of the sidewalk plus two feet or to the face of building, whichever is less. The sidewalk easement must be recorded with the Cabarrus County or Rowan County Register of Deeds prior to issuance of a certificate of occupancy for the corresponding building(s).
7. Running slope of directional ramps shall be up to seven and one-half percent (7.5%) (eight and one-third percent (8.33%) maximum). Ramp length is not required to exceed fifteen (15) feet regardless of the resulting slope, which shall be uniform for the length of the ramp. Curb ramps are required where sidewalks intersect curbing at any street intersection and at Type III driveway connections.
8. Truncated domes shall be Federal Standard Color Code number 20109, "Red Brown".
9. Refer to the MUTCD (latest edition) for construction zone pedestrian routes and signalization and controls for actuators. Curb ramps shall be designed and constructed in accordance with the American Disability Act.
10. Where pedestrian routes are contained within a street or right-of-way, the grade of pedestrian access routes shall not exceed the general grade established for the adjacent street or highway.
11. A Driveway Permit from the City of Kannapolis is required and shall be obtained prior to making connection to a City street. If the connection is to a NCDOT street, NCDOT approval and permit shall be required.
12. Driveways shall be allocated and spaced as outlined in standard details, provided all other requirements of this article are met.
13. All driveway approaches shall be a concrete apron section ("ramp" type), except that Type III driveway entrances may be required to public or private developments that have parking spaces for two hundred (200) or more vehicles or when special conditions exist as determined by the Public Works Director or his designee. The concrete apron shall be installed to the right-of-way line or at least ten (10) feet from the edge of the roadway and/or back of curb.
14. Medians and Islands. Medians or islands may be permitted for street type driveways and private street entrances only, upon approval of the Public Works Director or his designee.

END OF SECTION

J. NCDOT COORDINATION

1. Any connection or potential impact to a NCDOT roadway shall require approval by NCDOT. It is recommended coordination meetings take place early in the development process with the developer, NCDOT and City of Kannapolis discussing potential requirements for roadway improvements, access to the site and right of way dedications. NCDOT has the ultimate authority for any work in NCDOT right of way.
2. It is the sole responsibility of the requesting party to determine if a street is State maintained or not.
3. Plan submittals, review and approvals should be coordinated concurrently with both, NCDOT and the City of Kannapolis, to avoid conflicting requirements. The coordination should take into account the review process of the two agencies may not coincide and communication of submittals from the requesting party is essential in avoiding delays. In situations where an agency's regulation differs from that of the other agency, the more restrictive of the two shall govern.
4. NCDOT and the City of Kannapolis require approvals for connections to existing roadways. The City of Kannapolis will approve any connections to City streets. Prior to obtaining Construction Plan approval, the requesting party shall provide the City of Kannapolis an approved driveway permit from NCDOT allowing access to the site from a NCDOT street.
5. During construction of the project, both NCDOT and the City of Kannapolis have enforcement authority to ensure safety in the right of way is not being compromised. Both agencies have the ability to affect the project's progress if there is reason to believe proper construction practices are not being adhered to and/or if unsuitable materials are being used in the right of way. Failure to comply with permits and the approved plans may result in revocation of permits.
6. The City of Kannapolis has the authority to request that Cabarrus County or Rowan County Code Enforcement withhold the issuance of a Certificate of Occupancy until all work is completed and in compliance with the approved permits.
7. For additional information regarding the coordination between NCDOT and the City of Kannapolis, please see NCDOT – Policy on Street and Driveway Access to North Carolina Highways, Chapter 2, Section A.

END OF SECTION

K. RETAINING WALLS

1. Retaining walls or retaining wall systems providing cumulative vertical relief greater than five (5) feet in height within a horizontal separation distance of fifty (50) feet or less shall be designed under the responsible charge of a registered design professional per the 2012 North Carolina Building Code, Section 1807.2 and NCDOT retaining wall design guidelines. These systems include but are limited to: cast-in-place walls, soil nailing, modular retaining wall system, Mechanically Stabilized Earth (MSE) Retaining Walls, H-beam retaining wall system, boulder retaining walls and gabions. Design submittals shall include copies of foundation reports, design load assumptions, and retaining wall design calculations.

Building Permit approval and inspection of retaining walls shall be conducted by Cabarrus County or Rowan County Code Enforcement as applicable.

The developer is required to provide the approved wall designs to the City of Kannapolis prior to plan approval.

The developer shall be responsible for providing geotechnical testing, engineering oversight, and construction observation of the wall construction by a qualified individual. Copies of the inspection reports and the design engineer's wall certification shall be provided with the as-built drawings for the retaining wall.

For retaining walls impacting City of Kannapolis easements, utilities, and right of ways, County approval of proper construction of the completed walls and completion of the City's Retaining Wall Certification form is required prior to the issuance of a Final Plat or Certificate of Occupancy, as applicable. If the retaining walls are used to assist with ingress/egress of City easements, the City will also be included in the approval process.

2. Mechanically Stabilized Earth (MSE) retaining walls, geogrid, soil nails, piles or caissons, or other methods used for slope stabilization or wall support, shall not be permitted within the theoretical 1:1 of the roadway. Cast in place concrete retaining walls may be considered within the theoretical 1:1 of the roadway on a case by case basis.

END OF SECTION

L. BRIDGES

1. The use of a bridge for a publicly maintained project shall require prior approval by the City Engineer.
2. Definition of a bridge as outlined in The National Bridge Inspection Standards, published in the Code of Federal Regulations (23 CFR 650.305): A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than twenty (20) feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes: it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.
3. The layout and design of bridges shall follow the current version of the NCDOT Bridge Policy manual, the NCDOT Design Manual, and the Guidelines for Drainage Studies and Hydraulic Design Manual. The bridge shall be designed under the responsible charge of a registered design professional.
4. The bridge shall be designed to include support for lighting, public water lines and other public utilities. Private utility lines are not allowed to be attached to the structure.
5. Increase in span width or reduction in culvert length to reduce permitting impacts shall not be used in bridge or culvert design.
6. Design submittals shall include copies of foundation reports, design load assumptions, and bridge design calculations for structural components.
7. The developer shall be responsible for providing geotechnical testing, engineering oversight and construction observation of the bridge and associated structures by a qualified individual. Copies of the inspection reports and the design engineer's as-built certification shall be provided with the as-built drawings for the bridge.
8. For private bridges an engineer's certification is required that shows weight and width capacity for Emergency Services to cross the bridge.

END OF SECTION

M. GREENWAYS

1. Greenways constructed in the jurisdiction of the City of Kannapolis shall follow current guidelines by NCDOT, MUTCD, AASHTO, FHWA, ADA and this manual.
2. Construction of greenways and trails shall require permits be obtained from each agency having jurisdiction within the construction area. Potential agencies requiring permits for greenway construction are: NCDOT, FEMA Conditional Letter of Map Revision (CLOMR/LOMR), U. S. Army Corps of Engineers, DWQ and NCDEQ.
3. Minimum stopping sight distance for various design speeds, vertical and horizontal curves, and grades need to be considered to ensure safe braking distance on a shared use path. The AASHTO Guide for the Development of Bicycle Facilities provides methodologies, tables and graphs of stopping sight distance for various combinations of grade and design speed.
4. Horizontal radii shall be not less than a ninety (90) feet centerline radius.
5. Radii at greenway intersections shall be a minimum of twenty (20) feet to accommodate maintenance vehicles.
6. Greenway intersections should be aligned at ninety (90) degree angles when possible.
7. Shared-use trails shall be constructed to a minimum width of ten (10) feet. Trails to be used for pedestrians only shall be constructed to a minimum width of five (5) feet.
8. Shoulders for all trails shall have a minimum two (2) foot width on each side of the trail. Five (5) foot shoulders shall be required in fill areas and three (3) foot shoulders in cut areas.
9. A clear, unobstructed, space from the edge of pavement of ten (10) feet shall be required. Trees greater than fifteen (15) inches in diameter may remain, provided they are at least two (2) feet clear of the trail.
10. Greenways and trails shall not be constructed with a crown. All greenways and trails shall be constructed with cross-slopes.
11. The minimum cross-slope shall be one percent (1%) and maximum cross-slope shall be two percent (2%).
12. Fill placement will not be allowed within the Floodway. Any grading with the Floodway will be accommodated with excavation. (The definition of fill does not include placement of materials to replace existing soils that have been removed for construction of the greenway.) Excess soil may be placed in the Floodplain outside of the Floodway as part of the Floodplain Development Permit. Exception: Fill may be placed in the Floodway when the appropriate permits or a letter of map revision are obtained as a condition of the work.
13. Longitudinal slope shall be five percent (5%) or less, unless existing contours prohibit. In the event grades are steeper than five percent (5%), an eight and one-third percent (8.33%) grade shall not be longer than two hundred (200) feet, a ten percent (10%) grade shall not exceed thirty (30) feet and a twelve and one-half percent (12.5%) grade shall not exceed ten (10) feet without a rest area.
14. Rest areas shall be a minimum of five (5) feet in length, have a width equal to or greater than the width of the trail segment to and from the rest area, have a grade that does not exceed five percent (5%), have a cross-slope that exceeds two percent (2%), have a minimal change of grade and cross-slope on the segment connecting the rest area with the main pathway and have accessible designs for amenities such as benches, where provided.
15. The typical section for greenways shall include:
 - a. Geotextile fabric for soil stabilization placed on subgrade compacted to a density of ninety-two percent (92%) of that obtained by compacting a sample of material in accordance with AASHTO T99 as modified by NCDOT.
 - b. ABC shall be placed at a six (6) inch compacted depth with a density of ninety-two percent (92%) of that obtained by compacting a sample of material in accordance with AASHTO T180 as modified by NCDOT for both nuclear and ring test.
 - c. Asphalt option: place asphalt, two (2) inches of S9.5C placed in one lift, in accordance with Section 610 of the Standard Specifications, compacted to at least ninety percent (90%) of the maximum specific gravity. Coring of the final surface course will not be allowed.

- d. Concrete option: place six (6) inches of Class AA concrete in accordance with NCDOT and ACI specifications. The concrete shall be reinforced with 6"x6"x1.4x1.4 WWF with non-structural fiber. The concrete will include one-half (½) inch expansion joints at forty (40) foot spacing and control joints at ten (10) foot spacing.
16. Provide a forty-eight (48) inch safety rail when the following circumstances are within six (6) feet of the edge of pavement:
 - a. Slope is greater than or equal to three (3) foot horizontal to one (1) foot vertical (3:1) and drop of six (6) feet.
 - b. Slope is greater than or equal to two (2) foot horizontal to one (1) foot vertical (2:1) and drop of four (4) feet.
 - c. Slope is greater than or equal to one (1) foot horizontal one (1) foot vertical to (1:1) and drop of one (1) foot.
 17. Retaining walls should be avoided within the greenway corridor. In the event retaining walls are required to be constructed; the wall may require a building permit and inspection from the respective county and be designed by a licensed professional as outlined previously in this manual. All efforts shall be made to keep the wall to a height of four (4) feet or less.
 18. The current North Carolina Building Code requires handrails for instances where the distance from the top of a boardwalk deck to the bottom of the creek or top of ground is thirty (30) inches or more. For instances where the distance is less than thirty (30) inches, a six (6) inch toe board shall be used to prevent falls.
 19. Bridges shall have at least ten (10) feet clear inside dimensions. For bridges ten (10) feet in width, a design load of H5 shall be required. For bridges twelve (12) feet in width, a design load of H10 shall be required.
 20. Overhead clearance shall be eight (8) feet minimum of vertical height for pedestrian trails and ten (10) feet of vertical height for multi-use trails. All pruning is to be done in accordance with the National Arborist Association and ANSI A300-1995 standards. No topping off, rounding over, stub, or flush cuts to trees on greenway property shall be permitted.
 21. During paving operations, dump truck loads shall be prohibited to fifteen (15) tons to prevent damage to the compacted ABC.
 22. In environmentally sensitive areas, alternative seeding specifications may be required. All areas to be mowed shall be required to follow NCDOT Specifications for seeding.
 23. Signage is required along greenway for location markers for public safety and emergency services.

END OF SECTION

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Chapter 3 STORM DRAINAGE

A. GENERAL NOTES

1. All work and materials shall conform to the latest edition of the NCDOT Standard Specifications unless otherwise specified in this manual.
2. Prior to beginning construction in the City of Kannapolis, a preconstruction meeting with the City Inspector shall be held, and submittals (shop drawings) shall be approved. The submittals should include all materials (roadway, storm and utilities) to be used during construction. Please allow two (2) weeks for the review. The review will be performed by the City Engineer or his/her designee.
3. All utility easements shall be a minimum of twenty (20) feet wide (with the main centered in the easement). See Table 4C of Appendix A for Easement Width requirements based on depth of Sewer Main. The width of easements must provide for the excavation of the pipe assuming a 1:1 cut slope and a bottom width that is at least as wide as the outside diameter of the pipe plus 2 feet. Public easements shall be dedicated to the City of Kannapolis in order for the City to accept and maintain the utilities. Easements are preferred to be located in Common Open Spaces (COS) when possible. Easements located outside of a COS shall not be centered on property lines. Easements must provide viable access with maximum slopes of 15% for maintenance vehicles. Cross slopes should not exceed 5%. If a storm drainage channel is also constructed in the easement, sufficient width shall be dedicated so that a minimum 12-foot travel area beyond the top of grade is provided.
4. Easements are to be located in Common Open Spaces (COS). Easements located outside of a COS shall not be centered on property lines.
5. Reinforced Concrete Pipe (RCP), Dual Wall High Density Polyethylene Pipe (HDPE) may be used in all storm drain applications. The City Engineer may approve the use of Polypropylene Profile Wall Pipe, Corrugated Aluminized Steel Type 2 pipe, Corrugated aluminum pipe, Corrugated aluminum alloy structural plate pipe, or Corrugated aluminum alloy structural pipe arches in special locations for culverts sixty (60) inches in diameter or greater. Type 1A corrugated metal pipe shall not be allowed. The metal pipe shall be a minimum of 14-gauge metal. All pipe must be supplied by NCDOT approved manufacturers.
6. All pipe shall be laid with the bell or groove up grade and the joint entirely interlocking.
7. All pipe shall be installed using NCDOT Specifications outlined in the NCDOT Standard Specifications for Roads and Structures, Section 300, unless otherwise noted in this manual.
8. The minimum cover for all pipes is two (2) feet measured from the final surface. Special applications for less than two (2) feet of cover will be reviewed and approved by the City Engineer individually. The maximum cover for storm drainage pipes shall at a minimum comply with the requirements of the NCDOT Highway Design Branch Roadway Design Manual, Part I, Chapter 5, and "Drainage Design" or manufacturer's recommendations. Storm pipe design that exceeds these criteria may be approved at the discretion of the City Engineer.
9. In areas where downstream impoundments will create a tailwater that backs water up into the pipe system, culverts shall be constructed with O-ring seals in the joints, which may require testing of the system. Locations of the system testing will be determined by the City Engineer.
10. When pipe testing is required, the storm structures shall also be tested as required. Vacuum testing may be used as outlined in ASTM C1244. Exfiltration tests may also be performed as follows: Plug the inlet and outlet and fill the manhole with water to within six (6) inches of the top of the manhole. Allow the water to stabilize for one-half (1/2) hour and refill the manhole to the original elevation. Mark the initial depth of water, and after one (1) hour record the drop in the water level in the manhole. The maximum allowable drop in vertical water height in the manhole shall be one-fourth (1/4) inches for all diameter sizes of manholes. If the water level in the manhole drops below the allowable drop amount, the Contractor shall repair the leak and retest.
11. Pipe velocities for the design storm event shall not exceed twenty (20) feet per second.
12. The minimum pipe slope is one percent (1 %) for all pipes, excluding special structures used for stream crossings, which should match the existing stream bed grade.
13. Storm drainage piping shall be placed in a straight alignment at uniform grade. No changes in alignment shall be allowed except at catch basins, manholes, or other junctions that provide

appropriate clean out access. The maximum length between access points is three hundred (300) linear feet.

14. The interior surfaces of all storm drainage structures shall be pointed up and smoothed to an acceptable standard using mortar mixed to manufacturer's specifications.
15. All pipes in storm drain structures shall be flush with the inside wall. The floor of all storm drain structures shall be filled with concrete to an elevation flush with the downstream invert.
16. All storm drain structures over three feet, six inches (3'6") in height must have steps in accordance with standard details set forth in NCDOT Standard Specifications for Roads and Structures.
17. Catch basins, junction boxes, and storm drainage manholes shall be sized for the number and angle of pipes entering the structure. The following structures require a PE's certification for the design of the structure and shop drawings for the structure dimensions and construction details:

STRUCTURE	HEIGHT*
Brick catch basins	> twelve (12) feet
Precast catch basins	> sixteen (16) feet
Open throat catch basins	> sixteen (16) feet
Drop inlets	> twelve (12) feet
Junction Box	> twelve (12) feet
Precast waffle wall structures	> ten (10) feet
Traffic bearing precast structures	> fifteen (15) feet
Precast manholes	> thirty (30) feet
Brick manholes	Not Allowed

*Refer to the NCDOT Roadway Standard Drawings for the location of the measurement points to determine maximum height.

18. Catch basins with frame, grates and hoods installed in curb and gutter sections less than two feet, six inches (2'6") wide shall offset the frame, grate and hood to the back of the structure to maintain a consistent width of roadway.
19. Frames, grates and hoods shall not be offset from the catch basin more than four (4) inches, front to back.
20. Density tests shall be required on trench backfill at a frequency established in the NCDOT Specifications. Test reports shall be conveyed to the City on a weekly basis.
21. Precast waffle boxes may not be used in areas with traffic bearing loads. Pipe shall enter precast waffle boxes in the area provided for knock outs, the corner or supporting wall section of a waffle box shall not be cut.
22. All graded creek banks and slopes shall be at a maximum of two (2) feet horizontal to one (1) foot vertical (2:1) and not to exceed ten (10) feet without terracing, otherwise the slopes shall be designed by a Professional Geotechnical Engineer and approved by the City Engineer on a case by case basis.
23. The contractor shall be required to submit a video of the storm system prior to acceptance of the system. In new subdivisions, two (2) videos of the storm system shall be required. The first video is required to be performed prior to the first proof roll. The second video is required after the installation of dry utilities, but prior to acceptance of the streets by the City of Kannapolis.
24. Prior to acceptance of the storm, the video of the storm system and as-built drawings shall be submitted for review and approval by the City of Kannapolis. As-builts are to be submitted in hard copies and digital formats and adhere to the As-built Checklist in Chapter 5, Section E. Once the video and as-built drawings are approved, the storm system shall be certified by the design engineer using the Certification Form in Chapter 5, Section G.

END OF SECTION

B. STANDARDS FOR STORM DRAINAGE DESIGN

1. All storm drainage design shall conform to the standards and specifications as provided in the Kannapolis Storm Water Design Manual or the more restrictive of any standards that conflict.
2. Adequate storm drainage shall be provided throughout the development by means of storm drainage pipes or properly graded channels. All pipes shall be of adequate size and capacity, as approved by the City Engineer, to carry all storm water in its drainage area. In no case, shall storm water be transmitted more than five hundred (500) feet in the gutter line. No open ditches will be permitted within the limits of the street rights-of-way except for pre-existing stream channels which may be approved by the City Engineer.
3. The lowest finish floor elevations for residential structures must be a minimum of two (2) feet above the downstream road crossing elevation or two (2) feet above the calculated one hundred (100) year flood elevation. Non-residential structures may use flood proofing practices to construct structures in areas that may be flooded.
4. Cross-drainage storm sewers shall be designed for a twenty-five (25) year, twenty-four (24) hour frequency storm. All other storm sewers shall be designed for a ten (10) year, twenty-four (24) hour frequency storm.
5. The minimum pipe size is fifteen (15) inch diameter to inlet. The minimum pipe size is eighteen (18) inch diameter for open cross pipe culverts.
6. The allowable headwater for design frequency conditions should allow for the following upstream controls:
 - a. Maximum HW/D \leq one point two (1.2)
 - b. Twelve (12) inch minimum freeboard for culverts up to three (3) feet in diameter.
 - c. Eighteen (18) inch minimum freeboard for culverts larger than three (3) feet in diameter.
 - d. Prevention of upstream property flooding.
 - e. Elevations established to delineate floodplain zoning restrictions.
 - f. Low point in the road grade that is not at the culvert location.
 - g. Ditch elevation of the adjacent terrain that will permit flow to divert around culvert.
 - h. The headwater should be checked for the one hundred (100) year flood to ensure compliance with the locally adopted floodway ordinance and one hundred (100) + one (1) criteria.
 - i. The maximum acceptable outlet velocity should be identified. Either the headwater and pipe size should be set to produce acceptable velocities, or stabilization or energy dissipation should be provided.
7. Site grading shall not increase the flow rate or velocity of runoff onto downstream properties unless specifically approved as part of a project's drainage plan. Exceptions to this will be at the discretion of the Public Works Director or his designee.
8. Downstream ponds, lakes or other man-made bodies of water shall be analyzed using the fifty (50) year storm event.

END OF SECTION

C. HIGH DENSITY POLYETHYLENE PIPE (HDPE)

1. The Product used shall be corrugated exterior/smooth interior pipe (Type S), conforming to the requirements of AASHTO Specification M294 (latest edition) for Corrugated Polyethylene Pipe and meet the minimum specifications set forth in Section 1032 of the NCDOT Standard Specifications for Roads and Structures.
2. Bell and spigot joints shall be required on all pipes inside the right-of-way. Bells shall cover at least two (2) full corrugations on each section of pipe. The bell and spigot joint shall have an O-ring rubber gasket 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.
3. All HDPE pipe installed must be inspected and approved by the City's Inspector prior to any backfill being placed. The City inspector must be present during the backfilling operation as well.
4. Bedding for HDPE pipe shall be Select Material Class III or Class II, Type 1, loosely placed to a depth as outlined in NCDOT Standard Drawing 300.01, Flexible Pipe.
5. Backfill material used to install HDPE pipe within the street right-of-way shall be Select Material, Class III or Class II, Type 1, as defined by Section 1016-3 of the NCDOT Standard Specifications for Roads and Structures. All backfill material shall be approved by the City inspector prior to placement of the material within the street right-of-way.
6. The minimum length of HDPE pipe permitted for use shall be four (4) feet. HDPE flared end sections or fittings are not allowed.
7. All HDPE pipe installed shall be third party certified and shall bear the Plastic Pipe Institute's (PPI) certificate sticker.
8. All HDPE pipe shall be checked for deflection using a mandrel no sooner than thirty (30) days after installation of the final backfill and prior to the final acceptance of the pipe. The mandrel size shall not be more than five percent (5%) of the inside diameter of the pipe, see Table 3B.1 of Appendix A for dimensions of mandrel.
9. ASTM F1417 or ASTM 2487 shall be used when testing is required by the City Engineer.

END OF SECTION

D. POLYPROPYLENE PROFILE WALL PIPE

1. Polypropylene Profile Wall twelve inch through sixty inch (12"–60") dual pipe shall have a smooth interior and annular exterior corrugations; thirty inch through sixty inch (30"–60") triple wall pipe shall have smooth interior and exterior surfaces with the exterior having minor annular corrugations.
2. Polypropylene Profile Wall pipe of the sizes shown or specified shall conform to:
 - a. ASTM F2736 Standard Specification for six inch to thirty inch (6"-30") Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
 - b. ASTM F2764 Standard Specification for thirty inch to sixty inch (30"-60") Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications
3. Submittals shall include:
 - a. Manufacturer's product information including details of installation, joints and pipe/manhole connections; properties and strengths of pipes; and instructions on storage, handling, transporting and installation.
 - b. Pipe design load calculations (Suggested if deep burial is an issue).
 - c. Factory test reports.
4. Pipe shall be joined with a gasketed integral bell and spigot joint meeting the requirements of ASTM F2736.
5. Pipe diameters twelve inch through sixty inch (12"-60") shall be watertight according to the requirements of ASTM D3212, with the addition of a fifteen (15) psi pressure requirement. Spigot shall have two (2) gaskets meeting the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gaskets are free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.
6. Twelve inch through sixty inch (12"-60") diameters shall have a reinforced bell with a polymer composite band installed by the manufacturer.
7. Special care in handling shall be exercised during delivery, distribution, and storage of pipe to avoid damage and unnecessary stresses. Damaged pipe will be rejected and shall be replaced at the Contractor's expense. Pipe and specials stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.
8. Fittings shall not be allowed. Any change in direction and/or additional pipes shall have a catch basin, manhole or junction box installed at the necessary location.
9. Polypropylene compound for pipe and fitting production shall be an impact modified copolymer meeting the material requirements of ASTM F2736 or ASTM F2764.
10. Polypropylene pipe shall be installed within six (6) months of delivery to project site unless written approval is granted from the manufacturer and approved by the Engineer. Approval of an extension in storage time must be requested in writing and accompanied by inspection within two (2) weeks prior to installation by an authorized representative of the manufacturer.
11. Proper long-term above ground storage of polypropylene pipe and fittings shall conform to the following procedure:
 - a. Pipe shall be stored on flat timber supports to facilitate placement and removal of lifting slings around pipe. All pipes shall be chocked to prevent rolling in high winds.
 - b. If stacked, minimum three (3) inch wide timber supports shall be used and placed at the quarter points with chocks. Pipe shall not be stacked higher than ten (10) feet above the ground.
 - c. Pipe and Fitting laydown should be relatively flat and free of other potentially damaging debris. Laydown area should have proper drainage. At no time, shall any portion of pipe or fittings be stored in standing water for more than twenty-four (24) hours.
12. Pipe shall be handled using textile slings or other means recommended by manufacturer. Chains and cables in direct contact with pipe are not recommended.
13. Installation shall be in accordance with NCDOT Specifications, Section 300, and ASTM D2321 and manufacturer recommended installation guidelines, with the exception that minimum cover in traffic areas for twelve inch through forty-eight inch (12"-48") diameters shall be one (1) foot and for sixty (60) inch diameters the minimum cover shall be two (2) feet in single run applications.

Backfill for minimum cover situations shall consist of Class 1, Class 2 ninety-five percent to eighty-five percent (95-85% SPD), Class 3 ninety-five percent to ninety percent (95-90%), Class 4 ninety-five percent (95%) material. Maximum fill heights depend on embedment material and compaction level. Heavy construction loading cover heights shall be a minimum of three (3) feet of cover for vehicles of 30T to 60T.

14. Jointing:

- a. Clean ends of pipe and coupling components.
 - b. Apply joint lubricant to pipe ends and elastomeric seals of coupling. Use only lubricants approved by the pipe manufacturer.
 - c. Use suitable equipment and end protection to push or pull the pipes together.
 - d. Do not exceed forces recommended by the manufacturer for coupling pipe.
 - e. Join pipes in straight alignment. Do not allow any deflection angle or pipe misalignment to exceed the maximum permitted by the manufacturer.
 - f. Backfill shall be Non-cohesive materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, non-cohesive soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.
 - g. Backfilling of trenches shall be accomplished immediately after the pipe is laid. The fill around the pipe shall be placed in layers not to exceed eight (8) inches. Each layer shall be thoroughly compacted to ninety-five percent (95%) of the maximum density obtainable with the AASHTO T 99 Modified Proctor Test (a density of one hundred percent (100%) AASHTO T 99 Modified Proctor is required for the top eight (8) inches). Backfill the trench as shown on plans or per the Maximum Cover Height Table 3C.1 in Appendix A.
15. To assure watertightness, field performance verification may be accomplished by testing in accordance with ASTM F1417 or ASTM F2487. Appropriate safety precautions must be used when field-testing any pipe material.
16. All Polypropylene Profile Wall pipe shall be checked for deflection using a mandrel no sooner than thirty (30) days after installation of the final backfill and prior to the final acceptance of the pipe. The mandrel size shall not be more than five percent (5%) of the inside diameter of the pipe, see Table 3B.1 for dimensions of mandrel.
17. Provide properly trained manufacturer's service technician employed by the manufacturer to ensure proper installation of Polypropylene Profile Wall Pipe. The service technician shall observe and make recommendations to the Contractor as to the care and methods of construction.
18. Minimum service requirements for polypropylene pipe shall include, one half (0.5) day or four (4) hour minimum of manufacturer QC. Cost shall include all travel and expenses of QC representative. The four (4) hour day shall not include travel to the site. Shall not include inclement weather days. Coordinate visit so that it occurs during installation of the first reach of pipe on the project. Cost shall be included in Contractor's total price bid.

END OF SECTION

E. REINFORCED CONCRETE PIPE

1. All concrete shall meet the minimum specifications set forth in Section 1032 of the NCDOT Standard Specifications for Roads and Structures.
2. Concrete pipe used within the street right-of-way shall be a minimum of Class III Reinforced Concrete Pipe, with a minimum diameter of fifteen (15) inches (eighteen (18) inches minimum on cross drain culverts within the ETJ and open-ended culverts under a road). Installation of Class IV or higher concrete pipe shall be identified on the As-Built Plan and the City inspector shall be given documentation and notification of this information prior to construction.
3. Use flexible plastic joint material except when material of another type is specified in the contract documents. Joint material of another type may be used when permitted.
4. For all pipe forty-two (42) inches in diameter or larger;
 - a. wrap filtration geotextile fabric around all pipe joints. Extend geotextile at least twelve (12) inches beyond each side of the joint. Secure geotextile against the outside of the pipe by methods approved by the Engineer.
 - b. No. 57 stone shall be used as bedding. Bedding shall consist of a minimum of seven (7) inches in depth under the pipe, continuing up to the springline of the pipe.
5. For all pipe under forty-two (42) inches in diameter, NCDOT Section 300 shall be used for installation.
6. ASTM C969 and ASTM C1103 are acceptable methods of testing concrete pipe when testing is required by the City Engineer.

END OF SECTION

F. CORRUGATED ALUMINIZED METAL PIPE (SPECIAL DESIGN)

1. Bedding, installation and backfill of CAMP piping shall follow NCDOT specifications for flexible pipe in Section 300.
2. The minimum cover for CAMP piping shall follow NCDOT specifications and manufacturer recommended specifications, whichever is the more restrictive.
3. Corrugated aluminum alloy culvert pipe shall meet AASHTO M 196, except that Type IA pipe will not be permitted.
4. When a pipe is proposed to be installed in a stream with high velocity (more than fifteen (15) fps) runoff and with heavy bed load (especially angular rocks with sharp corners), the design and pipe gage must be evaluated for abrasion.
5. Required to submit testing of pH with the soil water environment shall have a pH range between four (4.0) to nine (9.0) and a resistivity of five hundred (500) ohm-cm or greater.
6. Galvanized steel, asphalt coated and polymer coated pipe shall not be permitted.

END OF SECTION

G. SPECIAL STRUCTURES

1. Bridges, arch culverts, retaining walls, box culverts bottomless culverts, large headwalls, etc. shall be reviewed on a case by case basis depending on the intended use and environmental impacts associated with the project. The City Engineer shall set forth guidelines for the design of Special Structures.
2. All Special Structures shall be designed by a licensed professional with credentials to support the intended design and work.
3. All Special Structures shall follow the specifications, certifications and approval processes associated with Federal, State, and Local agencies, along with the requirements of this manual.

END OF SECTION

H. WATER QUALITY STANDARDS FOR DESIGN

1. Both point and non-point source pollutants shall be managed to comply with the Phase II NPDES Storm Water Permit requirements for post-construction pollution control.
2. Articles 4 and 9 and Appendix C in the Kannapolis UDO outlines requirements for post-construction compliance.
3. The City of Kannapolis utilizes the State of North Carolina Department of Environmental Quality Design Manual for standards of design to obtain compliance to these requirements within the city limits or ETJ.
4. Alternate SCM designs may be used, but the products to be used must be part of the NCDEQ Preliminary Evaluation Period Program and include specifications for monitoring and replacement with an approved SCM if the product does not perform as designed.

END OF SECTION

I. FLOOD STUDIES

1. Flood studies documenting the impact of drainage structures to be constructed within a one hundred (100) year floodplain are required. Proposed structures should not increase the water surface elevation on upstream property owners unless drainage easements are obtained. The culvert design capacity for these structures is the one hundred (100) year storm event.
2. Flood Studies documenting the impact of fill placed in the one hundred (100) year floodplain may be required for a project. See the City of Kannapolis UDO sections related to Flood Protection for additional guidance on when a flood study is required for fill placement.
3. Flood Studies submittals should include digital files of the HECRAS models used to evaluate the impacts and a copy of the work maps used to prepare the study.
4. Work Maps should clearly label the existing and proposed conditions, the existing FEMA data, and the proposed ineffective areas, floodway modifications, revised flood fringe areas, and the revised one hundred (100) year flood fringe.
5. Guidance for the Preparation of Flood Studies can be found in the following documents:
 - a. NC Department of Floodplain Mapping – Riverine Hydrologic & Hydraulic Engineering Guidelines and Standards
 - b. FEMA – Procedures For “No-Impact” Certification for Proposed Developments in Regulatory Floodways
 - c. FEMA – MT-2 Application Forms and Instructions for Conditional Letters of Map Revision and Letters of Map Revision.
 - d. FEMA – MT-1 Application Forms & Instructions Conditional Letters of Map Amendment (CLOMAs), Final Letters of Map Amendment (LOMAs), Letters of Map Revision Based on Fill (LOMR-Fs) and Conditional Letters of Map Revisions Based on Fill (CLOMR-Fs)
 - e. NCDOT – Guidelines for Drainage Studies and Hydraulic Design 2016

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Chapter 4 UTILITIES

A. GENERAL NOTES

1. Specifications used in addition to this manual are City of Kannapolis Water and Sewer Extension Policy, Code of Ordinances Chapter 17 – Water and Sewer, NCAC, NCDEQ, NCDOT Standard Specifications for Roads and Structures and WSACC.
2. All water and sewer permits shall be obtained prior to beginning construction. Any piping installed prior to obtaining permits will not be accepted. Water and sewer permits are obtained through WSACC and NCDEQ.
3. All utility easements shall be a minimum of twenty (20) feet wide (with the main centered in the easement). See Table 4C of Appendix A for Easement Width requirements based on depth of Sewer Main. The width of easements must provide for the excavation of the pipe assuming a 1:1 cut slope and a bottom width that is at least as wide as the outside diameter of the pipe plus 2 feet. Public easements shall be dedicated to the City of Kannapolis in order for the City to accept and maintain the utilities. Easements are preferred to be located in Common Open Spaces (COS) when possible. Easements located outside of a COS shall not be centered on property lines. Easements must provide viable access with maximum slopes of 15% for maintenance vehicles. Cross slopes should not exceed 5%.
4. Prior to beginning construction in the City of Kannapolis, a preconstruction meeting with the City Inspector shall be held, and submittals (shop drawings) shall be approved. The submittals should include all materials (roadway, storm and utilities) to be used during construction. Please allow two (2) weeks for the review. The review will be performed by the City Engineer or his/her designee.
5. Casing pipe for boring and jacking operations shall be steel pipe and have a minimum yield strength of thirty-five thousand (35,000) psi. The casing pipe shall be installed using City of Kannapolis Standard Drawings.
6. Water and sewer piping and manholes shall be tested prior to placing ABC, curb and gutter or asphalt. No laterals shall cross back through an utility easement or within a ROW. Also no bends will be permitted for lateral lines between the tap and the meter location.
7. Master meters for water are not permitted for use at multi-family facilities. Each structure is required to have the proper backflow prevention installed and be individually metered.
8. Continuity tests shall be performed on all tracer wire installed on all utility systems.
9. As-builts (Record Drawings) shall be submitted after construction is complete. The as-builts should show measurements and elevations for all fittings, valves, fire hydrants, water services, manholes, laterals, types of pipe installed and other pertinent information relevant to the project. As-builts are to be submitted in hard copies and digital formats and adhere to the As-built Checklist in Chapter 5, Section E.
10. Prior to the City of Kannapolis accepting any utility into public service, a final utility inspection is required and as-built drawings and engineer's certifications shall be obtained and approved by the City of Kannapolis and NCDEQ.
11. Public water extensions shall be accepted into public service prior to any combustible materials being delivered or vertical construction beginning on new construction sites. Any deviation of this requirement shall need written permission from the City Engineer and Kannapolis Fire Chief.
12. Any utility cuts performed in City of Kannapolis streets shall be patched using City of Kannapolis Standard Details.
13. All utility structures installed in existing streets shall require excavatable flowable fill concrete be used as backfill to fill the voids between the structure and the walls of the excavation.
14. Density tests shall be required on trench backfill at a frequency established in the NCDOT Specifications. Test reports shall be conveyed to the City on a weekly basis.
15. A minimum notice of two (2) business days is required to schedule testing or final inspections of utilities.

END OF SECTION

B. SANITARY SEWER

1. All sanitary sewer piping shall be either PVC or Ductile Iron Pipe.
 - a. PVC four inch through fifteen inch (4"-15") shall be Solid wall ASTM D3034, SDR 35, Cell Classification 12454
 - b. PVC eighteen inch through forty-eight inch (18"-48") shall be Profile wall ASTM F794 Stiffness PS46. Ductile Iron Pipe (DIP) all sizes shall be Class 50.
2. All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than two (2) feet per second, based on Manning’s formula using an “n” value of zero point zero, one, three (0.013). Minimum slopes for piping are as follows:

Diameter of Pipe (inches)	Minimum Slope (feet per 100 feet)
6	0.60
8	0.40
10	0.28
12	0.22
14	0.17
15	0.15
16	0.14
18	0.12
21	0.10
24	0.08
27	0.07
30	0.06
36	0.05

3. PVC pipe shall be shipped, stored, and strung in a manner to limit its total accumulated exposure to sunlight and UV radiation to no more than four (4) weeks.
4. All materials shall be new, manufactured either in the year that construction begins or the previous year.
5. Transitions between PVC and DIP shall be made with an Adaptor Coupling SWRxDIOD Harco PT #2834-080 or approved equal.
6. Sanitary Sewer Bedding:
 - a. PVC - No.57 stone six (6) inches under the pipe to six (6) inches over the top of pipe
 - b. DIP - No.57 stone six (6) inches under the pipe.
7. Number fifty-seven (57) stone is required on all sewer laterals; see Kannapolis Standard Details.
8. Tracer wire is required to be taped to all sewer piping, including mains and laterals. Tracer wire shall be number twelve (#12) plastic coated solid copper wire. Non-metallic location tape is required one (1) foot above the sewer piping.
9. Laterals shall have a No-Hub cast iron cap with a stainless-steel No-Hub coupling at the clean out at the property line.
10. Laterals are to be installed to the center of the lot. Driveway plan negates the center of lot. Lateral lines shall not cross back over an easement for sewer or water mains.
11. Clean outs shall not be permitted in sidewalks or driveways or other pavements.. Any clean outs in conflict shall be capped at the main and a new lateral connected at the main and installed to the property line.
12. All clean outs shall be installed uniformly on both sides of the street.
13. For pipe twenty-four (24) inches in diameter and less, low pressure air testing shall be used in lieu of exfiltration testing. Low pressure air testing shall comply with ASTM C828 for PVC pipe. See Table 4B.1 in Appendix A for Air Test requirements.
14. A representative of the City of Kannapolis shall be present for all testing. The design engineer or engineer’s representative may also be required to be present during testing. The contractor is responsible for scheduling the design engineer.

15. No basement finished floor elevation shall be lower than the downstream sanitary sewer rim elevation.
16. The contractor shall be required to submit a video of the sanitary sewer system prior to acceptance of the system. In new subdivisions, one (1) video of the sanitary sewer system shall be required. The video is required after the installation of dry utilities, but prior to acceptance of the streets by the City of Kannapolis.
17. Prior to acceptance of the sanitary sewer system, the video of the sewer system and as-built drawings shall be submitted for review and approval by the City of Kannapolis. As-builts are to be submitted in hard copies and digital formats and adhere to the As-built Checklist in Chapter 5, Section E. Once the video and as-built drawings are approved, the design engineer shall complete and submit to the City of Kannapolis the Sanitary Sewer Certification forms which will be sent to the state for approval.

END OF SECTION

C. SANITARY SEWER MANHOLES

1. Manholes shall be constructed with precast bases as indicated in the details.
2. Inside drops shall be used for eight (8) inch to twelve (12) inch diameter sewer unless indicated otherwise on the drawings.
3. Manhole inside diameters* shall be as follows, unless otherwise directed by the engineer or noted on the drawings, according to the largest sewer pipe connected to the manhole:

Pipe Diameter (inches)	Manhole Diameter (feet)
8 to 16	4
18 to 36	5
39 to 54	6
54 and larger	8

*The minimum diameter of all drop manholes (inside or outside) shall be five (5) feet.

4. Minimum invert elevation entering manhole shall be 0.20' above exiting invert or top of invert out pipe minus diameter of the entering, whichever is greater.
5. Drop manholes shall be required on sewer entering a manhole at an elevation greater than two (2) feet above the manhole invert. Where the difference in elevation is less than two (2) feet, the invert shall be filleted to prevent solids deposition.
6. The flow channel shall be made to conform as closely as possible in shape, and slope to that of the connecting sewers.
7. All connections to manholes shall require resilient connectors, conforming to ASTM C923, with stainless steel clamp, drawbolt and nut or "A" Lok. Connections to existing manholes shall be made by coring into the existing manhole wall and installation of a resilient connector.
8. The connecting pipe shall not protrude more than two (2) inches inside the manhole wall.
9. All manhole components shall be designed to withstand an H-20 loading. All precast manholes installed in the NCDOT right of way shall be approved by NCDOT.
10. Concrete used in the manufacture of manholes shall be four thousand (4,000) psi minimum at twenty-eight (28) days, containing four percent (4%) minimum air content, cement at a rate of five hundred, sixty-four (564) pounds per cubic yard minimum, and conform to ASTM C478, C890, C891, C923, C33, C494, and C260.
11. Manhole reinforcement shall conform to ASTM A615 grade 60 deformed bar, ASTM A82 or ASTM A185 welded wire fabric.
12. All joints between precast components shall be sealed with butyl rope no less than fourteen (14) feet long and having a cross-sectional area no less than the annular space times the height of the joint. The external joint shall be wrapped with a polyethylene backed flat butyl rubber sheet no less than one, sixteenth (1/16) inches thick and six (6) inches wide applied to the outside perimeter of the joint.
13. Manhole steps shall be provided in all sections of the manhole (bases, risers, cones) and be aligned vertically on fifteen (15) inch centers. The bottom step shall be no more than twenty-six (26) inches from the top of the bench in the base section. The step pull-out strength shall be one thousand (1,000) lbs. minimum in accordance with ASTM C478. Steps are to be installed with a compression fit in tapered holes or cast in place. Steps shall not be vibrated or driven into freshly cast concrete or grouted in place. Materials for the steps shall conform to ASTM A615, Grade 60 minimum, and be totally encapsulated in copolymer polypropylene per ASTM D4101.
14. Manholes shall have a maximum of twelve (12) inches of grade rings placed on the structure. All joints, including grade rings, shall be sealed with butyl sealant, rope and sheet types.
15. All frames and covers on sewer manholes shall be solid and state the use of system, "SANITARY SEWER" on the cover. Use NCDOT Standard Drawing 840.54.
16. All frames shall be set on butyl sealant and wrapped with sheet butyl. All frames set outside of the roadway shall be bolted to the manhole with at least two (2) bolts on opposing sides of the frame. Frames and covers located outside the roadway shall extend at least two (2) feet above grade unless otherwise specified by the Engineer or noted on the drawings. Any frames and covers located in roadways or shoulders shall conform to the slopes surrounding the frame and covers.

17. Manholes shall be designed for protection from the one hundred (100) year flood by either setting the frame and cover two (2) feet above the one hundred (100) year flood elevation, or installing a watertight frame and cover with a vent two (2) feet above the one hundred (100) year flood elevation. Manholes shall be vented every one thousand (1,000) feet or every other manhole, whichever is greater.
18. Vent pipes shall be Grade B, FY=35,000 psi, three (3) inch diameter with a mesh stainless steel screen in the opening.
19. Manholes shall be installed at the end of each line, at all changes in grade, size, or alignment, at all intersections, and at distances not greater than four hundred, twenty-five (425) feet. Sewer mains greater than four hundred, twenty-five (425) feet may be allowed at the discretion of the Public Works Director or City Engineer.
20. Manholes shall set on a minimum of six (6) inches of No.57 stone.
21. The connecting pipe shall not protrude more than two (2) inches inside the manhole wall.
22. Where corrosive conditions are anticipated, consideration shall be given to providing corrosion protection on the interior of the manhole.
23. A vacuum of ten (10) inches of mercury shall be placed on the inside of the manhole. If the vacuum drops from ten (10) to nine (9) in less than sixty (60) seconds for a four (4) foot diameter manhole, seventy-five (75) seconds for a five (5) foot diameter manhole, ninety (90) seconds for a six (6) foot diameter manhole, one hundred and five (105) seconds for a seven (7) foot diameter manhole, one hundred-twenty (120) seconds for an eight (8) foot diameter manhole, and one hundred-fifty (150) seconds for a ten (10) foot diameter manhole, the manhole fails the vacuum test. Vacuum testing shall be performed on one hundred (100%) percent of the manholes installed. No vacuum testing can be performed with visible leaks in the manhole.
24. All visible leaks shall be eliminated. In the event a leak in the manhole occurs after a successful vacuum test, the leak shall be repaired and another vacuum test shall be performed on the leaking manhole.

END OF SECTION

D. WASTEWATER PUMP STATIONS

1. The City of Kannapolis policy for wastewater pump stations is to minimize the need for pump stations. The additional expense of operation and maintenance, along with the environmental concerns associated with pump stations is the basis of the policy.
While the construction of pump stations is not viewed as the initial option for providing sewer service, there are situations that pump stations can be allowed. The following criteria will be utilized during the consideration of developer funded pump stations.
 - a. The pump station can be eliminated by a project or combination of projects, all of which are included for funding in the approved five (5) year CIP. The pump station can be eliminated by a project being done under a reimbursable program and the funds have been made available to Kannapolis Public Works for construction.
 - b. The proposed pump station is at an appropriate location and has adequate capacity or expansion capacity to serve as a permanent or long term facility and gravity service is cost prohibitive or not possible due to other circumstances.
 - c. The construction of the proposed pump station would include elimination of one or more existing pump stations.
 - d. The construction of the proposed pump station would facilitate significant progress toward achievement of land use goals and strategies described by current, officially approved planning documents and no other reasonable options are available for service.

In all cases, the receiving system must have available capacity to carry the proposed pump station discharge. Any upgrades required will be the responsibility of the customer requesting the pump station.
2. All wastewater pump stations shall be designed by Professional Engineer licensed in the North Carolina, comply with the NCDEQ, Minimum Design Criteria for the Permitting of Pump Stations and Force Mains and be permitted through NCDEQ.
3. Other permits shall be obtained when applicable. The additional permits may include, but are not limited to: NCDEQ Erosion Control Permit, City of Kannapolis Grading Permit, Nationwide 12 Permit, Individual 404 Permit, or applicable 401 Certifications. Also, compliance with 15A NCAC 2B .0200 "Classifications and Water Quality Standards Applicable to Surface Water and Wetlands of North Carolina" and 15A NCAC 2H .0100 "Stormwater Management" is required.
4. The following specifications, reiterates some of the specifications required by NCDEQ Minimum Criteria for the Permitting of Pump Stations and Force Mains. For the complete set of specifications from NCDEQ, visit their website at <https://deq.nc.gov>.
5. Only non-clog pumps, designed and manufactured for use in conveying raw, unscreened wastewater shall be permitted. The pumps shall consider the duty requirements, physical and chemical characteristics of the wastewater being conveyed and be capable of handling a three (3) inch solid and any trash or stringy material that can pass through a four (4) inch hose. Pumps shall be designed for continuous duty.
6. The impellers shall have blades that are generally forward rounded or otherwise configured to avoid catching solids, trash, and stringy material.
7. Pumps shall have no less than a four (4) inch diameter suction and discharge opening.
8. Multiple pumps shall be used such that the pump station is capable of conveying the peak hourly wastewater flow to its desired outfall location with the largest single pump out of service.
 - a. In duplex pump stations, the pumps shall be of the same capacity.
 - b. If pumps in series are required to meet capacity or total dynamic head requirement, each set of pumps in series shall be viewed as a single pumping unit.
 - c. Priming pumps as well as any other auxiliary system that is required for pump functionality shall also be provided in multiple numbers.
9. Determination of pump capacity shall be based on wastewater flows expected to become tributary to the pump station for the entire project/development at build out. For regional pump stations, pump capacity shall be based on wastewater flows expected to become tributary from the entire service area over the life of the pump station.
10. The minimum allowable design daily wastewater flow to the pump station shall be as follows:

- a. Where a pump station is designed to serve a developed service area, historical potable water use or wastewater flow generation data may be used to determine design daily wastewater flow.
 - b. Where a pump station is designed to serve a broad service area for which specific development is not known, design daily wastewater flows may be established based on historical data for the broad service area or established long-range wastewater planning criteria.
 - c. The storage capacity for the pump station shall include two (2) hour storage above the high water alarm elevation at the peak flow rate.
11. Pump capacity shall also be based upon the need to maintain a minimum velocity of two (2) feet per second.
 12. Pump selection shall be based on a hydraulic analysis of the system through which the wastewater is to be conveyed.
 13. The analysis shall utilize total dynamic head versus capacity, static head requirements of the system, friction head requirements, head derived from any minor losses, and if applicable, the pressure head at the junction of the existing force main.
 14. System curves shall be generated and evaluated not only for present day conditions, but also for conditions that may exist over the expected lifetime of the pump station.
 15. The Hazen-Williams friction coefficient, C, appropriate for the force main pipe material and age of the force main shall be used.
 16. Pump selection shall be selected such that all design operating points are on the pump curve, will not cavitate, and their operating efficiency is maximized during all hydraulic conditions that may exist over the expected lifetime of the pump station.
 17. Consideration shall be given to minimizing motor speed and the motor horsepower shall be at least one point one-five (1.15) times what is required during the entire pump performance curve.
 18. Constant speed pumps shall be cycled such that the number of starts is minimized and resting times are maximized to avoid overheating and overstressing of the pump motor.
 19. All pumps shall be UL or FM listed, hermetically sealed, air filled submersible type, electric motor for operation at four hundred sixty (460) Volt, three (3) phase, sixty (60) hertz power. Pumps shall be designed for use in electrically hazardous locations, general use in pumping sewage, and be provided with thermal overload protection and moisture detection system.
 20. A quick disconnect suction line shall be installed in the wet well, one (1) foot above finished floor, extending above the finished grade of the wet well. The suction line shall be restrained joint DIP.
 21. A quick disconnect pump connection shall be required at location designated by the City Engineer.
 22. If the pump station will be maintained by the City, the tract of land where the pump station will be located shall be deeded and recorded to the City of Kannapolis. The tract shall be large enough to accommodate the pump station, structures, emergency generator, parking, and maneuvering of maintenance vehicles, accommodate grading, ingress/egress to the site, and a security fence.
 23. All ports of entry to the pump station, structures, vaults, panels, etc. shall be lockable.
 24. Adequate indoor and outdoor lighting shall be provided at the site.
 25. The security fence shall be chain link, eight (8) feet high, around the entire perimeter and have double-swing gates with a minimum clear opening of fourteen (14) feet.
 26. Roads for ingress/egress of pump stations shall be evaluated on a case by case basis to adequately serve the pump station in any weather condition.
 27. All structures shall be designed and constructed in complete compliance with all applicable state, local and federal codes as well as applicable Occupational Safety and Health Administration (OSHA) and National Fire Protection Association (NFPA) standards and display all applicable safety placards.
 28. Piping and valves shall be designed and installed per the NCDEQ, Minimum Design Criteria for the Permitting of Pump Stations and Force Mains.
 29. The site shall have a water supply. If municipal water is the source of potable water, a three-fourths ($\frac{3}{4}$) inch water service with a reduced pressure principle backflow prevention device is required. If municipal water is unavailable, a well shall be required to provide water. Wells shall be required to deliver ten (10) gallons/minute at forty (40) psi and be marked as non-potable. A freeze-proof yard hydrant is required inside of the security fence.

30. All electrical systems and equipment shall be designed and installed meeting the standards of Underwriters Laboratories Incorporated (UL), National Electrical Manufacturer's Association (NEMA), National Fire Protection Association (NFPA), North Carolina State Building Code (NCSBC), National Electrical Code (NEC) and NCDEQ, Minimum Design Criteria for the Permitting of Pump Stations and Force Mains (MDCPPSFM).
31. Contact Kannapolis Public Works Department, (704) 920-4200, to obtain the current requirements for installation of telemetry and other instrumentation.
32. Stand-by power generation is required for pump stations. The stand-by power shall be fueled by natural gas, where available, or liquid propane, where natural gas is not available. The generator shall be sized to adequately supply the pump station with consistent power enough to operate the pumps and supporting accessories throughout a power outage. The generating unit shall be located in a building structure or otherwise protected from the weather elements and meet the minimum requirements per the NCDEQ, Minimum Design Criteria for the Permitting of Pump Stations and Force Mains.
33. Testing of all appurtenances associated with the pump station shall be performed per the NCDEQ, Minimum Design Criteria for the Permitting of Pump Stations and Force Mains and/or local specifications.
34. Operations and Maintenance (O&M) Manuals shall be provided to the City upon start-up of the pump station. The manual shall be prepared using the criteria in the NCDEQ, Minimum Design Criteria for the Permitting of Pump Stations and Force Mains.
35. Prior to acceptance of the pump station, as-built drawings shall be submitted for review and approval by the City of Kannapolis. As-builts are to be submitted in hard copies and digital formats and adhere to the As-built Checklist in Chapter 5, Section E. Once as-built drawings are approved, the design engineer shall complete and submit to the City of Kannapolis the Sanitary Sewer Certification forms which will be sent to the state for approval. Any additional permits for structures, electrical, etc. shall have the approving agency's certification of compliance and the permit closed-out.

END OF SECTION

E. FORCE MAINS

1. Force mains shall be designed per NCDEQ, Minimum Design Criteria for the Permitting of Pump Stations and Force Mains, Section 4.0.
2. Pipe materials and specifications shall be selected based on the installation and operating conditions of the system and shall consider the following criteria:
 - a. Installation depth and overburden pressure.
 - b. Soil conditions and groundwater pressure.
 - c. Corrosion resistance from both external and internal sources.
 - d. Strength required withstanding internal pressures expected during normal operation as well as those resulting from hydraulic surges and water hammer.
3. Force mains shall be constructed of the following pipe:
 - a. Ductile iron pipe (DIP) – DIP shall conform to ANSI/AWWA C151/A21.51 “Ductile Iron Pipe, Centrifugally Cast in Metal Molds for Water or Other Liquids.”
 - i. The thickness and pressure class of DIP pipe required for the installation and operating conditions during the expected service life of the force main shall be determined in accordance with ANSI/AWWA C150/A21.50 “Thickness Design of Ductile Iron Pipe.”
 - ii. Fittings for DIP shall conform to ANSI/AWWA C110/A21.10 “Ductile-Iron and Gray-Iron Fittings, three inch through forty-eight inch (3”-48”) for Water and Other Liquids” or ANSI/AWWA C153/A21.53 “Ductile Iron Compact Fittings, three inch through twenty-four inch (3”-24”) and fifty-four inch through sixty inch (54”-60”) for Water Service.”
 - iii. Force mains of DIP shall have mechanical or gasketed push-on type joints. If exposed, force mains of DIP shall have flanged joints. Restrained joint DIP may be used for anchoring purposes. Gaskets shall be manufactured of vulcanized natural or synthetic rubber in accordance with ANSI/AWWA C111/A21.11 “Rubber Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.” Flanged DIP shall conform to ANSI/AWWA C115/A21.15 “Flanged Ductile Iron Pipe with Ductile Iron or Gray-Iron Threaded Flanges.”
 - iv. Consideration shall be given to the existence of or the potential for development of corrosive environments within and outside the force main shall be performed. Sources of corrosion may include: acidic soils, septic wastewater, cathodic protection from other utilities, and air entrainment within the force main. Where corrosion is deemed to be a serious problem, DIP shall be provided with cathodic protection or an internal/external encasement, lining, or coating appropriate for the pipe material and situation. Such encasements, linings and coating shall be manufactured or applied in accordance with the appropriate ANSI and AWWA standards.
 - b. Polyvinyl Chloride (PVC) – PVC material used in the manufacture of PVC pipe shall conform to ASTM D1784 “Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.”
 - i. PVC pipe shall conform to AWWA C900 or C905. The thickness and pressure class of PVC pipe required for the installation and operating conditions during the expected service life of the force main shall be determined in accordance with AWWA C900 or AWWA C905, but shall be a minimum or Pressure Class 200 with an SDR of 14 or less.
 - ii. Force mains of PVC pipe shall have elastomeric gasketed push-on type joints. Gaskets shall be manufactured in accordance with ASTM F477 “Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.”
 - iii. Mechanical joint DIP fittings conforming to ANSI/AWWA C110/A21.10 and C116/A21.16-98 shall be used for force mains four inches in diameter and larger.
 - iv. PVC pipe shall be shipped, stored, and strung in a manner to limit its total accumulated exposure to sunlight and UV radiation to no more than four weeks.

4. All force mains shall be identified with green plastic locator tape, with black lettering clearly identifying the pipeline as sanitary sewer. The tape shall be placed approximately one (1) foot above the pipe.
5. All materials shall be new, manufactured either in the year that construction begins or the previous year.
6. Tracer wire is required to be taped to the force main. Tracer wire shall be number twelve (#12) plastic coated solid copper wire.
7. Force mains shall be adequately anchored to resist thrusts that may develop at fittings and any other location where a change in flow direction occurs.
8. Testing of the force main cannot be performed until the force main has been backfilled and a minimum of seven (7) days after the last thrust block has been poured.
9. The hydro-static test pressure shall be one and one-half (1.5) times the maximum pump operating head range, but not less than one hundred (100) psi. The test pressure shall be held a minimum of two (2) consecutive hours.
10. Prior to acceptance of the force main, as-built drawings shall be submitted for review and approval by the City of Kannapolis. As-builts are to be submitted in hard copies and digital formats and adhere to the As-built Checklist in Chapter 5, Section E. Once as-built drawings are approved, the design engineer shall complete and submit to the City of Kannapolis the Sanitary Sewer Certification forms which will be sent to the state for approval.

END OF SECTION

F. WATER DISTRIBUTION

1. Water service piping shall be Type K Copper tubing, per ASTM B-88. End connections shall be compression. Copper services shall conform to AWWA C-800.
2. Water piping materials shall be either PVC or Ductile Iron Pipe (DIP). Two inch to four inch (2"-4") PVC ASTM D 2241, SDR 13.5, Class 315, ASTM D 1784 cell classification 12454-B, ASTM D 1869. Six inch to twelve inch (6"-12") PVC ANSI/AWWA C900; cast iron pipe OD. Pressure Class 200 psi, wall thickness of DR-14. The bell of the pipe shall be an integral thickness wall made mono-lithically with the pipe. Ductile iron piping shall meet ANSI/AWWA C151/A21.51. Three inch to twelve inch (3"-12") DIP, Class 350 and sixteen (16) inch and larger, Class 250.
3. Fittings for water piping shall be: two (2) inch and smaller, push-on PVC, ASTM D-3139, SDR-13.5, 315psi rating. All mechanical joint fittings shall be cast iron or ductile iron and conform to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 for compact fittings. Three (3) and four (4) inch, 250psi pressure rating. Twenty-four (24) inch and smaller, 350psi pressure rating. Thirty (30) inch and larger, 250psi pressure rating. Fittings for water services shall be red brass containing eighty-five percent (85%) copper, five percent (5%) lead, five percent (5%) tin, and five percent (5%) zinc in conformance with ASTM B-62. Fittings shall be compression in accordance with AWWA C-800. fittings shall utilize a compression and/or the split clamp with tightening screw. Stab type fittings are prohibited.
4. All materials shall be new, manufactured either in the year that construction begins or the previous year.
5. PVC pipe shall be shipped, stored, and strung in a manner to limit its total accumulated exposure to sunlight and UV radiation to no more than four (4) weeks.
6. Tracer wire is required to be taped to all water piping, including mains and services. Tracer wire shall be #12 plastic coated solid copper wire. Non-metallic location tape is required one (1) foot above the water piping.
7. Water line installation requires staking for alignment, location and elevation.
8. All mechanical joint fittings, gate valves and fire hydrants require restraining glands and appropriate thrust blocks unless otherwise noted.
9. Water mains shall be adequately anchored to resist thrusts that may develop at fittings and any other location where a change in flow direction occurs.
10. Testing of the water main cannot be performed until the water main has been backfilled and a minimum of seven (7) days after the last thrust block has been poured.
11. All connections to existing mains shall require tapping sleeve and valves. Sizes two inches through twelve inches (2"-12") shall be rated for a minimum water working pressure of two hundred (200) psi and shall be tested at four hundred (400) psi. Sizes fourteen inches through twenty-four inches (14"-24") shall be rated for a working pressure of one hundred-fifty (150) psi and shall be tested at three hundred (300) psi.
12. Tapping sleeves shall be cast iron or stainless steel, rated for a working pressure of one hundred-fifty (150) psi. Split-type cast iron tapping sleeves shall be required for all taps where the new branch line is of equal diameter as the existing main being tapped. Stainless steel tapping sleeves shall be required on all existing asbestos concrete piping regardless of size.
13. Water services shall be installed to the center of the lots unless otherwise specified.
14. Water services shall not be permitted in sidewalks or driveways or other pavements. Any services in conflict shall be capped at the main and a new service connected at the main and installed to the property line. Lateral lines shall not cross back over an easement for sewer or water mains.
15. All water services shall be installed uniformly on both sides of the street. No bends allowed in lateral line between tap and meter.
16. Water meters shall read in gallons.
17. Fire hydrants shall have integral Storz nozzles. Hydrants are to be painted Safety Red with industrial enamel paint.
18. A minimum three (3) feet of clear space shall be maintained around the circumference of fire hydrants, unless otherwise approved.
19. Water mains installed in cul-de-sacs shall maintain a straight alignment to the back of the cul-de-sac with a blow off installed at the termination point, located behind the back of curb.

20. All new water mains shall be pressure tested for leakage and disinfected prior to acceptance by the City of Kannapolis.
21. A representative of the City of Kannapolis shall be present for all testing. The design engineer or engineer's representative may also be required to be present during testing. The contractor is responsible for scheduling the design engineer.
22. Pressure tests will be conducted without interruption for a period of two (2) hours and no more than five thousand (5,000) linear feet per section tested. The allowable leakage (gallons) shall follow the guidelines:
 $Q = 0.0075 DLN$
 Where
 Q = allowable leakage in gallons per hour
 D = nominal diameter of pipe in inches
 L = length of section tested in thousand feet
 N = square root of average test pressure in psi
23. Unless otherwise noted, fire hydrants shall be in the closed position during testing.
24. Disinfection of water mains shall conform to the requirements of ANSI/AWWA C651-92, WSACC and NCDEQ.
25. All frame and covers on manholes installed during construction of the water system shall be solid and state the use of system, "WATER" on the cover. Use NCDOT Standard Drawing 840.54.
26. Valve boxes installed during construction of the water system shall state the use of system, "WATER".
27. Consideration shall be given to the existence of or the potential for development of corrosive environments within and outside the water line shall be performed. Sources of corrosion may include: acidic soils, septic wastewater, and cathodic protection from other utilities. Where corrosion is deemed to be a serious problem, DIP shall be provided with cathodic protection or an internal/external encasement, lining, or coating appropriate for the pipe material and situation. Such encasements, linings and coating shall be manufactured or applied in accordance with the appropriate ANSI and AWWA standards.
28. Water main extensions may require installation of infrastructure to support the Mi.Net system utilized by the City of Kannapolis. The type of equipment and locations of said equipment shall be coordinated with Kannapolis Public Works Department. The City of Kannapolis shall not be responsible for the cost of the additional equipment unless otherwise noted.
29. Prior to acceptance of the water system, as-built drawings shall be submitted for review and approval by the City of Kannapolis. As-builts are to be submitted in hard copies and digital formats and adhere to the As-built Checklist in, Chapter 5, Section E. Once as-built drawings are approved, the design engineer shall complete and submit to the City of Kannapolis the Water Certification forms which will be sent to the state for approval.
30. The spacing and quantity of fire hydrants required can be found in the IFC 507 and City of Kannapolis UDO Appendix C for reference.

END OF SECTION

G. APPROVAL TO CONSTRUCT

1. The general process for approval to construct water and sewer lines is as follows:
 - a. Developer submits plans to City for review of all water and sewer line extensions and approval. Including all necessary applications and permits pertaining to the project.
 - b. Following approval, the application and all applicable information is sent to NCDEQ Department of Water Quality (DWQ) for review and approval. All fees are based on type and linear footage and is provide on application. See Appendix E for City Water Permit.
 - c. Once received back at the City, an Approval to Construct letter will be sent to developer for construction of water
 - d. Following City approval for the sewer extension, the application and all applicable information is sent to WSACC for their review and approval. No associated fees for WSACC review. Once approved, WSACC will send back to the City the sewer flow acceptance form. This information will be forwarded to NCDEQ, associated fees are on the form and is detailed in the City Sewer Permit located in Appendix E.
 - e. Once received back at the City, an Approval to Construct letter and Permit will be sent to developer for construction and operation upon certification of sewer with any special provisions.
 - f. Upon completion of water and sewer line construction Engineer to provide to the City the following:
 - i. Engineer's Certification
 - ii. As-Built Drawings
 - iii. CAD file
 - iv. Video Inspection

END OF SECTION

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Chapter 5 PLAN REQUIREMENTS

A. PLAN SUBMITTAL REQUIREMENTS

This list should be considered as a guideline for technical and engineering requirements and should not be considered as a comprehensive list for all the requirements of a submittal.

1. Construction Plan Requirements:
 - a. Design according to, and submit, the “Public Infrastructure Plan Review Checklist” as provided by the City Engineer and/or the City of Kannapolis website.
 - b. Stream Buffers shall be clearly delineated or provide letter from a Qualified Individual stating that there are no streams on the site.
2. Roadways:
 - a. Per City of Kannapolis Land Development Standards Manual, NCDOT and UDO Standards.
 - b. Design according to, and include, the “Plan Submittal Roadway Notes” as shown on the City of Kannapolis website.
 - c. Minimum road grade to be 1%.
 - d. Existing curb and gutter and pavement to be replaced or repaired as required to tie to sound material.
 - e. Tack coat to be applied to all existing asphalt surfaces prior to placing new asphalt.
 - f. Show locations of curb cut for curb ramps and provide curb ramp detail.
 - g. Provide a driveway plan sheet showing each lot and designating driveway locations and service locations.
 - h. Provide driveway details and driveway profiles.
3. Water & Sewer:
 - a. See Section C of this chapter for requirements of water and sewer.
4. Stormwater Systems:
 - a. Per City of Kannapolis and NCDOT Standards.
 - b. Public maintained structures shall meet NCDOT construction standards and be traffic rated.
 - c. Ensure that culverts will fit in the proposed catch basin.
 - d. Junction Boxes should be based on NCDOT standard details. If an alternate design is requested, structural calculations and construction details must be provided to review the request.
 - e. Provide inlet and outlet control calculations for storm drainage systems. Hydraulic grade should be no higher than 6” below grade on pipe networks. HW/D should be a maximum of 1.2 for open systems.
 - f. Provide piping system profiles which include Hydraulic Grade Line (HGL)
 - g. O-ring culverts or HDPE culverts may be required for pressurized systems.
 - h. Culverts to be designed for 25-year storm event for cross-drainage.
 - i. Provide gutter spread calculations. Gutter spread to flood no more than ½ the lane width. Ensure that the values used in the calculations match the typical road section slopes and street slope. Gutter Spread flows should be based on a minimum intensity of 4” per hour. The design should also consider where the bypass runoff, during the 10-year storm event, will overflow the downstream curb.
 - j. Show that water is not being backed up on upstream properties or diverted onto lower properties.
5. Stormwater Structures:
 - a. Provide a cross-section of the embankment showing fill slope angles, top width, barrel size & type, riser size & type, orifices (including size, location, type, & inverts), top of dam elevation, and spillway elevation.
 - b. Make sure that the structures, orifices, and pipes and the associated inverts match in the design calculations and dimension details.
 - c. Provide a construction detail for the trash rack.
 - d. Show how the joints and connections will be made watertight.

- e. Show uplift anchor dimensions.
 - f. If the structure is to be a regional or shared system, show the location of access easements and provide a copy of the proposed maintenance agreement.
 - g. It is recommended that storage areas be fenced to prevent inadvertent entry.
 - h. Provide a minimum 6" of freeboard in the system.
 - i. If an emergency spillway is not provided, the system must pass the runoff from a 100-year storm event.
 - j. Provide forebay construction details.
6. Stormwater Calculations:
- a. Provide a report documenting pre and post development conditions, offsite impacts, and the method of treatment. Ensure that the following items are included:
 - i. Pre and post development drainage basin map.
 - ii. Documentation for curve number or C values used for runoff calculations.
 - iii. Documentation for time of concentration values used for runoff calculations.
 - iv. Detention is based on the 1 year and 10-year storm events.
 - v. Use rainfall runoff intensities and depths for Cabarrus County.
 - vi. Documentation of the equations used to generate the stage/storage/discharge tables.
 - vii. Hydrographs of the pre and post conditions.
 - viii. Buoyancy calculations for the riser and uplift anchor.
 - ix. Stormwater SCM Supplements.
7. FEMA Flood Hazards:
- a. Show the location of FEMA floodway, 100-year flood fringe, cross-sections and flood elevations as determined by FIRM maps on the drawings.
 - b. Show the location of the flood fringe area based on the FEMA flood elevation and the actual site topography.
 - c. Show the minimum finish floor elevation for sites adjacent to a flood hazard (2 feet above flood elevation).
 - d. Provide material specifications and compaction notes for fill to be placed in a floodplain. Certification of fill compaction is required for material placed in a floodplain.
 - e. Provide the note listing the datum used for the topo and flood elevations.
8. Easements:
- a. Minimum easement width with water, sewer and stormwater is 20-feet. Additional width may be necessary based on pipe size & depth. Allow for trench box and a 1:1 excavation side slope.
 - b. Sanitary sewer and stormwater easements must provide viable access with maximum slopes of 15% for maintenance vehicles. Cross slopes should not exceed 5%. If a storm drainage channel is also constructed in the easement, sufficient width shall be dedicated so that a minimum 12-foot travel area beyond the top of graded channels is provided. Easements are preferred to be located in Common Open Spaces (COS) when possible. Easements located outside of a COS shall not be centered on property lines.
 - c. All water mains that serve more than one structure shall be considered public and will be provided with an adequate easement to maintain the line. All multi-family developments shall be provided with a separate meter for each structure. Waterlines feeding these meters will be considered public.
 - d. See Standard Details for reference on overlapping easements.
9. Other:
- a. Erosion Control Permit:
 - i. If land disturbance > 1 acre provide NCDEQ permit to City.
 - ii. If land disturbance < 1 acre obtain permit from City planning department.
 - b. Provide copies of all necessary environmental permits.
 - c. Encroachments will be needed for work in public right-of-ways and easements.
 - d. Provide copies of land owner agreements for any offsite grading.
 - e. Provide an AutoCAD file for AutoTurn and review of the site design.

END OF SECTION

B. PLAN REVIEW CHECKLIST

THE FOLLOWING INFORMATION IS REQUIRED FOR ALL CONSTRUCTION DRAWINGS

1 hard copy, 1 digital copy with supporting Engineering Calculations, submit CAD file upon plan approval

- Initial Review Submittal** **Revised Review Submittal** **Final Approval Submittal**
- Plans are submitted on 24-inch by 36-inch sheets with an Index listing the sheets & page numbers.
 - The Legend in the plans designates linetypes and attributes used throughout the plans.
 - All Infrastructure (Water, Sewer, Storm & Roadways) shall be provided at a scale of 1" = 40' horizontal and 1" = 4' vertical. Overall plan and Plan & Profile sheets are legible and may be at a larger or smaller scale.
 - An overall sheet for each section is provided. (e.g. Site, Grading & Erosion Control, Storm & Roadway, Utility),
 - Road Profiles with all road and stormwater data. Water & Sewer crossings are shown in the profiles.
 - Utility which include water and sanitary sewer plan and profile on the same sheet. Stormwater is referenced in the plan and profile with structures labeled. Utility Profiles are stationed along sanitary sewer.
 - A plan sheet showing all easements, common open spaces and greenways is included.
 - The benchmarks and datum used are shown on the plans.
 - Length & Bearing for sewer pipe outside of R/W, Length for water main lines & Stormwater pipes.
 - Match lines designate the start and stop of each sheet and include the sheet numbers that precede and proceed the match line.
 - All referenced details are included and follow the appropriate plan designs
 - Cross Sections and Pavement Designs are included in the roadway detail sheets.
 - The storm pipe schedule is placed in the grading and/or storm drainage detail sheets.
 - Proposed grading plan at culvert crossing
 - Engineers' Report with the following sections included: Project description, Soils Map, FEMA Map, Pre/Post DA Maps, storm piping calculations using 4"/ hr intensity, Storm piping profiles w/HGL, gutter spreads, SCM design calculations.

C. PUBLIC WATER AND SEWER MAIN EXTENSION REQUIREMENTS

1. All Water and Sewer Extensions to the City of Kannapolis systems shall be permitted through the North Carolina Department of Environmental Quality (NCDEQ) and shall be in accordance with The Standard Specifications for Wastewater Collection and Water Distribution for the Water and Sewer Authority of Cabarrus County (WSACC) and The City of Kannapolis Public Works Standard and Policies. Standard Details provided on request.
 - a. The below list should be considered as a guide line and should not be considered as a comprehensive list for all requirements of plan submittal.
 - i. NCDEQ & City forms to be completed after initial City Review.
 - ii. Permitted through NCDEQ (City to review prior to NCDEQ Submittal)
 - iii. Electronic Copy of plans will be required for WSACC flow acceptance.
 - iv. Design per City of Kannapolis Land Development Manual and WSACC Standards–Standard Details can be obtained at www.wsacc.org and www.kannapolisnc.gov
 - v. Water Meters, Fire Hydrants, and Backflow devices per City Standards.
 - vi. All Fire Hydrants shall be public and connected to mains owned and operated by the City of Kannapolis.
 - vii. All Irrigation Lines shall be metered separately.
 - viii. All water mains that serve more than one structure shall be considered public and will be provided with an adequate easement to maintain the line. All multi-family developments shall be provided with a separate meter for each structure. Waterlines feeding these meters will be considered public.
 - ix. All water & sewer mains shall be required within the pavement section of all roads, regardless of public or private maintenance of the roads.
2. Water models shall be required for permitting and to verify sufficient flows and pressures for the proposed extension.
 - a. The following items shall be included as part of proposed water system model:
 - i. Summary of the flow test data used to create model.
 - ii. A schematic of the proposed system with all nodes and pipes clearly labeled.
 - iii. Model should show that average daily use plus minimum fire flow requirements will not drop the pressure below 20 psi anywhere in the system.
 - iv. To simulate the existing system, the connection to the existing system should be modeled using a reservoir and pump. Pump curve should be based on fire hydrant flow data. Pump Report should be provided.
 - v. Pipe summary table should be provided that includes the following:
 1. Pipe label, length and diameter
 2. "C" factor (maximum allowable "C" factor = 120)
 3. Flow under average daily conditions
 4. Hydraulic grade (upstream and downstream)
 5. Head loss per 1,000' of pipe
 - vi. Junction summary table should be provided that includes the following:
 1. Junction label, elevation and demand under average daily conditions
 2. Static head and pressure
 3. Residual head and pressure under average daily conditions.
 - vii. Fire flow summary table should be provided that includes the following:
 1. Junction label
 2. Available fire flow
 3. Available total flow
 4. Residual pressure at the fire flow node
 5. Minimum system pressure junction
 6. Minimum system pressure

END OF SECTION

D. PLAN NOTES

The following notes shall be included in the plans on the Site Plan Sheet:

1. The City of Kannapolis Land Development Standards Manual and NCDOT Standard Specifications are used for construction of the roadways, including the NCDOT SuperPave Manual.
2. Section 1018 of the NCDOT Standard Specifications will be used for the acceptance of borrow material being used for embankments backfill or other intended uses.
3. A 48-hour notice for scheduling is required for the proof roll. Please allow adequate time for the inspector to perform grade checks on the subgrade and ABC.
 - a. A proof roll will be performed prior to:
 - i. Placement of curb and gutter.
 - ii. Placement of ABC.
 - iii. Placement of asphalt.
4. Aggregate Base Course shall be provided from approved sources as outlined in Section 1010 of the NCDOT Standard Specifications.
5. A Pre-Paving meeting will be required prior to any paving.
6. A NCDOT approved Job Mix Formula must be submitted for approval prior to paving.
7. Asphalt mixes and depths will adhere to the typical section for roadways approved in the construction drawings. Minimum depths unless otherwise noted will be 2 ½" of I 19.0C placed in one lift and 2" of S9.5C placed in two lifts. The first lift of S9.5C will be placed immediately on the I19.0C, and the second lift will be placed prior to acceptance of the road. Drainage will be required on the roadway during the transition of the two lifts of S9.5C.
8. A Pre-Pour meeting will be required prior to any concrete pours.
9. A NCDOT approved Mix Design must be submitted on a NCDOT form 312U prior to placing any concrete.
10. Refer to detail sheets for the proper installation requirements for storm piping using NCDOT Standard Drawing 300.01.
11. The contractor shall be required to submit a video of the storm system prior to acceptance of the system. In new subdivisions, two (2) videos of the storm system shall be required. The first video is required to be performed prior to the first proof roll. The second video is required after the installation of dry utilities, but prior to acceptance of the streets by the City of Kannapolis.
12. Erosion Control Permit is required on-site during construction. NCDEQ will be inspecting the project for compliance with the erosion control plan if disturbing more than 1 acre. City of Kannapolis Erosion Control Permit required for all construction disturbing less than 1 acre. City will be inspecting the project for compliance with the erosion control plan.
13. The approved typical section includes a shoulder behind the curb and gutter on both sides of the roadway. The shoulder must be preserved during grading of adjacent properties.
14. Only street legal vehicles, legally loaded appropriately for the hauling vehicle, shall be used to transport construction materials on City streets.
15. Notify the City of any work being performed on the weekends. No work requiring testing or observation by the City will be permitted without written permission.
16. Noise Ordinance: 7:00am to 9:00pm – weekdays, 8:00am to 9:00pm weekends.

The following notes should be included in the Utility Plan Sheet:

1. All water main and sanitary sewer work shall be in accordance with the City of Kannapolis Land Development Standards Manual and standard specifications for wastewater collection and distribution for the Water and Sewer Authority of Cabarrus County (WSACC). Contractor shall have a copy of these specifications on-site at all times.
2. All existing water and sewer mains are owned and operated by the City of Kannapolis. The site inspector must be contacted at least 48 hours prior to making any connection to the existing system.
3. Sanitary sewer laterals and water meter locations are approximate and are subject to relocation due to field locations. Under no circumstance will cleanouts and meters be located in driveways, sidewalks or under pavement of any type.
4. Water meters shall meet City of Kannapolis standards. Contractor is responsible for installing meter boxes and purchasing meters. Contractor shall coordinate with site inspector to have water meters delivered to the City of Kannapolis.
5. The developer will be responsible for paying applicable water and sewer connection fees before Zoning Clearance Permits are issued.
6. Contractor is fully responsible for contacting all appropriate parties assuring that utilities are located prior to commencement of construction. Call North Carolina 811 (1-800-632-4949) for utility locating services as required by law prior to commencement of any work. Contractor shall verify location and depth of all utilities prior to construction.
7. Contractor shall be responsible for sewer overflows that occur due to activities initiated by them and shall be responsible for, but not limited to, the costs associated with performing remedial work off/for environmental impacts and/or the paying of fines assessed by regulatory agencies and/or third-party claims.
8. Water & Sewer mains shall have a minimum cover of 36 inches.
9. Bedding for PVC sewer mains and laterals should be WSACC Class B Bedding.
10. Unless otherwise noted, waterlines shall be PVC C900 for 6"-12" diameter and PVC SDR 13.5 for 2"-4" diameter per WSACC standards.
11. Unless otherwise noted, Sewer mains shall be PVC SDR 35 per WSACC standards.
12. Laterals shall have a No-Hub cap and stainless-steel No-Hub band at the clean out.
13. Ductile iron pipe shall be required for both water and sanitary sewer if the following clearances are not met:
 - a. Waterline crossing under sanitary sewer (for any clearance).
 - b. 18-inch vertical clearance for waterline installed above sewer line.
 - c. 10-foot horizontal separation for waterline parallel to sewer line (or 18-inch vertical separation in separate ditches).
 - d. For waterline, 18-inch clearance with storm drains.
 - e. For waterline, 12-inch clearance with gas mains, telephone ducts and underground cables.
 - f. For sanitary sewer, 24-inch clearance with storm drains.
14. Initial connection to the existing water main shall be in accordance with the City of Kannapolis detail for a temporary by-pass connection for filling new water mains. The temporary jumper connection shall be removed and the waterline connected to the existing system only after the proposed system has been pressure tested, chlorinated and accepted by the City of Kannapolis. No other connections will be allowed to the system until the proposed system has been accepted.
15. Notify the city of any work being performed on the weekends. No work requiring testing or observation by the city will be permitted without written permission.
16. Noise ordinance: 7:00AM TO 9:00PM – Weekdays, 8:00AM TO 9:00PM Weekends.

ADDITIONAL PROJECT SPECIFIC NOTES MAY BE NECESSARY.

E. ENCROACHMENT AGREEMENTS

1. Encroachment of any structures or landscaping, including, but not limited to, driveways, pools, fences, trees, wells, reservoirs, or other obstructions, which would interfere with free, easy, and clear access to utilities on any easement, are prohibited. However, certain structures, filling, or grading may be permitted upon execution of an express Encroachment Agreement. The City of Kannapolis may authorize an Encroachment Agreement, but only after review and approval of detailed plans.
2. In the event the City authorizes an Encroachment Agreement, obtaining the encroachment shall require the following:
 - a. A list of appurtenances being requested to encroach into the easement.
 - b. Provide a map of the encroachments with:
 - i. Site plan/map showing location of easements with the encroaching items (buildings, parking, utilities, etc.)
 - ii. Plat or deed book and page number that has the property and/or easement.
3. The following conditions apply to right of way/easement encroachments within Kannapolis city limits and where Kannapolis utilities are located (this includes NCDOT roadways/right of ways and Kannapolis roadways/right of ways):
 - a. The contractor shall contact the City of Kannapolis Public Works Department, 704-920-4200, prior to beginning work within the city limits in order to have an inspector assigned to the project. A preconstruction conference may be required with the City's Inspector.
 - b. The Owner, Operator and/or Contractor shall be responsible for any repairs necessitated by damage that is caused to roadways, sidewalks, landscaping, utilities and all areas within the City of Kannapolis or NCDOT right of way or property to the satisfaction and at the direction of the Director of Public Works.
 - c. The City of Kannapolis Land Development Standards Manual (LDSM) shall be followed.
 - d. Directional boring under roadway crossings shall be a ten (10) foot minimum depth under roadways. Also, directional boring shall be at a four (4) foot minimum depth below ground surface.
 - e. All other boring procedures shall be at a four (4) foot minimum depth under roadways and below ground surface.
 - f. A five (5) foot horizontal and vertical clearance from any structure, footing or pipe culvert (including tunnels, water lines, sanitary sewer lines, and storm lines) is required.
 - g. Provide videos of the encroachment areas (right of ways and easements) before and after construction to the City's Inspector, to determine damage to areas impacted during construction.
 - h. Any sidewalk damaged during construction of the lines shall have the entire panel removed and replaced as part of the repair. Partial repairs of panels shall not be permitted.
 - i. The City of Kannapolis Standard Drawing, "Utility Cut Pavement Repair, 109" shall be used for pavement patching.
 - j. A pre-pour meeting and subgrade check with the City's Inspector will be required prior to any concrete pours.
 - k. The use of City water to perform construction activities shall be metered per LDSM Chapter 1 A. General Note 9.
 - l. As-built drawing, CAD file and shape files shall be submitted to City within thirty (30) days upon completion of project.
4. The Public Works Director may impose additional and reasonable conditions upon the granting of any encroachment.

END OF SECTION

F. AS-BUILT REQUIREMENTS

Prior to Final Acceptance of the improvements, the Project Engineer shall submit to the City Engineer three (3) certified copies of the “As Built Record Drawings”, one (1) pdf file and one (1) digital file in AutoCad format. “As Built Drawings” shall be tied to NAD 83 horizontal datum and to the NAVD 88 vertical datum. The Project Engineer shall provide to the City Engineer all certifications that are required by the state for water and sewer improvements.

As-Built Drawings shall include the following:

1. Sanitary Sewer
 - a. Elevations: Rim, Invert In (including inside drop), Invert Out
 - b. Linear Footage and type of pipe installed
 - c. Changes need to be reflected in plan and profile sheets
 - d. Permanent Easements shown (if applicable)
 - e. Lateral Cleanouts shown in plan view
2. Water
 - a. Valve and Fitting locations
 - b. Fire Hydrant locations
 - c. Verify elevation of main and type of pipe installed
 - d. Show restrained joint pipe (if applicable)
 - e. Distances need to be shown in linear footage in plan view
 - f. Meters shown in plan view
3. Storm
 - a. Invert elevations (invert in and out)
 - b. Rim elevations (junction boxes)
 - c. Grate elevations (gutter line)
 - d. Invert elevations on culverts (box and pipe)
 - e. Flared End Sections elevation
 - f. Linear footage of piping and type of pipe installed
 - g. Topo of ditches included in the system (as required)
 - h. All dimensions shall be shown in plan and profile views
 - i. Update the pipe schedule.
4. SCM
 - a. Riser dimensions and elevations
 - b. Anti-floatation block dimensions
 - c. Stage storage chart for storage basins, forebays, detention areas, chambers, etc.
 - d. Calculations verifying that the as-built design complies with design guidelines for the SCM and that the system provides the required detention storage and reduced runoff discharge rates.
 - e. As-built topo verifying:
 - i. Location and Storage capacity of SCM
 - ii. Access easement grades
 - iii. Basin side slopes (interior and exterior), Top of embankment widths
 - iv. Riser/Spillway elevations and widths
 - v. Location of drainage features
 - vi. Location/outline of underground filter systems
 - vii. Pipe inverts, pipe size, and pipe materials.
 - viii. Underdrain inverts, cleanout inverts, underdrain pipe size and materials.
 - ix. Orifice/weir inverts and dimensions
 - x. Bottom drain gate size/type and critical elevations (invert and top of valve stem)
 - f. As-built Certification statements
5. Streets
 - a. Road profile

END OF SECTION

G. CERTIFICATIONS

Certification forms for Stormwater As-Builts, Retaining Walls, Bridges and Stormwater Control Measures can be found in Appendix C.

H. FINAL PROJECT PLAN APPROVAL REQUIREMENTS

1. Walk through of site with City Staff to verify compliance of utilities.
2. All As-Builts per section F of Chapter 5.
3. All required certifications for Water, Sewer & Stormwater Controls.
4. Street sign fees (if applicable)
5. Street lighting fees (if applicable)
6. Bond Review & Approval by Public Works/Engineering Department
7. Bonding for Utilities/Driveway/Stormwater Control

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Chapter 6 REFERENCES

1. American Association of State Highway and Transportation Officials most recent edition, A Policy on Geometric Design of Highways and Streets
2. Charlotte-Mecklenburg SCM Design Manual, latest edition
3. Charlotte-Mecklenburg Wastewater Pump Stations
4. City of Charlotte Storm Water Services-Mecklenburg County Storm Water Services, Charlotte-Mecklenburg Storm Water Design Manual, latest edition.
5. City of Charlotte – Charlotte Water's Design Manual
6. Contech – CMP Design Guide, 2017
7. Federal Highway Administration, Manual on Uniform Traffic Control Devices (MUTCD), latest edition
8. International Fire Code, latest edition
9. Massachusetts Highways – Shared Use Paths and Greenways
10. Mecklenburg County Greenways – General Planning and Design Guidelines
11. National Association of City Transportation Officials, Urban Bikeway Design Guide
12. National Bridge Inspection Standards – Code of Federal Regulations
13. North Carolina Building Code
14. North Carolina Department of Environmental Quality, Minimum Design Criteria for the Permitting of Pump Stations and Force Mains
15. North Carolina Department of Environmental Quality, Stormwater Control Measures, latest edition
16. North Carolina Department of Environment and Natural Resources, Erosion and Sediment Control Planning and Design Manual, latest edition
17. North Carolina Department of Transportation, Asphalt Quality Management System Manual, latest edition
18. North Carolina Department of Transportation, Complete Streets Planning and Design Guidelines
19. North Carolina Department of Transportation, Greenway Design Guidelines, latest edition
20. North Carolina Department of Transportation, Policy on Street and Driveway Access
21. North Carolina Department of Transportation, Roadway Design Manual, latest edition
22. North Carolina Department of Transportation, Roadway Standards Drawings, latest edition
23. North Carolina Department of Transportation, Standard Specifications for Roads and Structures, latest edition.
24. Raleigh – Capital Area Greenway Planning and Design Guide
25. Raleigh Street Design Manual
26. Roundabouts: An Informational Guide (Federal Highway Administration Publication No. FHWA-RD-00-067)
27. Water and Sewer Authority of Cabarrus County (WSACC), latest edition.

END OF SECTION

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B. DRAWINGS

The Kannapolis Standard Drawings shown are to be used for design and construction for projects in the City of Kannapolis. For construction activities not shown by Kannapolis Standard Drawings, NCDOT Standard Drawings shall be used.

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TABLE 2B.1 STOPPING SIGHT DISTANCE

MINIMUM STOPPING SIGHT DISTANCE (FT.)							
Vehicle Speed	UPGRADES			FLAT	DOWNGRADES		
	9 %	6 %	3 %		0 %	-3 %	-6 %
25	140	145	150	155	160	165	175
30	180	185	200	200	205	215	230
35	225	230	240	250	260	275	290
40	270	280	290	305	315	335	355
45	320	330	345	360	380	400	430
50	375	390	405	425	450	475	510

TABLE 2B.2 DESIGN INTERSECTION SIGHT DISTANCE, LEFT TURN FROM STOP

Design Speed (mph)	Stopping Sight Distance (FT)	Intersection Sight Distance for Passenger Cars	
		Calculated (FT)	Design (FT)
15	80	165.4	170
20	110	220.5	225
25	155	275.6	280
30	200	330.8	335
35	250	385.9	390
40	305	441.0	445
45	360	496.1	500
50	425	551.3	555

TABLE 2M GREENWAY MINIMUM STOPPING SIGHT DISTANCE

A	English Units. Minimum Length of Crest Vertical Curve (L) Based on Stopping Sight Distance														
	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300
2												30	70	110	150
3								20	60	110	140	180	220	260	300
4						15	55	95	135	175	215	256	300	348	400
5					20	60	100	140	180	222	269	320	376	436	500
6				10	50	90	130	171	216	267	323	384	451	523	600
7				31	71	111	152	199	252	311	376	448	526	610	700
8			8	48	88	128	174	228	288	356	430	512	601	697	800
9			20	60	100	144	196	256	324	400	484	576	676	784	900
10			30	70	111	160	218	284	360	444	539	640	751	871	1000
11			38	78	122	176	240	313	396	489	592	704	826	958	1100
12		5	45	85	133	192	261	341	432	533	645	768	901	1045	1200

1. When $S > L = 2S - 900/A$ Shaded area represents $S = L$
2. When $S < L = AS^2/900$
 L = Minimum Length of Vertical Curve (ft)
 A = Algebraic Grade Difference (%)
 S = Stopping Sight Distance (ft)
 Height of Cyclist's Eye = 4.5'
 Height of Object = 0'
 Minimum Length of Vertical Curve = 3'

Source: AASHTO, Guide for the Development of Bicycle Facilities

TABLE 3B MANDREL DIMENSIONS

Pipe Type	Pipe Diameter (inches)	Minimum Inside Diameter	Inside Diameter with 5% Deflection
Dual Wall	15	14.85	14.11
	18	17.93	17.03
	24	23.90	22.71
	30	29.89	28.30
Triple Wall	30	29.62	28.14
	36	35.40	33.63
	42	41.31	39.24
	48	47.31	44.94
	60	59.30	56.34

TABLE 3C MAXIMUM COVER FOR POLYPROPYLENE PIPE

Diameter (In.)	Class 1	Class 2			Class 3		Class 4
	Compacted	95%	90%	85%	95%	90%	95%
12	39	27	20	9	21	12	11
15	42	29	21	10	22	12	11
18	36	25	18	9	19	12	11
24	31	22	16	7	16	11	10
30	33	23	17	9	17	11	10
36	32	22	16	7	16	11	10
42	32	22	15	7	16	11	10
48	31	21	15	6	15	10	9
60	34	23	16	6	16	11	10

TABLE 4A CASING PIPE SIZES

Pipe Diameter (inches)	HIGHWAY		RAILROAD	
	Casing O.D.	Min. Wall Thickness	Casing O.D.	Min. Wall Thickness
6	12.75"	0.188"	12.75"	0.250"
8	18"	0.250"	18"	0.312"
12	24"	0.250"	24"	0.406"
16	30"	0.312"	30"	0.500"
24	36"	0.375"	36"	0.5625"

TABLE 4B AIR TEST TABLE

Length of Line in Feet	4	6	8	10	12	15	18	21	24
25	0:04	0:10	0:18	0:28	0:40	1:02	1:29	2:01	2:38
50	0:09	0:20	0:35	0:55	1:19	2:04	2:58	4:03	5:17
75	0:13	0:30	0:53	1:23	1:59	3:06	4:27	6:04	7:55
100	0:18	0:40	1:10	1:50	2:38	4:08	5:56	8:05	10:34
125	0:22	0:50	1:28	2:18	3:18	5:09	7:26	9:55	11:20
150	0:26	0:59	1:46	2:45	3:58	6:11	8:30	9:55	11:20
175	0:31	1:09	2:03	3:13	4:37	7:05	8:30	9:55	11:20
200	0:35	1:19	2:21	3:40	5:17	7:05	8:30	9:55	11:20
225	0:40	1:29	2:38	4:08	5:40	7:05	8:30	10:25	13:36
250	0:44	1:39	2:56	4:35	5:40	7:05	8:31	11:35	15:07
275	0:48	1:49	3:14	4:43	5:40	7:05	9:21	12:44	16:38
300	0:53	1:59	3:31	4:43	5:40	7:05	10:12	13:53	18:09
350	1:02	2:19	3:47	4:43	5:40	8:16	11:54	16:12	21:10
400	1:10	2:38	3:47	4:43	6:03	9:27	13:36	18:31	24:12
450	1:19	2:50	3:47	4:43	6:48	10:38	15:19	20:50	27:13
500	1:28	2:50	3:47	5:15	7:34	11:49	17:01	23:09	30:14

1. If the length of sewer to be tested is submerged or partially submerged in groundwater, the test pressure shall be increased as required to overcome the actual static pressure exerted by the groundwater. If a test pressure greater than eight (8) PSI results, air testing shall not be used and exfiltration testing will be required.

TABLE 4C UTILITY EASEMENT WIDTH CHART

SEWER MAIN PIPE								
Diameter (In.)	Diameter (ft.)	Min. Bottom Width (ft.)	Max. depth to bottom of pipe @ Esmt Width (ft.)					
			20'	25'	30'	35'	40'	50'
8	0.67	2.67	8.67	11.17	13.67	16.17	18.67	23.67
12	1.00	3.00	8.50	11.00	13.50	16.00	18.50	23.50
16	1.33	3.33	8.33	10.83	13.33	15.83	18.33	23.33
24	2.00	4.00	8.00	10.50	13.00	15.50	18.00	23.00

* - Depth beyond those shown on this chart shall require additional easement width to the nearest 5' increment.

STORM PIPE									
Pipe Inner Diameter (In.)	Wall Thickness (In.)	Pipe Outer Diameter (ft.)	Min. Bottom Width (ft.)	Max. depth to bottom of pipe @ Esmt Width (ft.)					
				20'	25'	30'	35'	40'	50'
15	2.25	1.63	3.63	8.19	10.69	13.19	15.69	18.19	20.91
18	2.50	1.92	3.92	8.04	10.54	13.04	15.54	18.04	20.98
24	3.00	2.50	4.50	7.75	10.25	12.75	15.25	17.75	21.13
30	3.50	3.08	5.08	7.46	9.96	12.46	14.96	17.46	21.27
36	4.00	3.67	5.67	7.17	9.67	12.17	14.67	17.17	21.42
42	4.50	4.25	6.25	6.88	9.38	11.88	14.38	16.88	21.56
48	5.00	4.83	6.83	6.58	9.08	11.58	14.08	16.58	21.71
54	6.25	5.54	7.54	6.23	8.73	11.23	13.73	16.23	21.89
60	6.75	6.13	8.13	5.94	8.44	10.94	13.44	15.94	22.03
66	7.25	6.71	8.71	5.65	8.15	10.65	13.15	15.65	22.18
72	7.00	7.17	9.17	5.42	7.92	10.42	12.92	15.42	22.29

* - Depth beyond those shown on this chart shall require additional easement width to the nearest 5' increment.

Appendix B

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2C	RETAINING WALLS	B-4

DIAGRAM 2A – DEAD-END FIRE APPARATUS ACCESS ROAD TURNAROUND

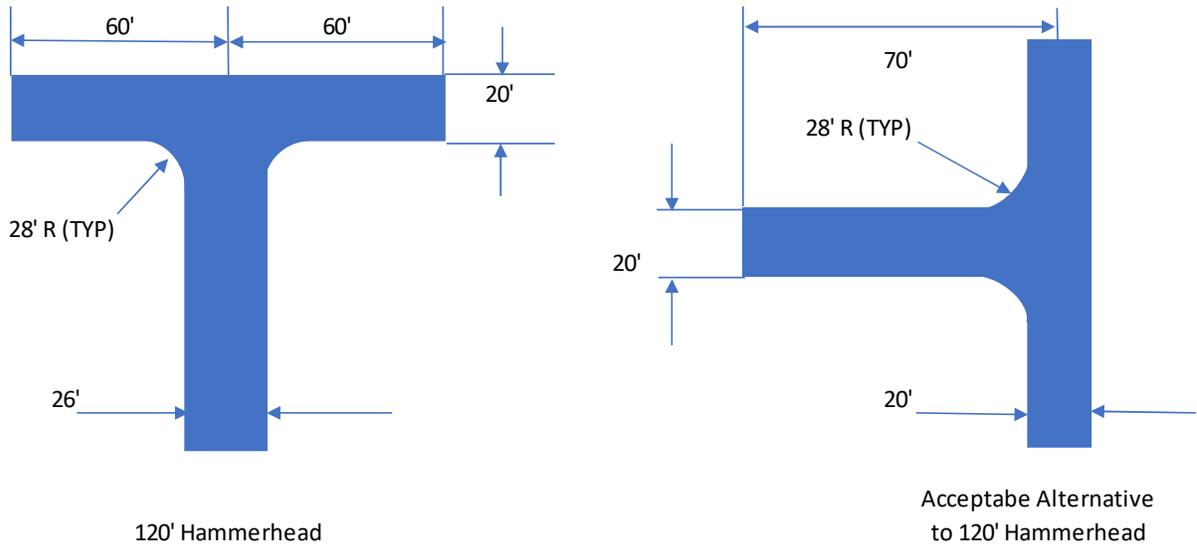
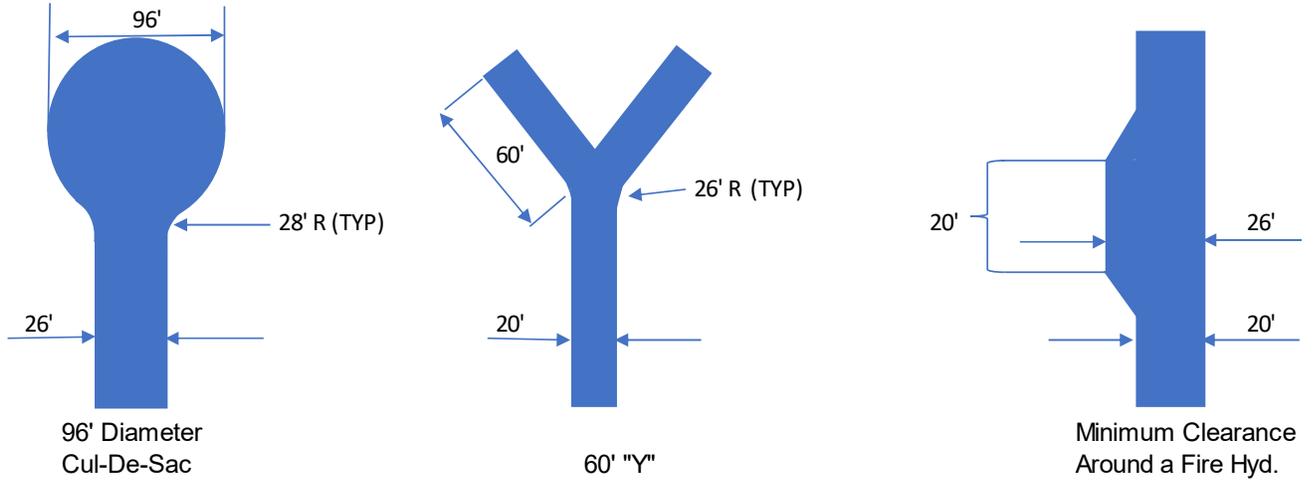


DIAGRAM 2B – INTERSECTION GRADES

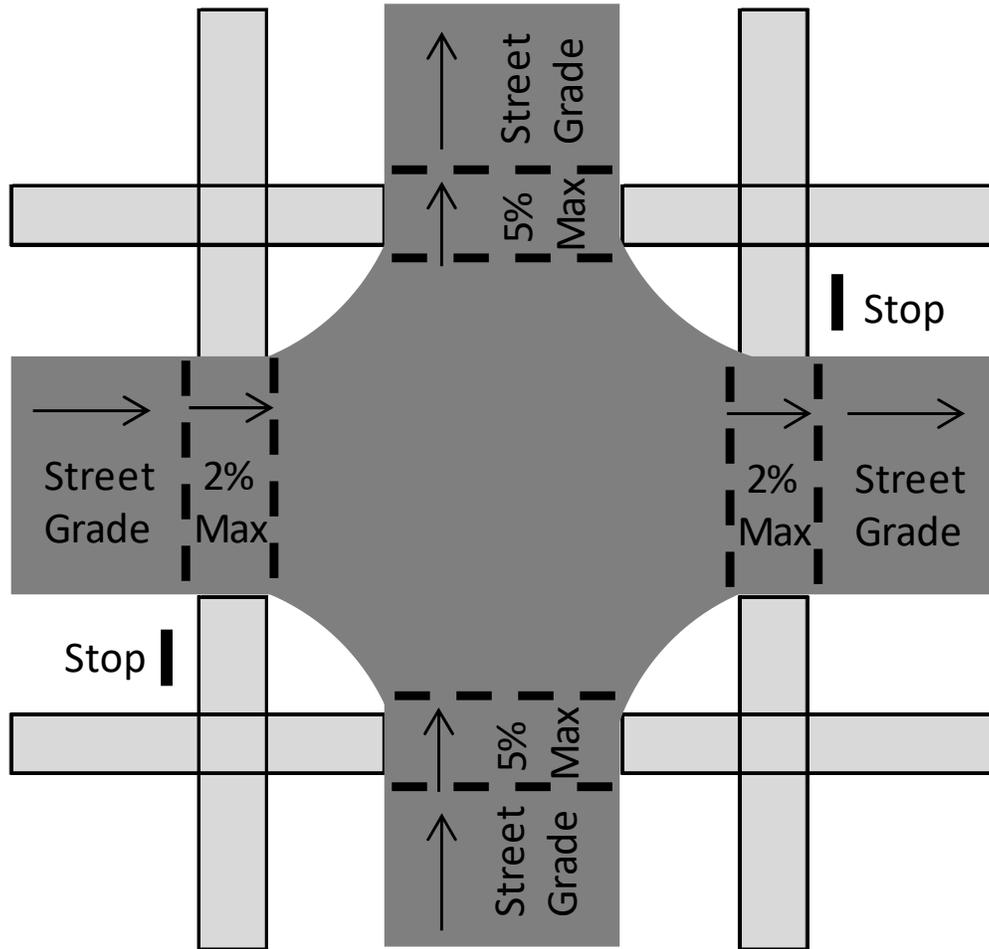
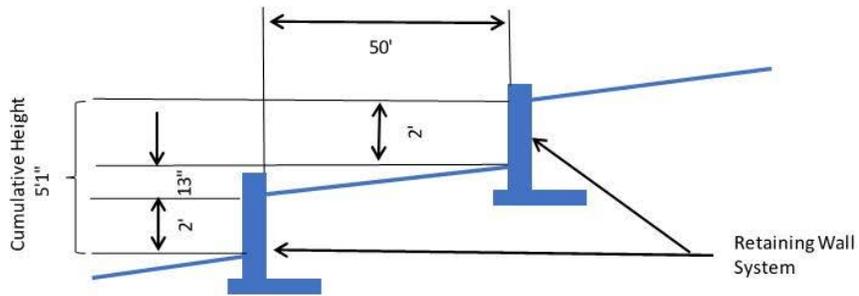
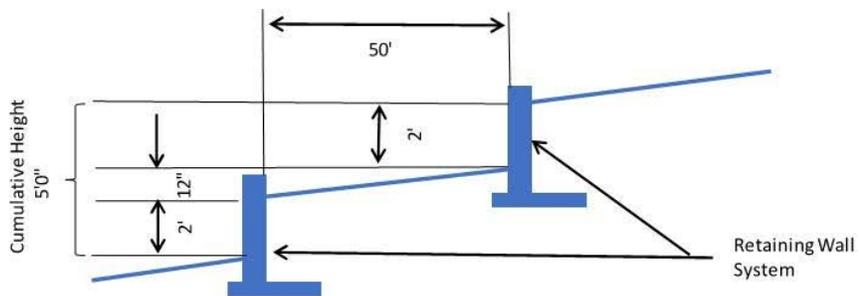


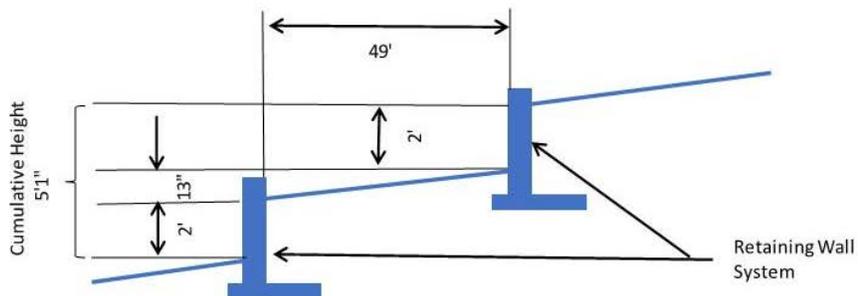
DIAGRAM 2C – RETAINING WALLS



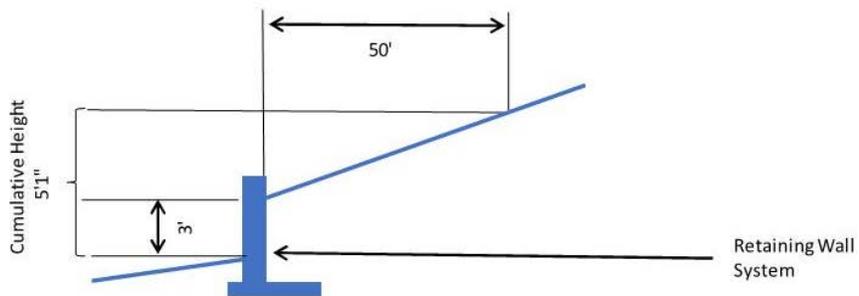
Example - A
Design Professional Required



Example - B
Design Professional Not Required



Example - C
Design Professional Required



Example - D
Design Professional Required

Appendix C

Index of Certifications:

	Page No:
STORMWATER	C-2
RETAINING WALL	C-3
BRIDGE	C-4
STORMWATER CONTROL MEASURE (SCM)	C-5



STORMWATER CERTIFICATION

Stormwater As-Built Certification

I, _____, attest that this certification, for the _____ Project, has been reviewed by me and is accurate, complete and consistent with the information supplied in the plans, specifications, engineering calculations, and all other supporting documentation to the best of my knowledge. I further attest that to the best of my knowledge the As-Built Plans have been prepared based on an accurate account of the stormwater piping and appurtenances installed during construction and any deviations from the approved construction plans shall not adversely impact the drainage system, discharge points, and/or adjacent properties analyzed during the approval process of the construction plans. Although other professionals may have developed certain portions of this submittal package, inclusion of these materials under my signature and seal signifies that I have reviewed this material and have judged it to be consistent with the proposed design.

SEAL:

(Date)

(Signature)

Engineer:
Firm:
Firm License #:
Address:



BRIDGE CERTIFICATION

Bridge As-Built Certification

I, _____, attest that this certification, for the _____Project, has been reviewed by me and is accurate, complete and consistent with the information supplied in the plans, specifications, engineering calculations, and all other supporting documentation to the best of my knowledge. I further attest that to the best of my knowledge the As-Built Plans have been prepared based on an accurate account of the bridge and appurtenances installed during construction and any deviations from the approved construction plans were analyzed and verified to not adversely impact the performance of the bridge analyzed during the approval process of the construction plans. Although other professionals may have developed certain portions of this submittal package, inclusion of these materials under my signature and seal signifies that I have reviewed this material and have judged it to be consistent with the proposed design.

SEAL:

(Date)

(Signature)

Engineer:
Firm:
Firm License #:
Address:



RETAINING WALL CERTIFICATION

Retaining Wall As-Built Certification

I, _____, attest that this certification, for the _____ Project, has been reviewed by me and is accurate, complete and consistent with the information supplied in the plans, specifications, engineering calculations, and all other supporting documentation to the best of my knowledge. I further attest that to the best of my knowledge the As-Built Plans have been prepared based on an accurate account of the retaining wall system and appurtenances installed during construction and any deviations from the approved construction plans were analyzed and verified to not adversely impact the performance of the wall system analyzed during the approval process of the construction plans. Although other professionals may have developed certain portions of this submittal package, inclusion of these materials under my signature and seal signifies that I have reviewed this material and have judged it to be consistent with the proposed design.

SEAL:

(Date)

(Signature)

Engineer:
Firm:
Firm License #:
Address:



SCM CERTIFICATION

SCM As-Built Certification

I, _____, attest that this certification, for the _____ Project, has been reviewed by me and is accurate, complete and consistent with the information supplied in the plans, specifications, engineering calculations, and all other supporting documentation to the best of my knowledge. I further attest that to the best of my knowledge the As-Built Plans have been prepared based on an accurate account of the bridge and appurtenances installed during construction and any deviations from the approved construction plans were analyzed and verified to not adversely impact the performance of the bridge analyzed during the approval process of the construction plans. Although other professionals may have developed certain portions of this submittal package, inclusion of these materials under my signature and seal signifies that I have reviewed this material and have judged it to be consistent with the proposed design.

SEAL:

(Date)

(Signature)

Engineer:
Firm:
Firm License #:
Address:



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Appendix D

Approved Products List for Water Materials

Contact City of Kannapolis Engineering Department with any questions, 704-920-4214.

Pipe

- C-900 (6" and larger)
 - 200 PSI pressure class
 - DR 14
- DIP (6" and larger)
 - 350 PSI pressure class (3" — 12")
 - 250 PSI pressure class (16" and larger)
- SDR 13.5 (2" — 4")
 - Class 315
- Type K Cooper (3/4" — 2")

Saddles

- 2" pipe
 - Dresser #194
 - Ford S-70 Hinged
 - McDonald 3891
 - Mueller 13000 series
- 6" pipe and larger
 - Mueller DR2S
 - Ford FCD202
 - Smith Blair 317
 - Romac 202NS
 - McDonald 4855A

Tapping Sleeves

- New Branch line equal diameter as existing Main
 - Mueller H-615
 - American Flow Control Series 2800
- New Branch line smaller than existing Main.
 - Mueller H-304
 - Romac SST

Corporation Stop

- Mueller B-25008N
- Ford FB1000-XX-G-NL
- McDonald 74701BQ

1" Tee

- Mueller H-15381N
- Mueller P-15381N
- Ford T444-444-G-NL
- McDonald 74760Q

1" Ball Valve

- Mueller B-25209N
- Ford B44-444-NL
- McDonald 76100WQ

Reducer

- Mueller H-15403N
- Ford C44-34-G-NL
- McDonald 74758Q

Meter Stop

- Mueller B-24258N
- Mueller P-24258N
- Ford BA94-332W-Q-NL
- Ford BA94-444W-Q-NL
- McDonald 74642BQ

Expansion Handwheel

- Mueller H-14234
- Ford ECL-23-NL
- Ford ECL-4-NL
- McDonald 714-2EHG
- McDonald 714-4EHG

Yoke

- Mueller H-5020
- Ford Y502
- McDonald 14-2
- Mueller H-5040
- Ford Y504

Straight Check Valve

- Mueller H-14247N
- Ford HS91-323-NL
- Ford HS91-444-NL

1.5"- 2" Coppersetter

- Ford 70 Series
- Mueller B-2423-2N

Valve Boxes

- Star Pipe Products — VB-0003
- Pro Select — PSVB461AW
- Sigma Corporation — VB-461

Water Meter Box

- Southeastern MB-17 with solid lid
 - 3/4" — 1" meters
- DFW Plastics DFW486WBC-12-1 with lid
 - 3/4" — 1" meters
- 2'x3'x31" concrete meter box & lid
 - 1-1/2" — 2" meters
- 84"x72"x72" concrete meter box
 - 3" - 4" meter
 - Bilco JD-AL H-20 aluminum Double Leaf Access Door
 - Halliday Products Series H2C
- 84"x96"x72" concrete meter box
 - 6" meter
 - Bilco JD-AL H20 - aluminum Double Leaf Access Door
 - Halliday Products Series H2C

Irrigation Box

- Southeastern MB-9 with #106 Lid

Meters

- 3/4" - Hersey 420 Bronze PD Meter 5/8" x 3/4" with NICOR connector and MI. Node 3 AMI module with NICOR Connector
- 1" - Hersey 452 PD meter with NICOR connector and MI. Node 3 AMI module with NICOR Connector
- 1-1/2" - Hersey 562 Bronze body meter with NICOR connector and MI. Node 3 AMI module with NICOR Connector
- 2" - Hersey 572 Bronze body meter with NICOR connector and MI. Node 3 AMI module with NICOR Connector
- 3" - Hersey MVR350 Magnetic Vertical Turbine Meter with NICOR connector and MI Node 3 AMI module with NICOR connector
- 4" - Hersey MVR650 Magnetic Vertical Turbine Meter with NICOR connector and MI Node 3 AMI module with NICOR connector
- 6" - Hersey MVR1300 Magnetic Vertical Turbine Meter with NICOR connector and MI Node 3 AMI module with NICOR connector

Fire Hydrants

- Mueller — Super Centurion 200
- American Darling — 5-1/4" B-84-B-5
- American AVK — Series 2780
- Clow — Medallion F-2545
- American Darling — 6' B-84-B-5

Resilient Seated Gate Valves

- Mueller — A-2362 RWGV
- Clow — C-509
- Kennedy — C-509
- American Flow Control — Series 2500

3/4"- 2" Reduced Pressure Principle Assembly (RP)

- Zurn Wilkins 975XL2
- Zurn Wilkins 375XL
- Annes LF4000B
- Conbraco 4ALF-200
- Febco LF860
- Hersey FRP 2
- Watts LF009

3"-10" Reduced Pressure Detector Assembly (RPDA)

- Zurn Wilkins 375DA
- Zurn Wilkins 475DA
- Annes SOOOSS
- Conbraco 4ANLF-700LBF
- Febco LF866
- Febco LF866V
- Hersey 6CM
- Watts 909RPDA

3/4"-2" Double Check Valve Assembly (DCVA)

- Zurn Wilkins 950XL
- Ames LF2000B
- Conbraco 4ALF-100
- Febco LF850
- Hersey FDC
- Watts LF007

3"-10" Double Check Detector Assembly (DCDA)

- Zurn Wilkins 450DA
- Zurn Wilkins 350DA
- Ames 3000SS
- Conbraco 4ALF-600 LBF (3"-8")
- Conbraco 4S-600 (10")
- Febco LF856
- Febco LF876V
- Hersey DDC2
- Watts 709DCDA

Hot Boxes

- BF Products 232-APD
- BF Products 322-APD
- BF Products 56N-APD
- BF Products 65-APD
- BF Products 78 APD
- BF Products 98 APD

Air Release Valves

- APCO 200A
- GA Industries Series 920
- Miltiplex Crispin PL series

Combination Air and Vacuum Valve

- APCO 140C
- Miltiplex Crispin Universal Air Release Valves UL series

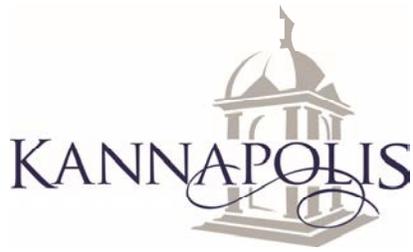
END OF SECTION

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Appendix E

Index of Permits:

DRIVEWAY
EROSION CONTROL (LESS THAN 1 ACRE)
GRADING
WASTEWATER FLOW ACCEPTANCE
SEWER APPLICATION
WATER APPLICATION
WATER MAIN EXTENSION – ENGINEER’S REPORT



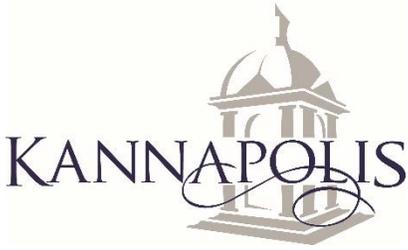
Driveway Access Permit Application

Contact	Name: _____	Project	Address: _____
	Phone: _____		Parcel: _____
	Email: _____		Contractor: _____

- I, the undersigned property owner, request access and or permission to construct driveway(s) or street(s) on public right-of-way at the above location.
- I agree to construct and maintain driveway(s) or street entrance(s) in absolute conformance with the current "Policy on Street and Driveway Access" as adopted by the City of Kannapolis.
- I agree that no signs or objects will be placed on or over the public right-of-way.
- I agree that the driveway(s) or street(s) will be constructed as shown on the plot plan.
- I agree that driveway(s) or street(s) as used in this agreement include any approach tapers, storage lanes or speed change lanes as deemed necessary.
- I agree that if any future improvements to the roadway become necessary, the portion of driveway(s) or street(s) located on public right-of-way will be considered the property of the City of Kannapolis, and I will not be entitled to reimbursement or have any claim for present expenditures for driveway or street construction.
- I agree that this permit becomes void if construction of driveway(s) or street(s) is not completed within the time specified by the City of Kannapolis.
- I agree to construct and maintain the driveway(s) or street(s) in a safe manner so as not to interfere with or endanger the public travel.
- I agree to provide during construction proper signs, signal lights, traffic control and other warning devices for the protection of traffic in conformance with the current "Manual on Uniform Traffic Control Devices for Streets and Highways" and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the City of Kannapolis or NCDOT.
- I agree to indemnify and save harmless the City of Kannapolis from all damages and claims for damage that may arise by reason of this construction.
- I agree that the City of Kannapolis will assume no responsibility for any damages that may be caused to such facilities, within the highway right-of-way limits, in carrying out its construction.
- I agree to provide a Performance Bond in the amount specified by the City of Kannapolis for any construction proposed on the City Highway system.
- I agree that any weather event and/or freezing temperature after an inspection, voids the inspection and a new inspection will need to be scheduled before the concrete is poured.
- I agree to meet all driveway requirements of the Unified Development Ordinance (UDO) and the Land Development Standards Manual (LDSM).
- **I agree to notify the Public Works Department 16 business hours in advance of when the proposed work is to begin at 704-920-4214.**

Applicant Signature

For approval and questions regarding Driveway Access Permits,
please contact Heather Buckelew with Engineering Department at 704-920-4214.



Permit # _____

Erosion Control Permit Application

Type of Construction: Residential: _____ Commercial/Industrial: _____

Subdivision Name: _____ Parcel #: _____

Address: _____ Lot # _____

Approx. Date of land disturbing: _____ Parcel Ac: _____ Disturbed Ac: _____
activity will commence

Property Owner

Name: _____ Phone: _____ Email: _____

Financial Responsible Party

Name: _____ Phone: _____ Email: _____

Is Parcel in Floodplain: Yes _____ No _____

Is Parcel in Wetlands: Yes _____ No _____

Applicant must initial on lines below

_____ Existing utilities and utility easements must remain undisturbed. It is prohibited to change the grade or construct a permanent structure above the existing utility or within the utility easement. Call One-Call before digging 811 or 1-800-351-1111.

_____ City roads must not be damaged in the delivery of materials or equipment to the construction site. Parking of light or heavy equipment and placement of materials or portable toilets in the right of way (R.O.W) is not allowed. Vehicles in the R.O.W over 24 hours may be towed at the owner's expense. The applicant shall be responsible for any repairs necessitated by damage that is caused to roadway, sidewalk, landscaping, utilities and all areas within the City of Kannapolis or NCDOT right of way or property to the satisfaction and at the direction of the City Engineer.

_____ Any sediment spilled, dropped, washed, or tracked onto streets must be removed immediately. Any aggregate tracked into the street must be swept back onsite on a nightly basis.

_____ City Engineer or designee may impose additional & reasonable conditions upon the approval of this permit.

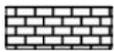
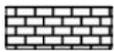
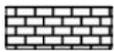
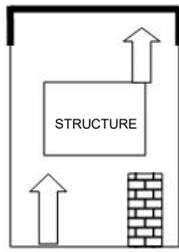
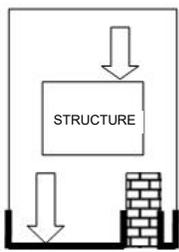
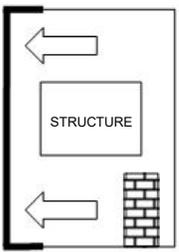
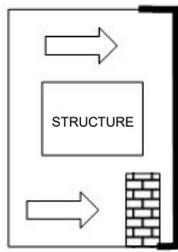
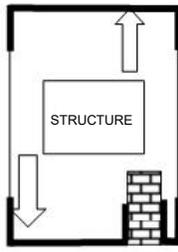
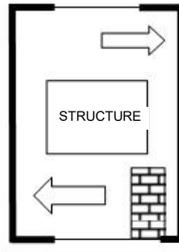
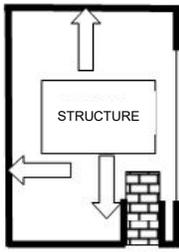
I hereby certify that I have read and examined this application and know the same to be true and correct. I understand that this is my application for coverage. All provisions of laws and resolutions governing this type of work will be complied with whether specified herein or not. This permit shall not be construed as authority to violate or cancel the provisions of any Federal, State or Local law regulating construction or the performance of construction.

Financial Responsible Party Signature _____ Name _____ Phone _____

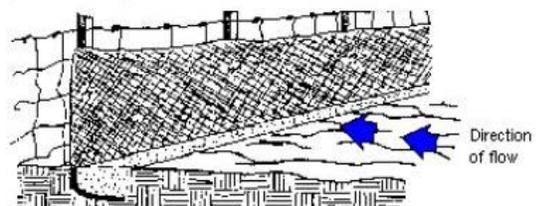
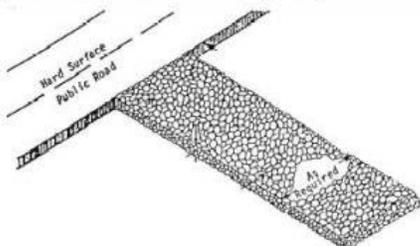
For approval and questions regarding Erosion Control Permits

The Unified Development Ordinance and LDSM requires that anyone conducting land-disturbing activity prevent sediment from leaving the disturbed site. Furthermore, conducting any land-disturbing activity requires a permit before beginning the disturbance. This includes the disturbance of multiple lots totaling one acre or less, regardless of proximity to each other within a subdivision; or in cases where fill material is stockpiled, needed, or wasted, the area where the material is stored, coming from, or going to, must also be included in the total disturbed area. Land disturbing activities are defined as anything which changes the topography or natural ground cover making an area susceptible to accelerated erosion, including demolition and land clearing. Erosion & Sedimentation Control measures must be installed per details found in Chapter 7 of the Kannapolis Land Development Standards Manual. If you are disturbing one acre or less contact 704-920-4214 to obtain permit application requirements.

Failure to maintain Erosion & Sedimentation Control measures may result in penalties of up to \$5000/day. In addition, all properties must comply with the S.W.I.M. Stream Buffer Ordinance and Drinking Water Supply Watershed Ordinances (Lake Buffers). For general buffer requirements, access the Surface Water Quality Data website at <https://ncdenr.maps.arcgis.com/apps/webappviewer/index.html?id=6e125ad7628f494694e259c80dd64265>, fill in the address and then follow the instructions.

SEDIMENTATION AND EROSION CONTROL OPTIONS				
L E G E N D	<p>INSTRUCTIONS: IDENTIFY ONE OR ANY COMBINATION OF LETTERS FROM THE SEDIMENT CONTROL SKETCHES BELOW THAT BEST DESCRIBES THE EROSION CONTROL MEASURES THAT WILL BE USED DURING CONSTRUCTION.</p>			
	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Silt Fence: </p> <p>Construction Entrance: </p> <p>Direction of Flow: </p> </td> <td style="width: 50%; vertical-align: top;"> <p>Construction Sequence:</p> <ol style="list-style-type: none"> 1. Install construction entrance & concrete washout 2. Install silt fence 3. Rough grade & stabilize site 4. Final grade & stabilize site 6. Remove erosion control measures after site has been inspected for compliance by Engineering Department Staff. </td> </tr> </table>	<p>Silt Fence: </p> <p>Construction Entrance: </p> <p>Direction of Flow: </p>	<p>Construction Sequence:</p> <ol style="list-style-type: none"> 1. Install construction entrance & concrete washout 2. Install silt fence 3. Rough grade & stabilize site 4. Final grade & stabilize site 6. Remove erosion control measures after site has been inspected for compliance by Engineering Department Staff. 	
<p>Silt Fence: </p> <p>Construction Entrance: </p> <p>Direction of Flow: </p>	<p>Construction Sequence:</p> <ol style="list-style-type: none"> 1. Install construction entrance & concrete washout 2. Install silt fence 3. Rough grade & stabilize site 4. Final grade & stabilize site 6. Remove erosion control measures after site has been inspected for compliance by Engineering Department Staff. 			
E R O S I O N C O N T R O L O P T I O N S	<p style="text-align: center;">Flow to the Rear OPTION A</p> 	<p style="text-align: center;">Flow to the Front OPTION B</p> 	<p style="text-align: center;">Flow to the Left OPTION C</p> 	<p style="text-align: center;">Flow to the Right OPTION D</p> 
	<p style="text-align: center;">Flow to the Front & Rear OPTION E</p> 	<p style="text-align: center;">Flow to the Left & Right OPTION F</p> 	<p style="text-align: center;">EXAMPLE</p>  <p style="text-align: right;">Combination C & E</p>	

Construction Examples



SEE LDSM STD DRAWINGS FOR CURRENT EROSION CONTROL STANDARDS

Permit Number:
Zoning Administrator:
Engineering Inspector:



Parcel ID
Project/Case Number
Original Submission Date

GRADING PERMIT ONLY

Project Name	Project Address	Zoning District	Inspections by:
Disturbed Area (SF or Acreage):	Parcel Size (SF or Acreage):	Project Description:	

Is site development proposed within the FEMA 100-year flood fringe?		Will any activities impact an NCDOT public street R/W?	
Will any activities impact a City of Kannapolis public Street R/W?		Will any activities take place within a public utility easement? (i.e. - water, sanitary sewer, storm drainage, power, gas)	

<u>Applicant Information</u>			<u>Property Owner Information</u>		
Company/Applicant Name			Property Owner		
Contact Name			Additional Property Owner Information		
Address			Address		
City	State	Zip Code	City	State	Zip Code
	NC			NC	
Phone Number	Contact Phone Extension:	Property Owner Phone Number:			
Contact Email Address:			Property Owner Email Address:		

<u>Comments/Conditions</u>	<u>Grading Plan Status Dates</u>
Planning Comments:	Planning
	Engineering

Engineering Comments:	Overall

Applicant Print and Sign Name

This is not a permit to construct or occupy a structure or open for business. Owner and/or applicant are responsible for the location of utility lines and easements. This Grading Permit does not guarantee the availability of water and/or sewer.

**WASTEWATER FLOW ACCEPTANCE FORM
FOR THE
WATER AND SEWER AUTHORITY OF CABARRUS COUNTY**

Jurisdiction Requesting Flow Acceptance:

Date:

- City of Concord City of Kannapolis Town of Harrisburg Town of Mt. Pleasant
 Charlotte Mecklenburg Utilities

Project Title, Description, and Number of Lots/Unit:

Project Title: _____ **-Project #** _____

Description: The _____ engineering plans and specifications, as prepared and sealed by _____, NCPE, with _____, for the wastewater collection system extension consisting of approximately _____ linear feet of _____-inch sanitary sewer with _____ manholes and other appurtenances to serve _____ located off/on of _____, with a wastewater discharge of _____ GPD.

***Number of Lots:** _____ **OR** ***Number of Units:** _____ ***Must be included in request.**

Where will the new line be connected:

- Directly into a WSACC Interceptor
 Into the Jurisdiction's existing collection system
 Into a private line

Describe the location of the tie-in line to which the new sewer line will connect: The proposed _____-inch sanitary sewer extension will tie-in to the existing _____-inch sanitary sewer system, which extends to the _____-inch material WSACC _____ Interceptor

Which WSACC Interceptor will the flow ultimately be discharged into: XX-inch material WSACC Name Interceptor

What is the WSACC manhole number that the flow will be discharged into? +/- Node _____

What is the quantity of flow that will be discharged? _____ GPD

Flow type:

- Domestic _____ % Commercial _____ % Industrial _____ %

Name of wastewater treatment facility (WWTF) receiving wastewater:

- Rocky River Wastewater Treatment Facility – Permit #NC0036269
 Muddy Creek Wastewater Treatment Facility – Permit #NC0081621

Design drawings of new lines will be submitted to WSACC with the request for acceptance. Drawings can be submitted as a digital file (DWG) or distance and bearing starting with the tap on existing infrastructure.

If the new line is to connect directly into a WSACC interceptor, detailed drawings including specification of the tap, will be required before **flow acceptance will be provided.**

Mark Lomax at 704-786-1783, ext. 231, **must** be notified 48 hours in advance of a connection into a WSACC interceptor. WSACC will inspect connection before, during, and after completion.

If construction is not started within two (2) year from the date of approval of the flow acceptance for this project, the approval is rescinded and a second request and approval will be required for the project.

WSACC USE ONLY:

DATE: _____

- Current sewer model shows an Interceptor as being surcharged south of the manhole in question.
 Approved _____ Not Approved _____
 Current Sewer Model shows: _____



State of North Carolina
Department of Environment and Natural Resources
Division of Water Resources
Flow Tracking/Acceptance for Sewer Extension Permit Applications
 (FTSE -01/14)

(JURISDICTION USE ONLY)

Jurisdiction Requesting Flow Acceptance for Collection System:

- City of Concord
 City of Kannapolis
 Town of Harrisburg
 Town of Mt. Pleasant
 Charlotte Mecklenburg Utilities

Project Title, Description, and Number of Lots/Unit:

Project Title: _____ -Project # _____

Description: The _____ engineering plans and specifications, as prepared and sealed by _____, NCPE, with _____, for the wastewater collection system extension consisting of approximately _____ linear feet of _____-inch sanitary sewer with _____ manholes and other appurtenances to serve _____ located off/on of _____, with a wastewater discharge of _____ GPD.

What is the quantity of flow that will be discharged? _____ GPD

Flow type:

- Domestic _____ %
 Commercial _____ %
 Industrial _____ %

Section I - List the Jurisdiction's pump stations located between the project connection point and the WSACC Interceptor connection point.

Pump Station (Name or Number)	Firm Capacity * MGD	(A) Design Average Daily Flow ** (Firm/pf) MGD	(B) Approx. Current Average Daily Flow MGD	(C) Obligated, Not Yet Tributary Daily Flow MGD	(D) = (B+C) Total Current Flow Plus Obligated Flow MGD	(E)=(A-D) Available Capacity*** MGD

* The Firm Capacity of any pump station is defined as the maximum pumped flow that can be achieved with the largest pump taken out of service.
 **Design Average Daily Flow is the firm capacity of the pump station divided by a peaking factor not less than 2.5.
 ***A Planning Assessment Addendum shall be attached for each pump station located between the project connection point and the WWTP where Available Capacity is ≤ 0.

Section II. Jurisdiction's Certification Statement:

I, Wilmer Melton, III, Director of Public Works, certify that, to the best of my knowledge, the addition of the volume of wastewater to be permitted in this project has been evaluated along the route to the receiving WSACC interceptor; and the flow from this project is not anticipated to cause any capacity related sanitary sewer overflows or overburden on any downstream pump station in route to the receiving WSACC interceptor normal circumstances, given the implementation of the planned improvements identified in the planning assessment where applicable. This analysis has been performed in accordance with local established policies and procedures using the best available data. This certification applies to those items listed above in Section I plus all attached planning assessment addendums for which, to the best of my knowledge, will not adversely affect the downstream sewer capacity. Signature of this form indicates acceptance of this wastewater flow.

Jurisdiction's Signing Official Signature

Date



State of North Carolina
Department of Environment and Natural Resources
Division of Water Resources
Flow Tracking/Acceptance for Sewer Extension Permit Applications
 (FTSE -01/14)

(WSACC USE ONLY)

Section I. Name of wastewater treatment facility (WWTF) receiving wastewater:

- Rocky River Wastewater Treatment Facility – Permit #NC0036269**
 Muddy Creek Wastewater Treatment Facility – Permit #NC0081621

WWTP facility's permitted flow, MGD _____

Estimated obligated flow not yet tributary to the WWTP, MGD _____

WWTP facility's actual avg. daily flow, MGD _____

Total flow for this specific request, MGD _____

Total actual and obligated flows to the facility, MGD _____

Percent of permitted flow used _____

Section II. Pump stations along the route from the **Jurisdiction's** connection point to the WWTP.

Pump Station (Name or Number)	Firm Capacity * MGD	(A) Design Average Daily Flow ** (Firm/pf) MGD	(B) Approx. Current Average Daily Flow MGD	(C) Obligated, Not Yet Tributary Daily Flow MGD	(D) = (B+C) Total Current Flow Plus Obligated Flow MGD	(E)=(A-D) Available Capacity*** MGD

* The Firm Capacity of any pump station is defined as the maximum pumped flow that can be achieved with the largest pump taken out of service.

**Design Average Daily Flow is the firm capacity of the pump station divided by a peaking factor not less than 2.5.

***A Planning Assessment Addendum shall be attached for each pump station located between the project connection point and the WWTP where Available Capacity is ≤ 0.

Section III. WSACC Certification Statement:

I, _____, certify that, to the best of my knowledge, the addition of the volume of wastewater to be permitted in this project has been evaluated along the route from the connection to the interceptor to the receiving wastewater treatment facility; and the flow from this project is not anticipated to cause any capacity related sanitary sewer overflows or overburden on any downstream pump station in route to the receiving treatment plant under normal circumstances, given the implementation of the planned improvements identified in the planning assessment where applicable. This analysis has been performed in accordance with local established policies and procedures using the best available data. This certification applies to those items listed above in Section I and Section II plus all attached planning assessment addendums for which, to the best of my knowledge, will not adversely affect the downstream sewer capacity. Signature of this form indicates acceptance of this wastewater flow.

WSACC's Signing Official Signature

Date



15A NCAC 02T .0300 – FAST TRACK SEWER SYSTEM EXTENSION APPLICATION
INSTRUCTIONS FOR FORM: FTA 04-16 & SUPPORTING DOCUMENTATION

This application is for sewer extensions involving gravity sewers, pump stations and force mains, or any combination that has been certified by a professional engineer and the applicant that the project meets the requirements of [15A NCAC 02T](#) and the Division's Minimum Design Criteria and that **plans, specifications and supporting documents have been prepared in accordance with, [15A NCAC 02T](#), [15A NCAC 02T .0300](#), [Division policies](#) and [good engineering practices](#).**

While no upfront engineering design documents are required for submittal, in accordance with 15A NCAC 02T .0305(b), design documents must be prepared prior to submittal of a fast track permit application to the Division. This would include plans, design calculations, and project specifications referenced in [15A NCAC 02T .0305](#) and the applicable minimum design criteria. These documents shall be available upon request by the Division.

Projects that are deemed permitted (do not require a permit from the Division) are explained in [15A NCAC 02T.0303](#).

Projects not eligible for review via the fast track process (must be submitted for full technical review):

- Projects that require an environmental assessment in accordance with 15A NCAC 1C .0100;
- Projects that do not meet any part of the minimum design criteria (MDC) document;
- Projects that involve a variance from the requirements of 15A NCAC 2T;
- Pressure sewer systems utilizing septic tank-effluent pumps (STEPS) or simplex grinder pumps;
- STEP or simplex grinder pumps connecting to pressurized systems (e.g. force mains);
- Vacuum sewer systems.

General – When submitting an application, please use the following instructions as a checklist in order to ensure all required items are submitted. Adherence to these instructions and checking the provided boxes will help produce a quicker review time and reduce the amount of requested additional information. **Failure to submit all required items will necessitate additional processing and review time, and may result in return of the application.** Unless otherwise noted, the Applicant shall submit one original and one copy of the application and supporting documentation.

A. One Original and One Copy of Application and Supporting Documents

- Required unless otherwise noted

B. Cover Letter (Required for All Application Packages):

- List all items included in the application package, as well as a brief description of the requested permitting action.
- Be specific as to the system type, number of homes served, flow allocation required, etc.
- If necessary for clarity, include attachments to the application form.

C. Application Fee (All New and Major Modification Application Packages):

- Submit a check or money order in the amount of **\$480.00** dated within 90 days of application submittal.
- Payable to North Carolina Department of Environmental Quality (NCDEQ)

D. Fast Track (Form: FTA 04-16) Application (Required for All Application Packages):

- Submit the completed and appropriately executed application.
- If necessary for clarity or due to space restrictions, attachments to the application may be made.
- If the Applicant Type in Item I.2 is a corporation or company, provide documentation it is registered for business with the [North Carolina Secretary of State](#).
- If the Applicant Type in Item I.2 is a partnership or d/b/a, enclose a copy of the certificate filed with the Register of Deeds in the county of business.
- The Project Name in Item II.1 shall be consistent with the project name on the flow acceptance letters, agreements, etc.
- The Professional Engineer's Certification on Page 5 of the application shall be signed, sealed and dated by a [North Carolina licensed Professional Engineer](#).
- The Applicant's Certification on Page 5 of the application shall be signed in accordance with [15A NCAC 02T .0106\(b\)](#). Per 15A NCAC 02T .0106(c), an alternate person may be designated as the signing official if a delegation letter is provided from a person who meets the criteria in 15A NCAC 02T .0106(b).

E. Flow Tracking/Acceptance Form (Form: FTSE 04-16) (If Applicable):

- Submit the completed and executed FTSE form from the owners of the downstream sewers and treatment facility.
- Multiple forms maybe required where the downstream sewer owner and wastewater treatment facility are different.
- The flow acceptance indicated in form FTSE must not expire prior to permit issuance and must be dated less than one year prior to the application date.
- Submittal of this application and form FTSE indicates that owner has adequate capacity and will not violate [G.S. 143-215.67\(a\)](#).
- Intergovernmental agreements or other contracts will not be accepted in lieu of a project-specific FTSE.

F. Site Maps (All Application Packages):

- Submit an 8.5-inch x 11-inch color copy of a USGS Topographic Map of sufficient scale to identify the entire project area and closest surface waters.
- Location of the project (gravity sewer, pump stations & force main)
- Downstream connection points and permit number (if known) for the receiving sewer
- Include a street level map showing general project area.

G. Existing Permit (All Modification Packages):

- Submit the most recently issued existing permit.
- Provide a list of any items within the permit the Applicant would like the Division to address during the permit modification (i.e., permit description, flow allocation, treatment facility, etc.).

H. Power Reliability Plan (Required if portable reliability option utilized for Pump Station):

- Per [15A NCAC 02T .0305\(h\)\(1\)](#), submit documentation of power reliability for pumping stations.
- This alternative is only available for average daily flows less than 15,000 gallons per day
- It shall be demonstrated to the Division that the portable source is owned or contracted by the applicant and is compatible with the station. The Division will accept a letter signed by the applicant (see 15A NCAC 02T .0106(b)) or proposed contractor, stating that “the portable power generation unit or portable, independently-powered pumping units, associated appurtenances and personnel are available for distribution and operation of this pump station.”
- **If the portable power source or pump is dedicated to multiple pump stations, an evaluation of all the pump stations' storage capacities and the rotation schedule of the portable power source or pump, including travel timeframes, shall be provided in the case of a multiple station power outage. (Required at time of certification)**

I. Certificate of Public Convenience and Necessity (All Application Packages for Privately-Owned Public Utilities):

- Per [15A NCAC 02T .0115\(a\)\(1\)](#) provide the Certificate of Public Convenience and Necessity from the [North Carolina Utilities Commission](#) demonstrating the Applicant is authorized to hold the utility franchise for the area to be served by the sewer extension, or
- Provide a letter from the [North Carolina Utilities Commission's Water and Sewer Division Public Staff](#) stating an application for a franchise has been received and that the service area is contiguous to an existing franchised area or that franchise approval is expected.

J. Operational Agreements (Applications from HOA/POA and Developers for lots to be sold):

- Home/Property Owners' Associations
 - Per [15A NCAC 02T .0115\(c\)](#), submit the properly executed [Operational Agreement \(FORM: HOA\)](#).
 - Per 15A NCAC 02T .0115(c), submit a copy of the Articles of Incorporation, Declarations and By-laws.
- Developers of lots to be sold
 - Per 15A NCAC 02T .0115(b), submit the properly executed [Operational Agreement \(FORM: DEV\)](#).

For more information, visit the Division's collection systems [website](#)

THE COMPLETED APPLICATION PACKAGE INCLUDING ALL SUPPORTING INFORMATION AND MATERIALS, SHOULD BE SENT TO THE APPROPRIATE REGIONAL OFFICE:

REGIONAL OFFICE	ADDRESS	COUNTIES SERVED
<u>Asheville Regional Office Water Quality Section</u>	2090 US Highway 70 Swannanoa, North Carolina 28778 (828) 296-4500 (828) 299-7043 Fax	Avery, Buncombe, Burke, Caldwell, Cherokee, Clay, Graham, Haywood, Henderson, Jackson, Macon, Madison, McDowell, Mitchell, Polk, Rutherford, Swain, Transylvania, Yancey
<u>Fayetteville Regional Office Water Quality Section</u>	225 Green Street Suite 714 Fayetteville, North Carolina 28301-5094 (910) 433-3300 (910) 486-0707 Fax	Anson, Bladen, Cumberland, Harnett, Hoke, Montgomery, Moore, Robeson, Richmond, Sampson, Scotland
<u>Mooresville Regional Office Water Quality Section</u>	610 E. Center Avenue Mooresville, North Carolina 28115 (704) 663-1699 (704) 663-6040 Fax	Alexander, Cabarrus, Catawba, Cleveland, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, Stanly, Union
<u>Raleigh Regional Office Water Quality Section</u>	1628 Mail Service Center Raleigh, North Carolina 27699-1628 (919) 791-4200 (919) 788-7159 Fax	Chatham, Durham, Edgecombe, Franklin, Granville, Halifax, Johnston, Lee, Nash, Northampton, Orange, Person, Vance, Wake, Warren, Wilson
<u>Washington Regional Office Water Quality Section</u>	943 Washington Square Mall Washington, North Carolina 27889 (252) 946-6481 (252) 975-3716 Fax	Beaufort, Bertie, Camden, Chowan, Craven, Currituck, Dare, Gates, Greene, Hertford, Hyde, Jones, Lenoir, Martin, Pamlico, Pasquotank, Perquimans, Pitt, Tyrrell, Washington, Wayne
<u>Wilmington Regional Office Water Quality Section</u>	127 Cardinal Drive Extension Wilmington, North Carolina 28405 (910) 796-7215 (910) 350-2004 Fax	Brunswick, Carteret, Columbus, Duplin, New Hanover, Onslow, Pender
<u>Winston-Salem Regional Office Water Quality Section</u>	450 W. Hanes Mill Road Suite 300 Winston-Salem, North Carolina 27105 (336) 776-9800	Alamance, Alleghany, Ashe, Caswell, Davidson, Davie, Forsyth, Guilford, Rockingham, Randolph, Stokes, Surry, Watauga, Wilkes, Yadkin



Application Number: _____ (to be completed by DWR)

All items must be completed or the application will be returned

I. APPLICANT INFORMATION:

- 1. Applicant's name: City of Kannapolis (company, municipality, HOA, utility, etc.)
2. Applicant type: Individual, Corporation, General Partnership, Privately-Owned Public Utility, Federal, State/County, Municipal, Other
3. Signature authority's name: Wilmer Melton, III per 15A NCAC 02T .0106(b)
Title: Director of Public Works
4. Applicant's mailing address: 401 Laureate Way
City: Kannapolis State: NC Zip: 28081-0005
5. Applicant's contact information:
Phone number: (704) 920-4200 Email Address: wmelton@kannapolisnc.gov

II. PROJECT INFORMATION:

- 1. Project name: _____
2. Application/Project status: Proposed (New Permit), Existing Permit/Project
If a modification, provide the existing permit number: WQ00_____ and issued date: _____
If new construction but part of a master plan, provide the existing permit number: WQ00_____
3. County where project is located: _____
4. Approximate Coordinates (Decimal Degrees): Latitude: _____° Longitude: - _____°
5. Parcel ID (if applicable): _____
(or Parcel ID to closest downstream sewer)

III. CONSULTANT INFORMATION:

- 1. Professional Engineer: _____ License Number: _____
Firm: _____
Mailing address: _____
City: _____ State: _____ Zip: _____-_____
Phone number: (____) ____-_____ Email Address: _____

IV. WASTEWATER TREATMENT FACILITY (WWTF) INFORMATION:

- 1. Facility Name: Rocky River Regional Wastewater Treatment Plant Permit Number: NC0036269
Owner Name: Water & Sewer Authority of Cabarrus County

V. RECEIVING DOWNSTREAM SEWER INFORMATION (if different than WWTF):

- 1. Permit Number(s): WQ_____
System Wide Collection System Permit Number(s) (if applicable): WQCS_____
Owner Name(s): _____

VI. GENERAL REQUIREMENTS

1. If the Applicant is a Privately-Owned Public Utility, has a Certificate of Public Convenience and Necessity been attached?
 Yes No N/A
2. If the Applicant is a Developer of lots to be sold, has a [Developer's Operational Agreement \(FORM: DEV\)](#) been attached?
 Yes No N/A
3. If the Applicant is a [Home/Property Owners' Association](#), has an [Operational Agreement \(FORM: HOA\)](#) been attached?
 Yes No N/A

4. Origin of wastewater: (check all that apply):

- | | | |
|---|---|--|
| <input type="checkbox"/> Residential Owned | <input type="checkbox"/> Retail (stores, centers, malls) | <input type="checkbox"/> Car Wash |
| <input type="checkbox"/> Residential Leased | <input type="checkbox"/> Retail with food preparation/service | <input type="checkbox"/> Hotel and/or Motels |
| <input type="checkbox"/> School / preschool / day care | <input type="checkbox"/> Medical / dental / veterinary facilities | <input type="checkbox"/> Swimming Pool /Clubhouse |
| <input type="checkbox"/> Food and drink facilities | <input type="checkbox"/> Church | <input type="checkbox"/> Swimming Pool/Filter Backwash |
| <input type="checkbox"/> Businesses / offices / factories | <input type="checkbox"/> Nursing Home | <input type="checkbox"/> Other (Explain in Attachment) |

5. Nature of wastewater : _____% Domestic/Commercial _____% Commercial
 _____% Industrial ([See 15A NCAC 02T .0103\(20\)](#))

 └─> Is there a Pretreatment Program in effect? Yes No

6. Has a flow reduction been approved under [15A NCAC 02T .0114\(f\)](#)? Yes No
 ➤ **If yes, provide a copy of flow reduction approval letter**

7. Summarize wastewater generated by project:

Establishment Type (see 02T.0114(f))	Daily Design Flow ^{a,b}	No. of Units	Flow
	gal/		GPD
		<i>Total</i>	GPD

a See [15A NCAC 02T .0114\(b\), \(d\), \(e\)\(1\) and \(e\)\(2\)](#) for caveats to wastewater design flow rates (i.e., minimum flow per dwelling; proposed unknown non-residential development uses; public access facilities located near high public use areas; and residential property located south or east of the Atlantic Intracoastal Waterway to be used as vacation rentals as defined in [G.S. 42A-4](#)).

b Per 15A NCAC 02T .0114(c), design flow rates for establishments not identified [in table [15A NCAC 02T.0114](#)] shall be determined using available flow data, water using fixtures, occupancy or operation patterns, and other measured data.

8. Wastewater generated by project: ___ GPD (per [15A NCAC 02T .0114](#))

➤ Do not include future flows or previously permitted allocations

If permitted flow is zero, indicate why:

Pump Station or Gravity Sewer where flow will be permitted in subsequent permits that connect to this line

Flow has already been allocated in Permit Number: _____

Rehabilitation or replacement of existing sewer with no new flow expected

Other (Explain): _____

VII. GRAVITY SEWER DESIGN CRITERIA (If Applicable) - [02T .0305](#) & [MDC \(Gravity Sewers\)](#):

1. Summarize gravity sewer to be permitted:

Size (inches)	Length (feet)	Material

- Section II & III of the MDC for Permitting of Gravity Sewers contains information related to design criteria
- Section III contains information related to minimum slopes for gravity sewer(s)
- **Oversizing lines to meet minimum slope requirement is not allowed and a violation of the MDC**

VIII. PUMP STATION DESIGN CRITERIA (If Applicable) - [02T .0305](#) & [MDC \(Pump Stations/Force Mains\)](#):

COMPLETE FOR EACH PUMP STATION INCLUDED IN THIS PROJECT

1. Pump station number or name: _____
2. Approximate Coordinates (Decimal Degrees): Latitude: _____° Longitude: - _____°
3. Design flow of the pump station: _____ millions gallons per day (firm capacity)
4. Operational point(s) of the pump(s): _____ gallons per minute at _____ feet total dynamic head (TDH)
5. Summarize the force main to be permitted (for this Pump Station):

Size (inches)	Length (feet)	Material

6. Power reliability in accordance with [15A NCAC 02T .0305\(h\)\(1\)](#):

- Standby power source or pump with automatic activation and telemetry - [15A NCAC 02T .0305\(h\)\(1\)\(B\)](#):
- Required for all pump stations with an average daily flow greater than or equal to 15,000 gallons per day
 - Must be permanent to facility

Or if the pump station has an average daily flow less than 15,000 gallons per day:

- Portable power source with manual activation, quick-connection receptacle and telemetry - [15A NCAC 02T .0305\(h\)\(1\)\(C\)](#)

or

- Portable pumping unit with plugged emergency pump connection and telemetry - [15A NCAC 02T .0305\(h\)\(1\)\(C\)](#):
- It shall be demonstrated to the Division that the portable source is owned or contracted by the applicant (draft agreement) and is compatible with the station.
 - If the portable power source or pump is dedicated to multiple pump stations, an evaluation of all the pump stations' storage capacities and the rotation schedule of the portable power source or pump, including travel timeframes, shall be provided in the case of a multiple station power outage.

IX. SETBACKS & SEPARATIONS – (02B .0200 & 15A NCAC 02T .0305(f)):

1. Does the project comply with all separations found in [15A NCAC 02T.0305\(f\) & \(g\)](#) Yes No

➤ 15A NCAC 02T.0305(f) contains minimum separations that shall be provided for sewer systems:

Setback Parameter*	Separation Required
Storm sewers and other utilities not listed below (vertical)	24 inches
Water mains (vertical-water over sewer including in benched trenches)	18 inches
Water mains (horizontal)	10 feet
Reclaimed water lines (vertical - reclaimed over sewer)	18 inches
Reclaimed water lines (horizontal - reclaimed over sewer)	2 feet
**Any private or public water supply source, including any wells, WS-I waters of Class I or Class II impounded reservoirs used as a source of drinking water	100 feet
**Waters classified WS (except WS-I or WS-V), B, SA, ORW, HQW, or SB from normal high water (or tide elevation) and wetlands (see item IX.2)	50 feet
**Any other stream, lake, impoundment, or ground water lowering and surface drainage ditches	10 feet
Any building foundation	5 feet
Any basement	10 feet
Top slope of embankment or cuts of 2 feet or more vertical height	10 feet
Drainage systems and interceptor drains	5 feet
Any swimming pools	10 feet
Final earth grade (vertical)	36 inches

- [15A NCAC 02T.0305\(g\)](#) contains alternatives where separations in [02T.0305\(f\)](#) cannot be achieved.
 ➤ **Stream classifications can be identified using the Division’s [NC Surface Water Classifications webpage](#)
 ➤ If noncompliance with [02T.0305\(f\) or \(g\)](#), see Section X of this application

2. Does the project comply with separation requirements for wetlands? (50 feet of separation) Yes No
 ➤ See the Division’s draft separation requirements for situations where separation cannot be meet
 ➤ No variance is required if the alternative design criteria specified is utilized in design and construction
 ➤ As built documents should reference the location of areas effected

3. Does the project comply with all setbacks found in the river basin rules per [15A NCAC 02B .0200?](#) Yes No
 ➤ This would include Trout Buffered Streams per [15A NCAC 2B.0202](#)

4. Does the project comply with an individual 404 Permit or any 401 Certifications? Yes No
 ➤ Wetland-related permits shall be requested, obtained, and adhered to for projects that impact wetlands or surface waters
 ➤ Information can be obtained from the [401 & Buffer Permitting Branch](#)

5. Does project comply with [15A NCAC 02T.0105\(c\)\(6\)](#) (additional permits/certifications)? Yes No
 Per [15A NCAC 02T.0105\(c\)\(6\)](#), directly related environmental permits or certification applications are being prepared, have been applied for, or have been obtained. Issuance of this permit is contingent on issuance of dependent permits (erosion and sedimentation control plans, stormwater management plans, etc.).

6. Does this project include any sewer collection lines that are deemed “high-priority?”
 Per [15A NCAC 02T.0402](#), “high-priority sewer” means “any aerial sewer, sewer contacting surface waters, siphon, or sewer positioned parallel to streambanks that is subject to erosion that undermines or deteriorates the sewer.”
 Yes No

➤ If yes, include an attachment with details for each line, including type (aerial line, size, material, and location).

High priority lines shall be inspected by the permittee or its representative at least once every six-months and inspections documented per 15A NCAC 02T.0403(a)(5) or the permittee’s individual System-Wide Collection permit.

X. CERTIFICATIONS:

1. Does the submitted system comply with [15A NCAC 02T](#), the [Minimum Design Criteria for the Permitting of Pump Stations and Force Mains \(latest version\)](#), and the [Gravity Sewer Minimum Design Criteria \(latest version\)](#) as applicable?

Yes No

If No, complete and submit the Variance/Alternative Design Request application (VADC 10-14) and supporting documents for review. **Approval of the request is required prior to submittal of the Fast Track Application and supporting documents.**

2. Professional Engineer's Certification:

I, _____ attest that this application for
(Professional Engineer's name from Application Item III.1.)

has been reviewed by me and is accurate, complete and consistent with the information supplied in the plans, specifications, engineering calculations, and all other supporting documentation to the best of my knowledge. I further attest that to the best of my knowledge the proposed design has been prepared in accordance with the applicable regulations, Gravity Sewer Minimum Design Criteria for Gravity Sewers (latest version), and the Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains (latest version). Although other professionals may have developed certain portions of this submittal package, inclusion of these materials under my signature and seal signifies that I have reviewed this material and have judged it to be consistent with the proposed design.

NOTE – In accordance with General Statutes 143-215.6A and 143-215.6B, any person who knowingly makes any false statement, representation, or certification in any application package shall be guilty of a Class 2 misdemeanor, which may include a fine not to exceed \$10,000, as well as civil penalties up to \$25,000 per violation.

North Carolina Professional Engineer's seal, signature, and date:



3. Applicant's Certification per 15A NCAC 02T .0106(b):

I, _____ attest that this application for
(Signature Authority's name & title from Application Item I.3.)

has been reviewed by me and is accurate and complete to the best of my knowledge. I understand that if all required parts of this application are not completed and that if all required supporting documentation and attachments are not included, this application package is subject to being returned as incomplete. I understand that any discharge of wastewater from this non-discharge system to surface waters or the land will result in an immediate enforcement action that may include civil penalties, injunctive relief, and/or criminal prosecution. I will make no claim against the Division of Water Resources should a condition of this permit be violated. I also understand that if all required parts of this application package are not completed and that if all required supporting information and attachments are not included, this application package will be returned to me as incomplete.

NOTE – In accordance with General Statutes [143-215.6A](#) and [143-215.6B](#), any person who knowingly makes any false statement, representation, or certification in any application package shall be guilty of a Class 2 misdemeanor, which may include a fine not to exceed \$10,000 as well as civil penalties up to \$25,000 per violation.

Signature: _____

Date: _____

**North Carolina Department of Environmental Quality
 Division of Water Resources
 Public Water Supply Section**

Application for Approval of Engineering Plans and Specifications For Water Supply Systems

Applicant	Design Engineer
City of Kannapolis _____ (Name of Board, Council or Owner – the Applicant) Wilmer Melton, III - Director of Public Works _____ (Name and Title of Authorized Official or Representative of the Applicant)	_____ (Name of Design Engineer of Record)
401 Laureate Way _____ (Street or Box Number)	_____ (Name of Engineering Firm)
Kannapolis, NC 28081 _____ (City, State & ZIP)	_____ (Street or Box Number)
704-920-4200 _____ (Phone Number)	_____ (City, State & ZIP)
_____ (FAX Number)	_____ (Phone Number)
wmelton@kannapolisnc.gov _____ (Email address)	_____ (FAX Number)
_____ (Signature of Authorized Official or Representative of the Applicant)	_____ (Email address)

Project Name: _____
 (Name of Project to appear on Public Water Supply Section records and tracking system)

_____ (description of project)

_____ (general location of project)

in _____ County.

Date _____
 (for DEQ use only)

Serial No. _____
 (for DEQ use only)

Application for Approval of Engineering Plans and Specifications for Water Supply Systems

To: Division of Water Resources,
Department of Environmental Quality

The **Applicant** applies under and in full accord with the provision of NCGS 130A-317, and such other statutes and rules as relate to public water systems. The **Authorized Official** or **Representative** of the **Applicant** represents that he is authorized to act for the **Applicant**. The **Authorized Official** or **Representative** of the **Applicant** understands and agrees to the following:

1. The **Applicant** shall not award contracts or begin construction without first receiving "Authorization to Construct" from DEQ.
2. The **Applicant** shall make no change or deviation from the engineering plans and specifications approved by DEQ except as allowed by 15A NCAC 18C .0306 or with the written consent and approval of DEQ.
3. The **Applicant** shall obtain Final Approval in accordance with 15A NCAC 18C .0306 prior to placing the project (or any portion thereof) into service.
4. Digital (PDF) submittals are true image copy of the original sealed/signed documents.

An authorized representative of the **Public Water System** (not always the same as the **Applicant**) is to complete and sign the following WSMP section.

Status of Water System Management Plan (WSMP)

Check one of the following, and if applicable, provide the required information:

- The WSMP for the project, as defined in the attached engineering plans and specifications, has not been submitted.
- Three copies of the WSMP for the project, as defined in the attached engineering plans and specifications, are submitted with this application.
- The WSMP that includes this project, as defined in the attached engineering plans and specifications, was previously submitted.

Provide the following:

Public Water System Name: City of Kannapolis

Owner Name: City of Kannapolis

Water System No.: NC

Serial Number of Deemed Complete WSMP: 00-02231

By my signature below, I certify that the previously submitted WSMP contains the information required by 15A NCAC 18C .0307(c) for the project defined in the attached engineering plans and specifications.

Wilmer Melton, III

(Type or print name of authorized representative of Public Water System)

Director of Public Works

(Title of authorized representative of Public Water System)

(Signature of authorized representative of Public Water System)

(Date)

Application for Approval of Engineering Plans and Specifications for Water Supply Systems

In accordance with NCGS 130A-328, the Public Water Supply Section charges a fee for plan review. **Any documents submitted for review must be accompanied by a check payable to DEQ-Public Water Supply Section before the review will begin.**

There is a \$25 fee for returned checks.

The charges for review of plans are shown below. Check one of the following.

Distribution System fees

- | | | |
|--------------------------|---|--------------|
| <input type="checkbox"/> | Construction of water lines, less than 5000 linear feet | \$150 |
| <input type="checkbox"/> | Construction of water lines, 5000 linear feet or more | \$200 |
| <input type="checkbox"/> | Other construction or alteration to a distribution system | \$ 75 |

Ground Water System fees

- | | | |
|--------------------------|--|--------------|
| <input type="checkbox"/> | Construction of a new ground water system or adding a new well | \$200 |
| <input type="checkbox"/> | Alteration to an existing ground water system | \$100 |

Surface water system fees

- | | | |
|--------------------------|---|--------------|
| <input type="checkbox"/> | Construction of a new surface water intake or treatment facility | \$250 |
| <input type="checkbox"/> | Alteration to existing surface water intake or treatment facility | \$150 |

Other fees

- | | | |
|--------------------------|--|--------------|
| <input type="checkbox"/> | Water System Management Plan review | \$ 75 |
| <input type="checkbox"/> | Miscellaneous changes or maintenance not covered above | \$ 50 |

Notes:

1. Projects for Tank Rehabilitation use separate "Application for Water Tank Reconditioning Plan Approval."
2. The fee is not refundable if the plans are not approved.
3. Revisions to plans to address the Public Water Supply Section's or other state agency's comments do not incur an additional fee.
4. If one set of plans has multiple related items (such as a new well with construction of water lines) only one fee must be submitted for highest price item. The amounts are not cumulative, except for fees for Water System Management Plans.
5. **If the appropriate plan review fee is not received within ten days after the receipt of plans, specifications, and reports for approval, then all plan documents will be recycled. A new set of documents must then be submitted with the appropriate fee for approval.**

This approval does not address all applicable laws, rules, standards and criteria, and other approvals and licenses that may be required by the local, state or federal government.

The Public Water Supply Section has stamped and sealed the official copies of plans and specifications accompanying this application with the serial number of this application _____. Any erasures, additions or alterations of the proposed improvements except those permitted in 15A NCAC 18C .0306 make this approval null and void.

This approval does not constitute a warranty of the design, construction or future operation of the water system.

Signed: _____
Robert W. Midgette, P.E., Operations Branch Head
Public Water Supply Section
Division of Water Resources

Application for Approval of Engineering Plans and Specifications for Water Supply Systems

Other Information and Checklist Page

- Attached is a check for the proper plan review fee amount, in accordance with NCGS 130A-328. See note 4 on page 3.
-

This-submittal includes one paper original with two digital (PDF) CDs of the following items, each item in separate folders:

- This completed “*Application for Approval of Engineering Plans and Specifications for Water Supply Systems*”
- The sealed plan drawings, separate file in PDF format for each drawing. Cover sheet must include drawings index;
- The project-specific Engineering Report (ER) describing the scope and purpose of the project and addressing each of the items listed in 15A NCAC 18C .0307(b), including the design basis of the project. [15A NCAC 18C .0307(b) (12)];
- Specifications for this project; **OR**
- The project will use the following system’s previously approved standard specifications for waterline extensions:

Name of System: City of Kannapolis

Serial Number: 89-7160

The Serial Numbers for previously approved standard specifications can be found at the following website:

<http://www.ncwater.org/?page=424>

One of the following:

- Attached is a letter signed by an authorized representative of the Public Water System agreeing to serve the project and stating that the system has adequate supply;
- OR**
- The **Applicant** is the Public Water System.
-

If the project has sought funding (for example, DWSRF loan) list the program and (if available) the application or funding number below:

Program Name	Application or Funding Number, if available

- Yes No
- Project will be completed with significant expenditure of state moneys, greater than ten million dollars (\$10,000,000) in accordance with G.S. 113A-9 (7a).
 - Project will cause substantial, permanent land-disturbing activity of an area greater than 10 acres of public lands in accordance with G.S. 113A-9 (11).

City of Kannapolis

Engineer's Report for Water Main Extensions

Date: _____

Project Name: _____

Water System Name: City of Kannapolis

Water System ID: _____

County of Project: _____

Prepared by:

This form includes the minimum information needed for the N.C. Public Water Supply Section to review water main extension projects. Complex or unique design conditions must be addressed in a supplemental document as deemed appropriate by the design engineer.

Signature and seal of professional engineer that prepared this report



I attest that this engineer's report has been prepared by me, or under my responsible charge, and is accurate, complete and consistent with the information supplied in the engineering calculations. I further attest that the proposed design has been prepared in accordance with 15A NCAC 18C. Although page 4 of this report incorporates data provided by others, inclusion of these materials under my seal signifies that I have reviewed this material and have judged it to be consistent with the proposed design.

Water Main Extension Engineer's Report Mandatory Information

To present data required by 15A NCAC 18C .0307(b)

Specific citations from 15A NCAC 18C are provided when data is required to confirm compliance with another regulation.

Applicant Information

Applicant name (must be a person): Wilmer Melton, III – Director of Public Works

Applicant mailing address: 401 Laureate Way
Kannapolis, NC 28081

Applicant phone numbers: Business 704-920-4200 Cell _____

Applicant e-mail address: wmelton@kannapolisnc.gov

Description of Proposed Project

Name of proposed project: _____

Provide a summary of the diameter, length and material of all piping proposed in the project.

Diameter of piping	Length of piping	Material
_____ -inch	_____ linear feet	
_____ -inch	_____ linear feet	
_____ -inch	_____ linear feet	
_____ -inch	_____ linear feet	
_____ -inch	_____ linear feet	

Location of project: (use existing road and intersections, address if available; and identify municipality).

The proposed project is an expansion of the existing public water system. Yes No

The source of water for the proposed project will be provided by a separately owned public water system. Yes No

Is the project phased? Yes No

If yes, delineate all phases in plan sheets. Partial final approvals may be granted to completed phases specified in this submittal.

If yes, depending on whether the water system does or does not provide fire flow; provide calculations to demonstrate that the project can provide adequate peak demand (domestic peak demand) at the minimum required residual pressure of 30 pounds per square inch gauge (psig) or can provide peak demand with fire flow (domestic peak demand plus fire flow) at the minimum pressure of 20 psig through *each* phase of construction.

Check here if project is a water main replacement with no additional demands. (Water main replacement consists of like size, no additional service connections, and no additional hydrants and no added fire demand.)	<input type="checkbox"/> If box checked, proceed to page 4
--	--

Provide anticipated project flows for any project that will increase demands

Does the proposed project include any in-ground irrigation?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If yes, attach appropriate analysis to address how the system is designed to accommodate the impact of irrigation use on treated water supply, storage needs and system pressure.	
Peak demand of the proposed project	_____ gpm
Maximum daily demand of the proposed project	_____ gpd
If the water system does not provide fire flow, indicate the minimum <i>calculated</i> pressure at domestic peak demand (non-fire flow). The pressure must be at least 30 psig per Rule .0901. You must attach supporting documentation.	_____ psig
If the water system does provide fire flow, indicate the minimum calculated pressure at peak demand (domestic plus fire flow). Pressure must be at least 20 psig per Rule .0901. You must attach supporting documentation.	_____ psig
Does this project meet the fire flow requirements specified by the public water system?	<input type="checkbox"/> Yes <input type="checkbox"/> No

gpm: gallons per minute

gpd: gallons per day

psig: pounds per square inch gauge

Water System-Supplied Information

Information on this page must be updated on an annual basis

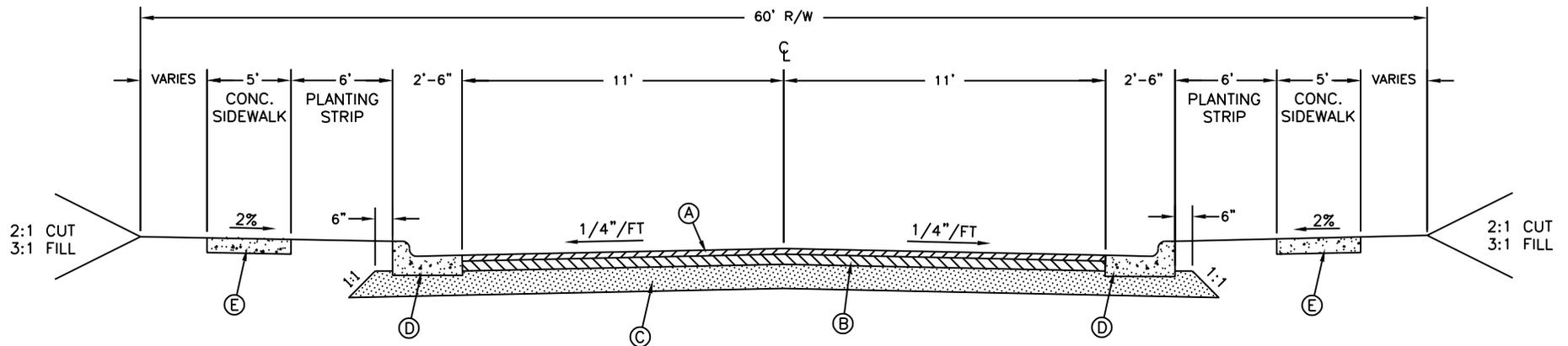
Data provided by: Wilmer Melton, III (name) Date provided: April 4, 2016

Position: Director of Public Works

Number of current connections in water system	<u>18,796</u> connections
Approved number of connections in water system	<u> </u> connections <input checked="" type="checkbox"/> N/A – local government system
Current average and maximum daily demand of existing system. Average day demand is the one day average demand for the latest calendar year.	<u>3.426 million</u> average gpd <u>5.200 million</u> maximum gpd
Current maximum daily treated water supply of existing system Maximum daily treated water supply is the maximum quantity of treated water that can be produced and/or purchased by the system.	<u>19.6 million</u> maximum gpd
Total elevated storage capacity of existing system	<u>1.6 million</u> gallons
Total ground storage capacity of existing system	<u>7.0 million</u> gallons
Total hydropneumatic storage capacity of existing system	<u>0</u> gallons
Contractual storage with other system(s) Attach a copy of the agreement with the providing system	<u>0</u> gallons
Systems > 300 connections or systems < 300 connections without hydropneumatic storage:	
• Total storage volume is at least half the average annual daily demand (Rule .0805(c))	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
• For municipalities, at least 75,000 gallons elevated storage and at least half the average day demand combined elevated and ground finished water storage (Rule .0805(b))	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Systems with hydropneumatic storage tanks up to 300 connections:	
• Volume of hydropneumatic storage tank is sufficient to meet peak demands based on Rule .0802 and calculations in Appendix B, Figure 6	<input type="checkbox"/> Yes <input type="checkbox"/> No
• For residential community systems, volume of hydropneumatic storage tank is at least 40 times the number of connections or 500 gallons, whichever is greater (Rule .0803)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
• For mobile home park systems, volume of hydropneumatic storage tank is at least 25 times the number of connections or 500 gallons, whichever is greater (Rule .0803)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
• For campground systems, volume of hydropneumatic storage tank is at least 10 times the number of connections or 500 gallons, whichever is greater (Rule .0803)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

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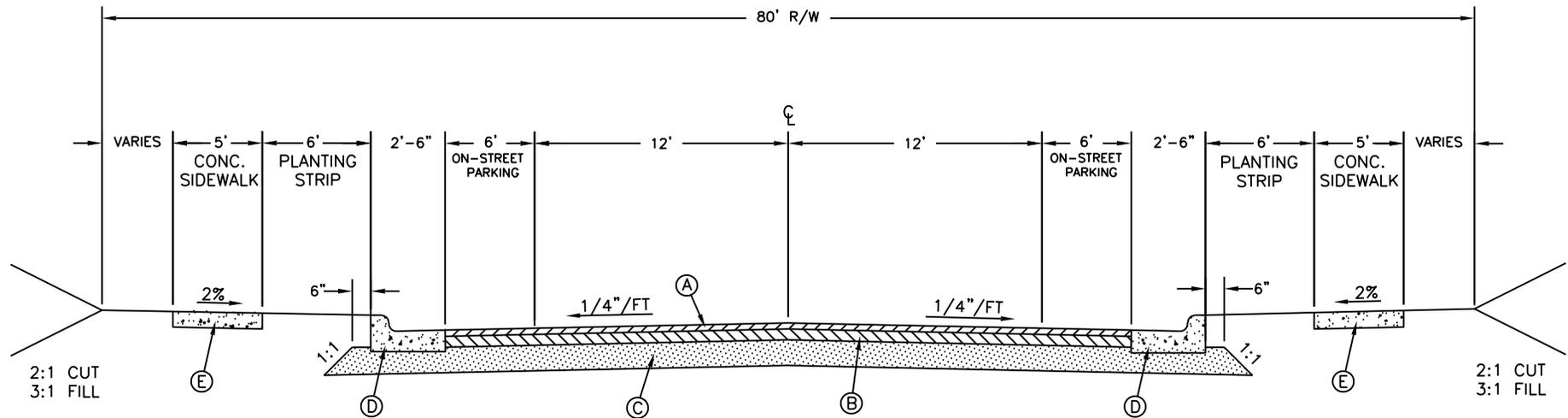
DRAFT



PAVEMENT SCHEDULE

- A. 2" S9.5B SURFACE COURSE (PLACED IN 2 - 1" LIFTS)
- B. 2.5" 119.0C INTERMEDIATE COURSE
- C. 8" AGGREGATE BASE COURSE (w/5.5" UNDER CURB)
OR 4" B25.0C BASE COURSE (w/4" UNDER CURB)
- D. 2'-6" CURB & GUTTER (2'-0" VALLEY GUTTER MAY BE USED WITH PRIOR APPROVAL)
- E. 4" CONCRETE SIDEWALK

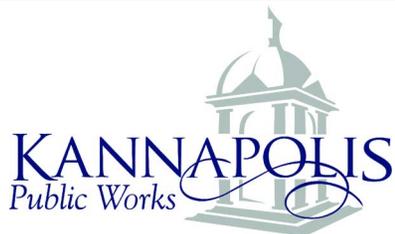
NOT TO SCALE



PAVEMENT SCHEDULE

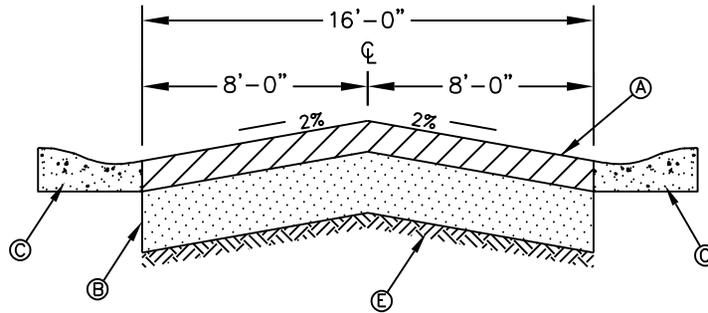
- A. 2" S9.5B SURFACE COURSE (PLACED IN 2 - 1" LIFTS)
- B. 2.5" I19.0C INTERMEDIATE COURSE
- C. 8" AGGREGATE BASE COURSE (w/5.5" UNDER CURB)
OR 4" B25.0C BASE COURSE (w/4" UNDER CURB)
- D. 2'-6" CURB & GUTTER
- E. 4" CONCRETE SIDEWALK

NOT TO SCALE

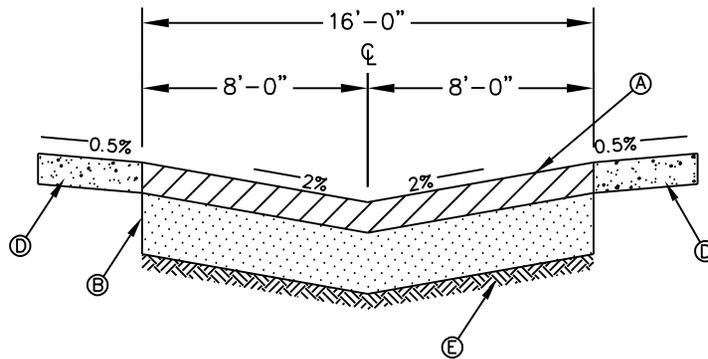


TYPICAL SECTION
RESIDENTIAL COLLECTOR STREET

November 2018



ALLEY WITH NORMAL CROWN



ALLEY WITH INVERSE CROWN

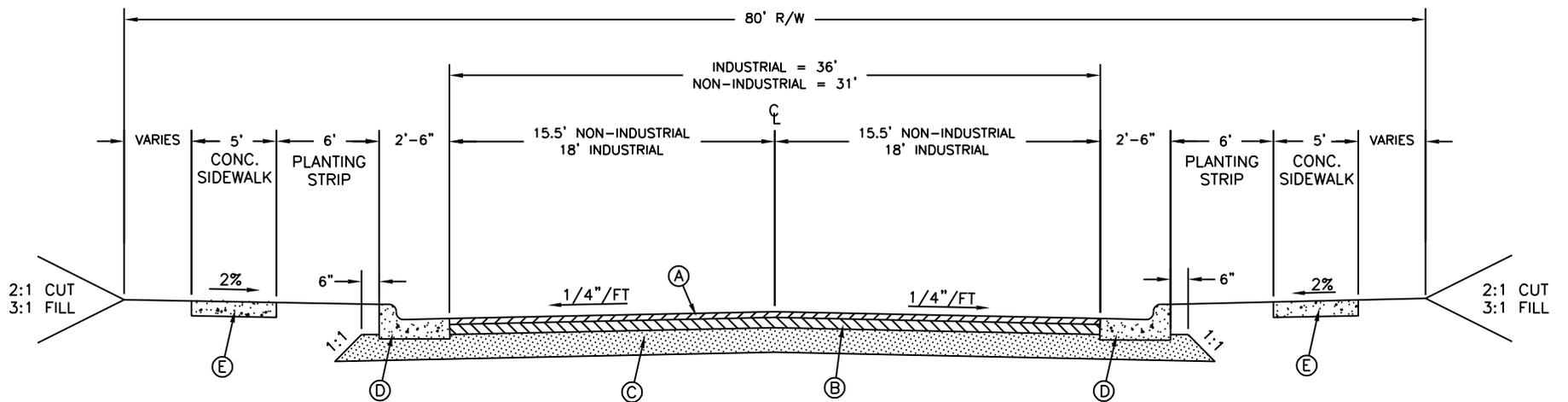
PAVEMENT SCHEDULE

- A. 2" S9.5C SURFACE COURSE
- B. 8" AGGREGATE BASE COURSE OR 4" B25.0C BASE COURSE
- C. 2'-0" VALLEY GUTTER
- D. 1'-0" CONCRETE STRIP
- E. SUBGRADE COMPACTED TO PUBLIC STREET STANDARDS

NOTES:

1. ALLEYS SHALL BE CONSIDERED PRIVATE EASEMENTS AND WILL NOT BE ACCEPTED FOR MAINTENANCE BY THE CITY OF KANNAPOLIS.
2. TYPICAL SECTION APPLIES TO SINGLE- OR DOUBLE-LOADED ALLEYS. FOR SINGLE-LOADED ALLEYS, THERE SHALL BE A 20-FOOT CLEAR ZONE FREE OF CUT SLOPES, OBSTRUCTIONS, HEDGES, ETC. FROM THE LOADED SIDE EDGE OF PAVEMENT.

NOT TO SCALE



PAVEMENT SCHEDULE

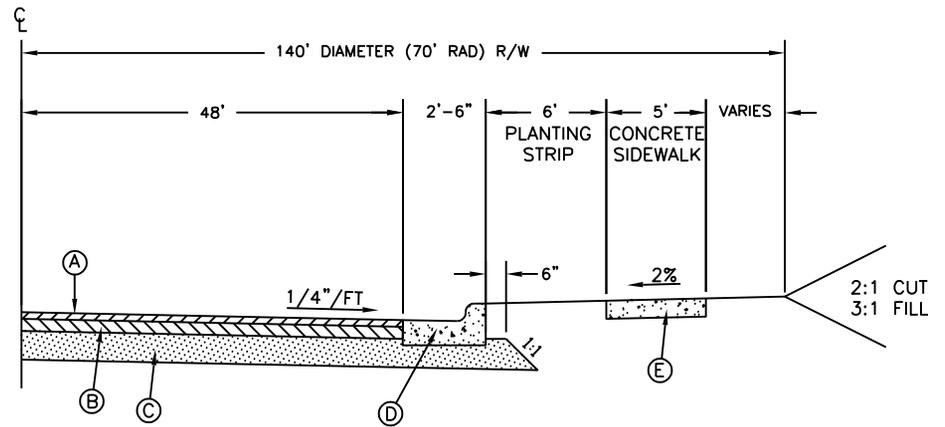
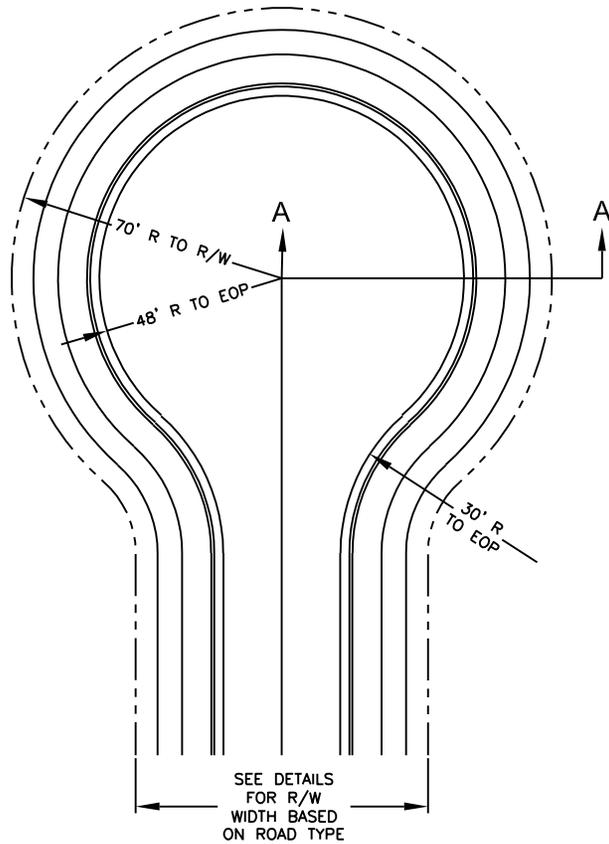
- A. 2" S9.5B SURFACE COURSE (PLACED IN 2 - 1" LIFTS)
- B. 2.5" 119.0C INTERMEDIATE COURSE
- C. 10" AGGREGATE BASE COURSE (w/7.5" UNDER CURB)
OR 5" B25.0C BASE COURSE (w/4" UNDER CURB)
- D. 2'-6" CURB & GUTTER
- E. 4" CONCRETE SIDEWALK

NOT TO SCALE



**TYPICAL SECTION
NON-RESIDENTIAL STREET**

November 2018

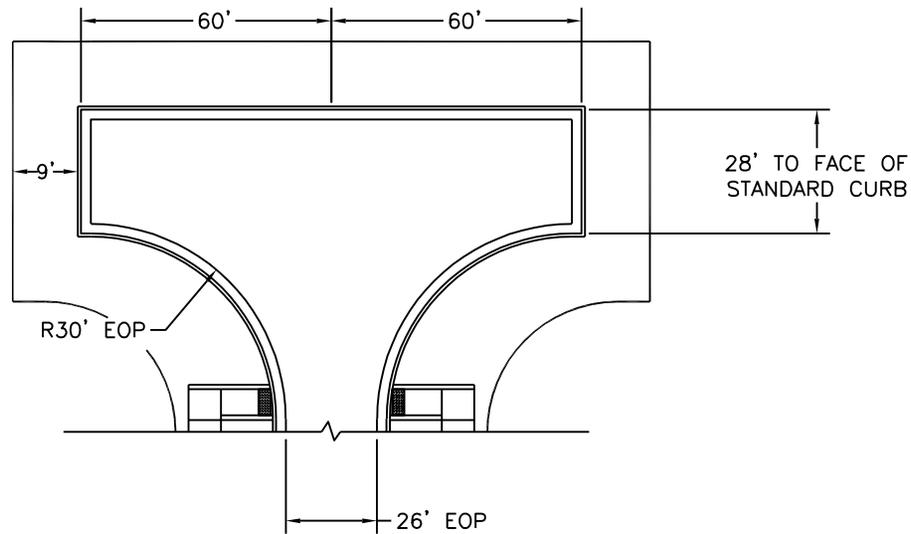


SECTION A-A

PAVEMENT SCHEDULE

- A. 2" S9.5B SURFACE COURSE (PLACED IN 2 - 1" LIFTS)
- B. 2.5" I19.0C INTERMEDIATE COURSE
- C. 10" AGGREGATE BASE COURSE (w/7.5" UNDER CURB)
OR 5" B25.0C BASE COURSE (w/4" UNDER CURB)
- D. 2'-6" CURB & GUTTER
- E. 4" CONCRETE SIDEWALK

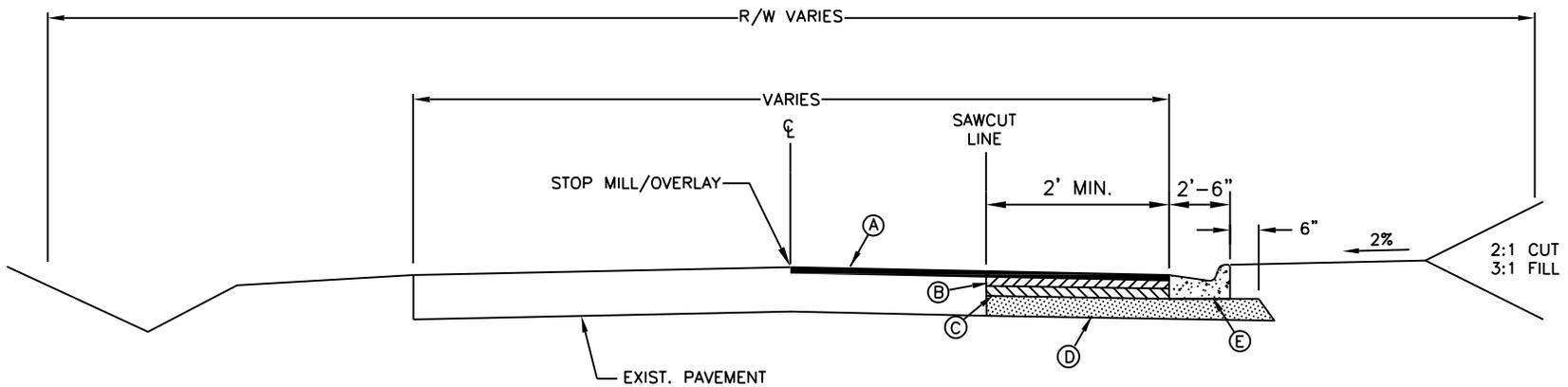
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NOTES

1. VARIATIONS ON THIS DESIGN (E.G., WYES, TURNAROUNDS IN THE STEM, ROTATION OF ENTRY POINT, ETC.) CAN BE SUBMITTED TO THE ENGINEERING DEPARTMENT FOR REVIEW AND APPROVAL ON A CASE-BY-CASE BASIS.
2. SIDEWALK MAY BE REQUIRED TO EXTEND AROUND THE HAMMERHEAD WHERE PARKS OR SCHOOLS HAVE FRONTAGE TO THE END OF THE HAMMERHEAD.
3. FOR USE ON STREETS ONLY
4. SEE STREET TYPICAL SECTION FOR CROSS SECTION REQUIREMENTS

NOT TO SCALE



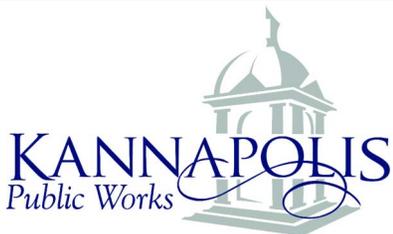
NOTES:

1. SIDEWALK, PLANTING STRIP AND CURB & GUTTER LOCATIONS SHALL BE DETERMINED BY THE APPLICABLE CROSS-SECTION DETAIL
2. ALL WORK TO BE DONE ON EXISTING NCDOT MAINTAINED STREETS SHALL REQUIRE NCDOT ENCROACHMENT/ACCESS APPLICATIONS, SUBMITTED TO THE CITY ENGINEER.
3. SAW CUT LOCATION TO BE DETERMINED IN FIELD.

PAVEMENT SCHEDULE

- A. 1.5" S9.5B OR S9.5C SURFACE COURSE
- B. 1.5" S9.5B OR S9.5C SURFACE COURSE
- C. 4" 119.0C INTERMEDIATE COURSE
- D. 4" B25.0C BASE COURSE
- E. 2'-6" CURB & GUTTER

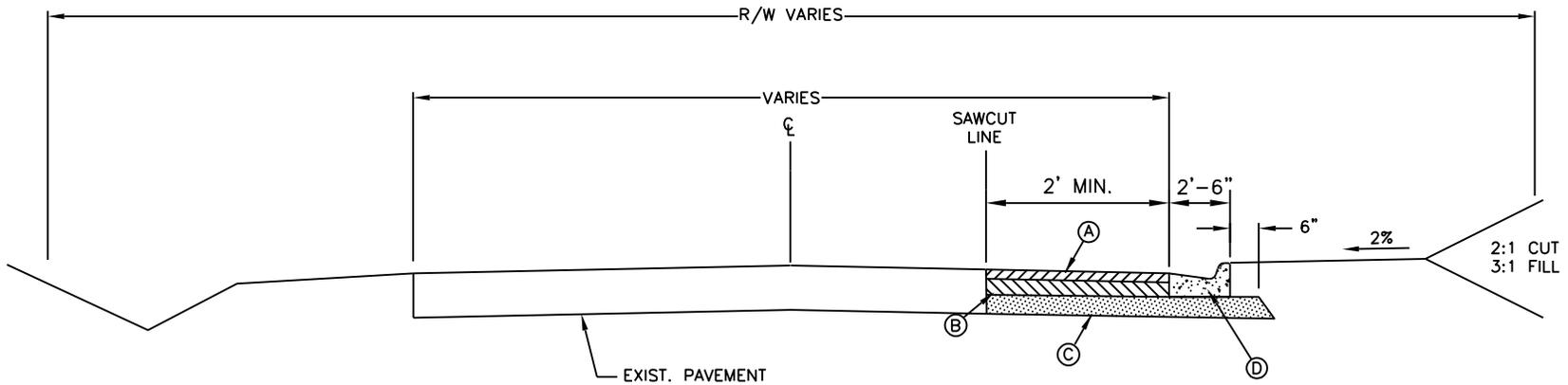
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**TYPICAL SECTION
ROAD WIDENING**

November 2018

107



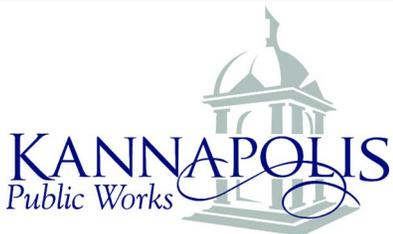
NOTES:

1. SIDEWALK, PLANTING STRIP AND CURB & GUTTER LOCATIONS SHALL BE DETERMINED BY THE APPLICABLE CROSS-SECTION DETAIL
2. ALL WORK TO BE DONE ON EXISTING NCDOT MAINTAINED STREETS SHALL REQUIRE NCDOT ENCROACHMENT/ACCESS APPLICATIONS, SUBMITTED TO THE CITY ENGINEER.
3. SAW CUT LOCATION TO BE DETERMINED IN FIELD.

PAVEMENT SCHEDULE

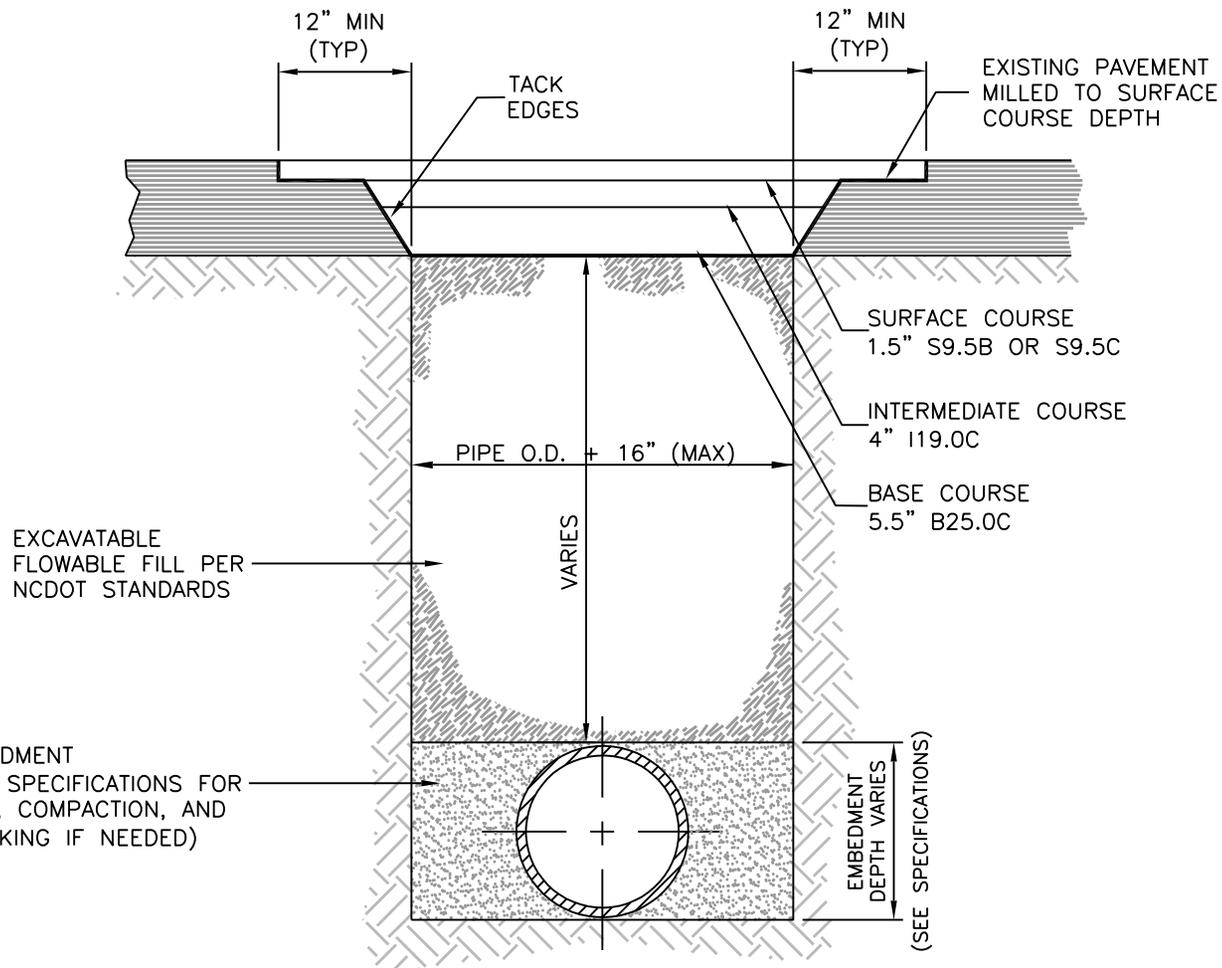
- A. 3" S9.5B OR S9.5C SURFACE COURSE (PLACED IN 2 - 1.5" LIFTS)
- B. 4" I19.0C INTERMEDIATE COURSE
- C. 4" B25.0C BASE COURSE
- D. 2'-6" CURB & GUTTER

NOT TO SCALE



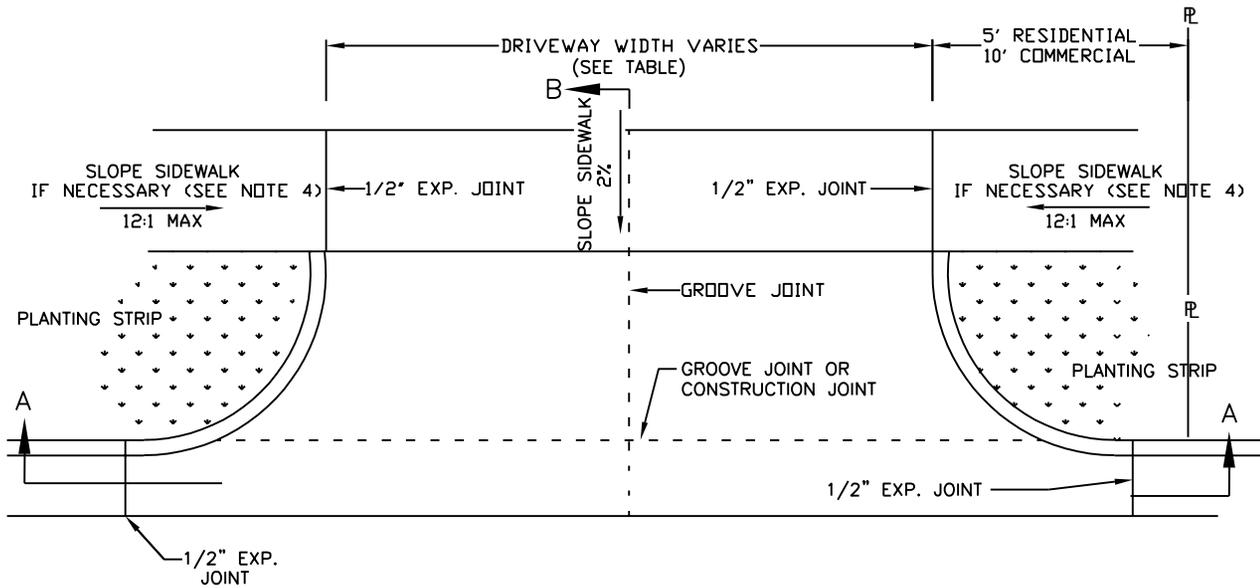
**TYPICAL SECTION
CURB & GUTTER INSTALLATION
ALONG EXISTING ROADWAY**

November 2018



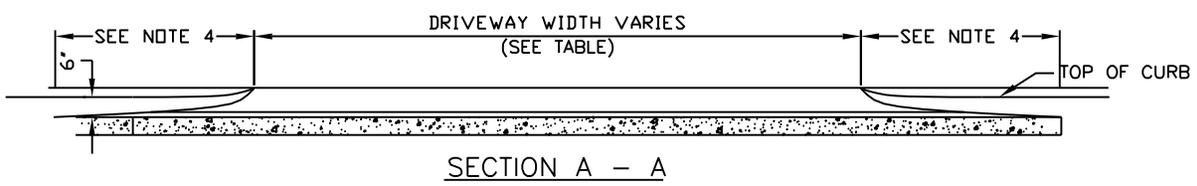
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**TYPICAL SECTION
UTILITY CUT PAVEMENT REPAIR**

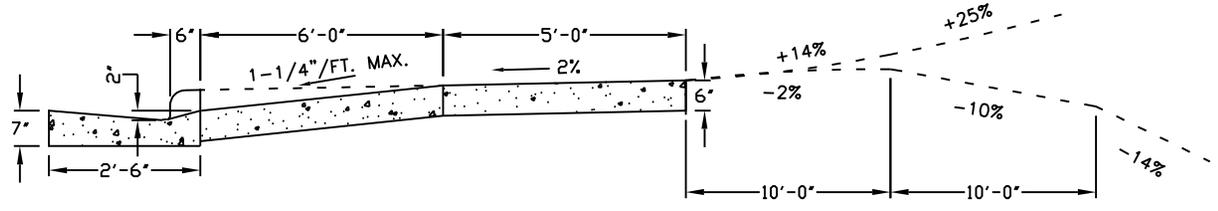


- NOTES:**
1. ALL CONCRETE TO BE MINIMUM NCDOT CLASS B, 6" MIN. THICKNESS.
 2. ALL DRIVEWAYS MUST MEET THE CURRENT CITY DRIVEWAY REGULATIONS AND NCDOT REQUIREMENTS FOR SPACING, SIGHT DISTANCE AND OFFSETS FROM PROPERTY LINES AND INTERSECTIONS.
 3. ALL CURB OR CURB AND GUTTER AND SIDEWALKS ARE TO BE REMOVED TO THE NEAREST JOINT BEYOND NEW CONSTRUCTION OR CUT WITH A SAW AND REMOVED. SAW CUT OR JOINT TO BE PERPENDICULAR TO EDGE OF EXISTING PAVEMENT.
 4. FOR PLANTING STRIP LESS THAN 6- FEET, SLOPE SIDEWALK TO MEET GRADE OF ENTRANCE. SIDEWALK GRADE SHALL BE 12:1 MAX.
 5. RADIUS REQUIREMENTS: SEE TABLE 2A IN CHAPTER 2 OF LDSM
 6. NO UTILITIES PERMITTED IN DRIVEWAYS.
 7. NO DRIVEWAY SHALL BE WITHIN 5' (AS MEASURED ALONG STREET CURB STARTING AT THE DRIVEWAY RADIUS) OF ANY MUNICIPAL OR STATE OWNED FEATURE (I.E. CURB INLETS, FIRE HYDRANTS, UTILITY POLES OR SIMILAR STRUCTURES)

B ←
PLAN VIEW



SECTION A - A



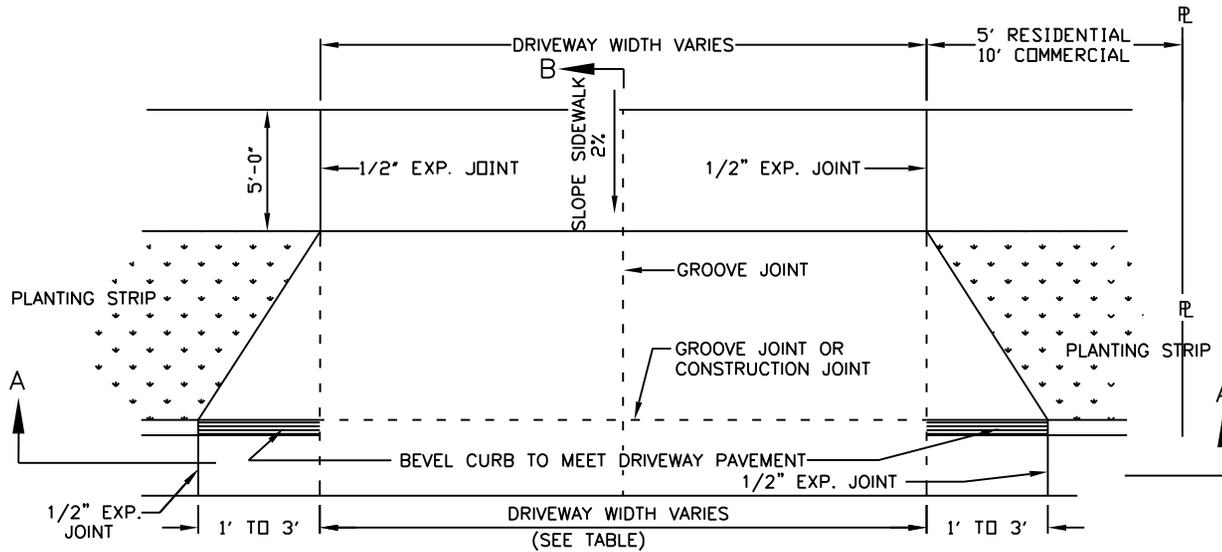
SECTION B - B

DRIVEWAY CLASSIFICATION		
TYPE DRIVEWAY	MINIMUM	MAXIMUM
RESIDENTIAL	12'	20'
COMMERCIAL/INDUSTRIAL MULTI-FAMILY	24'	36'
COMMERCIAL/INDUSTRIAL ONE-WAY	15'	20'

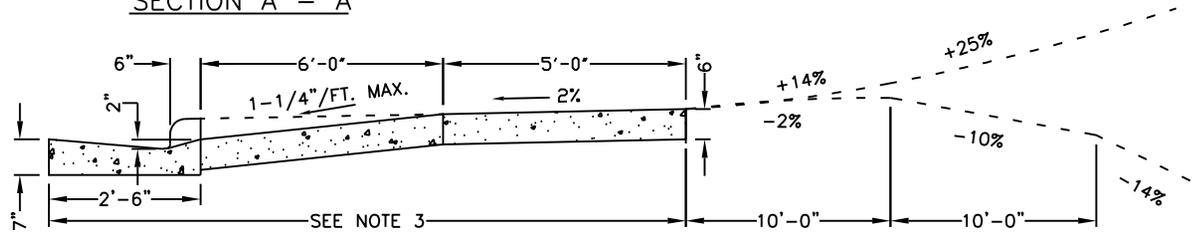
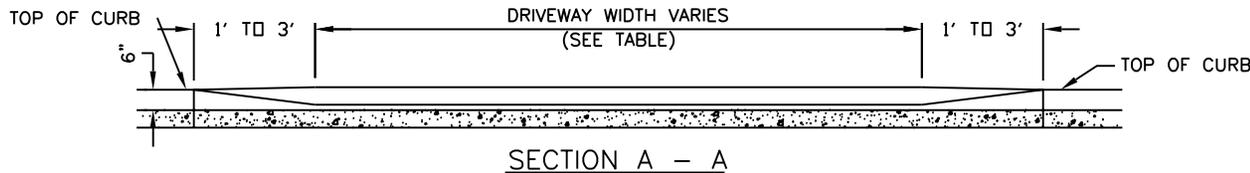
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**DRIVEWAY ENTRANCE
RADIUS TYPE**



PLAN VIEW



SECTION B - B

NOTES:

1. ALL CONCRETE TO BE MINIMUM NCDOT CLASS B, 6" MIN. THICKNESS.
2. ALL DRIVEWAYS MUST MEET THE CURRENT CITY DRIVEWAY REGULATIONS AND NCDOT REQUIREMENTS FOR SPACING, SIGHT DISTANCE AND OFFSETS FROM PROPERTY LINES AND INTERSECTIONS.
3. ALL CURB OR CURB AND GUTTER AND SIDEWALKS ARE TO BE REMOVED TO THE NEAREST JOINT BEYOND NEW CONSTRUCTION OR CUT WITH A SAW AND REMOVED. SAW CUT OR JOINT TO BE PERPENDICULAR TO EDGE OF EXISTING PAVEMENT.
4. FOR PLANTING STRIP LESS THAN 6--FEET, SLOPE SIDEWALK TO MEET GRADE OF ENTRANCE. SIDEWALK GRADE SHALL BE 12:1 MAX.
5. NO UTILITIES PERMITTED IN DRIVEWAYS.
6. NO DRIVEWAY SHALL BE WITHIN 5' (AS MEASURED ALONG STREET CURB STARTING AT THE DRIVEWAY RADIUS) OF ANY MUNICIPAL OR STATE OWNED FEATURE (I.E. CURB INLETS, FIRE HYDRANTS, UTILITY POLES OR SIMILAR STRUCTURES)

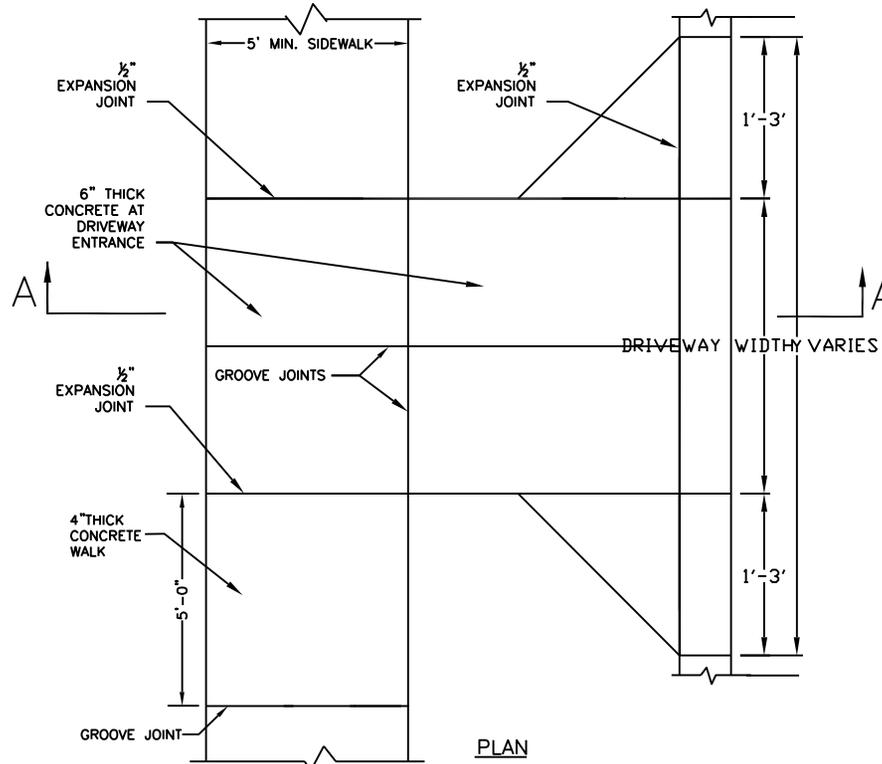
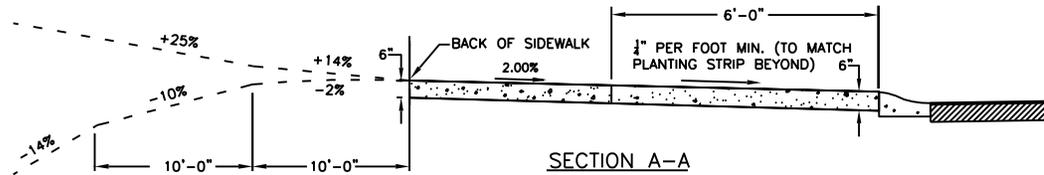
DRIVEWAY CLASSIFICATION		
TYPE DRIVEWAY	MINIMUM	MAXIMUM
RESIDENTIAL	12'	20'
COMMERCIAL/INDUSTRIAL MULTI-FAMILY	24'	36'
COMMERCIAL/INDUSTRIAL ONE-WAY	15'	20'

NOT TO SCALE



**DRIVEWAY ENTRANCE
DROP CURB TYPE**

November 2018



NOTES:

1. ALL CONCRETE TO BE MINIMUM NCDOT CLASS B, 6" MIN. THICKNESS.
2. ALL DRIVEWAYS MUST MEET THE CURRENT CITY DRIVEWAY REGULATIONS AND NCDOT REQUIREMENTS FOR SPACING, SIGHT DISTANCE AND OFFSETS FROM PROPERTY LINES AND INTERSECTIONS.
3. ALL CURB OR CURB AND GUTTER AND SIDEWALKS ARE TO BE REMOVED TO THE NEAREST JOINT BEYOND NEW CONSTRUCTION OR CUT WITH A SAW AND REMOVED. SAW CUT OR JOINT TO BE PERPENDICULAR TO EDGE OF EXISTING PAVEMENT.
4. FOR PLANTING STRIP LESS THAN 6- FEET, SLOPE SIDEWALK TO MEET GRADE OF ENTRANCE. SIDEWALK GRADE SHALL BE 12:1 MAX.
5. NO UTILITIES PERMITTED IN DRIVEWAYS.
6. NO DRIVEWAY SHALL BE WITHIN 5' (AS MEASURED ALONG STREET CURB STARTING AT THE DRIVEWAY RADIUS) OF ANY MUNICIPAL OR STATE OWNED FEATURE (I.E. CURB INLETS, FIRE HYDRANTS, UTILITY POLES OR SIMILAR STRUCTURES)

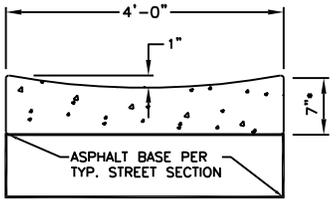
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**DRIVEWAY ENTRANCE
2'-0" VALLEY GUTTER**

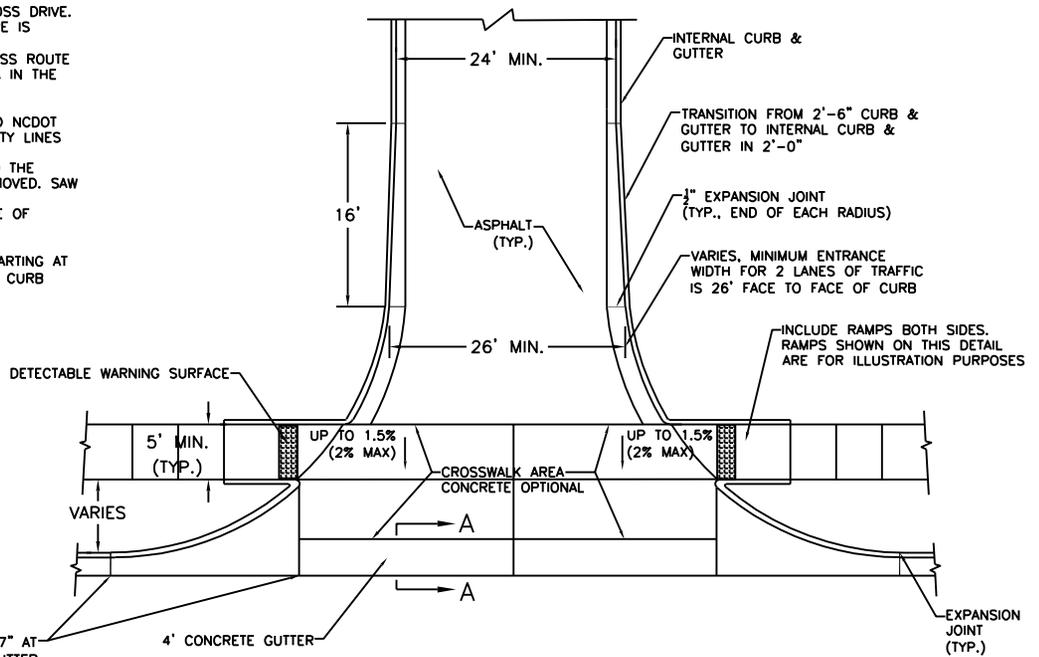
NOTES:

1. WHERE A TYPE III DRIVEWAY IS APPROVED BY THE KANNAPOLIS PUBLIC WORKS THAT CONNECTS TO AN EXISTING SIGNALIZED INTERSECTION, OR AT A LOCATION WHERE A TRAFFIC SIGNAL INSTALLATION IS PROPOSED BASED ON A TRAFFIC IMPACT/SIGNAL WARRANT STUDY, A FULL DEPTH ASPHALT PAVEMENT IS REQUIRED. THIS PAVEMENT DESIGN IS REQUIRED IN THE DRIVEWAY EASEMENT (100-FOOT MINIMUM) TO MAINTAIN DETECTOR LOOPS AND PAVEMENT MARKINGS. A TRAFFIC SIGNAL WILL BE INSTALLED ONLY IF KANNAPOLIS PUBLIC WORKS DETERMINES THAT ONE IS NECESSARY BASED ON A TRAFFIC STUDY OF CURRENT CONDITIONS.
2. MAY BE REQUIRED FOR PUBLIC OR PRIVATE DEVELOPMENTS WITH 200 OR MORE PARKING SPACES.
3. A CONCRETE GUTTER IS TO BE USED EXCEPT AT EXISTING OR PROPOSED TRAFFIC SIGNAL LOCATIONS. AT THESE LOCATIONS ADDITIONAL DRAINAGE REQUIREMENTS WILL BE NECESSARY TO ELIMINATE THE NEED FOR GUTTER ACROSS THE DRIVEWAY CONNECTIONS.
4. THE DRIVEWAY MUST RISE 6" FROM THE GUTTER LINE TO PREVENT RUNOFF FROM ENTERING DRIVEWAY. ALL DRIVEWAYS MUST MEET THE CURRENT CITY DRIVEWAY REGULATIONS AND NCDOT REQUIREMENTS FOR SPACING, SIGHT DISTANCE, AND OFFSETS FROM PROPERTY LINES AND INTERSECTIONS.
5. TWO (2) CURB RAMPS PER CURB RETURN REQUIRED AT SIGNALIZED INTERSECTIONS.
6. FOUR (4) FOOT GUTTER AND WINGS ARE REQUIRED TO DIRECT WATER ACROSS DRIVE. GUTTER AND WINGS MAY NOT BE REQUIRED IF THE DRIVEWAY GUTTER SLOPE IS GREATER THAN 2%.
7. MAINTAIN UP TO 1.5% (MAX. 2%) CROSS-SLOPE ON THE PEDESTRIAN ACCESS ROUTE BETWEEN CURB RAMPS. CONCRETE IS OPTIONAL FOR THE CROSSWALK AREA IN THE DRIVEWAY.
8. ALL CONCRETE TO BE MINIMUM NCDOT CLASS B, 6" MIN. THICKNESS.
9. ALL DRIVEWAYS MUST MEET THE CURRENT CITY DRIVEWAY REGULATIONS AND NCDOT REQUIREMENTS FOR SPACING, SIGHT DISTANCE AND OFFSETS FROM PROPERTY LINES AND INTERSECTIONS.
10. ALL CURB OR CURB AND GUTTER AND SIDEWALKS ARE TO BE REMOVED TO THE NEAREST JOINT BEYOND NEW CONSTRUCTION OR CUT WITH A SAW AND REMOVED. SAW CUT OR JOINT TO BE PERPENDICULAR TO EDGE OF EXISTING PAVEMENT.
11. FOR PLANTING STRIP LESS THAN 6- FEET, SLOPE SIDEWALK TO MEET GRADE OF ENTRANCE. SIDEWALK GRADE SHALL BE 12:1 MAX.
12. NO UTILITIES PERMITTED IN DRIVEWAYS.
13. NO DRIVEWAY SHALL BE WITHIN 5' (AS MEASURED ALONG STREET CURB STARTING AT THE DRIVEWAY RADIUS) OF ANY MUNICIPAL OR STATE OWNED FEATURE (I.E. CURB INLETS, FIRE HYDRANTS, UTILITY POLES OR SIMILAR STRUCTURES)



SECTION A-A

• TRANSITION CONCRETE DEPTH FROM 7" AT LIP TO 10" AT 4' CONCRETE GUTTER CONSTRUCTION JOINT IF NO ASPHALT BASE INSTALLED. IF ASPHALT BASE IS USED, 7" CONCRETE DEPTH CAN BE CARRIED THROUGH THE 4' CONCRETE GUTTER.

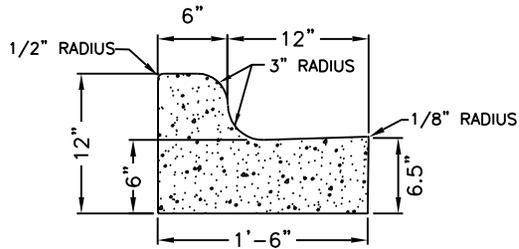


INCLUDE RAMPS BOTH SIDES. RAMPS SHOWN ON THIS DETAIL ARE FOR ILLUSTRATION PURPOSES

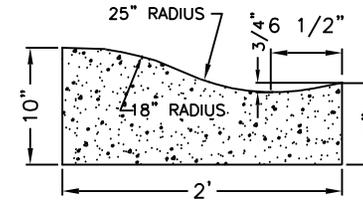
NOT TO SCALE



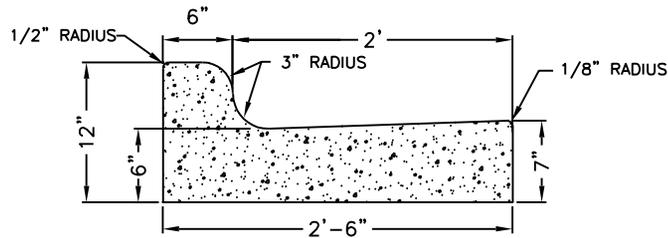
TYPE III DRIVEWAY ENTRANCE



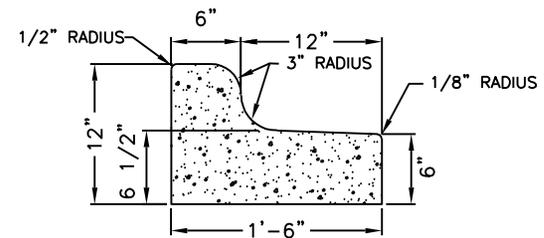
STANDARD 1'-6" CURB & GUTTER



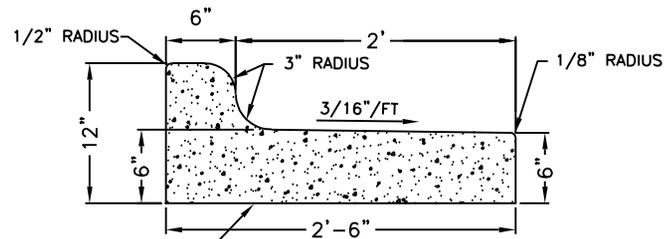
2'-0" VALLEY GUTTER



STANDARD 2'-6" CURB & GUTTER

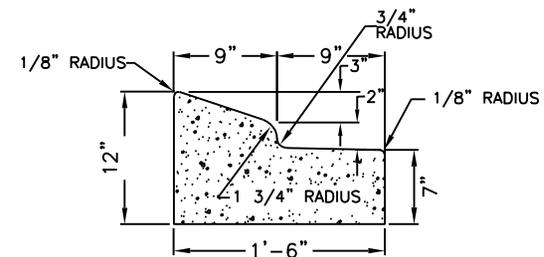


1'-6" MEDIAN CURB & GUTTER



SLOPE SUBGRADE TO PROVIDE 3/16"/FT FALL WITHIN CURB

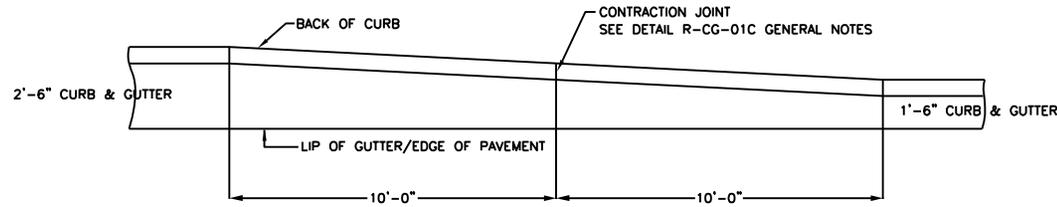
STANDARD 2'-6" SPILL CURB & GUTTER



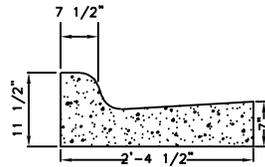
1'-6" MOUNTABLE CURB & GUTTER

NOT TO SCALE

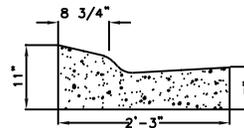
CURB & GUTTER



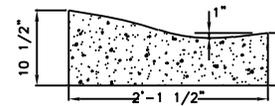
PLAN VIEW
CURB TRANSITION
2'-6" CURB & GUTTER TO 1'-6" CURB & GUTTER



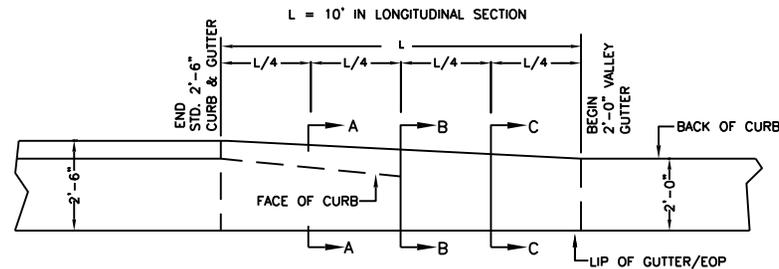
SECTION A-A



SECTION B-B



SECTION C-C



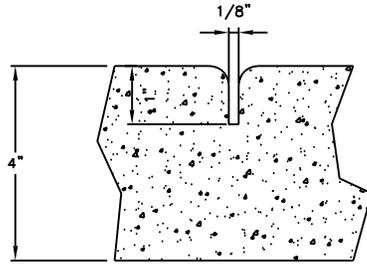
PLAN VIEW
CURB TRANSITION
2'-6" CURB & GUTTER TO 2'-0" VALLEY GUTTER

NOT TO SCALE

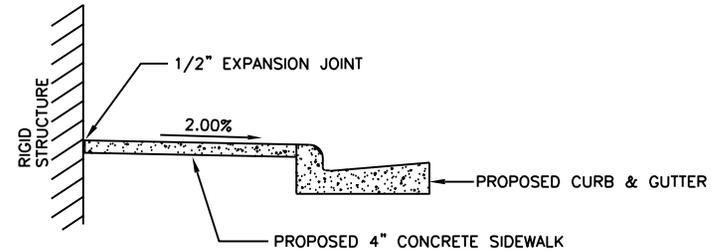


CURB TRANSITION
2'-6" CURB & GUTTER TO 2'-0" VALLEY GUTTER
AND
2'-6" CURB & GUTTER TO 1'-6" CURB & GUTTER

November 2018



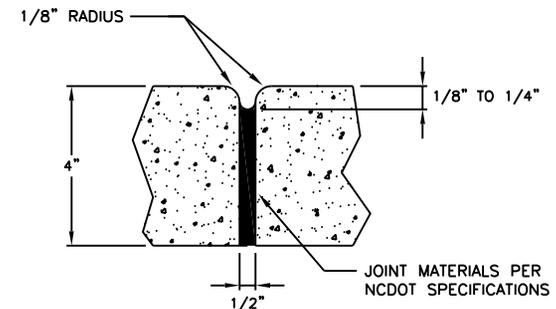
GROOVE JOINT IN SIDEWALK



DETAILS SHOWING EXPANSION JOINTS IN CONCRETE SIDEWALK

GENERAL NOTES:

1. CONSTRUCT STANDARD SIDEWALK 5' WIDE AND 4" THICK UNLESS OTHERWISE DENOTED ON PLANS.
2. CONSTRUCT SIDEWALK 5' WIDE AND 6" THICK AT DRIVEWAY ENTRANCES.
3. CONSTRUCT SIDEWALK WITH A 2.00% CROSS SLOPE.
4. PLACE A GROOVE JOINT 1" DEEP WITH 1/8" RADIUS 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. ALL EXPANSION JOINTS SHALL BE FILLED WITH JOINT SEALER.
5. ZONING CONDITIONS MAY REQUIRE ADDITIONAL WIDTH SIDEWALKS WHICH SHALL SUPERSEDE THESE STANDARD DIMENSIONS SHOWN.



TRANSVERSE EXPANSION JOINT IN SIDEWALK

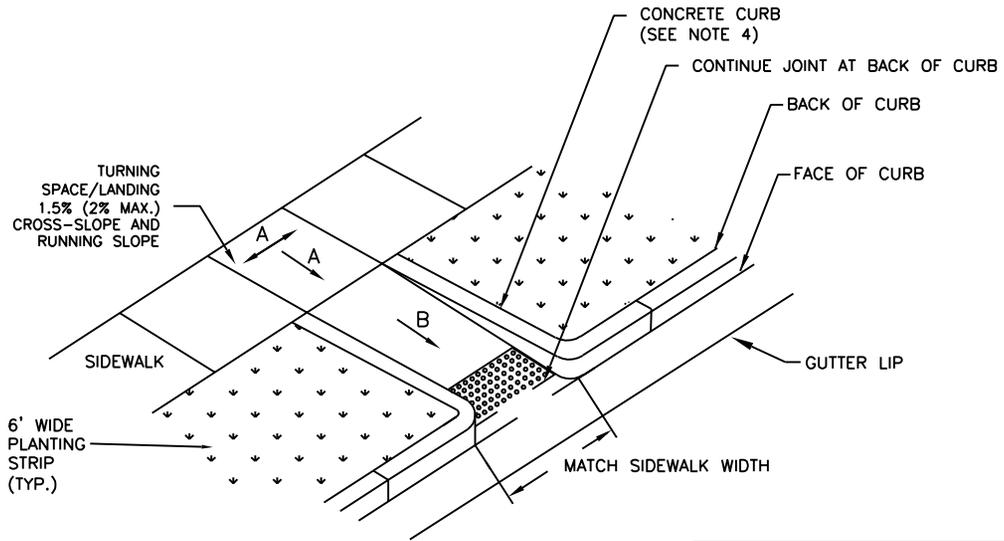
NOT TO SCALE

CONCRETE SIDEWALKS



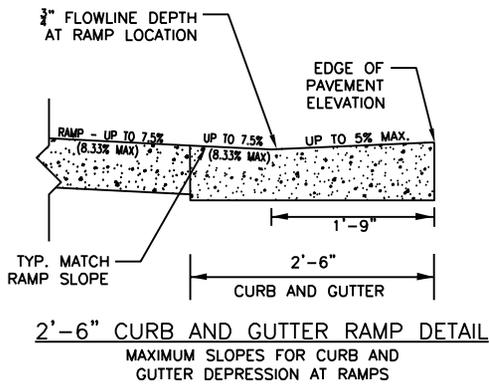
NOTES:

1. ENSURE FLUSH CONDITIONS AT CURB RAMP TO GUTTER TRANSITION.
2. TYPICALLY, THE SIDEWALK RUNNING SLOPE SHALL NOT EXCEED THE GENERAL GRADE ESTABLISHED FOR THE ADJACENT STREET.
3. IF THE SLOPE FROM FLOWLINE TO BACK OF CURB AT RAMP IS LESS THAN 8.33%, THEN THE SLOPE FROM LIP TO FLOWLINE AT RAMP MAY EXCEED 5% AS LONG AS THE ALGEBRAIC DIFFERENCE BETWEEN THESE TWO SLOPES IS LESS THAN 13.33%.
4. CURB RAMPS WITH RETURNED CURBS MAY BE USED ONLY WHERE PEDESTRIANS WOULD NOT TYPICALLY WALK ACROSS THE RAMP. THE ADJACENT SURFACE IS PLANTING OR OTHER NON-WALKING SURFACE.

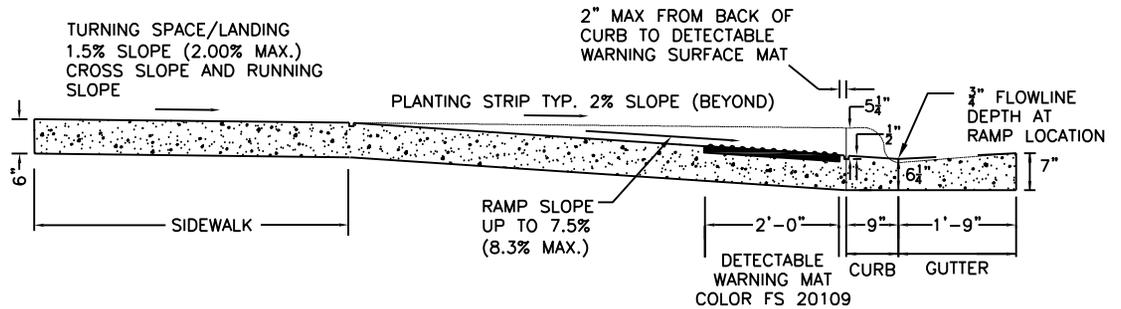


PLAN VIEW

SLOPE "A" = UP TO 1.5% (2.00% MAX)
 SLOPE "B" = UP TO 7.5% (8.33% MAX)



2'-6" CURB AND GUTTER RAMP DETAIL
 MAXIMUM SLOPES FOR CURB AND GUTTER DEPRESSION AT RAMPS



TYPICAL RAMP SECTION AT CENTERLINE

NOT TO SCALE

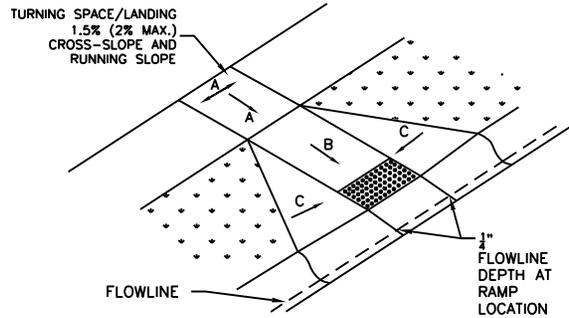


**PERPENDICULAR CURB RAMP
 WITH 2'-6" CURB & GUTTER**

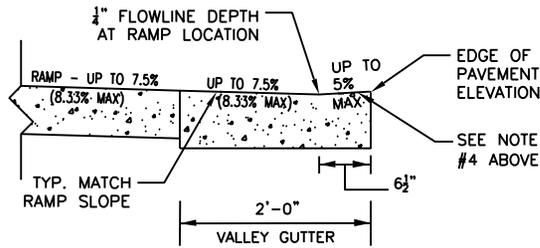
November 2018

NOTES:

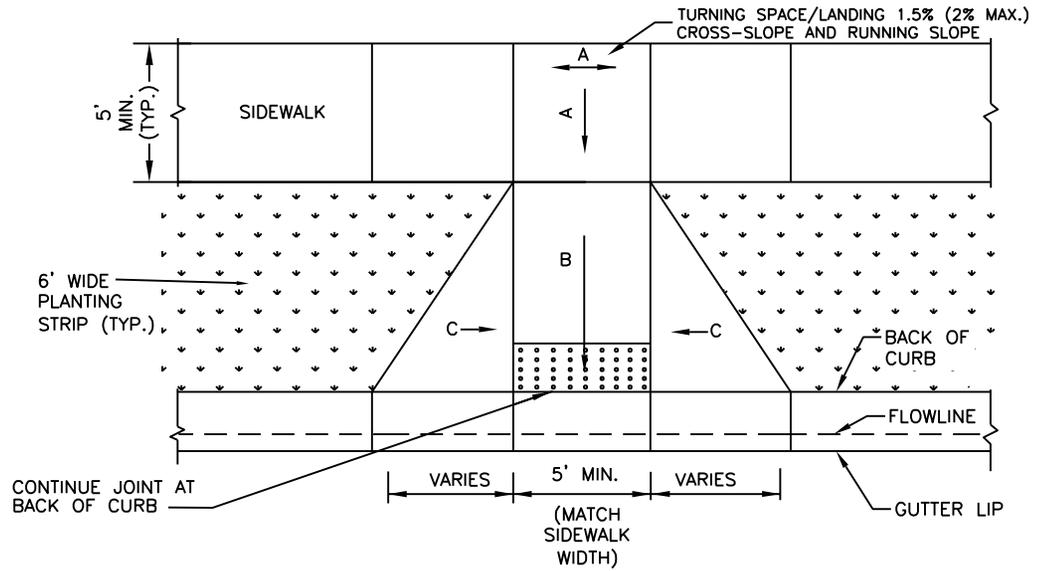
1. ENSURE FLUSH CONDITIONS AT CURB RAMP TO GUTTER TRANSITION.
2. TYPICALLY, THE SIDEWALK RUNNING SLOPE SHALL NOT EXCEED THE GENERAL GRADE ESTABLISHED FOR THE ADJACENT STREET.
3. MAINTAIN POSITIVE DRAINAGE ALONG THE LIP OF CUTTER IN RAMP. IN FLAT AREAS, ADDITIONAL CATCH BASINS MAY BE REQUIRED ON THE SIDES OF THE RAMP TO MINIMIZE STANDING WATER AT THE RAMP LOCATION.
4. IF THE SLOPE FROM FLOWLINE TO BACK OF CURB AT RAMP IS LESS THAN 8.3%, THEN THE SLOPE FROM LIP TO FLOWLINE AT RAMP MAY EXCEED 5% AS LONG AS THE DIFFERENCE BETWEEN THESE TWO SLOPES IS LESS THAN 13.3%.



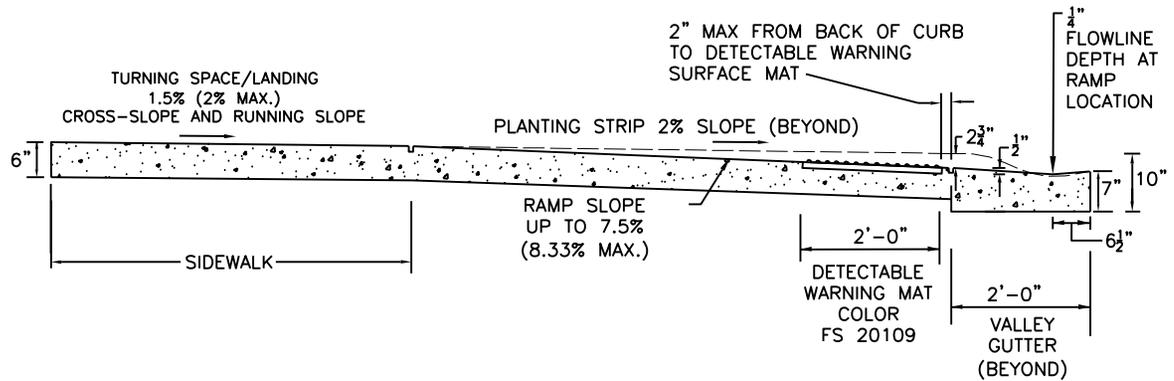
ISOMETRIC VIEW



2'-0" VALLEY GUTTER RAMP DETAIL
 MAXIMUM SLOPES FOR VALLEY GUTTER DEPRESSION AT RAMP



PLAN VIEW



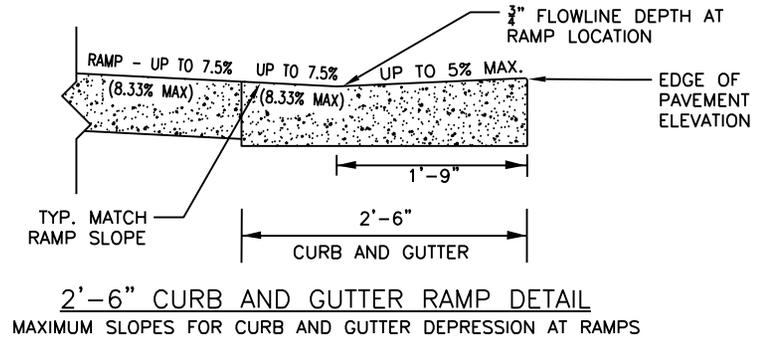
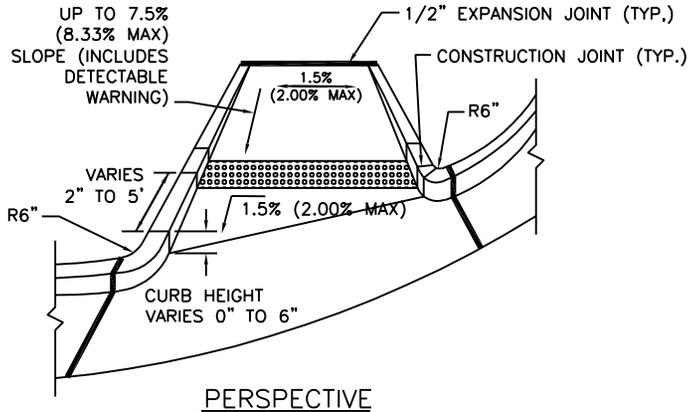
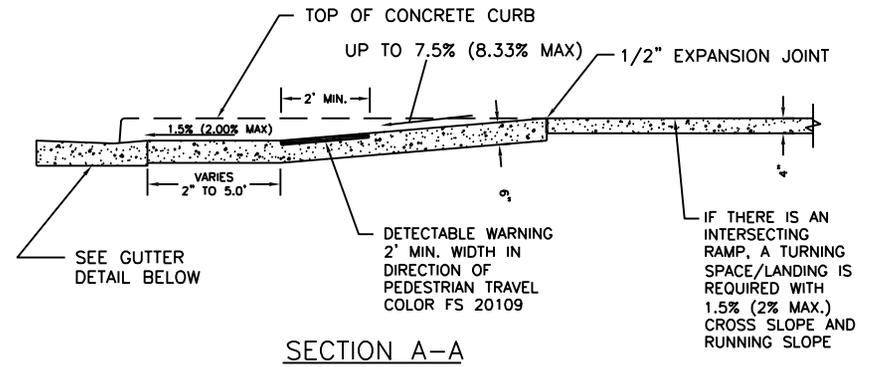
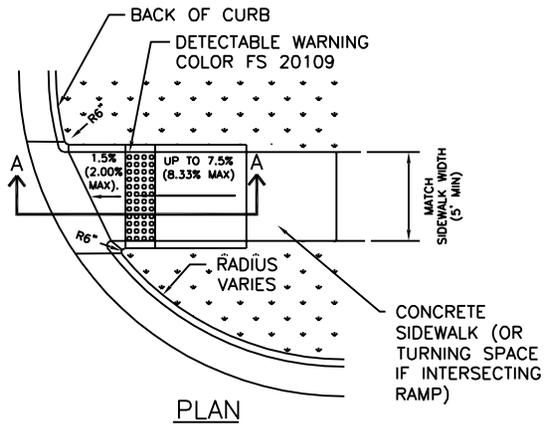
TYPICAL RAMP SECTION AT CENTERLINE

NOT TO SCALE



**PERPENDICULAR CURB RAMP
 WITH 2'-0" VALLEY GUTTER**

November 2018



NOTES:

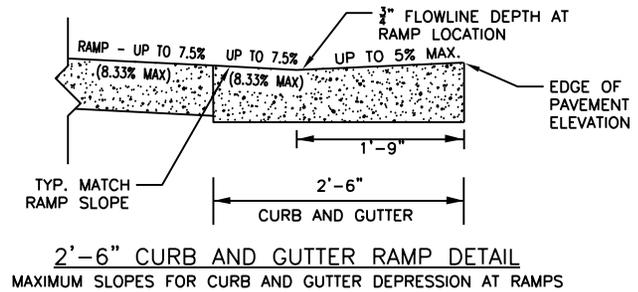
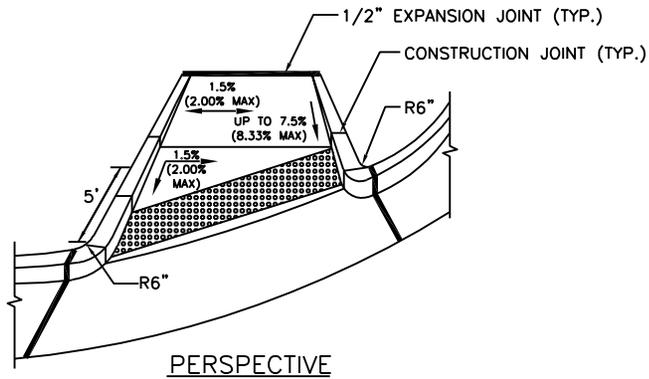
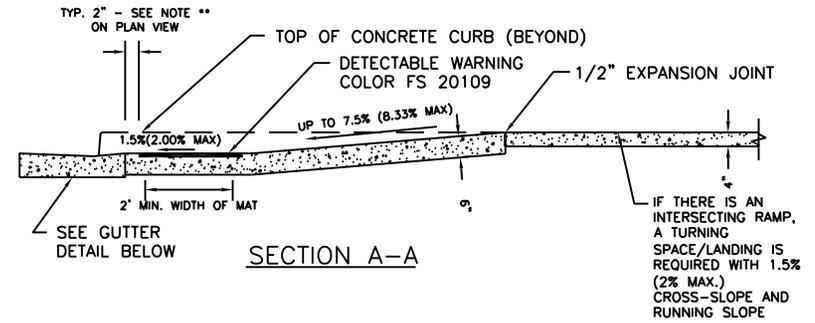
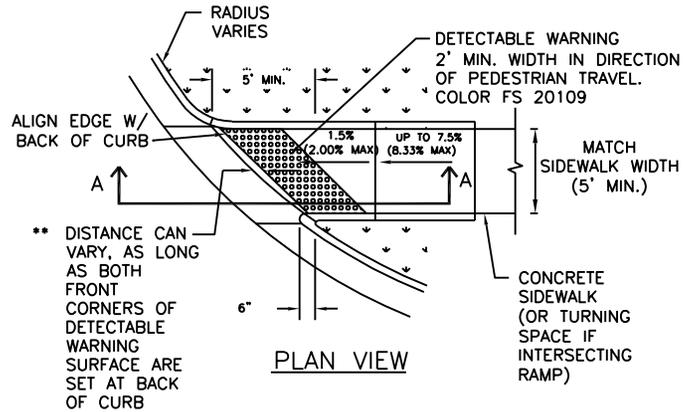
1. USE THIS DETAIL ONLY UNDER THE FOLLOWING CIRCUMSTANCES:
 - 5-FOOT SIDEWALKS WITH CURB RADII OF 35 FEET OR LESS
 - 6-FOOT SIDEWALKS WITH CURB RADII OF 30 FEET OR LESS
 - 8-FOOT SIDEWALKS WITH CURB RADII OF 25 FEET OR LESS
2. DIRECTIONAL RAMPS MAY BE USED WHEN AN 6-FOOT PLANTING STRIP IS PROVIDED. DO NOT USE THIS DETAIL IF THERE IS HARDSCAPE INSTEAD OF A PLANTING STRIP.
3. ALL CONCRETE SHALL BE AT LEAST NCDOT CLASS B.
4. ENSURE FLUSH CONDITIONS AT RAMP TO GUTTER TRANSITION.

NOT TO SCALE



**DIRECTIONAL CURB RAMP
WITH SMALL/MEDIUM CURB RADII**

November 2018



NOTES:

- USE THIS DETAIL ONLY UNDER THE FOLLOWING CIRCUMSTANCES:
 - 5-FOOT SIDEWALKS WITH CURB RADII GREATER THAN 35 FEET
 - 6-FOOT SIDEWALKS WITH CURB RADII GREATER THAN 30 FEET
 - 8-FOOT SIDEWALKS WITH CURB RADII GREATER THAN 25 FEET
- DIRECTIONAL RAMPS MAY BE USED WHEN A MIN. 6-FOOT PLANTING STRIP IS PROVIDED. DO NOT USE THIS DETAIL IF THERE IS HARDSCAPE INSTEAD OF A PLANTING STRIP.
- ALL CONCRETE SHALL BE AT LEAST NCDOT CLASS B.
- ENSURE FLUSH CONDITIONS AT CURB RAMP TO GUTTER TRANSITION.

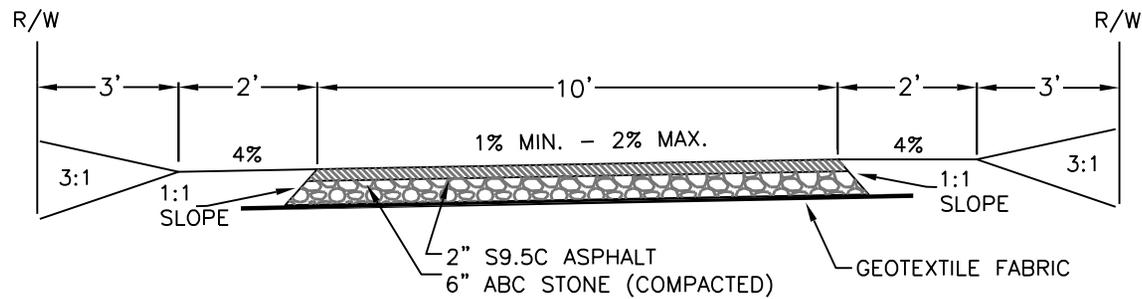
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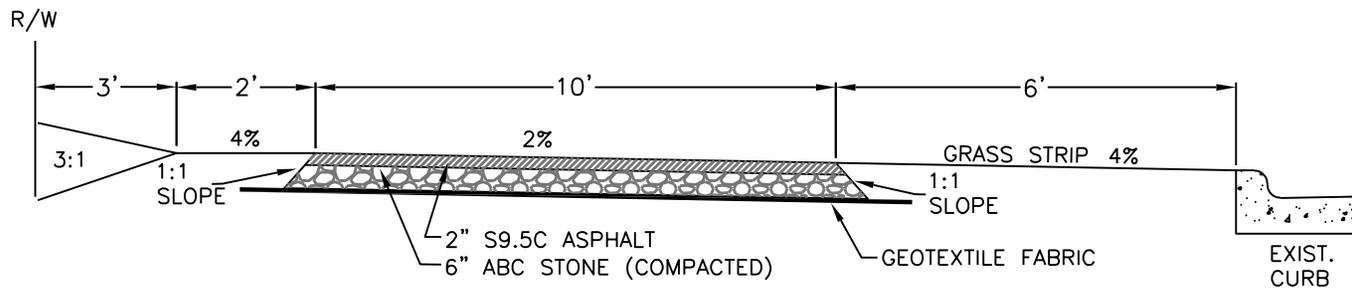
**DIRECTIONAL CURB RAMP
WITH LARGE CURB RADIUS**

November 2018

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TRAIL IN PARK SETTING

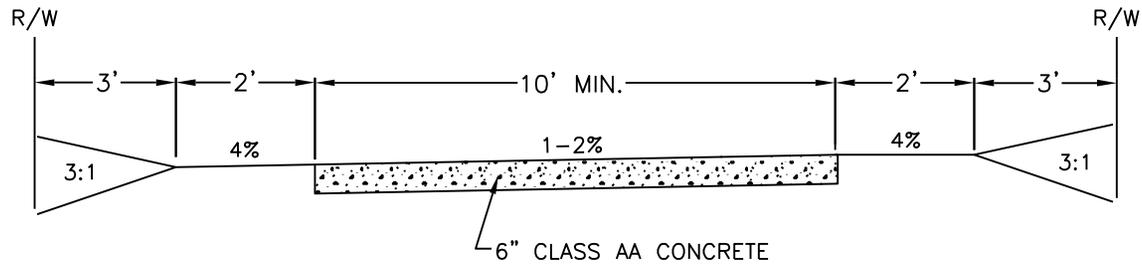


TRAIL PARALLEL TO STREET

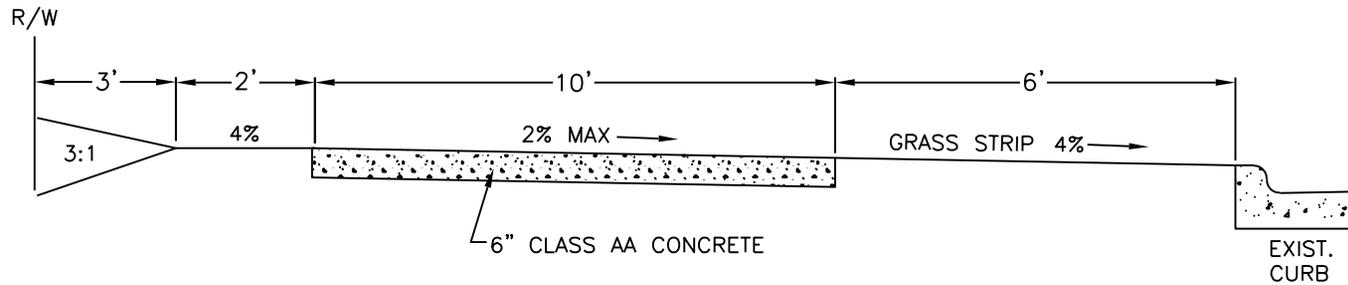
NOTES:

1. MINIMUM WIDTH MUST BE MAINTAINED UNLESS LEGITIMATE CONSTRAINTS DICTATE OTHERWISE.
2. DIRECTION OF CROSS SLOPE FOR TRAIL IN PARK SETTING TO BE DETERMINED BY TOPOGRAPHICAL CONDITIONS.
3. FOR TRAIL NEXT TO ROADWAY, THE AASHTO RECOMMENDED MINIMUM GRASS STRIP BETWEEN THE TRAIL AND CURB IS 6'. IF CONSTRAINTS PROHIBIT A 6' GRASS STRIP, THEN A PHYSICAL BARRIER OR RAILING SHOULD BE PROVIDED PER AASHTO.
4. GEOTEXTILE SHALL EXTEND 1'-6" BEYOND EDGE OF PAVEMENT ON EACH SIDE.

NOT TO SCALE



TRAIL IN PARK SETTING



TRAIL PARALLEL TO STREET

NOTES:

1. MINIMUM WIDTH MUST BE MAINTAINED UNLESS LEGITIMATE CONSTRAINTS DICTATE OTHERWISE.
2. DIRECTION OF CROSS SLOPE FOR TRAIL IN PARK SETTING TO BE DETERMINED BY TOPOGRAPHICAL CONDITIONS.
3. CONCRETE MUST BE REINFORCED IF ANY VEHICULAR TRAFFIC FOR MAINTENANCE OR ANY OTHER PURPOSE IS ANTICIPATED.
4. FOR TRAIL NEXT TO ROADWAY, THE AASHTO RECOMMENDED MINIMUM GRASS STRIP BETWEEN THE TRAIL AND CURB IS 6 FEET. IF CONSTRAINTS PROHIBIT A 6' GRASS STRIP, THEN A PHYSICAL BARRIER OR RAILING SHOULD BE PROVIDED PER AASHTO.

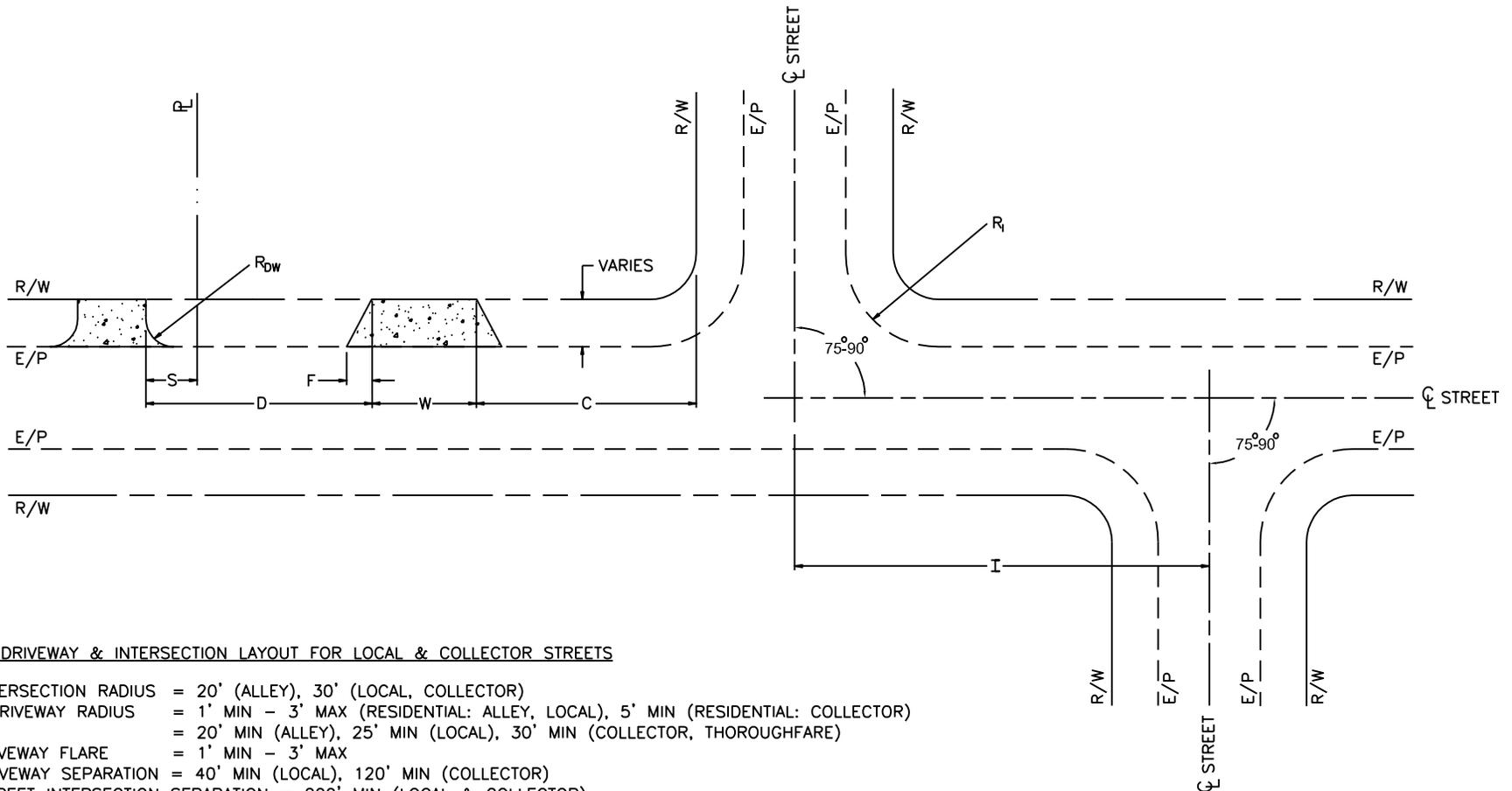
NOT TO SCALE



GREENWAY TRAIL
CONCRETE

November 2018

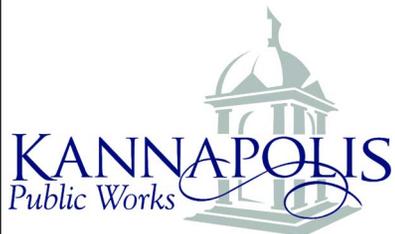
122



TYPICAL DRIVEWAY & INTERSECTION LAYOUT FOR LOCAL & COLLECTOR STREETS

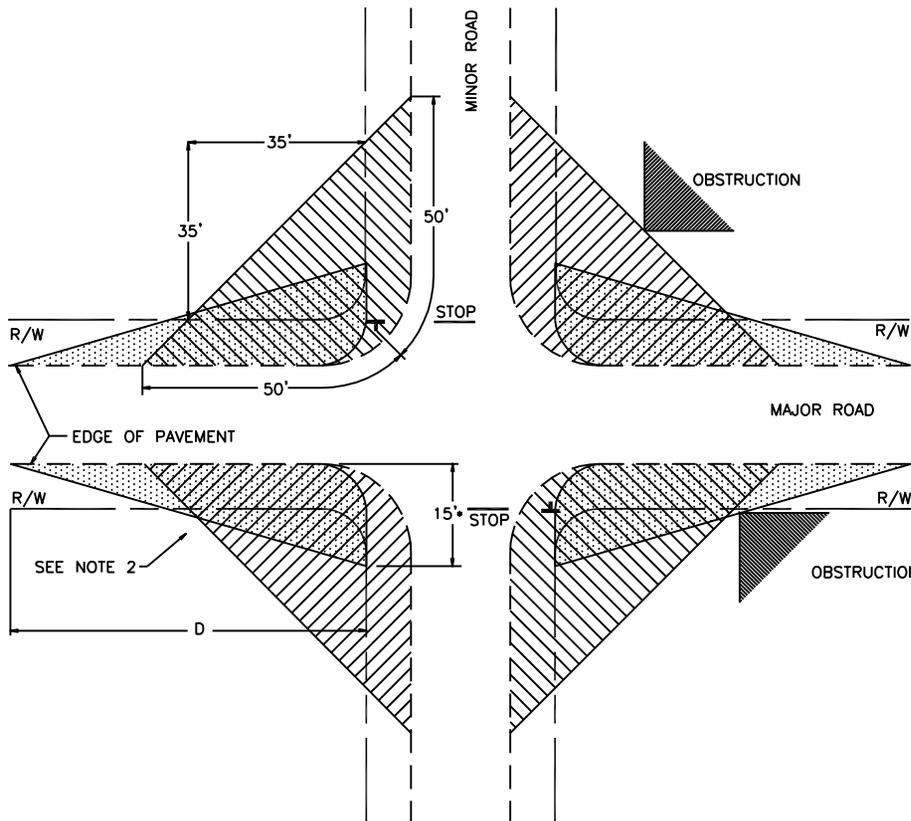
- R_i = INTERSECTION RADIUS = 20' (ALLEY), 30' (LOCAL, COLLECTOR)
- R_{DW} = DRIVEWAY RADIUS = 1' MIN - 3' MAX (RESIDENTIAL: ALLEY, LOCAL), 5' MIN (RESIDENTIAL: COLLECTOR)
= 20' MIN (ALLEY), 25' MIN (LOCAL), 30' MIN (COLLECTOR, THOROUGHFARE)
- F = DRIVEWAY FLARE = 1' MIN - 3' MAX
- D = DRIVEWAY SEPARATION = 40' MIN (LOCAL), 120' MIN (COLLECTOR)
- I = STREET INTERSECTION SEPARATION = 200' MIN (LOCAL & COLLECTOR)
- C = CORNER CLEARANCE = SEE INTERSECTION SIGHT DISTANCE APPROACH & DEPARTURE FOR CORNER CLEARANCE
- S = SIDE CLEARANCE = 5' MIN (RESIDENTIAL), 10' MIN (NON-RESIDENTIAL)
- W = DRIVEWAY WIDTH = 12' MIN - 20' MAX (RESIDENTIAL)
= 15' MIN - 20' MAX (NON-RESIDENTIAL ONE-WAY)
= 24' MIN - 36' MAX (NON-RESIDENTIAL TWO-WAY)

NOT TO SCALE



**TYPICAL DRIVEWAY & INTERSECTION LAYOUT
FOR
LOCAL & COLLECTOR STREETS**

November 2018



NOTES:

1. THE SIGHT TRIANGLES SHALL BE PROVIDED AT ALL STREET INTERSECTIONS. SEE TABLE FOR DISTANCES.
2. A SIGHT TRIANGLE SHALL CONTAIN NO FENCE, STRUCTURE, EARTH EMBANKMENT, WALL, OR OTHER OBSTRUCTION GREATER THAN 2' ABOVE THE GROUND.
3. DIMENSION "D" SEE PROVIDED TABLE FROM NCDOT GUIDELINES FOR PLANTING WITHIN RIGHT-OF-WAY (MARCH 2016 EDITION).
4. SEE NCDOT GUIDELINES FOR PLANTING WITHIN RIGHT-OF-WAY (MARCH 2016 EDITION) FOR ALL REFERENCES ON TREES, SHRUBS OR PLANTINGS.

* LOCATION OF DRIVER'S EYE IS 15' MIN. FROM EDGE OF NEAREST THROUGH LANE

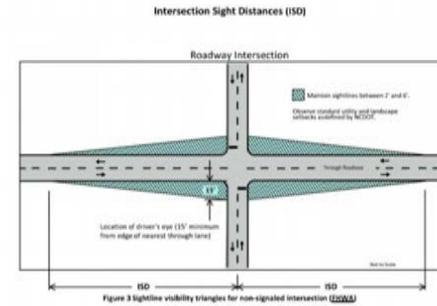


Figure 3 Sightline visibility triangles for non-signalized intersection (2004)

Sight Distance at Intersections		
Speed (mph) *	Stopping Sight Distance (ft.)	ISD- Design Intersection Sight Distance (ft.)
25	155	280
30	200	335
35	250	390
40	305	445
45	360	500
50	425	555
55	495	610
60	570	665
65	645	720

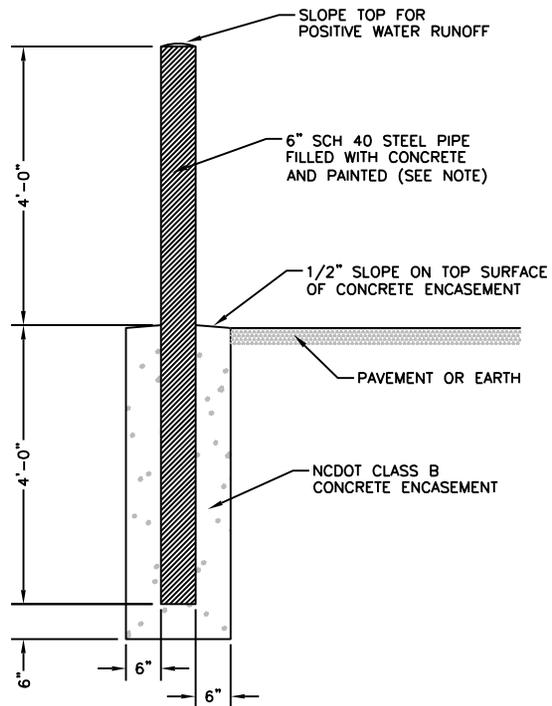
Source: A Policy on Geometric Design of Highway and Streets, 5th Edition, American Association of State Highway and Transportation Officials (AASHTO), 2004.

NOT TO SCALE



SIGHT LINE INTERSECTION VISIBILITY TRIANGLES

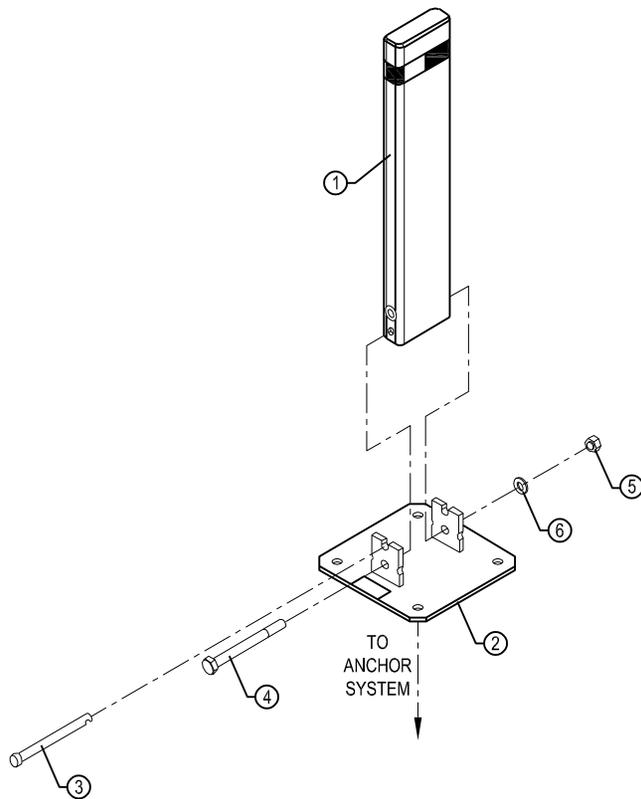
November 2018



NOTE:
 FINISH WITH ONE COAT OF EPOXY PRIMER AND 2 COATS OF ALL WEATHER ENAMEL, COLOR SAFETY YELLOW.

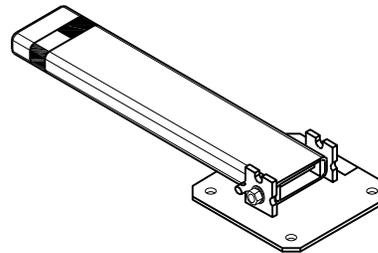
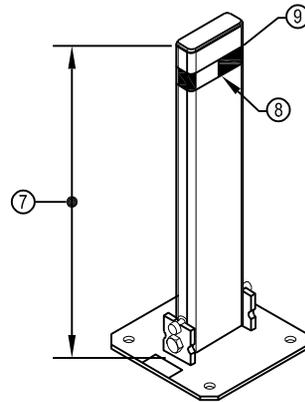
NOT TO SCALE

BOLLARD

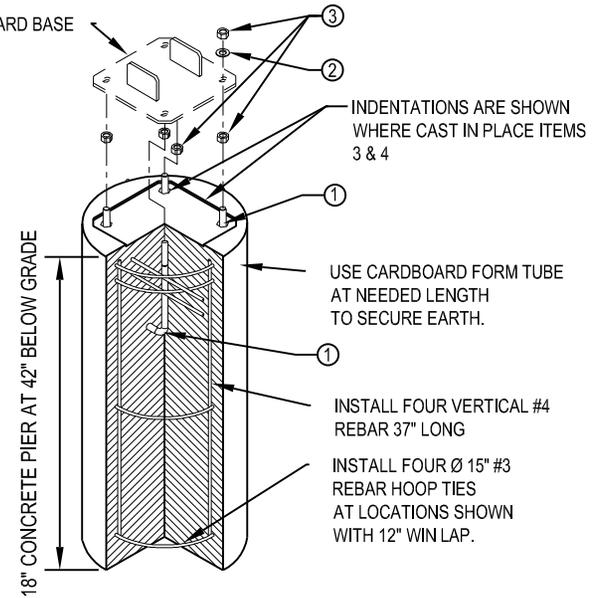


BOLLARD LEGEND:

- ① BOLLARD POST WELDMENT
- ② BASE WELDMENT
- ③ PIN
- ④ HEX HEAD BOLT
- ⑤ HEX NUT
- ⑥ WASHER
- ⑦ BOLLARD HEIGHT TO BE 30"
- ⑧ 2" WIDE REFLECTOR - RED AND WHITE WRAPPED AROUND ALL SIDES OF BOLLARD
- ⑨ TOP OF 2" REFLECTOR TO BEGIN 3" FROM TOP OF BOLLARD



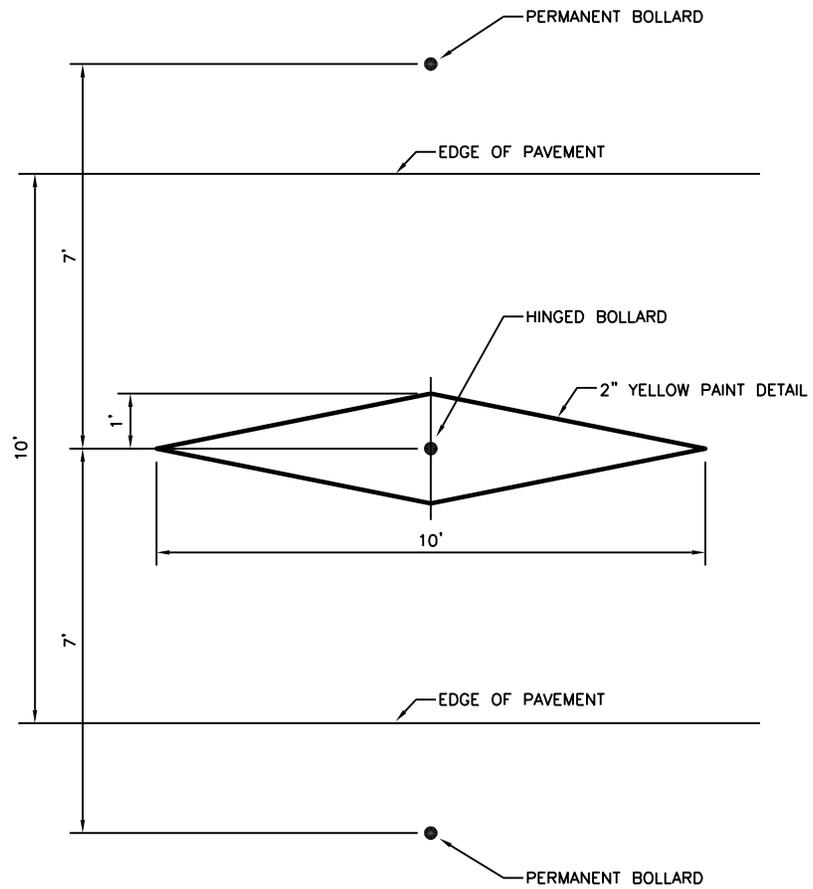
BOLLARD BASE



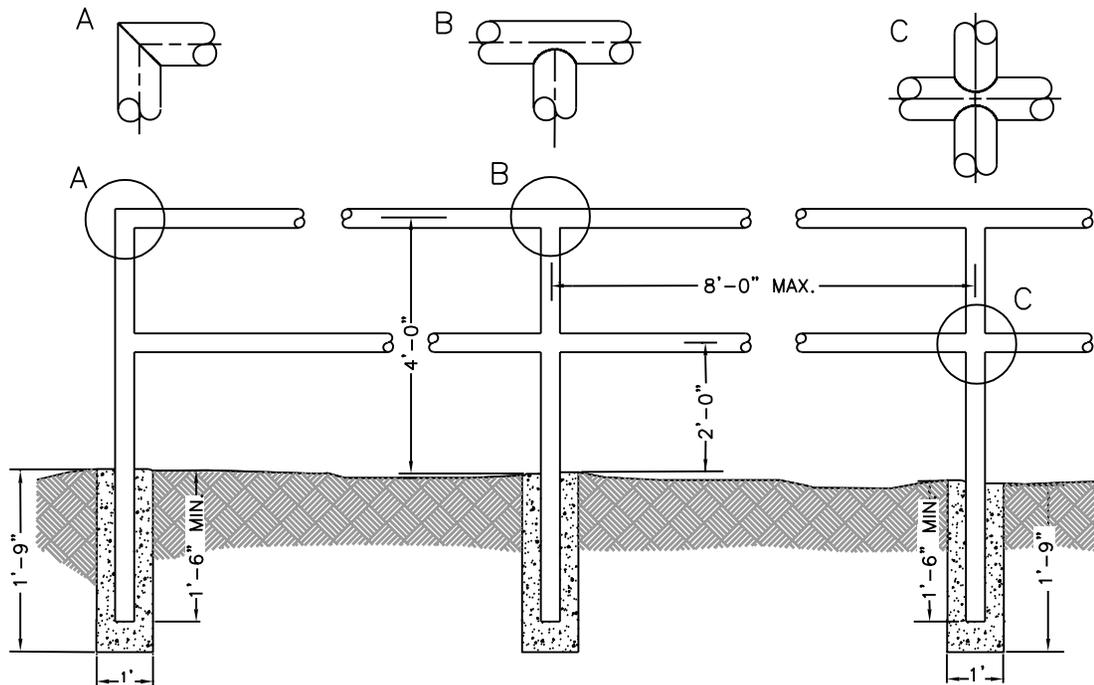
ANCHOR SYSTEM LEGEND:

- ① 3/4" X 12" TYPE L ANCHOR BOLT H.D.G
- ② 3/4" TYPE A FLAT NARROW WASHER GALVANIZED STEEL
- ③ 3/4" HEX NUT GALVANIZED STEEL

NOT TO SCALE



NOT TO SCALE



NOTES:

1. ALL CONCRETE TO BE 2500 P.S.I. COMPRESSIVE STRENGTH.
2. TYPE OF PIPE TO BE USED IS 1-5/8" MAX. O.D. BLACK IRON, LOW CARBON PIPE OR GALVANIZED.
3. ALL JOINTS TO HAVE A 1/2" FILLET WELD AT ALL JOINTS.
4. AFTER INSTALLATION PAINT ASSMBLY WITH BLACK ALL WEATHER ENAMEL.
5. SEE DETAIL STD 130 FOR WARRANTS.
6. ALTERNATIVE DESIGNS SHALL BE SENT TO KANNAPOLIS ENGINEERING DEPARTMENT FOR APPROVAL. ANY ALTERNATE DESIGN WILL BE PRIVATELY MAINTAINED.

NOT TO SCALE

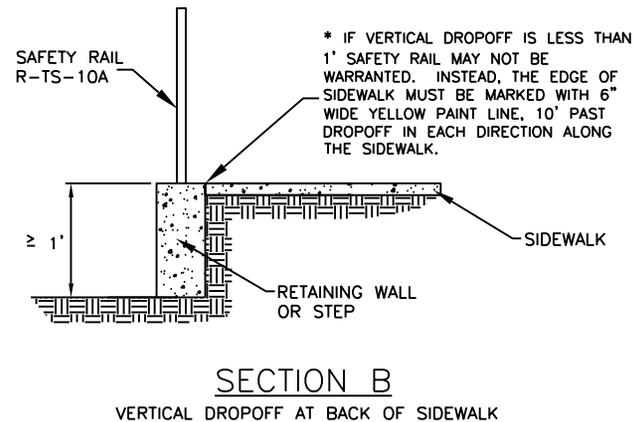
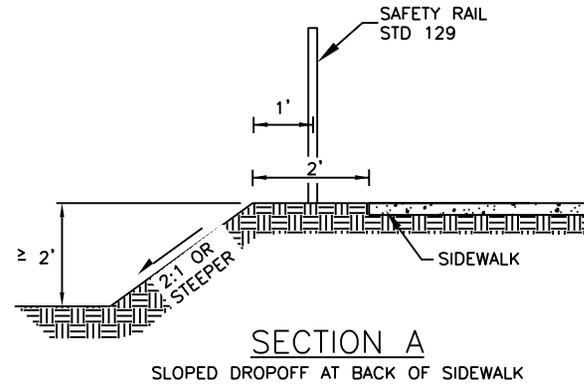
WARRANTS

STANDARD SAFETY RAIL (STD 129) SHALL BE INSTALLED UNDER ANY OF THE FOLLOWING CIRCUMSTANCES IN BOTH NEW CONSTRUCTION AND IN RETROFITTING OR RECONSTRUCTION OF EXISTING ROADWAYS OR SITES:

1. WHEN THE CULVERT CROSSING DETAIL (STD 150) APPLIES.
2. IF THERE IS A TWO FOOT OR GREATER DROPOFF WITHIN 2 FEET OF THE EDGE OF THE SIDEWALK (SEE DIAGRAM A).
3. IF THERE IS A 1-FOOT OR LARGER DROPOFF DIRECTLY ADJACENT TO THE SIDEWALK EDGE (SEE DIAGRAM B).
4. AT THE TOP OF ANY DROPOFF WITHIN THE PEDESTRIAN CLEAR ZONE OR WHERE PEDESTRIANS CAN REASONABLY BE EXPECTED IN THE VICINITY.
5. AT THE DIRECTION OF KANNAPOLIS ENGINEERING DEPARTMENT BASED ON FIELD CONDITIONS.

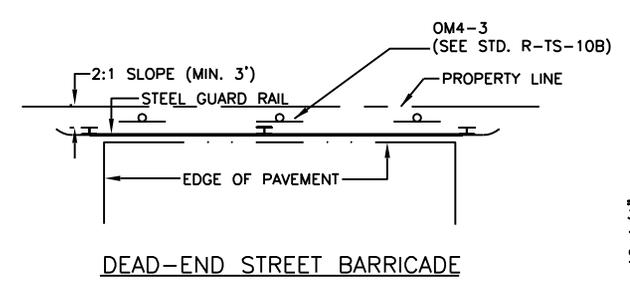
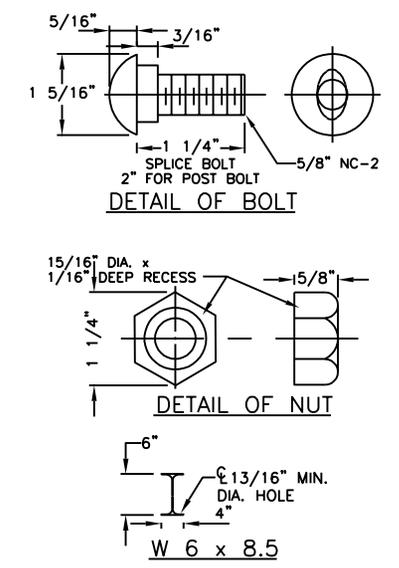
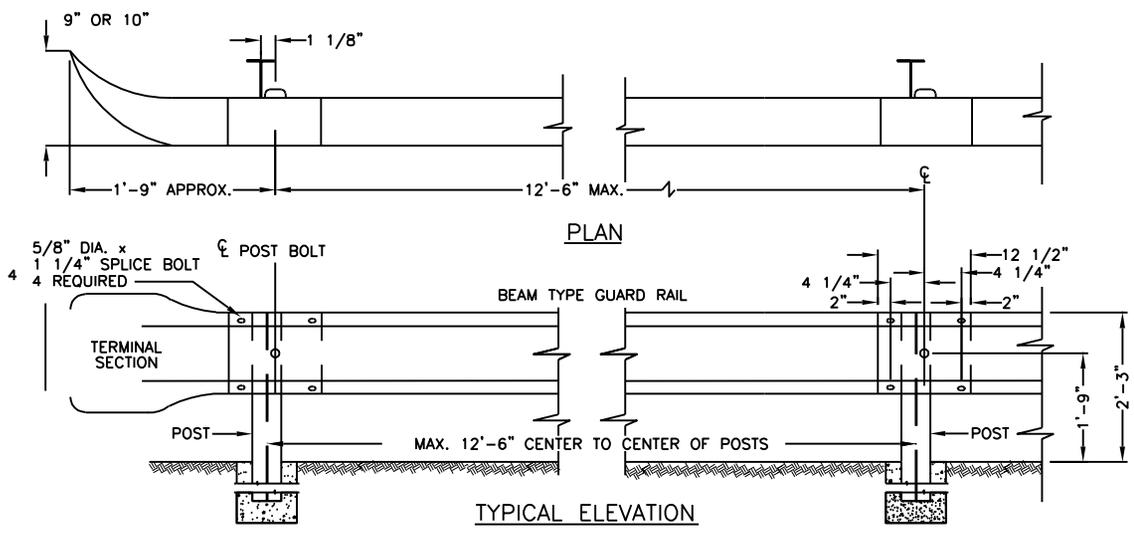
DEFINITIONS

- DROPOFF -- A SLOPE OF 2:1 OR STEEPER. EXAMPLES INCLUDE HEADWALLS, RETAINING WALLS, AND CULVERTS.
- PEDESTRIAN CLEAR ZONE -- 10 FEET OF ANY COMBINATION OF SIDEWALK, SLOPE, AND SHOULDER SLOPED AT 6:1 OR FLATTER. SIDEWALK DOES NOT NEED TO BE PRESENT.
- SIDEWALK -- FOR PURPOSES OF THIS STANDARD, THE TERM "SIDEWALK" IS USED GENERICALLY AND SHALL MEAN ANY PATH OR SURFACE TO BE USED FOR BICYCLE AND/OR PEDESTRIAN TRANSPORTATION. EXAMPLES INCLUDE, BUT ARE NOT LIMITED TO, SIDEWALKS, BIKE PATHS, SHARED-USE PATHS, PEDESTRIAN PATHS, AND GREENWAYS.

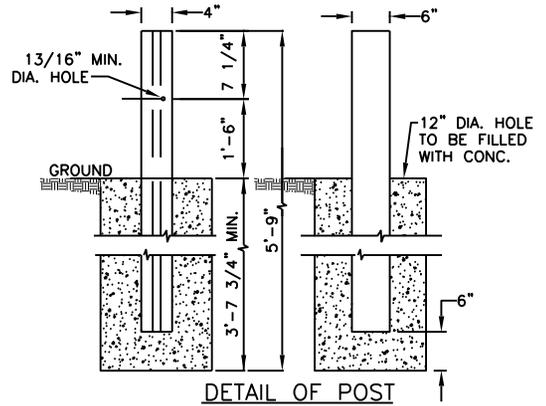
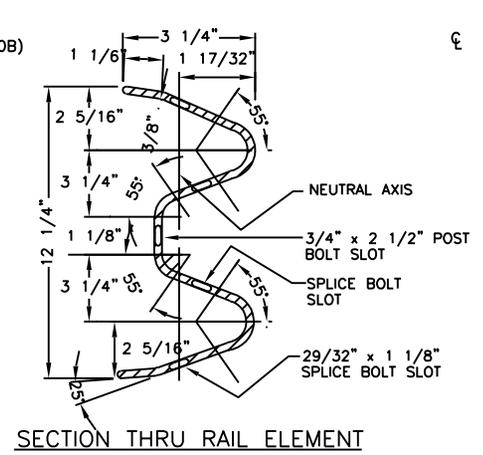


NOT TO SCALE

SAFETY RAIL WARRANTS



NOTE:
 THIS DETAIL IS NOT A GUARDRAIL DETAIL.
 FOR ROADSIDE GUARDRAIL, SEE NCDOT
 STANDARD DRAWINGS 862.01-862.03



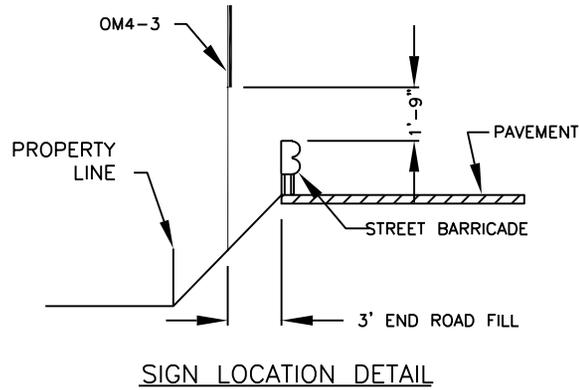
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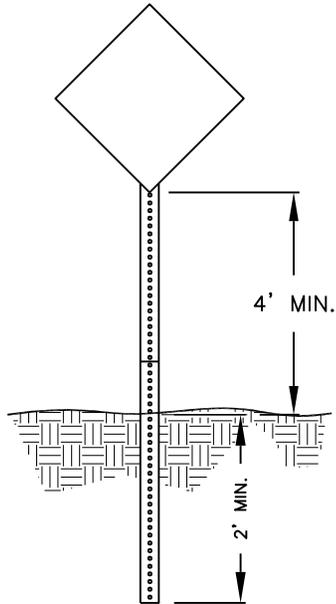
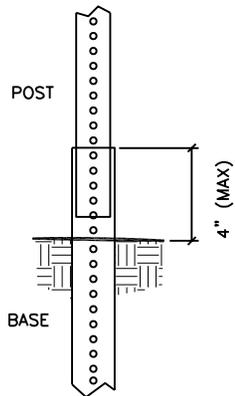
END OF ROADWAY BARRICADE

NOTES:

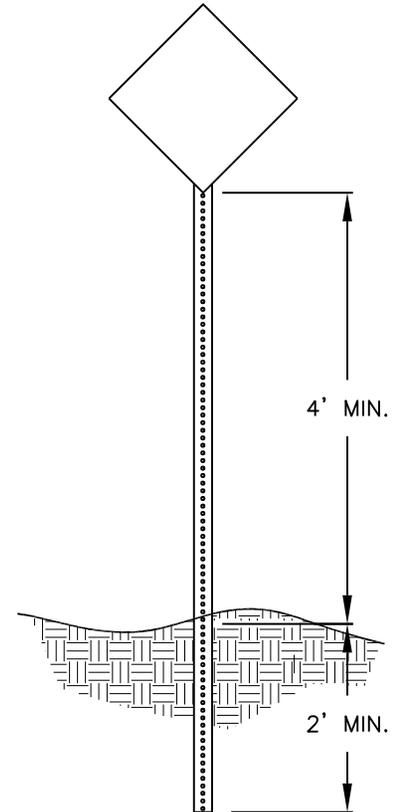
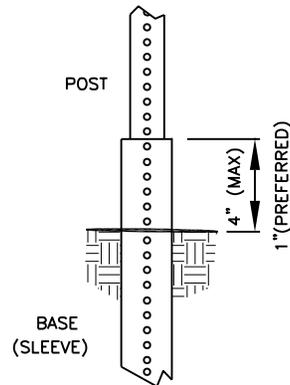
1. WHEN A DEAD-END OR STUBBED STREET REQUIRES A GUARDRAIL SECTION, END-OF-ROADWAY MARKER SIGNS (OM4-3, 24"x24", SOLID RED) SHALL BE PROVIDED.
2. SIGNS ARE TO BE PLACED BEHIND THE BARRICADE (SEE STD 131), EVENLY SPACED WITH ONE SIGN PLACED AT THE CENTERLINE LOCATION AND ADDITIONAL SIGNS AT 6' O.C. (MINIMUM OF 3 SIGNS, MAXIMUM OF 5 SIGNS).
3. ALL SIGNS/MARKERS SHALL MEET OR EXCEED MUTCD STANDARDS FOR RETROREFLECTIVITY.



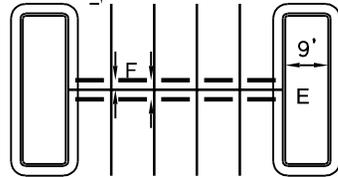
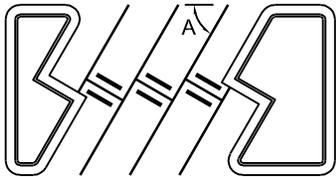
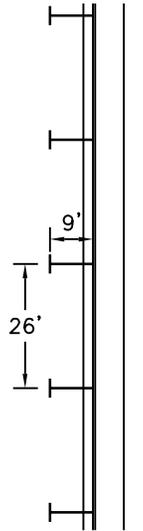
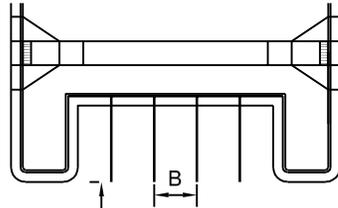
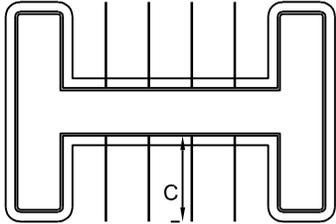
CROSS SECTION OF POST (2 LB./FT.)



CROSS SECTION OF POST (14 GAUGE)



NOT TO SCALE



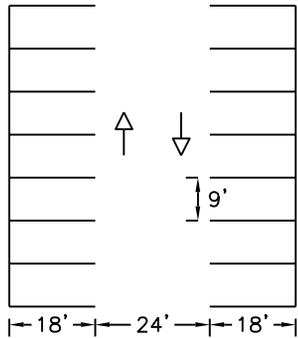
NOTES:

- SEE DETAIL #133, 134 AND 135 FOR ADA PARKING SIZING & REQUIREMENTS.
- PARKING LOCATED WITHIN A PARKING STRUCTURE IN THE CC DISTRICT MAY REDUCE PARKING STALLS TO A WIDTH OF EIGHT AND ONE-HALF (8.5) FEET.
- WHEEL OR BUMPER GUARDS OR CURBING SHALL BE PROVIDED, LOCATED AND ARRANGED SO THAT NO PART OF ANY PARKED VEHICLE WILL EXTEND BEYOND THE BOUNDARIES OF THE PARKING SPACE AND INTO A PEDESTRIAN CROSSING AREA.
- PAVEMENT MARKINGS SHALL BE 4" WHITE PAINT OR THERMOPLASTIC.
- DIMENSIONS ARE TO CENTER OF PAVEMENT MARKINGS.
- ALL ISLANDS ARE TO BE MINIMUM OF 9' WIDTH FROM BACK OF CURB TO BACK OF CURB.
- COMPACT SPACES ARE TO BE DESIGNATED WITH A "C" ON EVERY SPACE.
- SIDEWALK ADJACENT TO PARKING SHALL BE AT LEAST 7 FEET WIDE. SIDEWALK BETWEEN TWO ROWS OF PARKING SHALL BE AT LEAST 9 FEET WIDE.
 - A 2' WIDE GRASS PLANTED AREA LOCATED AT THE BACK OF CURB CAN BE USED IN LIEU OF 2 FEET OF SIDEWALK WIDTH
 - PARKING AT ANY ANGLE OTHER THAN PARALLEL SHALL BE SUBJECT TO THIS STANDARD.
 - IF MONOLITHIC CURB & SIDEWALK IS USED, ADD 6" TO ALL DIMENSIONS (1' IF PARKING ON BOTH SIDES).
 - WHEEL STOPS IN LIEU OF ADDITIONAL SIDEWALK WIDTH REQUIRE 2' OF ADDITIONAL DEPTH OF THE PARKING SPACES.

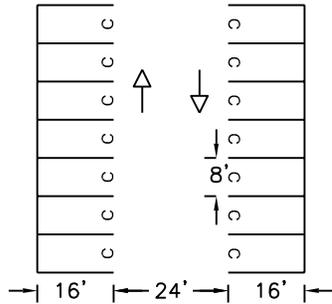
KEY:

- A. PARKING ANGLE
- B. STALL WIDTH
- C. STALL DEPTH
- D. AISLE WIDTH
- E. PLANTING ISLAND WIDTH
- F. WHEEL STOP (FRONT/REAR)

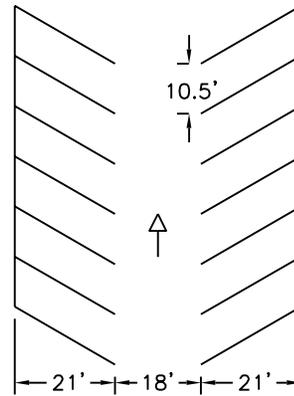
STANDARD SIZE VEHICLES					
A	B	C	D	E	F
0°	9'	26'	12' ONE WAY	N/A	N/A
45°	SEE DIAGRAM BELOW	SEE DIAGRAM BELOW	18' ONE WAY	9'	2' / 4'
60°	SEE DIAGRAM BELOW	SEE DIAGRAM BELOW	24' TWO WAY		
90°	9'	18'	24' TWO WAY		
COMPACT SIZE VEHICLES					
45°			12' ONE WAY	9'	2' / 4'
60°	8'	16'	18' ONE WAY		
90°			24' TWO WAY		



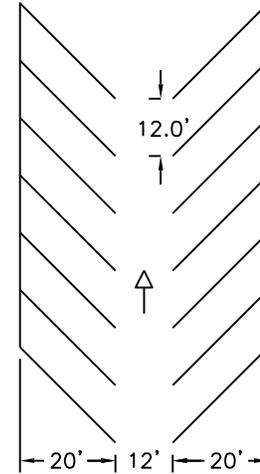
**PARKING ANGLE 90°
(TWO WAY TRAFFIC)**



**COMPACT PARKING
(TWO WAY TRAFFIC)**

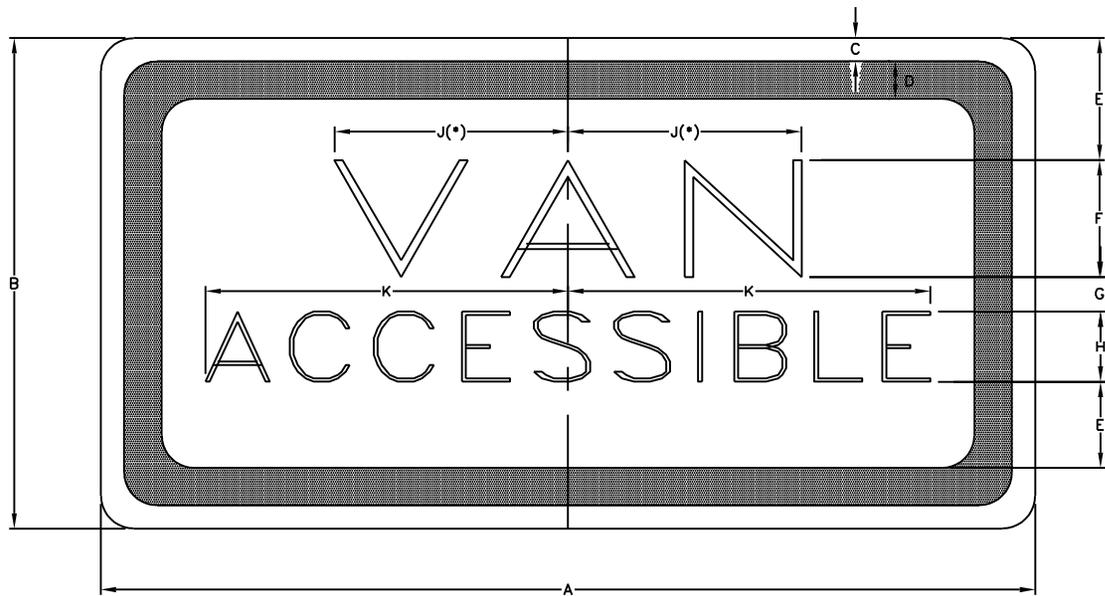


**PARKING ANGLE 60°
(ONE WAY TRAFFIC)**



**PARKING ANGLE 45°
(ONE WAY TRAFFIC)**

NOT TO SCALE

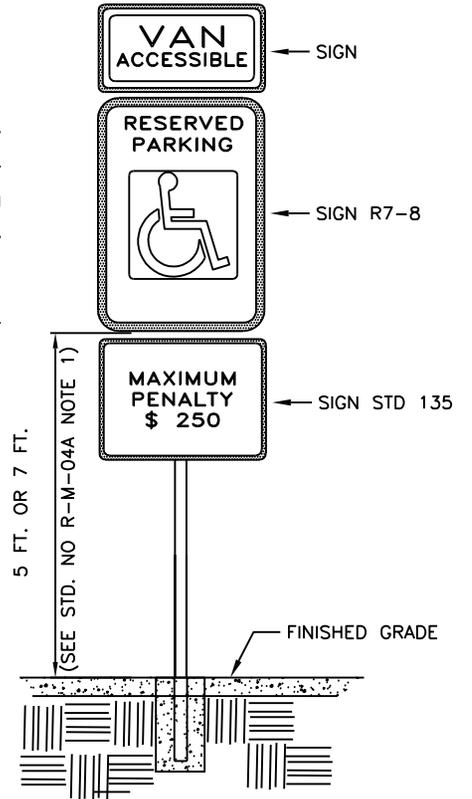


R7-8P

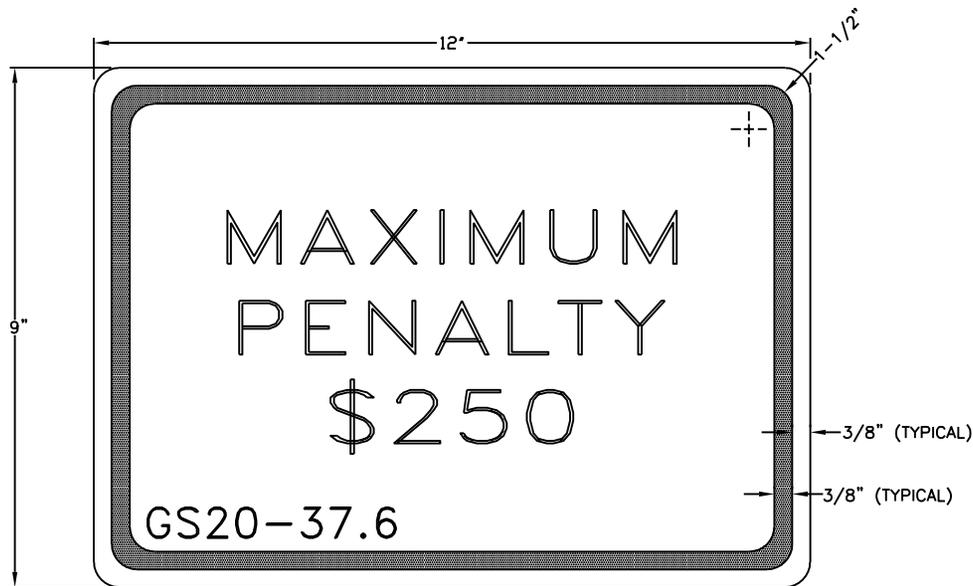
DIMENSIONS (INCHES)										
A	B	C	D	E	F	G	H	J	K	L
12	6	3/8	3/8	1-1/2	1-1/2D	1/2	1D	2-1/2	4	1-1/2

• INCREASE SPACING 50%
 D-FHWA (FEDERAL HIGHWAY ADMINISTRATION/USDOT)
 SERIES D LETTERS

LEGEND AND BORDER - GREEN
 BACKGROUND - WHITE



NOT TO SCALE



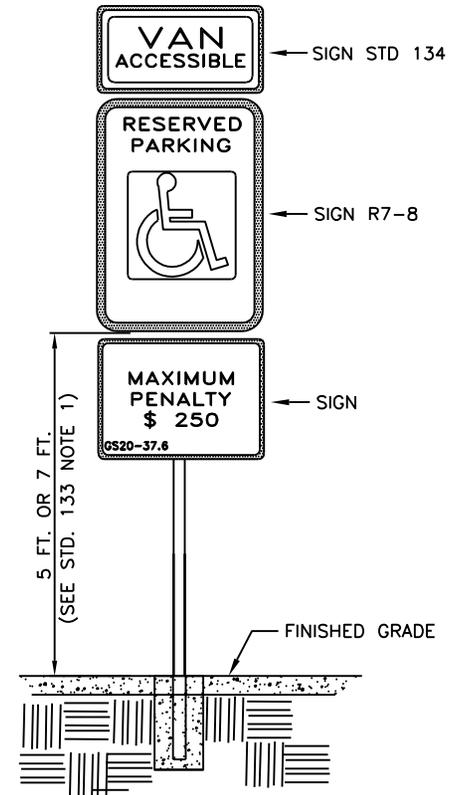
LEGEND AND BORDER - GREEN
BACKGROUND - WHITE

SIGN APPROVED FOR USE UNDER GENERAL STATUTE 20-37.6

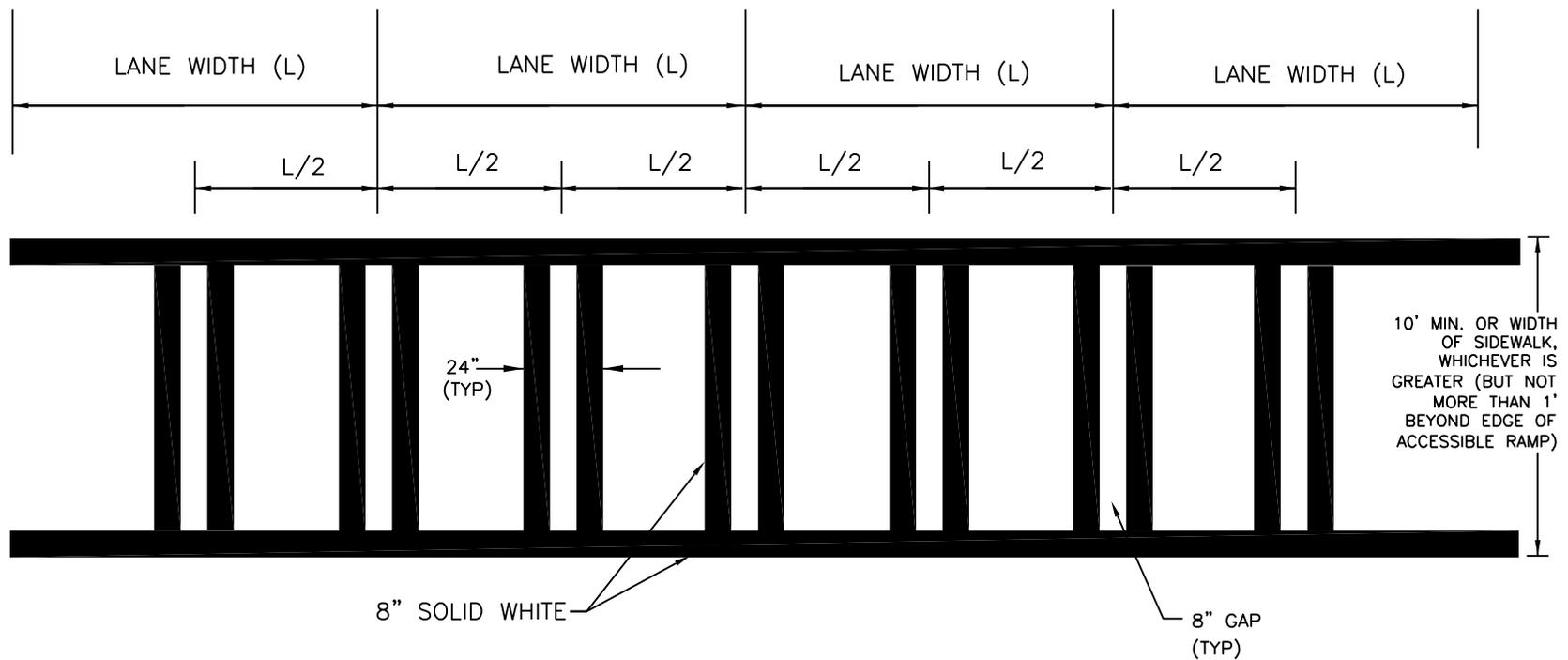
THIS PENALTY SIGN IS REQUIRED TO ACCOMPANY ALL R7-8
PARKING SIGNS ERECTED AFTER DECEMBER 31, 1990

NOTE:

SUPPLEMENTAL VAN ACCESSIBLE SIGN (R7-8P) USED IF THERE IS ONLY ONE REQUIRED ACCESSIBLE PARKING SPACE (MUST BE VAN ACCESSIBLE) AND AT EACH ADDITIONAL REQUIRED VAN ACCESSIBLE SPACE. (SEE STD. 134)



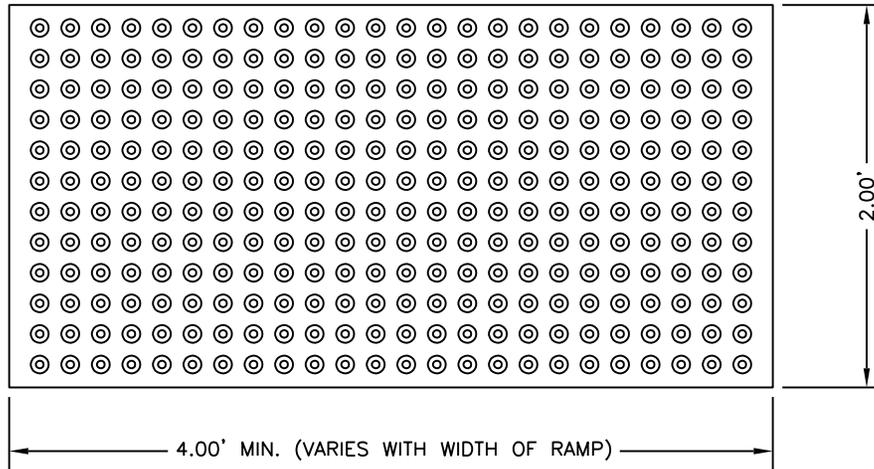
NOT TO SCALE



NOTES:

1. PER MUTCD STANDARDS, WHEN CROSSWALK LINES ARE USED THEY SHALL CONSIST OF SOLID WHITE LINES THAT MARK THE CROSSWALK. THEY SHALL BE NOT LESS THAN 150 MM (6 IN) NOR GREATER THAN 600 MM (24 IN) IN WIDTH.
2. IF TRANSVERSE LINES ARE USED TO MARK A CROSSWALK, THE GAP BETWEEN THE LINES SHOULD NOT BE LESS THAN 1.8 M (6 FT). IF DIAGONAL OR LONGITUDINAL LINES ARE USED WITHOUT TRANSVERSE LINES TO MARK A CROSSWALK, THE CROSSWALK SHOULD NOT BE LESS THAN 1.8 M (6 FT) WIDE.
3. IF USED, THE DIAGONAL OR LONGITUDINAL LINES SHOULD BE 300 TO 600 MM (12 TO 24 IN) WIDE AND SPACED 300 TO 1500 MM (12 TO 60 IN) APART. THE MARKING DESIGN SHOULD AVOID THE WHEEL PATHS, AND THE SPACING SHOULD NOT EXCEED 2.5 TIMES THE LINE WIDTH.

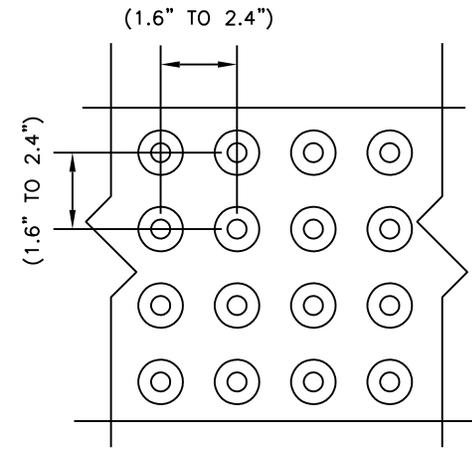
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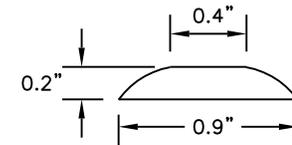
PLAN VIEW

NOTES:

1. ALL DETECTABLE WARNING DEVICES USED IN NEW CONSTRUCTION SHALL BE OF A RIGID PRECAST OR EMBEDDED PRODUCT APPROVED BY THE CITY ENGINEER. RETRO FIT MATS WILL ONLY BE ALLOWED ON EXISTING RAMPS WITH PRIOR APPROVAL OF THE CITY ENGINEER FOR MATERIAL TYPE AND INSTALLATION (IE. RESURFACING).
2. WIDTH OF DETECTABLE WARNING AREA SHALL BE A MINIMUM OF 4 FEET AND VARY WITH WIDTH OF RAMP.
3. LENGTH OF DETECTABLE WARNING AREA SHALL BE 2 FEET REGARDLESS OF SECTION WIDTH.
4. DETECTABLE WARNING DOMES SHALL BE ALIGNED ON A SQUARE GRID IN THE PREDOMINANT DIRECTION OF TRAVEL TO PERMIT WHEELS TO ROLL BETWEEN DOMES.
5. DETECTABLE WARNING AREA SHALL BE COLORED FS 20109 IN ALL LOCATIONS.
6. MATS ARE TO BE RIGID WITH TURN DOWN EDGES EMBEDDED IN CONCRETE TO ELIMINATE TRIP HAZARD.



TRUNCATED DOME SPACING



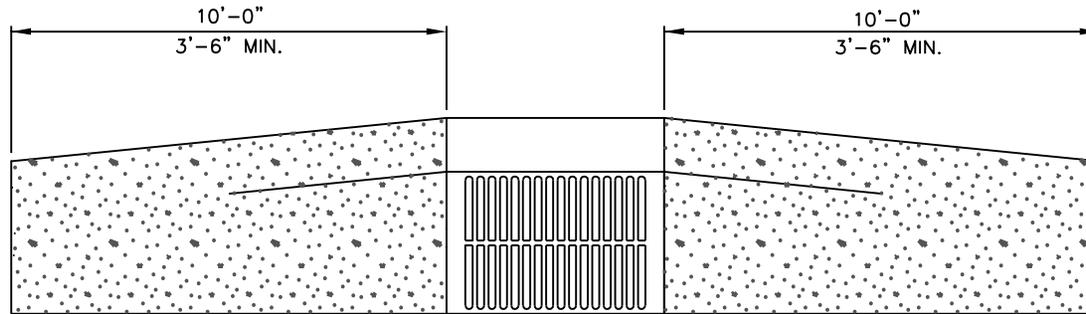
TRUNCATED DOME SECTION

NOT TO SCALE



TRUNCATED DOMES PLAN AND CROSS SECTION

November 2018

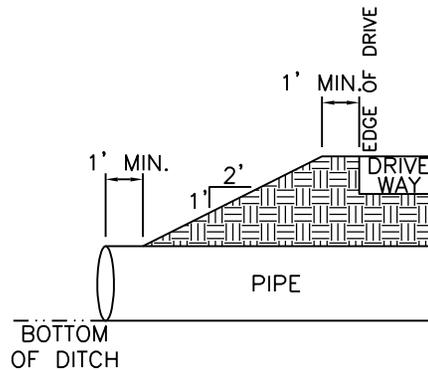


PLAN

NOTE:

1. TRANSITION FROM 2'-6" STANDARD CURB TO VALLEY CURB AT A DRAINAGE INLET ONLY.
2. TRANSITIONS SHORTER THAN 10' SHALL BE APPROVED BY THE CITY ENGINEER. UNDER NO CIRCUMSTANCE SHALL A TRANSITION BE SHORTER THAN 3'-6".

NOT TO SCALE



RESIDENTIAL DRIVEWAY PIPE DETAIL

NOTES:

- A. THE PIPE SHALL BE A MINIMUM DIAMETER OF 15" REINFORCED CONCRETE OR APPROVED BY KANNAPOLIS AND A MINIMUM LENGTH OF 20'.
- B. A LARGER PIPE SIZE MAY BE REQUIRED IF DETERMINED BY A PROFESSIONAL ENGINEER.
- C. THE LENGTH OF PIPE REQUIRED SHALL BE THE AMOUNT NEEDED TO EXTEND (1') BEYOND THE TOE OF A 2:1 SLOPE. SEE SECTION DETAIL.
- D. NO UTILITIES IN DRIVEWAY, MUST BE MIN. 3' FROM DRIVEWAY
- E. DITCH SHALL BE INSPECTED BY PUBLIC WORKS BEFORE PIPE IS INSTALLED.

NOT TO SCALE

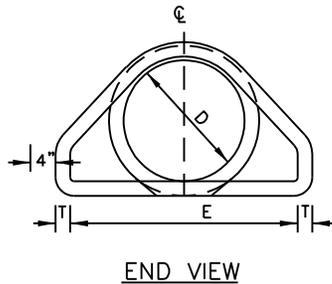
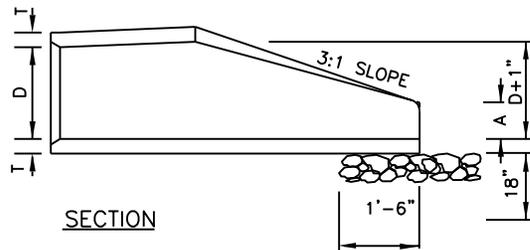
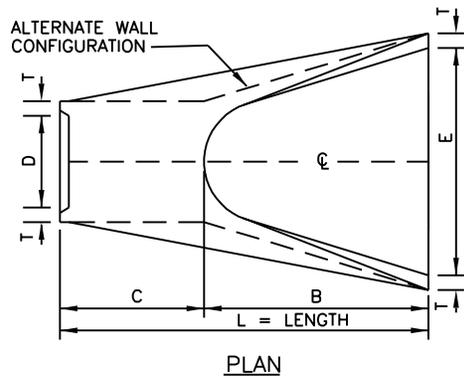


TABLE OF DIMENSIONS							
D	T	A	B	C	E	L	WT.
12"	2-1/4"	4"	2'-0"	4'-1"	2'-0"	6'-1"	730
15"	2-1/4"	6"	2'-3"	3'-10"	2'-0"	6'-1"	730
18"	2-1/2"	9"	2'-3"	3'-10"	3'-0"	6'-1"	1190
24"	3"	10"	3'-8"	2'-6"	4'-0"	6'-2"	1770
30"	3-1/2"	1'-0"	4'-6"	1'-8"	5'-0"	6'-2"	2380
36"	4"	1'-3"	5'-3"	2'-11"	6'-0"	8'-2"	5320
42"	4-1/2"	1'-9"	5'-3"	2'-11"	6'-6"	8'-2"	5920
48"	5"	2'-0"	6'-0"	2'-2"	7'-0"	8'-2"	7470
54"	5-1/2"	2'-3"	5'-6"	2'-10"	7'-6"	8'-4"	8810
60"	6"	2'-6"	5'-0"	3'-3"	8'-0"	8'-3"	11180
66"	6-1/2"	3'-0"	6'-0"	2'-3"	8'-6"	8'-3"	12530
72"	7"	3'-0"	6'-6"	1'-9"	9'-0"	8'-3"	13980

GENERAL NOTES:

1. SEE FORMER NCDOT STANDARD 310.01 FOR DETAILS.
2. REINFORCEMENT SHALL CONFORM TO THE REQUIREMENTS OF REINFORCED CONCRETE PIPE OF LIKE DIAMETER PER AASHTO M170, TABLE 2, WALL B.
3. ALL CONCRETE TO BE 3600 P.S.I COMPRESSIVE STRENGTH.
4. PROVIDE TONGUE OR SPIGOT JOINT AT INLET END SECTION.
5. PROVIDE GROOVE OR BELL JOINT AT OUTLET END SECTION.
6. THE DIMENSIONS FOR END SECTIONS SHALL SUBSTANTIALLY AGREE WITH THE TABLE. MINOR VARIATIONS WILL BE PERMITTED BASED ON THE MANUFACTURER'S STANDARD FORMS AND TEMPLATES.
7. NOT TO BE USED IN NCDOT MAINTAINED RIGHT OF WAY.

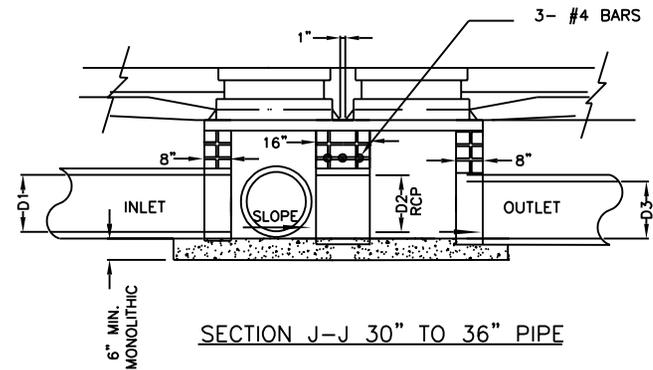
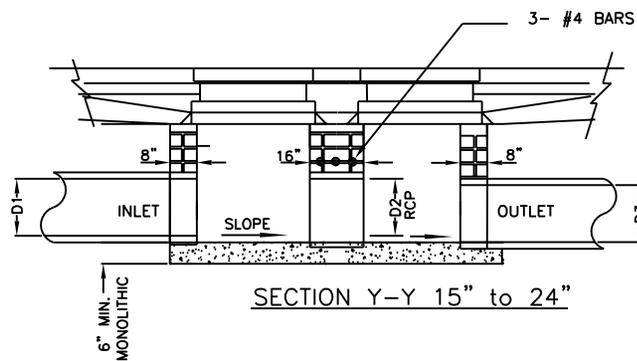
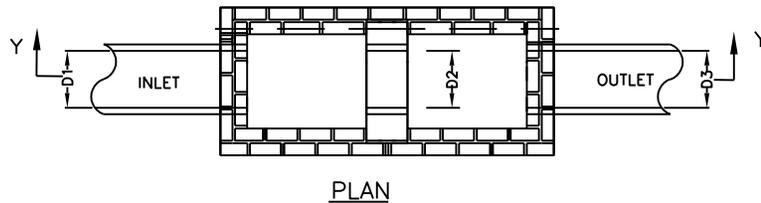
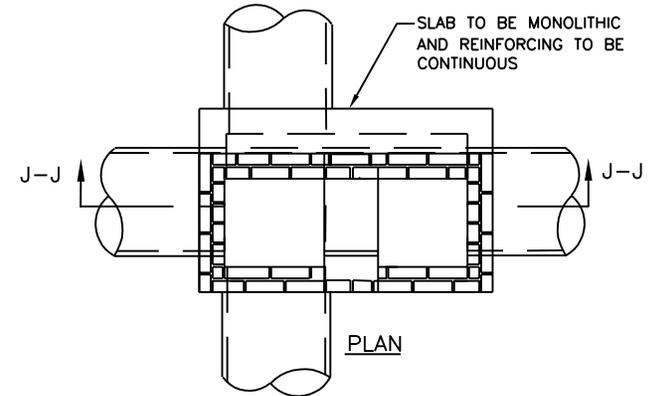
NOT TO SCALE

**FLARED END SECTION
12" THRU 72" PIPE**

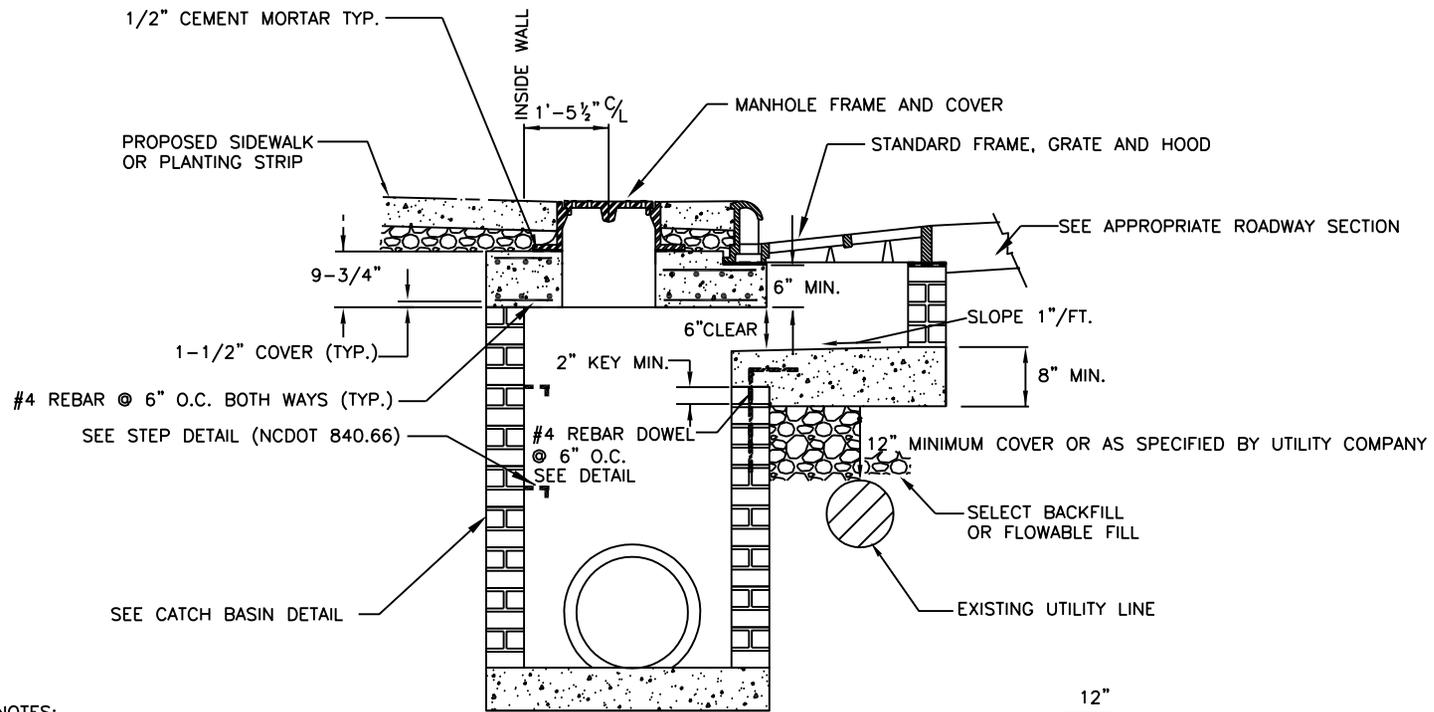


GENERAL NOTES:

1. SEE NCDOT STANDARD 840.01 FOR DETAILS BASED ON PIPE SIZE PER CROSS SECTION.
2. CONSTRUCT TWO SINGLE BASINS PER NCDOT STANDARD WITH DOUBLE INTERIOR WALL.
3. ALL CONCRETE TO BE NCDOT CLASS B CONCRETE.
4. BASE SLAB SHALL BE MONOLITHIC.
5. PIPE SECTION D2 CONNECTING CATCH BASINS SHALL HAVE A MINIMUM DIAMETER SAME AS OF OUTLET PIPE D3.
6. ALL REINFORCING STEEL SHOWN ON NCDOT STANDARDS IS TO BE PROVIDED AS CONTINUOUS MEMBERS. (NO LAPS, USED AS A SINGLE CONTINUOUS BAR IN THE SLAB)
7. WEEP HOLES SHALL BE PLACED IN BACK WALL WITH FILTER FABRIC OR STONE ON BACK SIDE



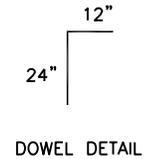
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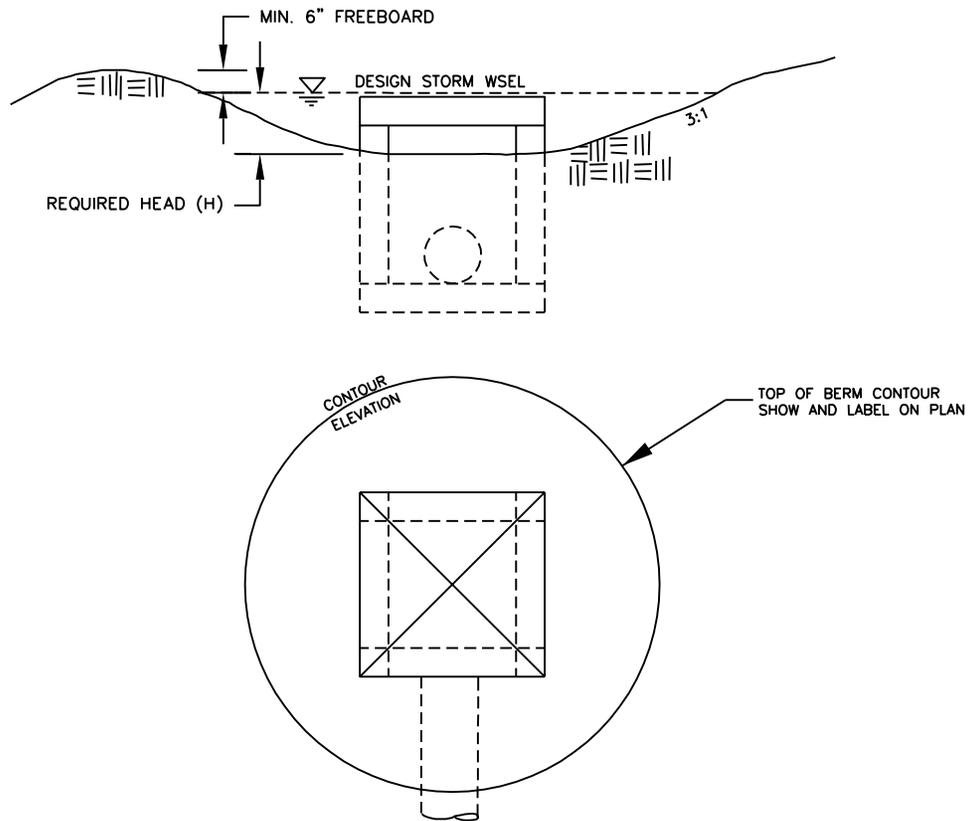
NOTES:

1. PRIOR APPROVAL FROM THE CITY ENGINEER IS REQUIRED.
2. THIS STRUCTURE IS TO ONLY BE USED ON CITY MAINTAINED STREETS AND NOT ON NCDOT STREETS WITHOUT THEIR PERMISSION.
3. SEE NCDOT DETAIL 840.01 FOR MAXIMUM PIPE SIZE ALLOWABLE.

OFFSET CATCH BASIN
EXISTING UTILITY CONFLICT



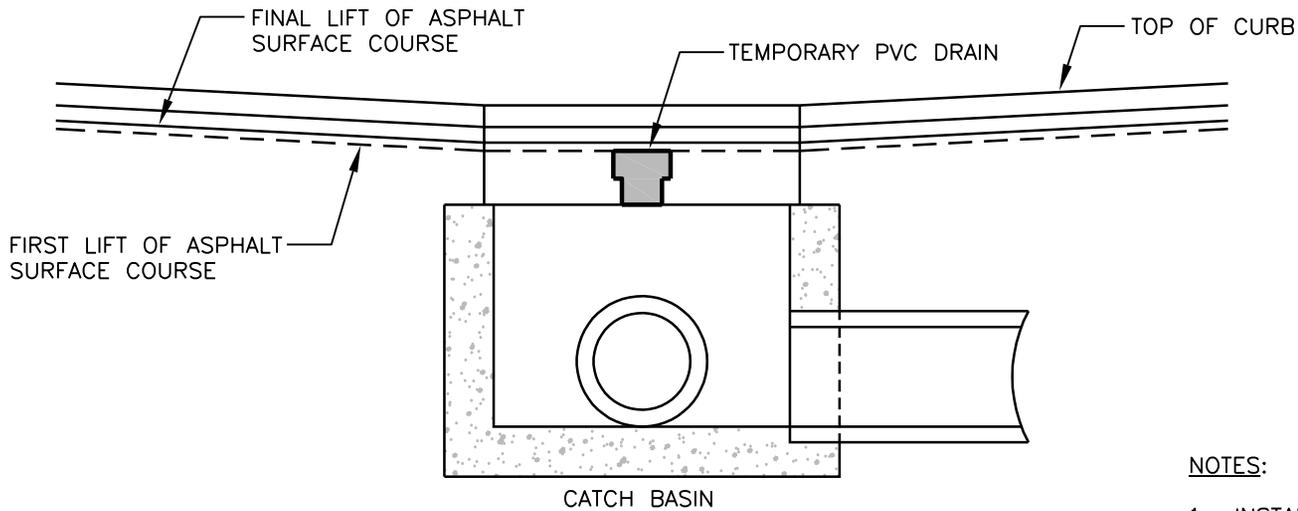
NOT TO SCALE



NOT TO SCALE

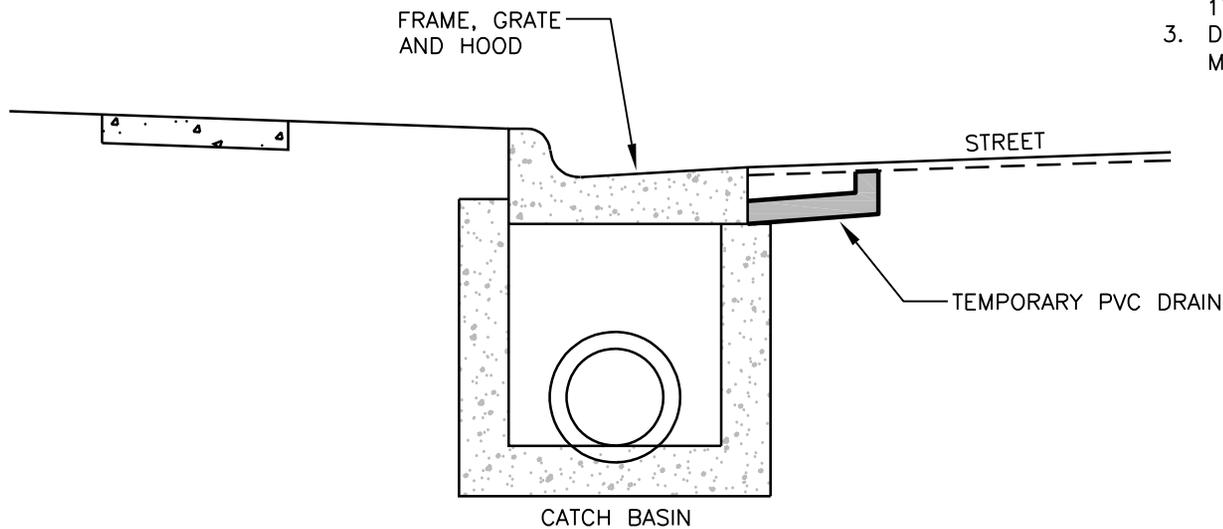


GRADING AT DROP INLET



NOTES:

1. INSTALL AND MAINTAIN DRAINS IN LOW POINTS OF STREETS UNTIL FINAL 1" LIFT OF ASPHALT SURFACE COURSE IS PLACED.
2. FILL DRAINS WITH CONCRETE PRIOR TO PLACING FINAL 1" LIFT OF ASPHALT SURFACE COURSE.
3. DRAINS MAY BE CONSTRUCTED OF SCHEDULE 40 PVC, MINIMUM 3" DIAMETER.



NOT TO SCALE

DEFINITION: GRAVELED AREA TO BE LOCATED AT POINTS WHERE VEHICLES ENTER AND LEAVE A CONSTRUCTION SITE.

PURPOSE: TO PROVIDE A BUFFER AREA WHERE VEHICLES CAN DROP THEIR MUD AND SEDIMENT TO AVOID TRANSPORTING IT ONTO PUBLIC ROADS, TO CONTROL EROSION FROM SURFACE RUNOFF, AND TO HELP CONTROL DUST.

CONDITIONS: TO BE USED WHEREVER TRAFFIC WILL BE LEAVING A CONSTRUCTION SITE AND MOVING DIRECTLY ONTO A PUBLIC ROAD OR OTHER PAVED OFF-SITE AREA. CONSTRUCTION PLANS SHOULD LIMIT TRAFFIC TO PROPERLY CONSTRUCTED ENTRANCES.

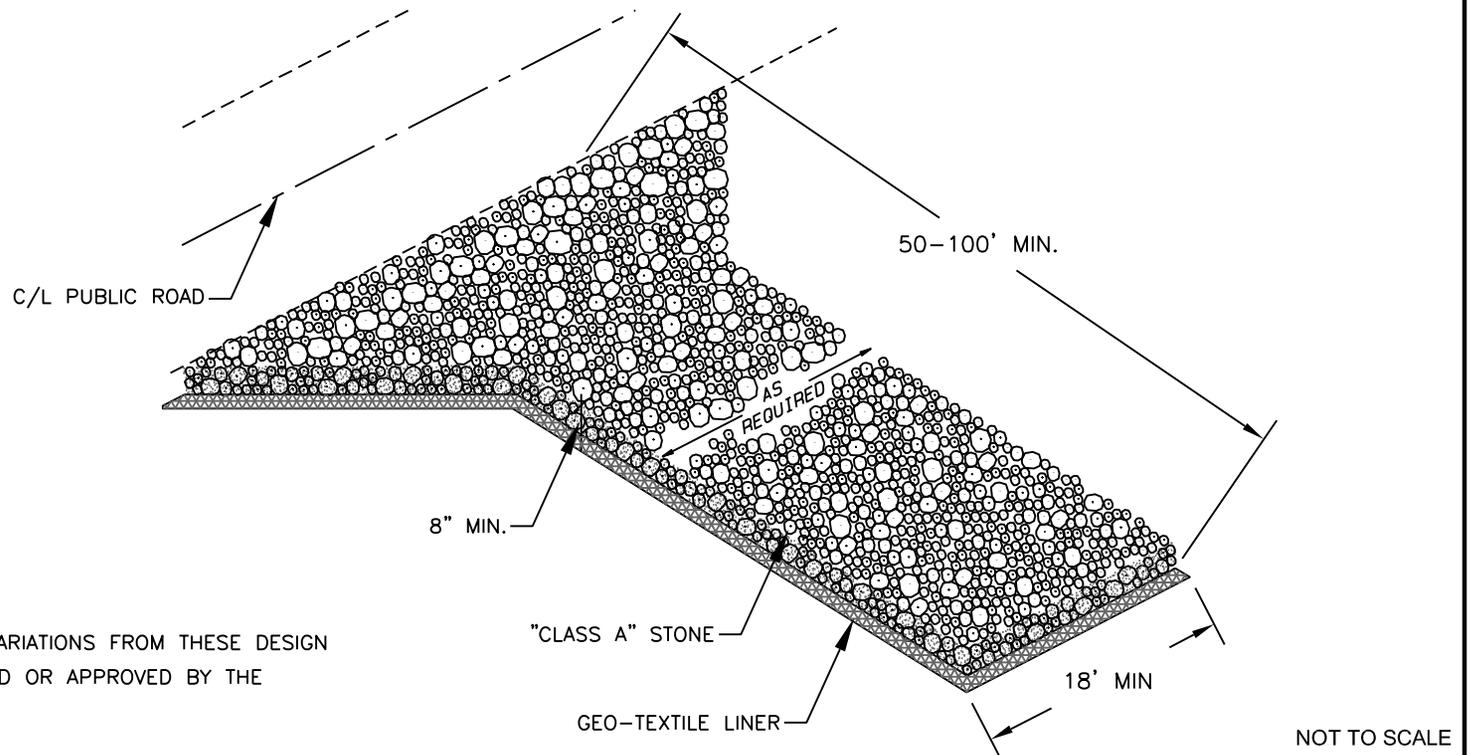
DESIGN CRITERIA: AGGREGATE SIZE – USE "CLASS A" STONE WITH GEO-TEXTILE LINER.

DIMENSIONS OF GRAVEL PAD – THICKNESS = 8" MINIMUM

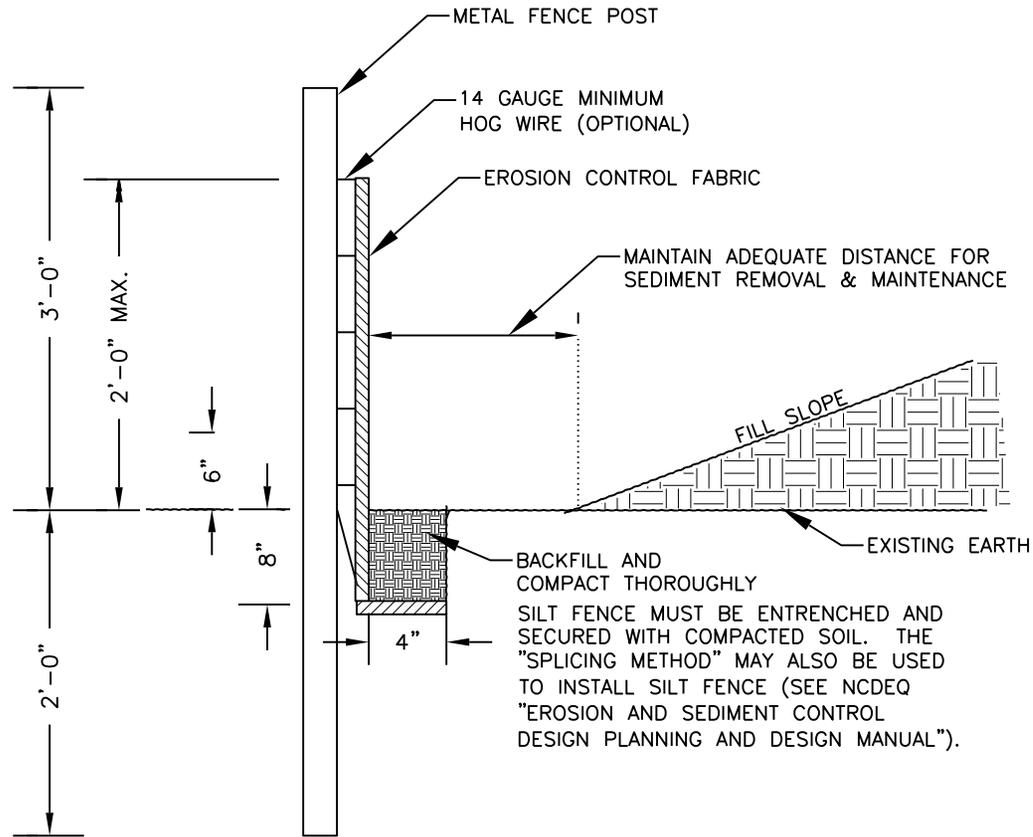
WIDTH = 18' MINIMUM

LENGTH = 50–100' MINIMUM, AS DETERMINED BY CITY STAFF

LOCATION = LOCATE CONSTRUCTION ENTRANCES TO LIMIT SEDIMENT FROM LEAVING THE SITE AND TO PROVIDE FOR MAXIMUM UTILITY BY ALL CONSTRUCTION VEHICLES.
AVOID STEEP GRADES AND ENTRANCES AT CURVES IN PUBLIC ROADS.

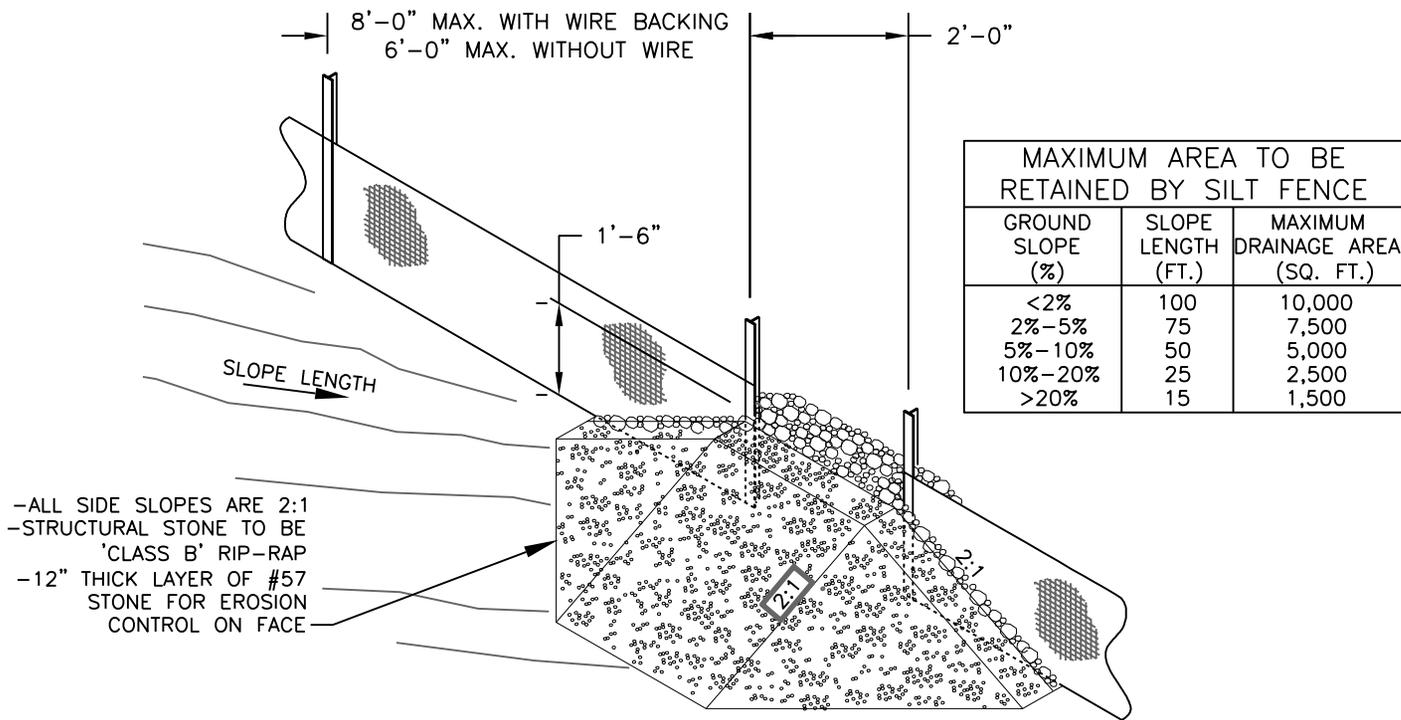


NOTE: SITE CONDITIONS MAY REQUIRE VARIATIONS FROM THESE DESIGN CRITERIA. VARIATIONS WILL BE DETERMINED OR APPROVED BY THE APPROPRIATE CITY STAFF.



NOTES:

1. SPACING OF POSTS USING HOG WIRE WITH APPROVED EROSION CONTROL FABRICS TO BE 8'-0" ON CENTER.
 2. SPACING OF POSTS WITHOUT HOG WIRE USING APPROVED EROSION CONTROL FABRICS TO BE 6'-0" ON CENTER.
- POST: METAL T-POST 5'-0" OR 6'-0" IN HEIGHT DEPENDING ON FILL SLOPE (MIN 1.33 LB/LF STEEL CONSTRUCTION).
- FABRIC: 3'-0" IN WIDTH (MUST BE STANDARD SPECIFICATIONS FOR SILT FENCE - ASTM D) WITH 12" BURIED IN TRENCH.
- STONE: (IF USED) #4 WASHED STONE PLACED 1'-0" DEEP AT SILT FENCE.
1. SPLICES IN FABRIC SHOULD BE OVERLAPPED A MIN. OF 4 FT.
 2. MAXIMUM DRAINAGE AREA = 1/4 ACRE PER 100 FT OF FENCE FOR 2% OR LESS SLOPE.
 3. SILT FENCE TO BE REMOVED AFTER CONSTRUCTION IS COMPLETE AS DIRECTED BY THE CONSTRUCTION INSPECTOR. NOT TO SCALE



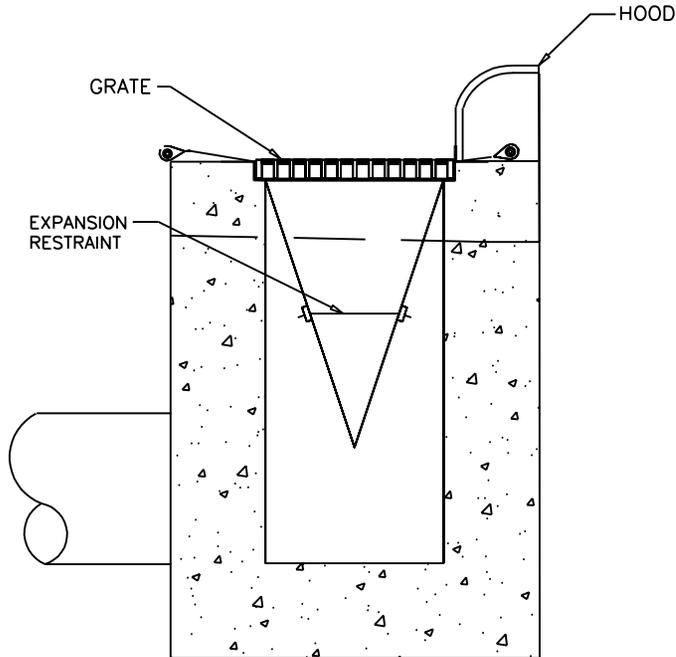
NOTES:

1. NON-EROSIVE OUTLETS ARE TO BE PLACED IN THE SILT FENCE AS SHOWN ON THE PROJECT PLANS AS DIRECTED BY THE CONSTRUCTION INSPECTOR.
2. NON-EROSIVE OUTLETS ARE TO BE LOCATED AT ALL NATURAL DRAINAGE AREAS AND DEPRESSIONS, WITH THE EXCEPTION OF PERENNIAL STREAMS.
3. THE MAXIMUM DRAINAGE AREA IMPOUNDED AT EACH OUTLET MUST NOT EXCEED 1/4 ACRE.

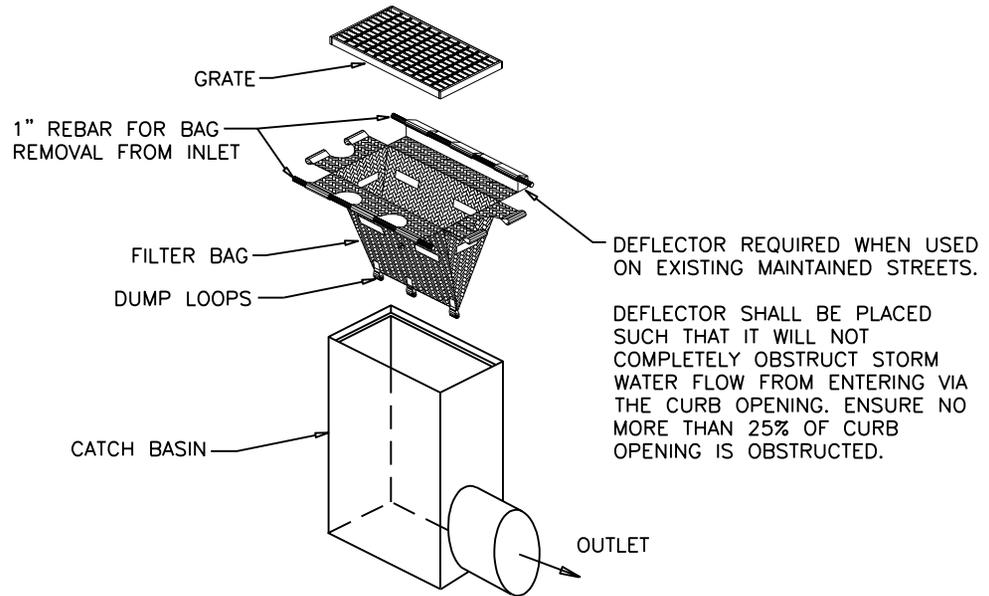
NOT TO SCALE

NOTES:

1. INLET MAINTENANCE SHALL BE DOCUMENTED IN PROJECT LOG BOOK.
2. FILTER TYPES SHALL BE APPROVED BY THE CITY INSPECTOR PRIOR TO INSTALLATION.
3. FILTER BAGS MAY BE REMOVED WHEN SITE IS STABILIZED AT THE DIRECTION OF THE ENGINEER.
4. FILTER BAGS SHALL BE REMOVED PRIOR TO STREET ACCEPTANCE AND/OR CLOSE OUT OF GRADING PERMIT.
5. FILTER BAGS SHALL BE CLEANED OR REPLACED ON A REGULAR BASIS (NOT BE MORE THAN HALF FULL AT ANY TIME).
6. FILTER BAGS MAY BE INSTALLED IN EXISTING CITY OR NCDOT ROADS AS LONG AS STORM DRAINAGE IS NOT IMPEDED.

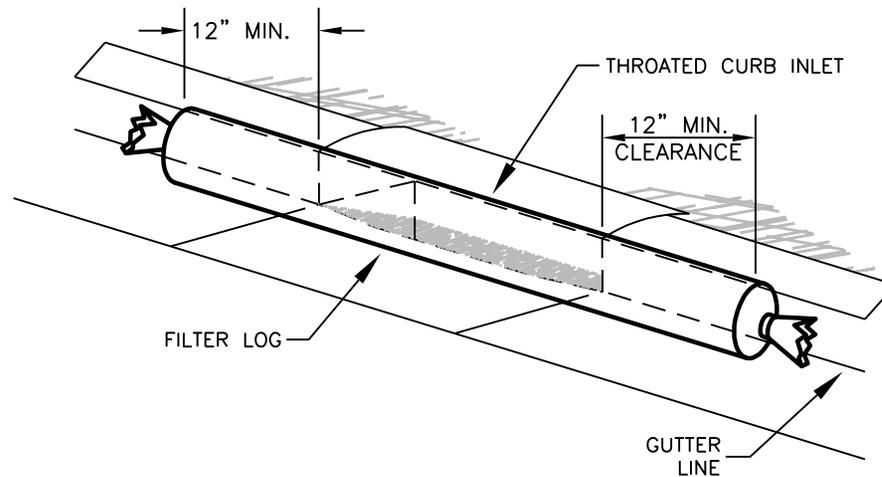


SECTION



INSTALLATION

NOT TO SCALE



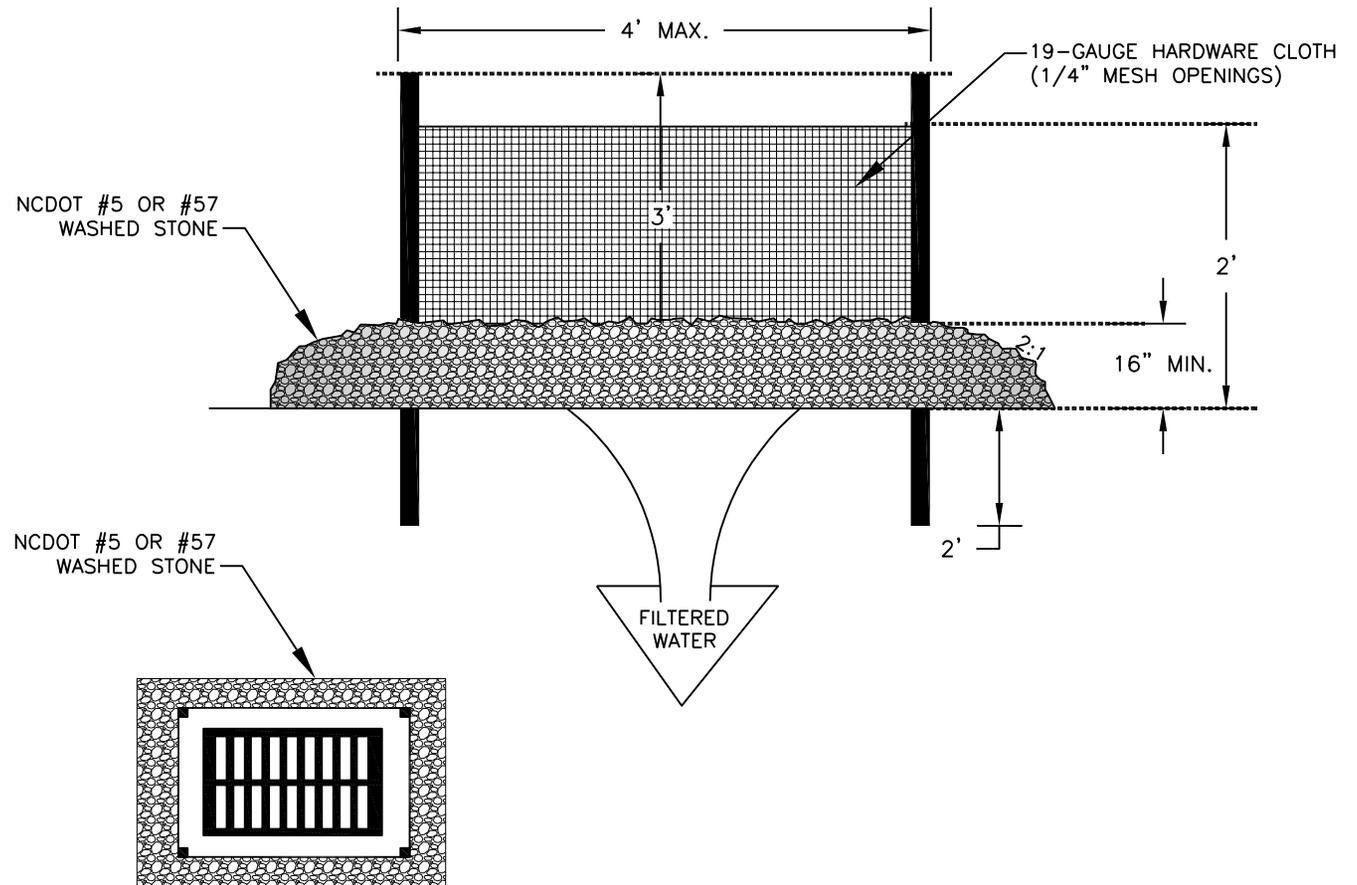
NOTES:

1. INSTALL THE FILTER LOG IN FRONT OF THE CURB INLET OPENING. EACH END OF THE FILTER LOG SHOULD OVERLAP THE CURB INLET APPROXIMATELY 12".
2. THE FILTER LOG SHALL BE A PRE-MANUFACTURED SYNTHETIC FILTER OR A SYNTHETIC SOCK MATERIAL FILLED WITH AN ACCEPTABLE FILTERING MATERIAL SUCH AS COMPOST, #57 CRUSHED STONE OR 100% SHREDDED RUBBER (TYPICALLY FROM TIRES).
3. THE FILTER LOG SOCK FABRIC SHALL BE HIGH DURABILITY NETTING MATERIAL TO RESIST PUNCTURE AND WEAR IN THE TRAFFIC AREAS.
4. SAND BAGS SHALL BE USED TO AID IN THE LOG SHAPE AND PREVENT IT FROM ENTERING INTO THE THROAT. THEY SHOULD BE PLACED BETWEEN THE LOG AND THE THROAT OPENING, AND USED TO SECURE THE ENDS OF THE LOG AGAINST THE CURB IF NEEDED. THE END OF THE LOG SHALL EXTEND A MINIMUM OF 1 FOOT PAST THE END OF THE THROAT OPENING.
5. IN ALL CASES, THE LOG SHALL PROVIDE A PHYSICAL BARRIER TO THE CATCH BASIN TO ALLOW FOR PONDING AND SEDIMENTATION ALONG THE UPSTREAM SIDE OF THE LOG. THE LOGS SHALL BE PLACED ON FLAT SURFACES AND MAINTAIN CONSTANT CONTACT WITH THE PAVED SURFACE. ANY DAYLIGHT WILL ALLOW FOR UNTREATED DISCHARGE AND IS NOT PERMITTED.
6. ALL FILTER LOGS MUST BE INSPECTED FREQUENTLY (24 HOURS AFTER A STORM EVENT AND WEEKLY) FOR PROPER FUNCTION. ACCUMULATED SEDIMENT AND DEBRIS SHALL BE REMOVED TO AVOID FUTURE FAILURE, AND MUST NOT EXCEED HALF OF THE EFFECTIVE HEIGHT OF THE LOG. REFERENCE MANUFACTURER'S RECOMMENDATIONS FOR ADDITIONAL MAINTENANCE.
7. REMOVE FILTER LOGS WHEN THE SITE HAS BEEN STABILIZED.

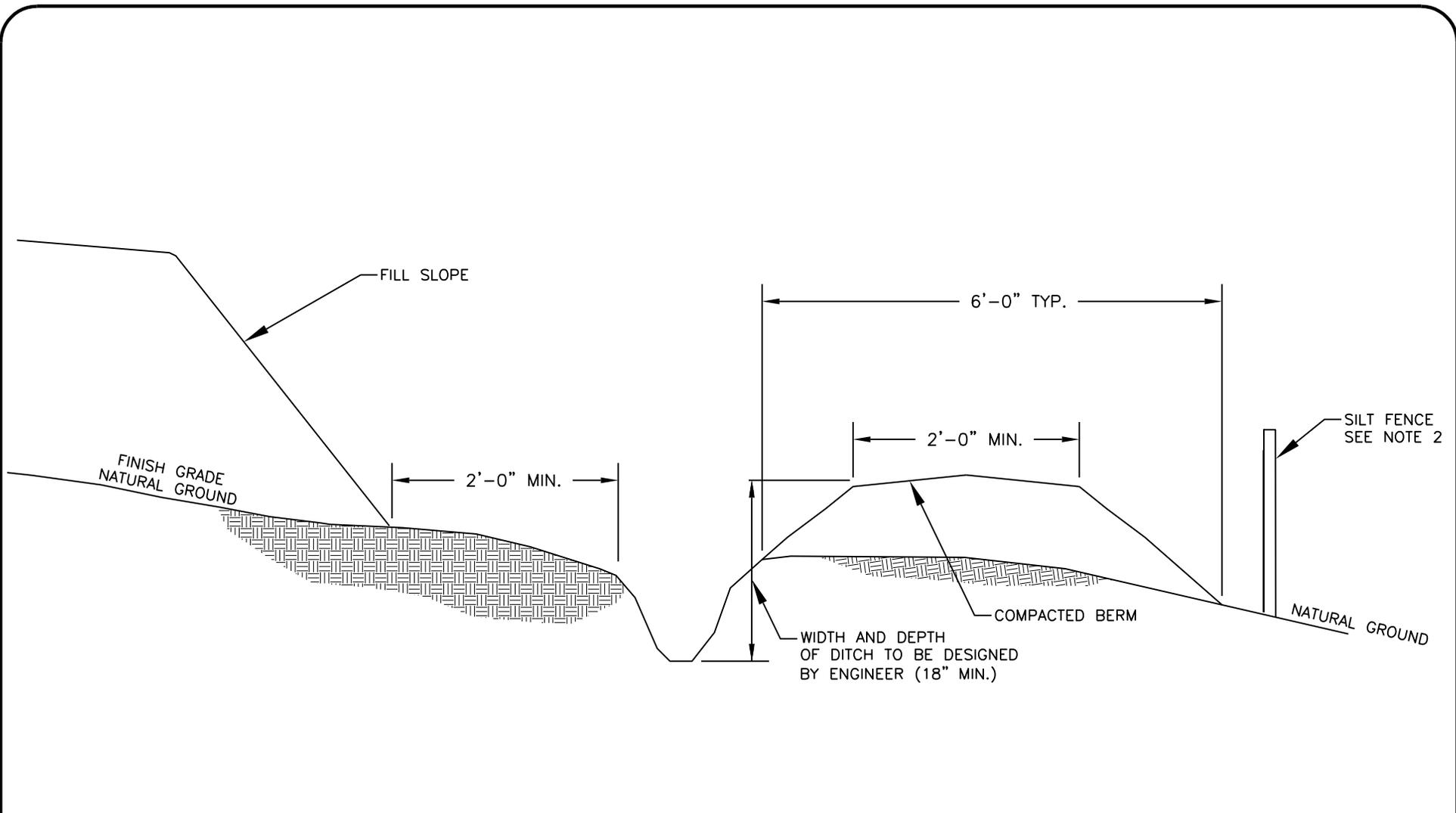
NOT TO SCALE

NOTES:

1. UNIFORMLY GRADE A SHALLOW DEPRESSION APPROACHING THE INLET.
2. DRIVE 5-FOOT STEEL POSTS 2 FEET INTO THE GROUND SURROUNDING THE INLET. SPACE POSTS EVENLY AROUND THE PERIMETER OF THE INLET, A MAXIMUM OF 4 FEET APART.
3. SURROUND THE POSTS WITH WIRE MESH HARDWARE CLOTH. SECURE THE WIRE MESH TO THE STEEL POSTS AT THE TOP, MIDDLE, AND BOTTOM. PLACING A 2-FOOT FLAP OF THE WIRE MESH UNDER THE GRAVEL FOR ANCHORING IS RECOMMENDED.
4. PLACE CLEAN GRAVEL (NC DOT #5 OR #57 STONE) ON A 2:1 SLOPE WITH A HEIGHT OF 16 INCHES AROUND THE WIRE, AND SMOOTH TO AN EVEN GRADE.
5. ONCE THE CONTRIBUTING DRAINAGE AREA HAS BEEN STABILIZED, REMOVE ACCUMULATED SEDIMENT, AND ESTABLISH FINAL GRADING ELEVATIONS.
6. COMPACT THE AREA PROPERLY AND STABILIZED IT WITH GROUND COVER.



NOT TO SCALE



NOTES:

1. DITCH SHALL HAVE LONGITUDINAL SLOPE OF 1%.
2. SILT FENCE MAY BE REQUIRED BEHIND BERM.

NOT TO SCALE



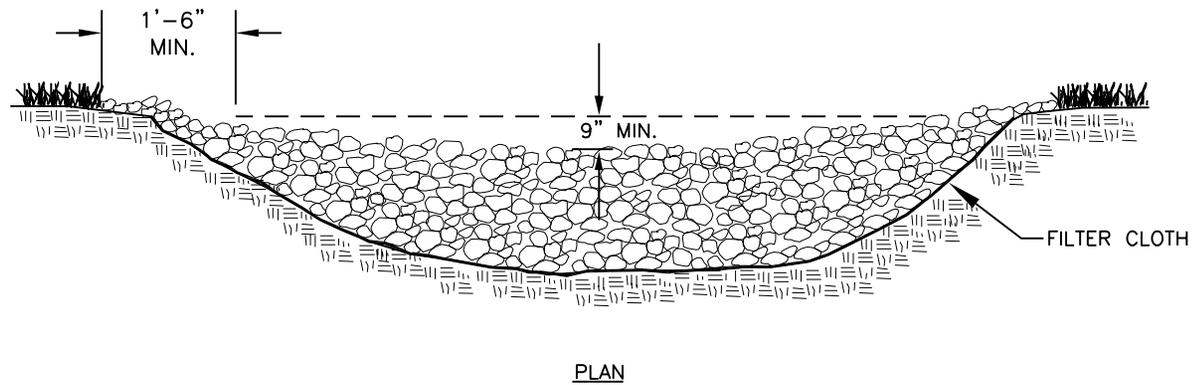
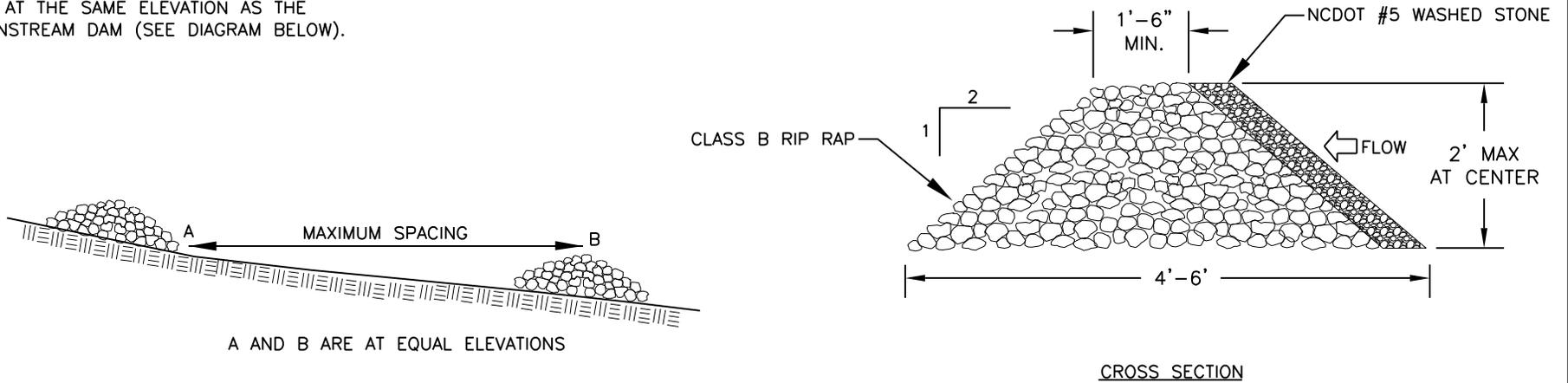
TEMPORARY SILT DITCH

November 2018

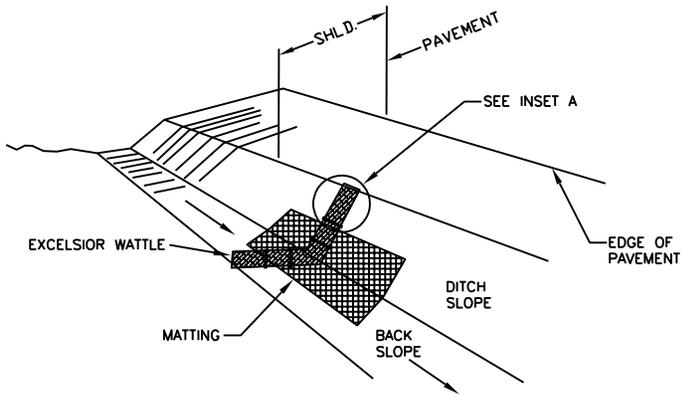
256

NOTES:

1. RIPRAP SIZE TO BE DESIGNED BY ENGINEER.
2. CHECK DAMS MAY BE USED IN SLOPING DITCHES OR CHANNELS TO SLOW VELOCITY OR TO CREATE SEDIMENT TRAPS.
3. ENSURE THAT MAXIMUM SPACING BETWEEN DAMS PLACES THE TOE OF THE UPSTREAM DAM AT THE SAME ELEVATION AS THE DOWNSTREAM DAM (SEE DIAGRAM BELOW).



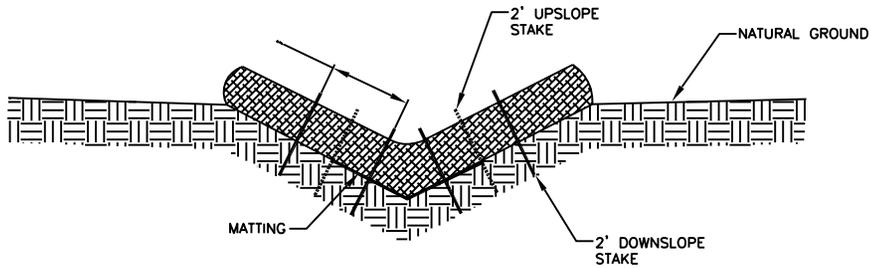
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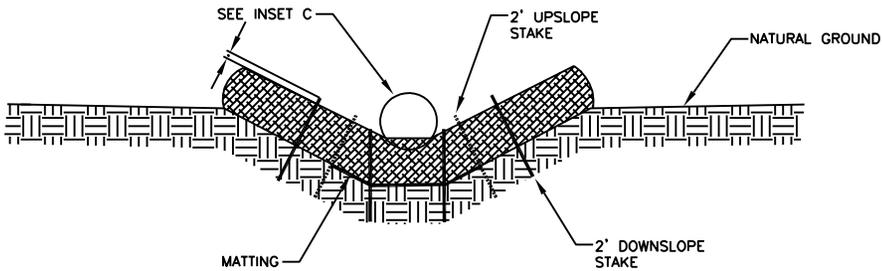
ISOMETRIC VIEW

NOTES:

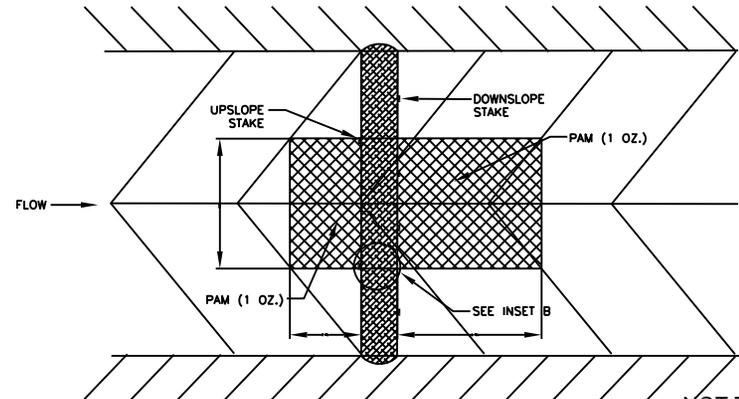
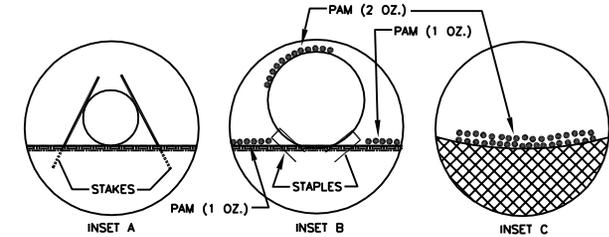
1. USE MINIMUM 12 INCH DIAMETER FIBER WATTLE.
2. USE 2 FT. WOODEN STAKES WITH A 2 IN. X 2 IN. NOMINAL CROSS SECTION.
3. ONLY INSTALL WATTLE(S) TO A HEIGHT IN DITCH SO FLOW WILL NOT WASH AROUND WATTLE AND SCOUR DITCH SLOPES AND AS DIRECTED.
4. INSTALL A MINIMUM OF 2 UPSLOPE STAKES AND 4 DOWNSLOPE STAKES AT AN ANGLE TO WEDGE WATTLE TO BOTTOM OF DITCH.
5. PROVIDE STAPLES MADE OF 0.125 IN. DIAMETER STEEL WIRE FORMED INTO A U SHAPE NOT LESS THAN 12" IN LENGTH.
6. INSTALL STAPLES APPROXIMATELY EVERY 1 LINEAR FOOT ON BOTH SIDES OF WATTLE AND AT EACH END TO SECURE IT TO THE SOIL.
7. INSTALL MATTING IN ACCORDANCE WITH SECTION 1631 OF THE NCDOT STANDARD SPECIFICATIONS.



CROSS SECTION
VEE DITCH



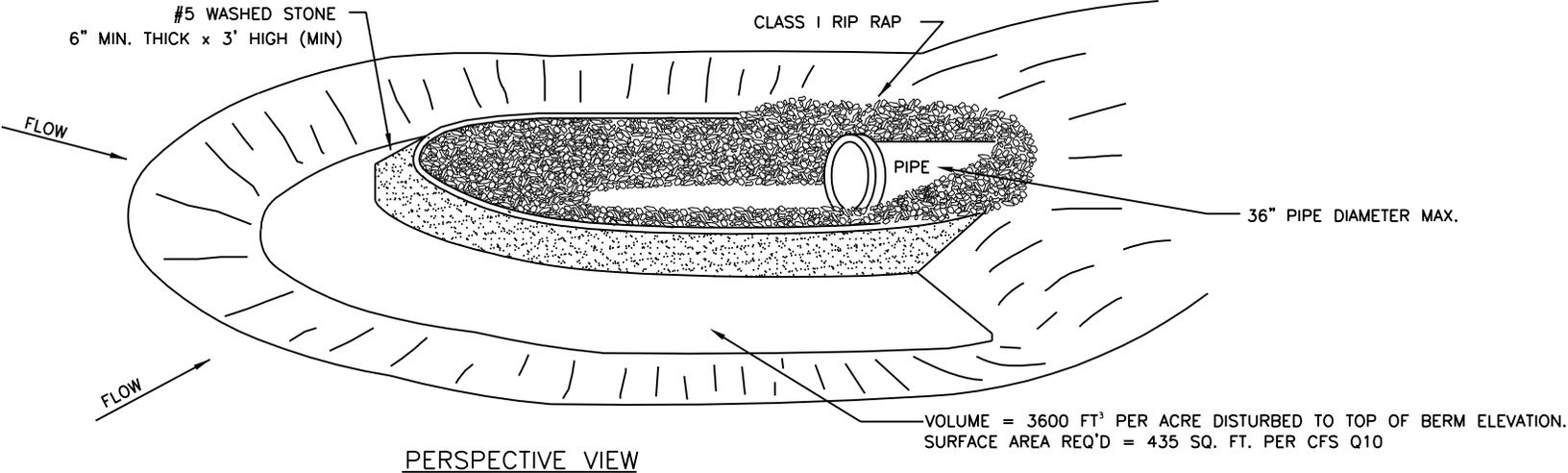
CROSS SECTION
TRAPEZOIDAL DITCH



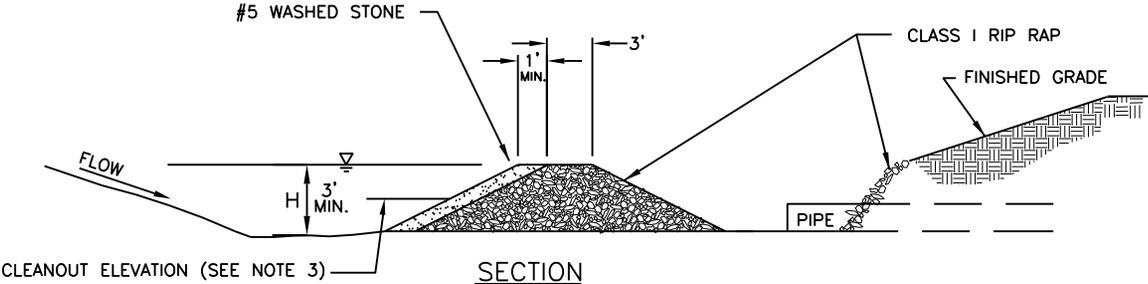
NOT TO SCALE

DATA BLOCK

BASIN NO.	DRAINAGE AREA (ACRES)	DENUDED AREA (ACRES)	BASIN VOLUME		BASIN SURFACE AREA		CLEANOUT DEPTH (FT.) H/2	H (FEET)
			REQUIRED (CUBIC FT.)	PROVIDED (CUBIC FT.)	REQUIRED (SQ FT.)	PROVIDED (SQ FT.)		



PERSPECTIVE VIEW



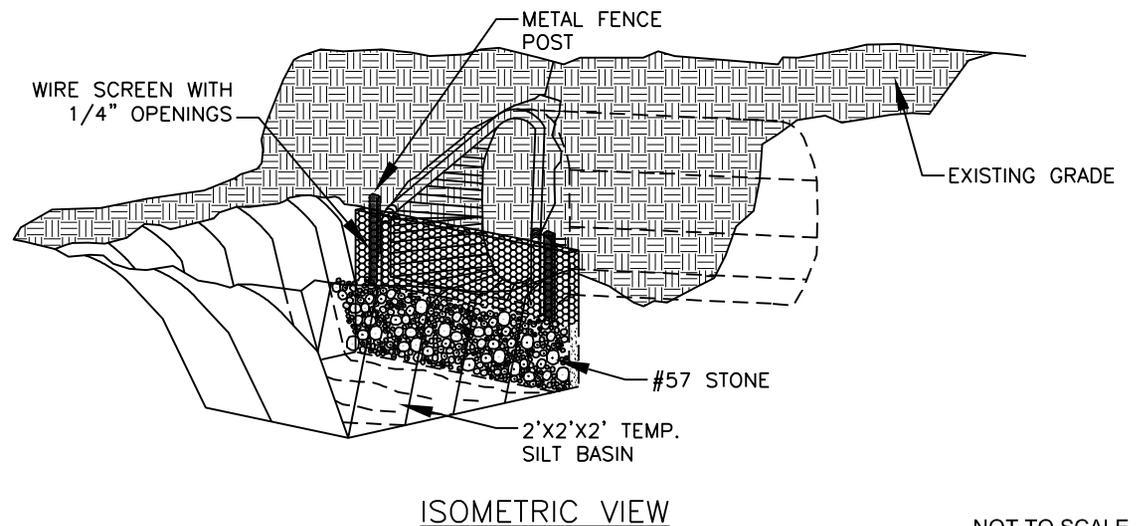
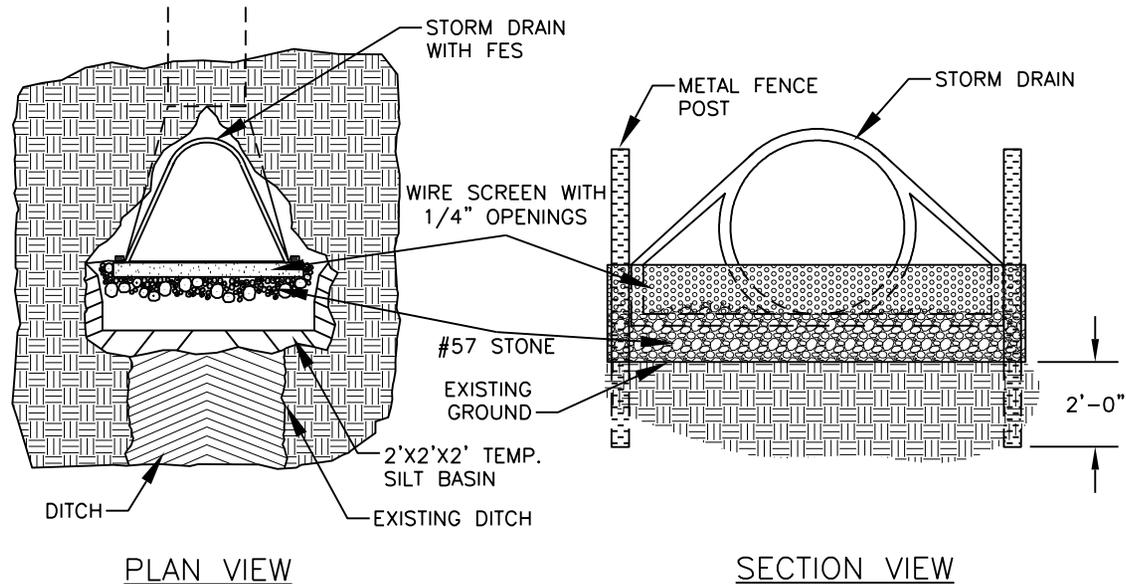
SECTION

- NOTES:
1. DIMENSIONS SHOWN ARE THE MINIMUM ACCEPTED UNLESS OTHERWISE NOTED.
 2. CLEANOUT PRIOR TO SEDIMENT REACHING HALF OF BERM HEIGHT.
 3. MAY BE USED AT PIPES WITH MAX. DIAMETER OF 36".

NOT TO SCALE



GRAVEL AND RIP RAP FILTER BERM BASIN



NOTES:

1. THIS MEASURE IS USED WHERE A DISTURBED DITCH FLOWS INTO A PROPOSED FES.
2. WIRE SCREEN SHALL BE 3/4" AND THE BOTTOM SHALL BE TRENCHED A MINIMUM OF 6" INTO THE GROUND AND HELD IN PLACE WITH #57 STONE.
3. ONCE DITCH IS STABILIZED, REMOVE WIRE SCREEN AND FILL BASIN WITH SUITABLE MATERIAL. INSTALL EXCELSIOR MATTING OVER BASIN TO STABILIZE FILL.

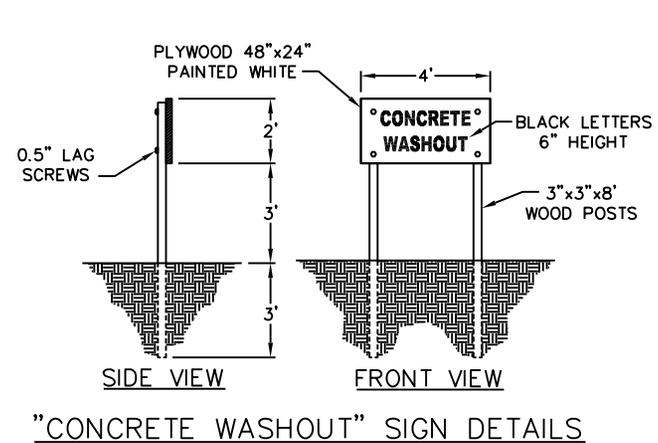
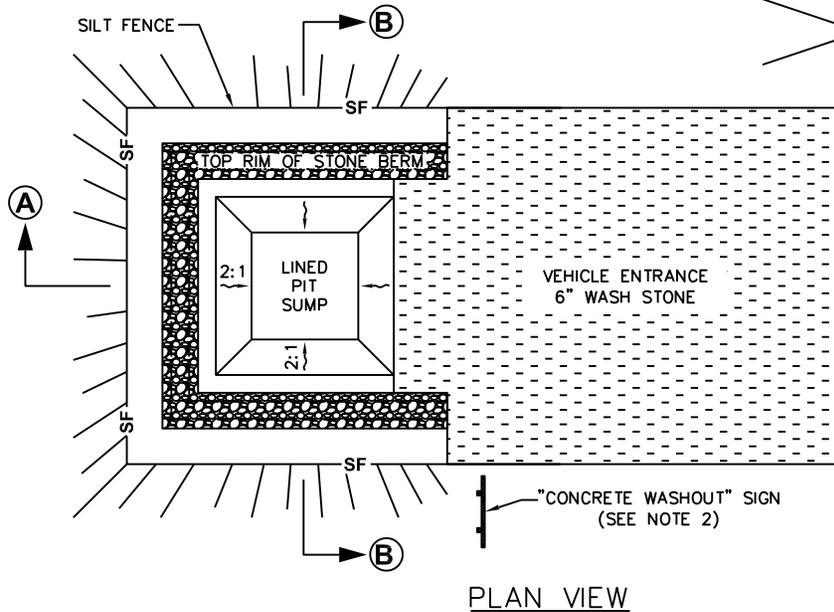
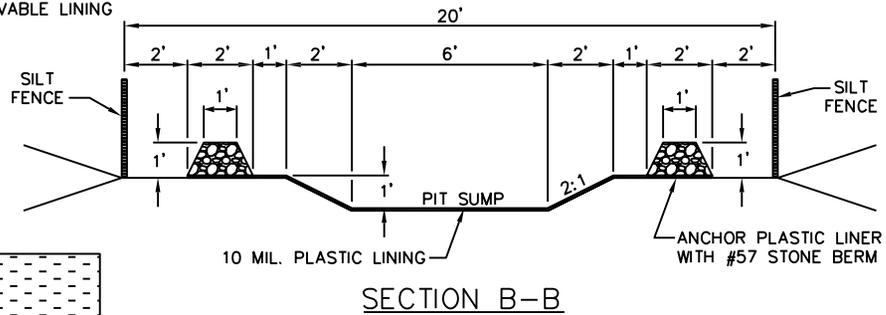
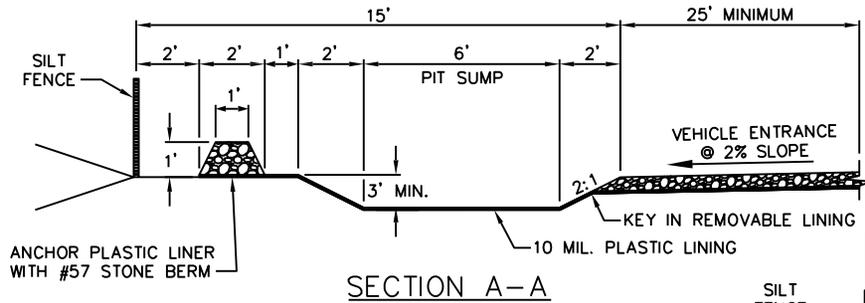
NOT TO SCALE

FES INLET PROTECTION



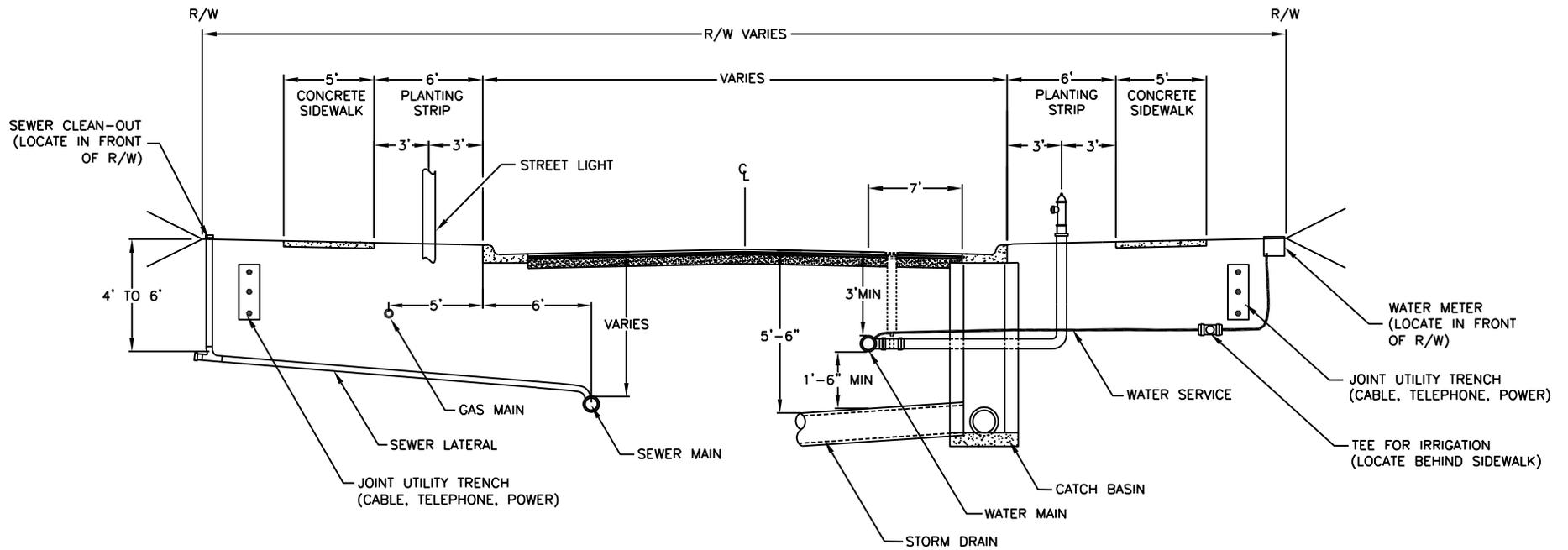
NOTES:

1. ACTUAL LOCATION DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT FACILITY SHALL BE MAINTAINED WHEN THE LIQUID AND/OR SOLID REACHES 75% OF THE STRUCTURES CAPACITY.
3. CONCRETE WASHOUT FACILITY SHALL BE CLEARLY MARKED WITH SIGN INSTALLED WITHIN 30 FEET OF THE CONCRETE WASHOUT FACILITY.



NOT TO SCALE

CONCRETE WASHOUT PIT



NOTES:

1. REFER TO STREET TYPICAL SECTIONS FOR DIMENSIONS & PAVEMENT SCHEDULE
2. WATER AND SEWER LOCATIONS MAY BE REVERSED FROM ABOVE

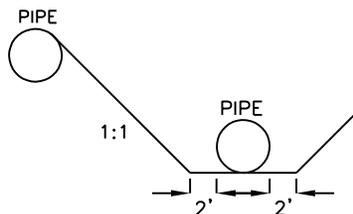
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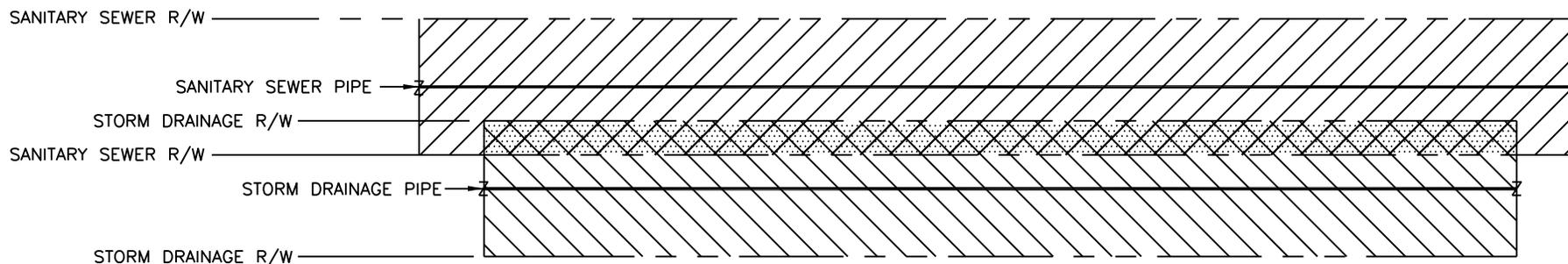
TYPICAL SECTION UTILITY LAYOUT

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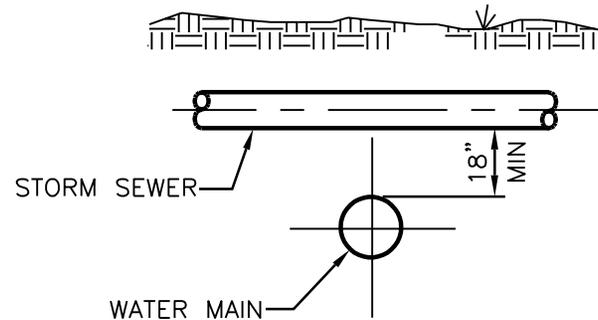
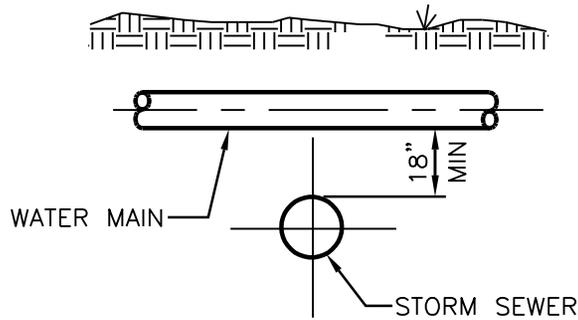
SECTION VIEW



THE SANITARY SEWER AND STORM DRAINAGE EASEMENTS MAY OVERLAP, HOWEVER THE PIPE & STRUCTURES MUST NOT BE IN THE OTHER UTILITY'S EASEMENT. THE SANITARY SEWER EASEMENT WIDTHS SHALL BE AS OUTLINED IN CITY'S LAND DEVELOPMENT STANDARDS MANUAL.

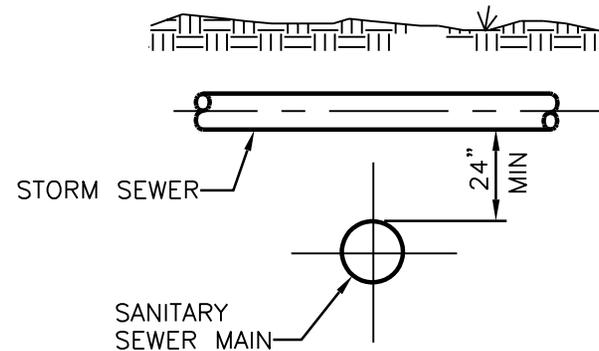
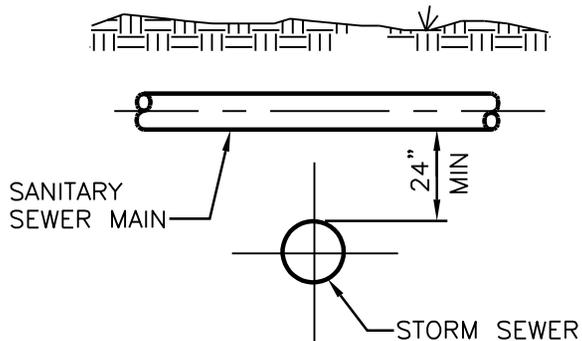
PLAN VIEW

NOT TO SCALE



NOTE:

WHEN A WATER MAIN CROSSES OVER OR UNDER A STORM SEWER AND CONDITIONS PREVENT THE REQUIRED 18" MIN VERTICAL SEPARATION, THE WATER MAIN SHALL BE CONSTRUCTED OF DUCTILE IRON PIPE WITH JOINTS EQUIVALENT TO WATER MAIN STANDARDS FOR A MINIMUM DISTANCE OF 10 FEET ON EACH SIDE OF THE POINT OF CROSSING.

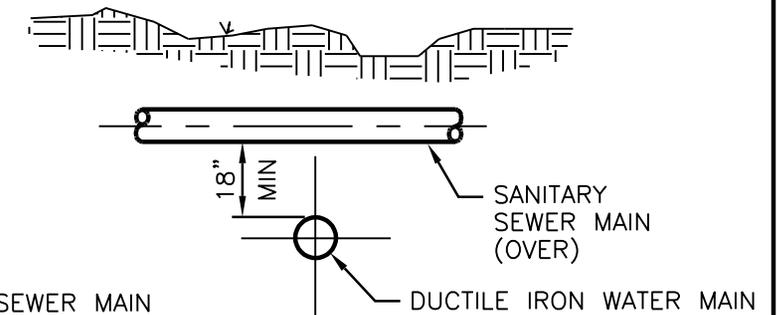
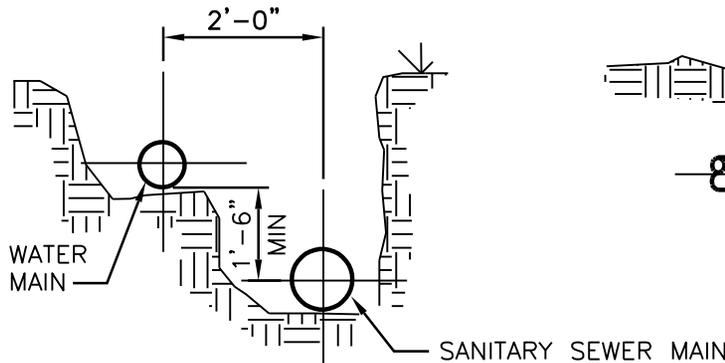
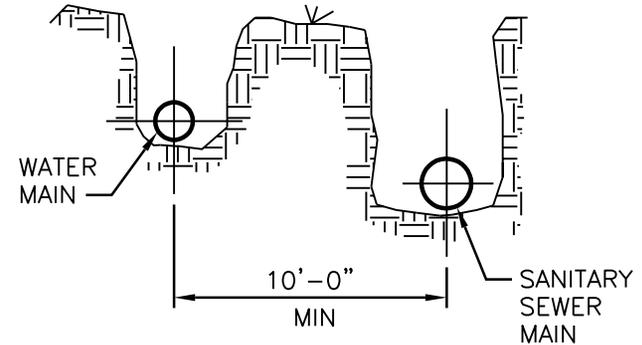
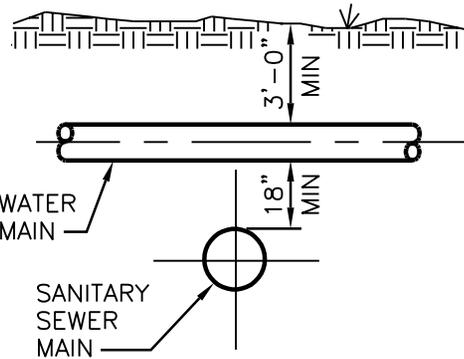
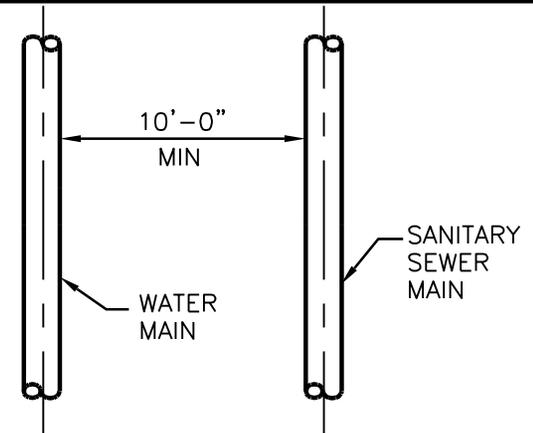
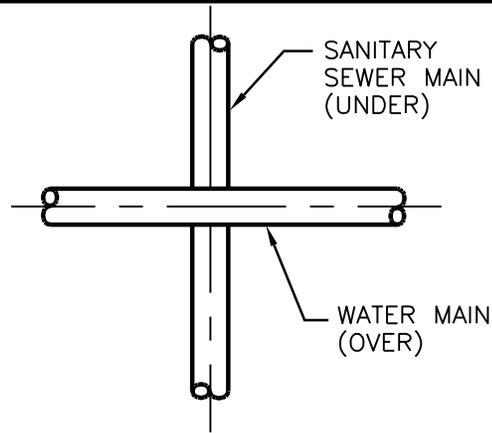


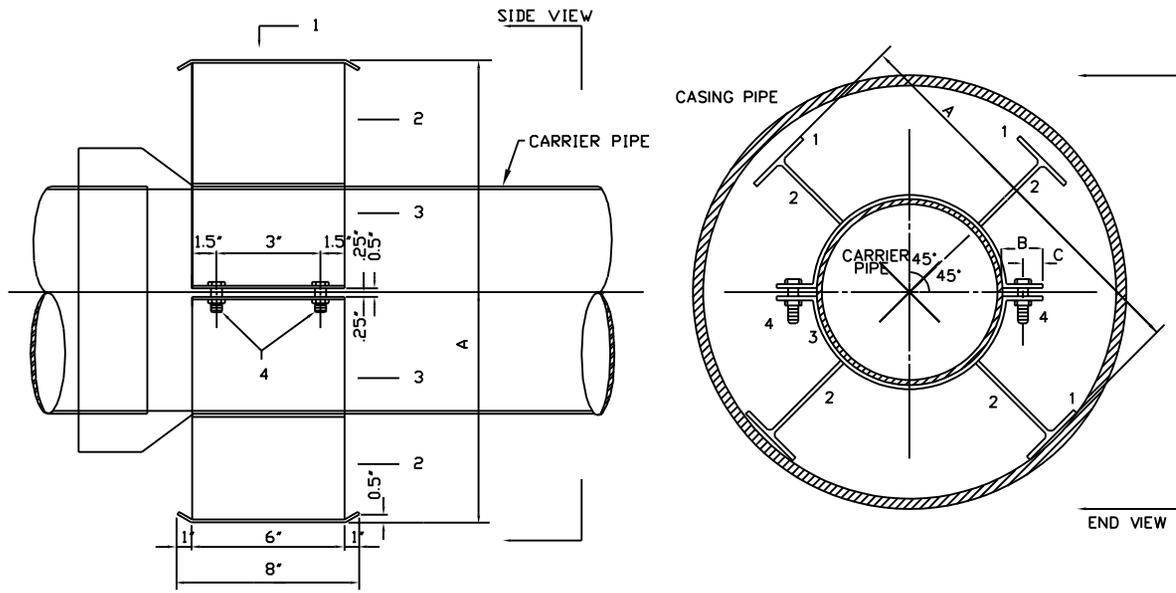
NOTE:

WHEN A SANITARY SEWER MAIN CROSSES OVER OR UNDER A STORM SEWER AND CONDITIONS PREVENT THE REQUIRED 24" MIN VERTICAL SEPARATION, THE SANITARY SEWER MAIN SHALL BE CONSTRUCTED OF DUCTILE IRON PIPE WITH JOINTS EQUIVALENT TO WATER MAIN STANDARDS FOR A MINIMUM DISTANCE OF 10 FEET ON EACH SIDE OF THE POINT OF CROSSING.

NOTE:

WHEN THE WATER MAIN IS ABOVE THE SANITARY SEWER MAIN, BUT WITH LESS THAN 18" CLEARANCE, OR WHEN THE SANITARY SEWER MAIN IS ABOVE THE WATER MAIN, BOTH THE WATER MAIN AND THE SANITARY SEWER MAIN SHALL BE CONSTRUCTED OF DUCTILE IRON PIPE WITH JOINTS EQUIVALENT TO WATER MAIN STANDARDS FOR A MINIMUM LATERAL DISTANCE, MEASURED AT RIGHT ANGLES TO THE SEWER, OF 10 FEET ON EACH SIDE OF THE CROSSING.





LEGS ROTATED OUT OF POSITION FOR CLARITY

NOTES:

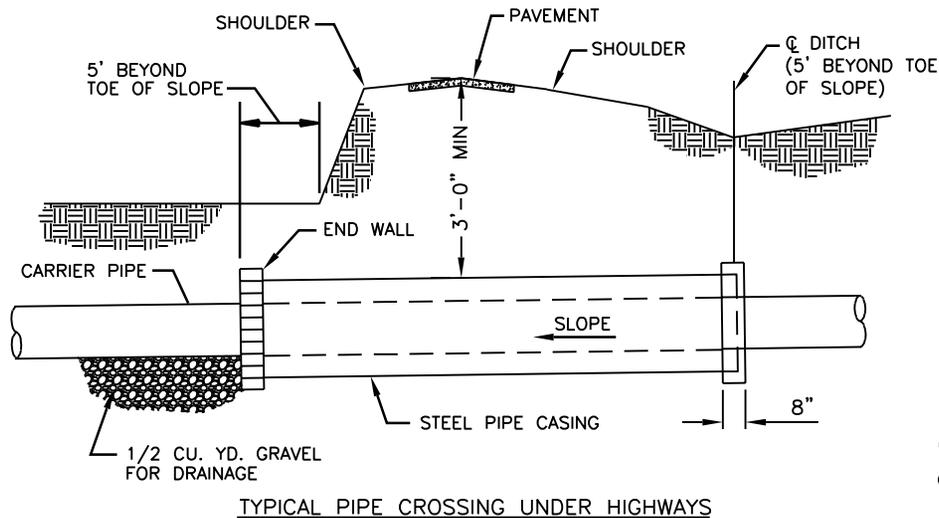
1. SEE WSACC SPEC 02240 FOR REQUIRED CASING DIAMETER AND MINIMUM THICKNESS.
2. CARRIER PIPE IS RESTRAINED PUSH-ON JOINT DIP, PROVIDE TWO SPIDERS PER JOINT OF CARRIER PIPE.
3. SPIDERS, NUTS, BOLTS & WASHERS SHALL BE STAINLESS STEEL.
4. ADJUST HEIGHT OF SPIDERS AS NECESSARY TO MAINTAIN SPECIFIED SLOPE.
5. CASING PIPE MATERIAL IS STEEL.

CARRIER PIPE		SPIDER DIMENSIONS		
NOMINAL DIA.	O. D.	A	B	C
6"	6.90"	11"	1 1/4"	5/8"
8"	9.05"	16 1/2"	2 1/4"	1"
12"	13.20"	22 1/2"	3"	1 1/4"
16"	17.40"	28 1/2"	3 1/2"	1 1/2"
24"	25.80"	34 1/4"	4"	2"
PIPE SUPPORT ASSEMBLY MARK NUMBER				
NOMINAL DIA.	1	2	3	4
6"	8" x 2" x 1/4" PL	6" x 1 1/2" x 1/4" PL	6" x 1/4" PL	3/8" NUT & BOLT
8"	8" x 3" x 1/4" PL	6" x 3 1/4" x 1/4" PL	6" x 1/4" PL	1/2" NUT & BOLT
12"	8" x 4" x 1/4" PL	6" x 3 5/8" x 3/8" PL	6" x 3/8" PL	1/2" NUT & BOLT
16"	8" x 4" x 3/8" PL	6" x 4 3/4" x 3/8" PL	6" x 3/8" PL	1/2" NUT & BOLT
24"	8" x 4" x 3/8" PL	6" x 5 1/2" x 3/8" PL	6" x 3/8" PL	1/2" NUT & BOLT

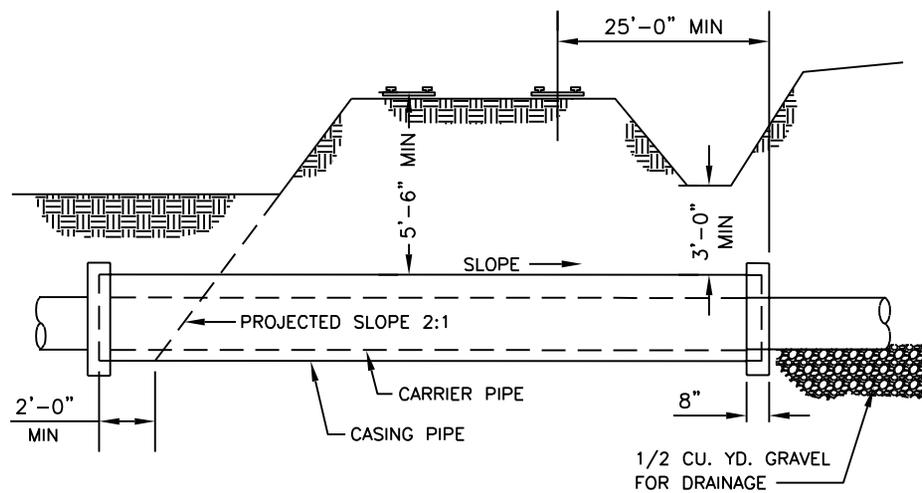
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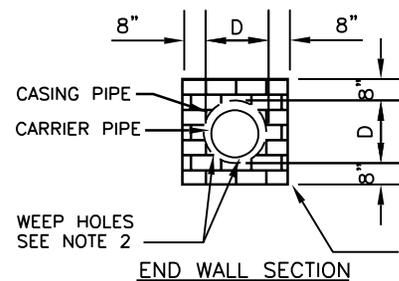
CASING SPIDER



TYPICAL PIPE CROSSING UNDER HIGHWAYS



TYPICAL PIPE CROSSING UNDER RAILROADS



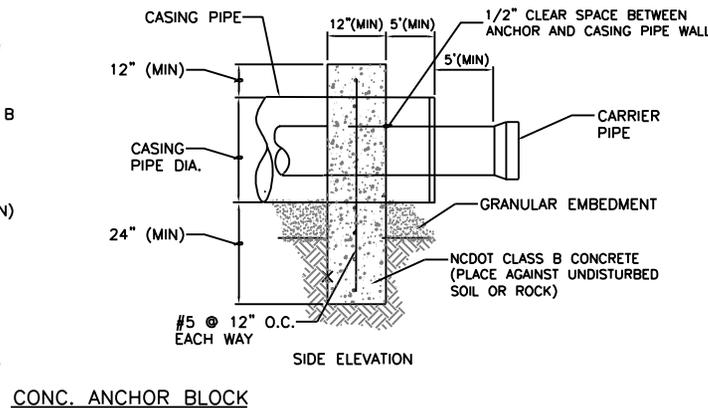
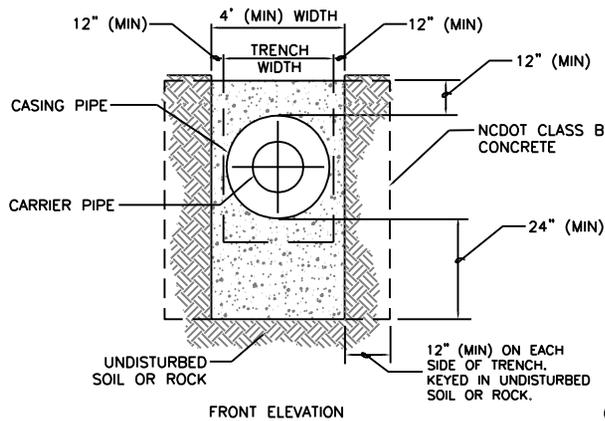
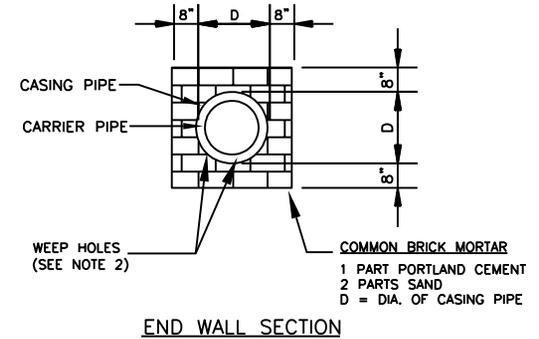
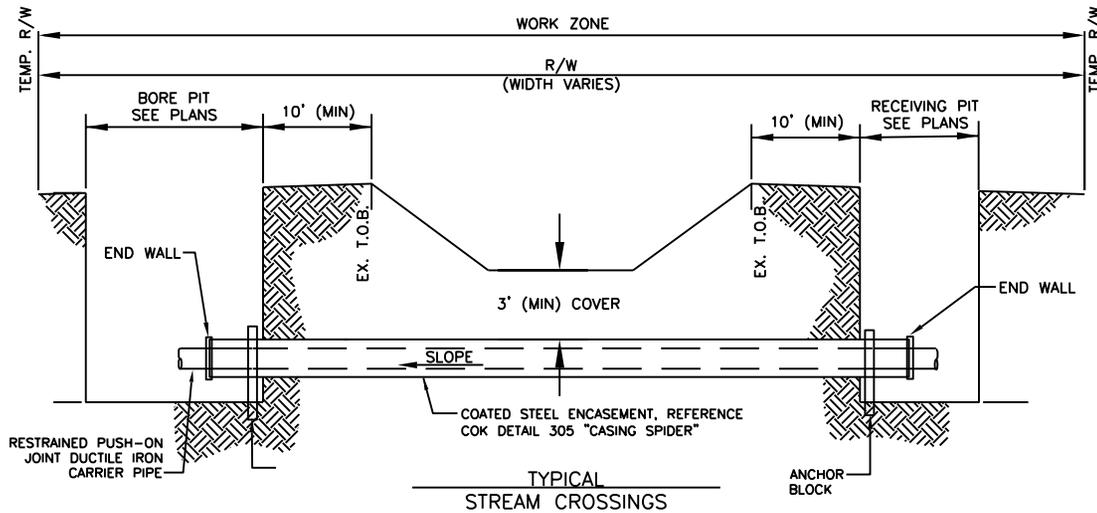
END WALL SECTION

COMMON BRICK MORTAR:
 1 PART PORTLAND CEMENT
 2 PARTS SAND
 D = DIAMETER OF CASING PIPE

NOTES:

1. SEE DESIGN DRAWINGS FOR LOCATION, SIZE, AND LENGTH OF STEEL PIPE CASINGS
2. INSTALL TWO (2) 1" DRAINS EACH SIDE OF CARRIER PIPE IN DOWNHIL ENDWALL

NOT TO SCALE



GENERAL NOTES:

1. SEE DRAWINGS FOR LOCATION, SIZE AND LENGTH OF STEEL PIPE CASINGS.
2. INSTALL TWO (2) 1-INCH DRAINS EACH SIDE OF CARRIER PIPE IN DOWNHILL END WALL.
3. THE PIT/TRENCH EXCAVATION SHALL IN NO CASE BE CLOSER THAN 10- FEET FROM THE TOP OF STREAM AND/OR CREEK BANK.
4. RESTRAINED PUSH-ON JOINT DUCTILE IRON CARRIER PIPE SHALL EXTEND THROUGH CASING PIPE ASSEMBLY.
5. SEE COK DETAIL 305 "CASING SPIDER" FOR CASING PIPE AND SPIDER REQUIREMENTS.
6. INSTALL GATE VALVES ON WATER MAINS ON EACH SIDE OF THE STREAM ON THE HORIZONTAL PIPING PRIOR TO 45° ELBOWS.

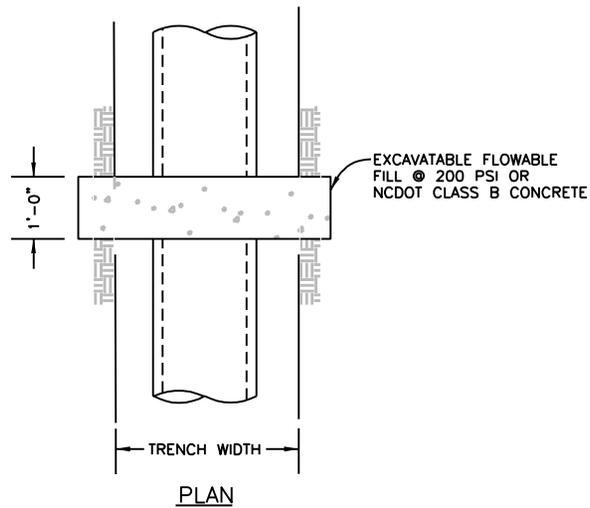
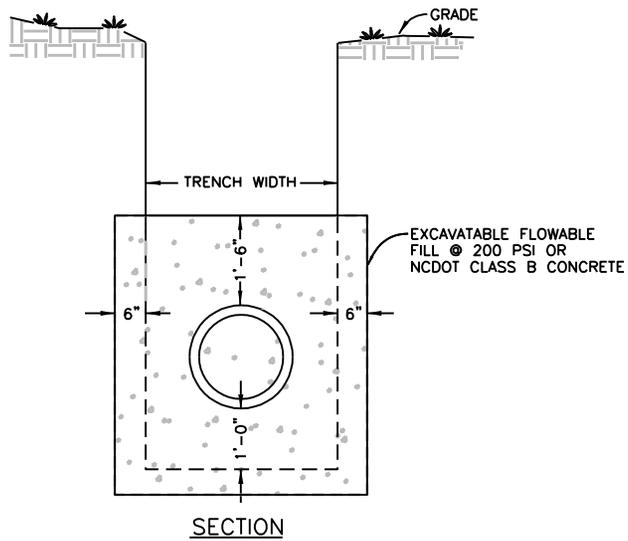
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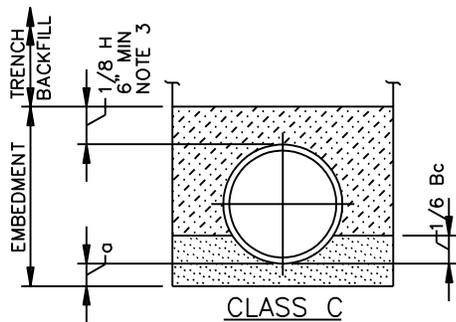
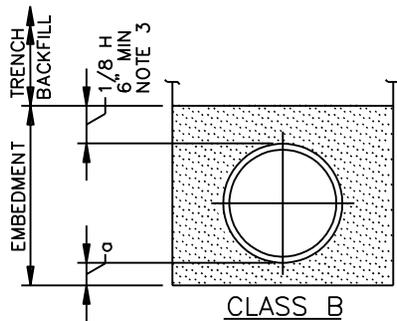
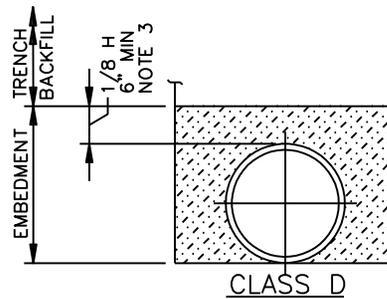
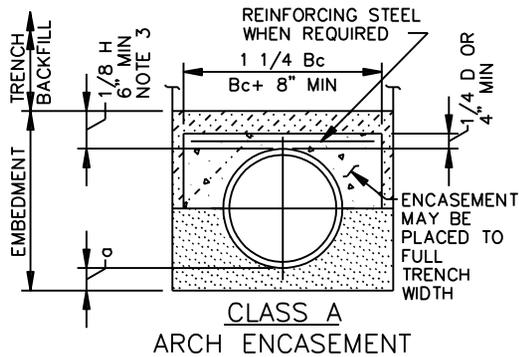
ENCASEMENT PIPES UNDER STREAM CROSSINGS

November 2018

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NOT TO SCALE



LEGEND

Bc OUTSIDE DIAMETER OF PIPE
 H COVER ABOVE TOP OF PIPE
 D NOMINAL PIPE SIZE
 o EMBEDMENT BELOW PIPE (SEE TABLE)

-  HAND PLACED EMBEDMENT
-  GRANULAR EMBEDMENT
-  CONCRETE

TABLE OF EMBEDMENT DEPTHS BELOW PIPE

<u>D</u>	<u>a</u> MIN SOIL	<u>a</u> MIN ROCK
27" & SMALLER	6"	6"
30" TO 60"	6"	9"
66" & LARGER	6"	12"

NOTES:

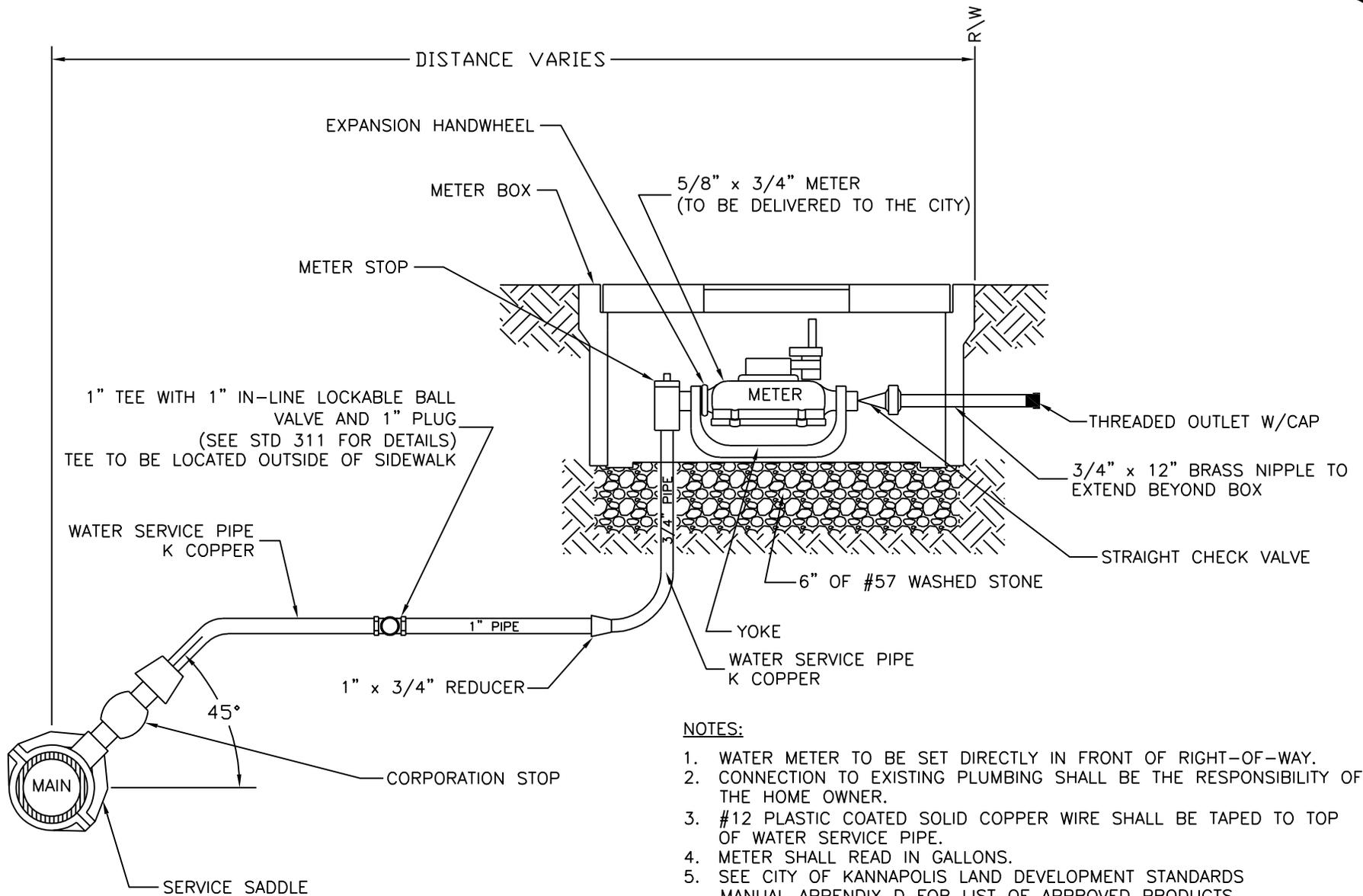
1. GRANULAR EMBEDMENT MATERIAL SHALL BE CRUSHED ROCK, PEA GRAVEL COARSE AGGREGATE SIZE NUMBER 57. EMBEDMENT MATERIAL SHALL BE PLACED IN LAYERS NOT MORE THAN 6" DEEP AND COMPACTED AS SPECIFIED.
2. HAND PLACED EMBEDMENT SHALL BE COMPACTED FINELY DIVIDED MATERIAL FREE FROM DEBRIS AND STONES.
3. EMBEDMENT ABOVE THE TOP OF THE PIPE SHALL BE AN UNCOMPACTED LAYER FOR ALL INSTALLATIONS.
4. REFER TO SPECIFICATIONS FOR GEOTECHNICAL FABRIC OR SPECIAL EMBEDMENT REQUIREMENTS FOR TRENCHES IN FINE SOILS EXTENDING BELOW GROUNDWATER LEVEL.
5. TRENCH OUTLINES DO NOT INDICATE ACTUAL TRENCH EXCAVATION SHAPE, SOIL CONDITIONS, OR PRESENCE OF SHEETING LEFT IN PLACE. EMBEDMENT MATERIAL SHALL EXTEND THE FULL WIDTH OF THE ACTUAL TRENCH EXCAVATION.
6. CLASS C BEDDING CAN BE USED ON DIP SEWER PIPING ONLY WHEN THE ENTIRE LENGTH OF PIPE BETWEEN MANHOLES IS DIP. FOR SHORT SECTIONS OF DIP INSTALLED IN PVC PIPING, CLASS B BEDDING SHALL BE USED.

NOT TO SCALE



EMBEDMENTS FOR MAINS

November 2018



NOTES:

1. WATER METER TO BE SET DIRECTLY IN FRONT OF RIGHT-OF-WAY.
2. CONNECTION TO EXISTING PLUMBING SHALL BE THE RESPONSIBILITY OF THE HOME OWNER.
3. #12 PLASTIC COATED SOLID COPPER WIRE SHALL BE TAPED TO TOP OF WATER SERVICE PIPE.
4. METER SHALL READ IN GALLONS.
5. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

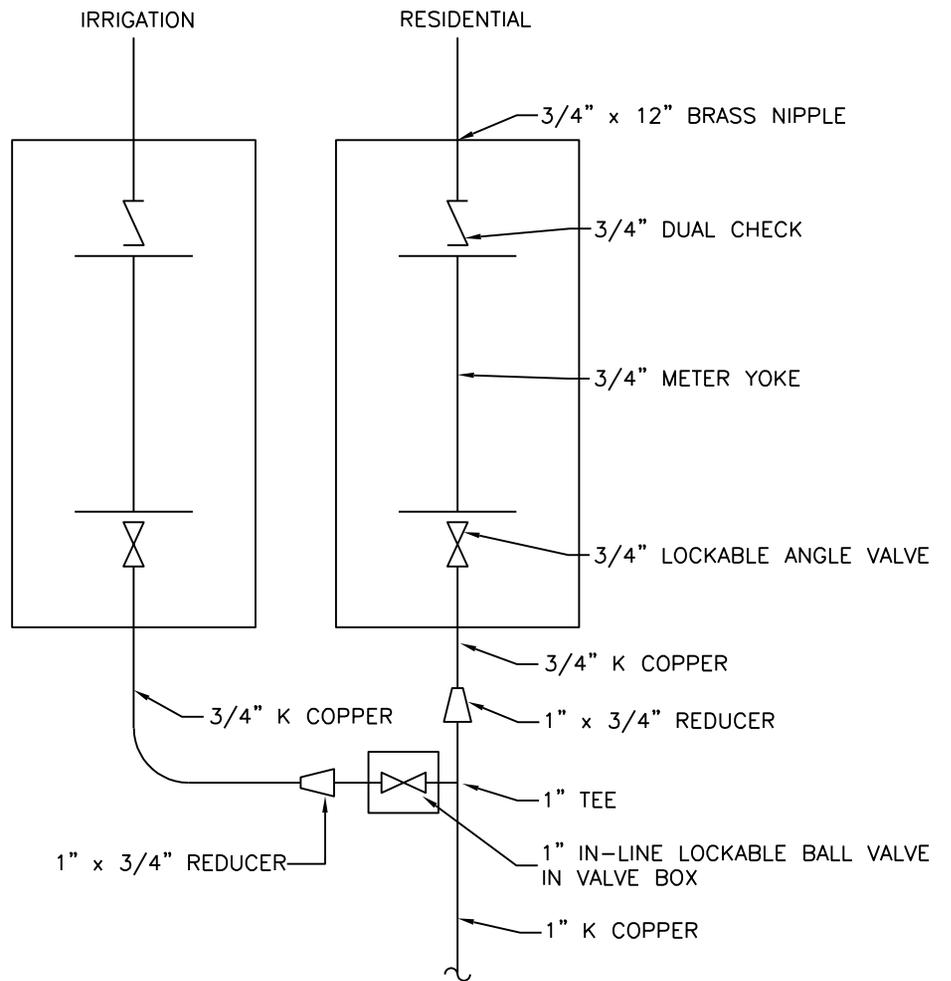
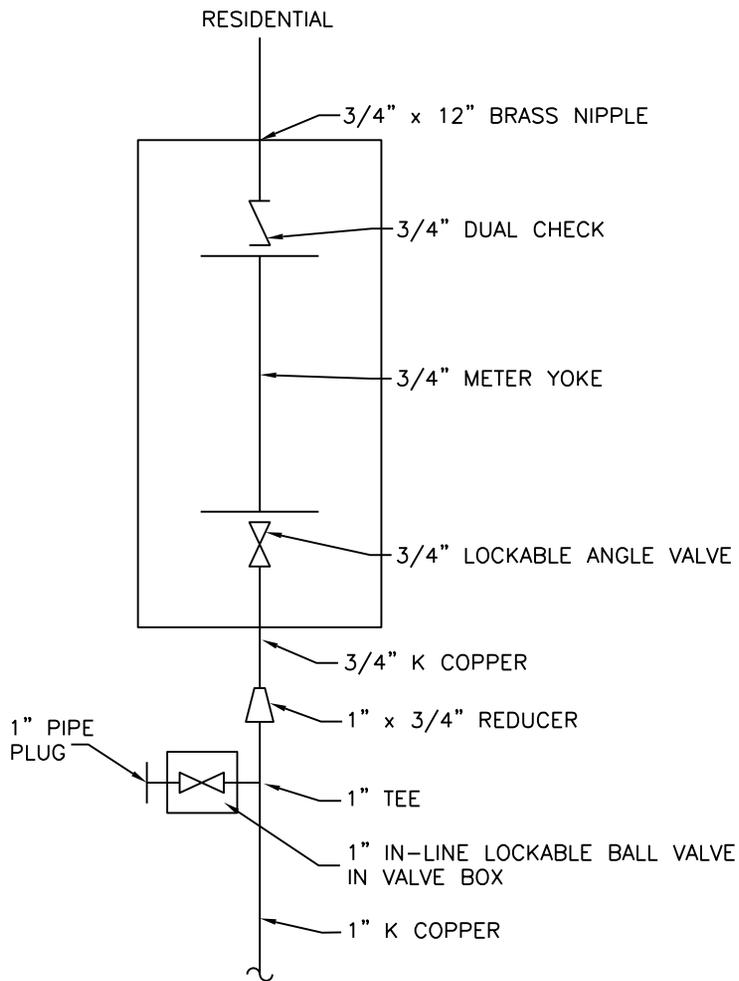
NOT TO SCALE



DOMESTIC WATER SERVICE
3/4" WATER METER CONNECTION WITH
1" TEE FOR IRRIGATION CONNECTION

November 2018

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NOTES:

1. PLACE METER BOX AT RIGHT-OF-WAY.
2. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

NOT TO SCALE

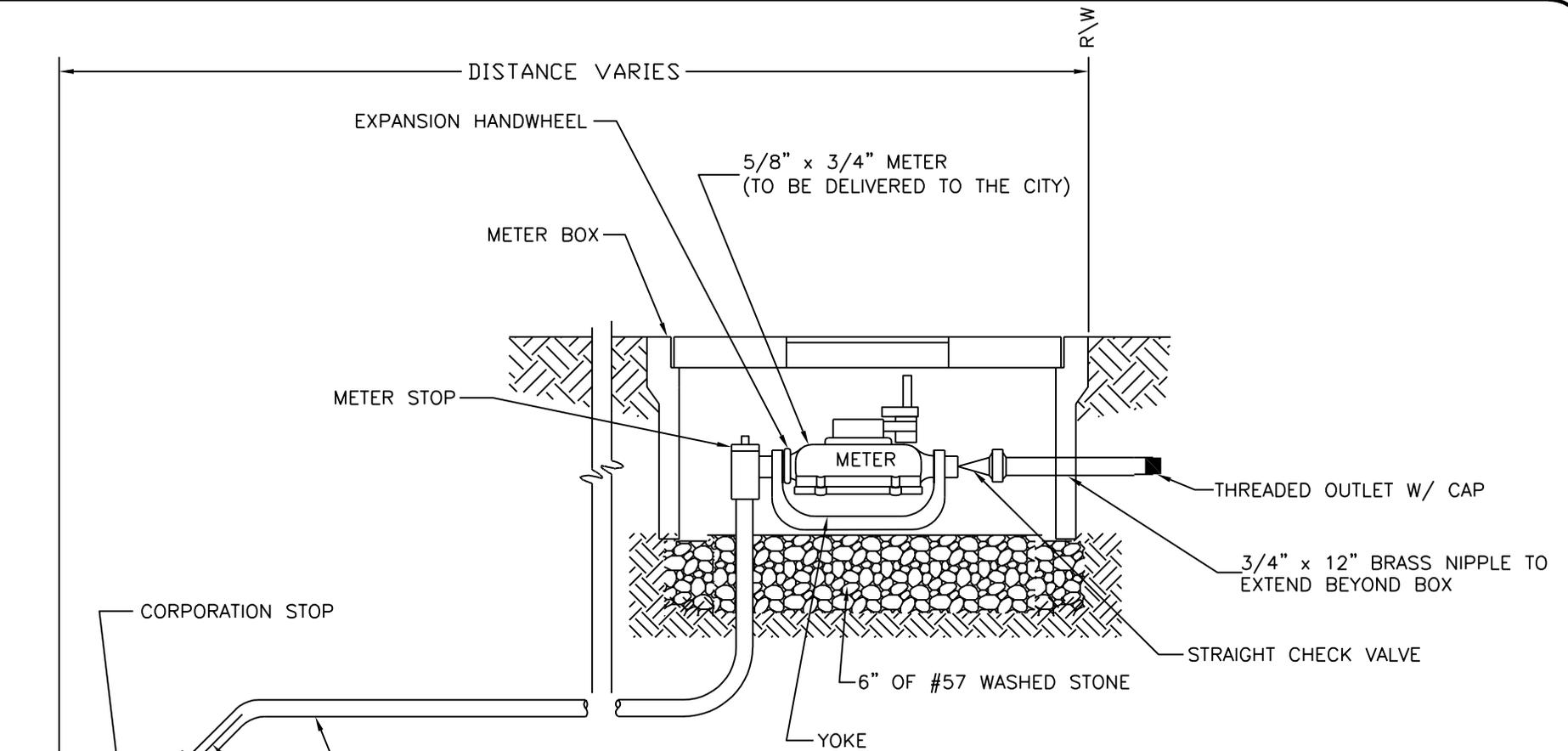


WATER SERVICE

**3/4" WATER METER CONNECTION WITH
1" TEE FOR IRRIGATION CONNECTION**

November 2018

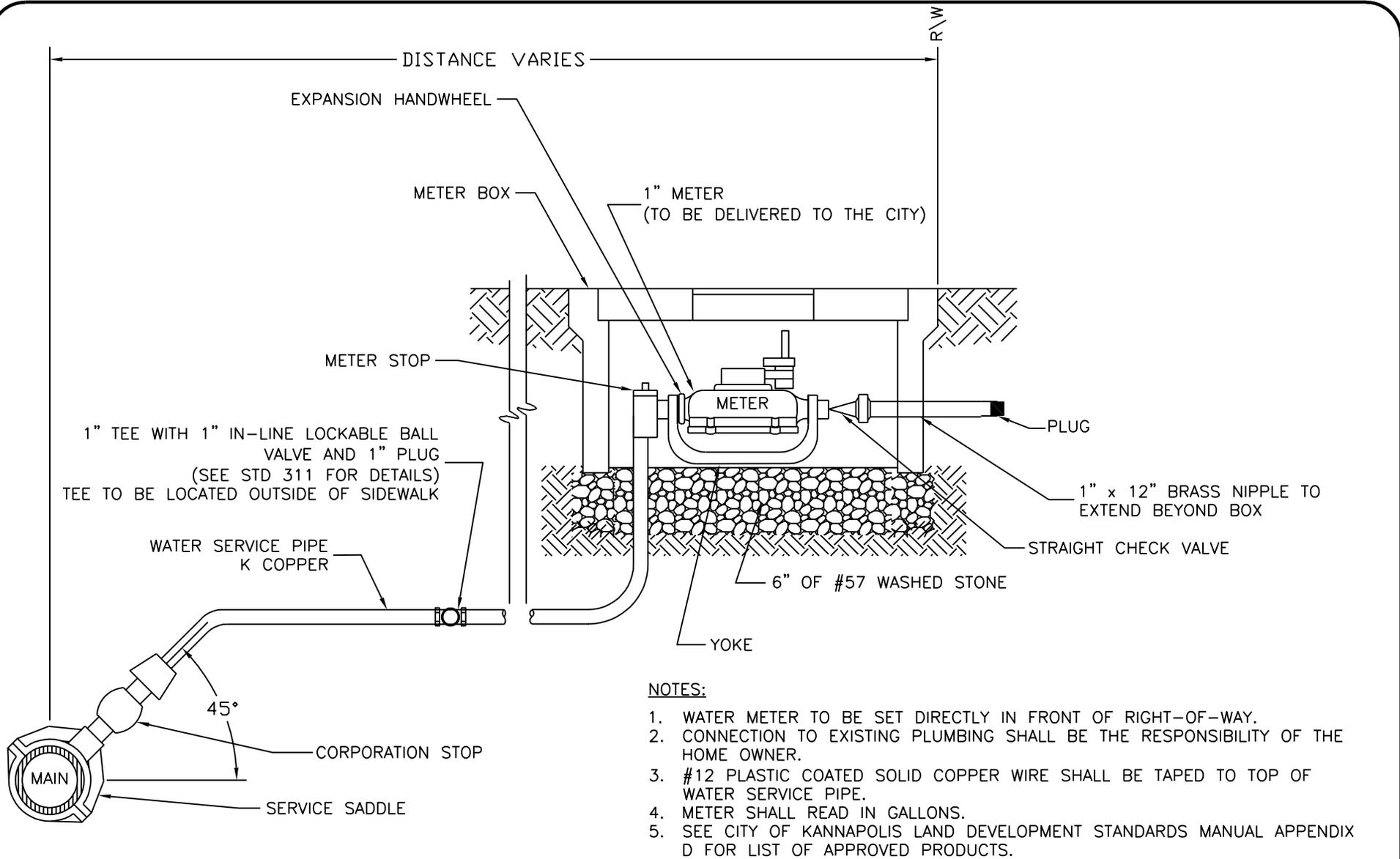
311



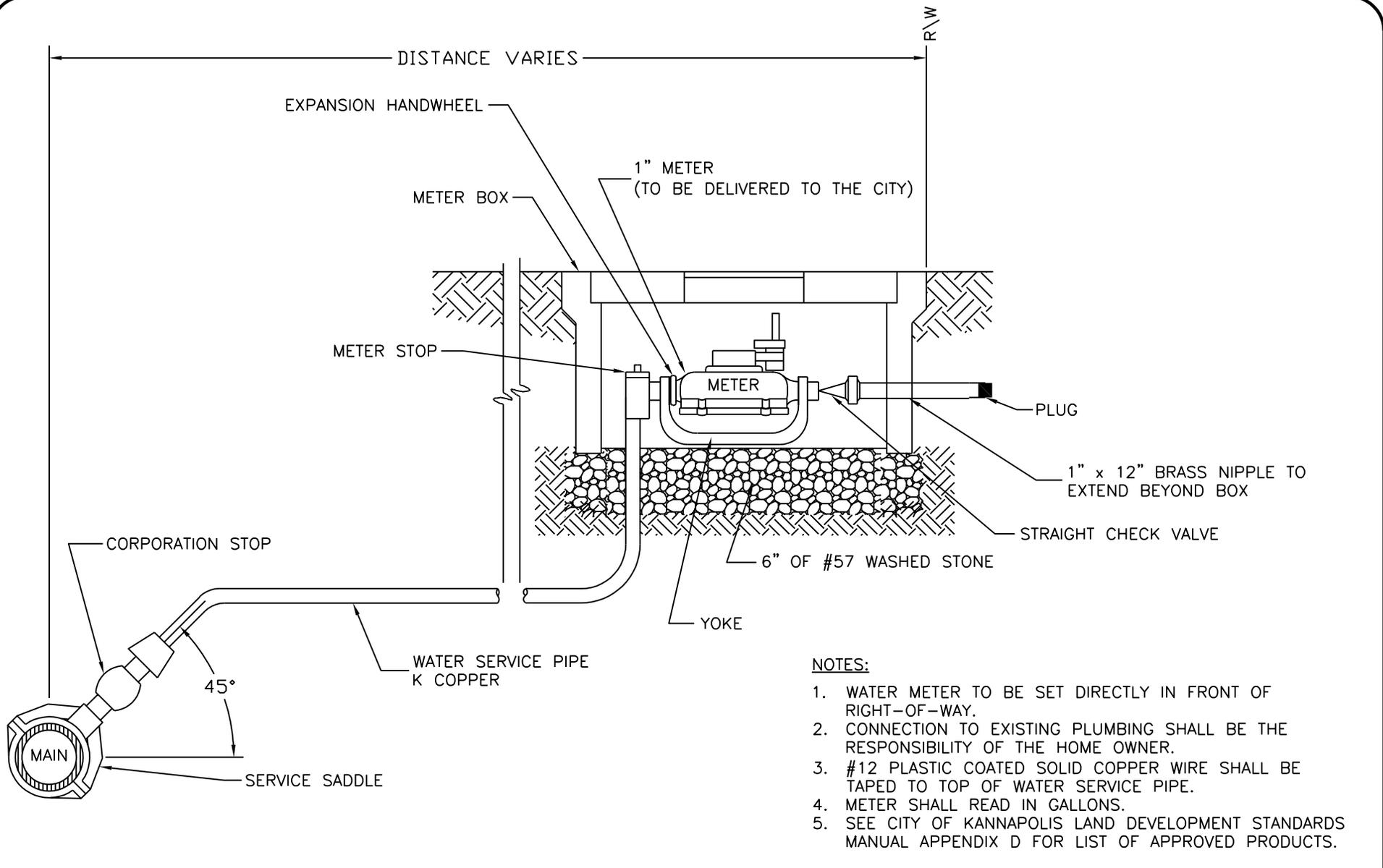
NOTES:

1. WATER METER TO BE SET DIRECTLY IN FRONT OF RIGHT-OF-WAY.
2. CONNECTION TO EXISTING PLUMBING SHALL BE THE RESPONSIBILITY OF THE HOME OWNER.
3. #12 PLASTIC COATED SOLID COPPER WIRE SHALL BE TAPED TO TOP OF WATER SERVICE PIPE.
4. METER SHALL READ IN GALLONS.
5. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

NOT TO SCALE



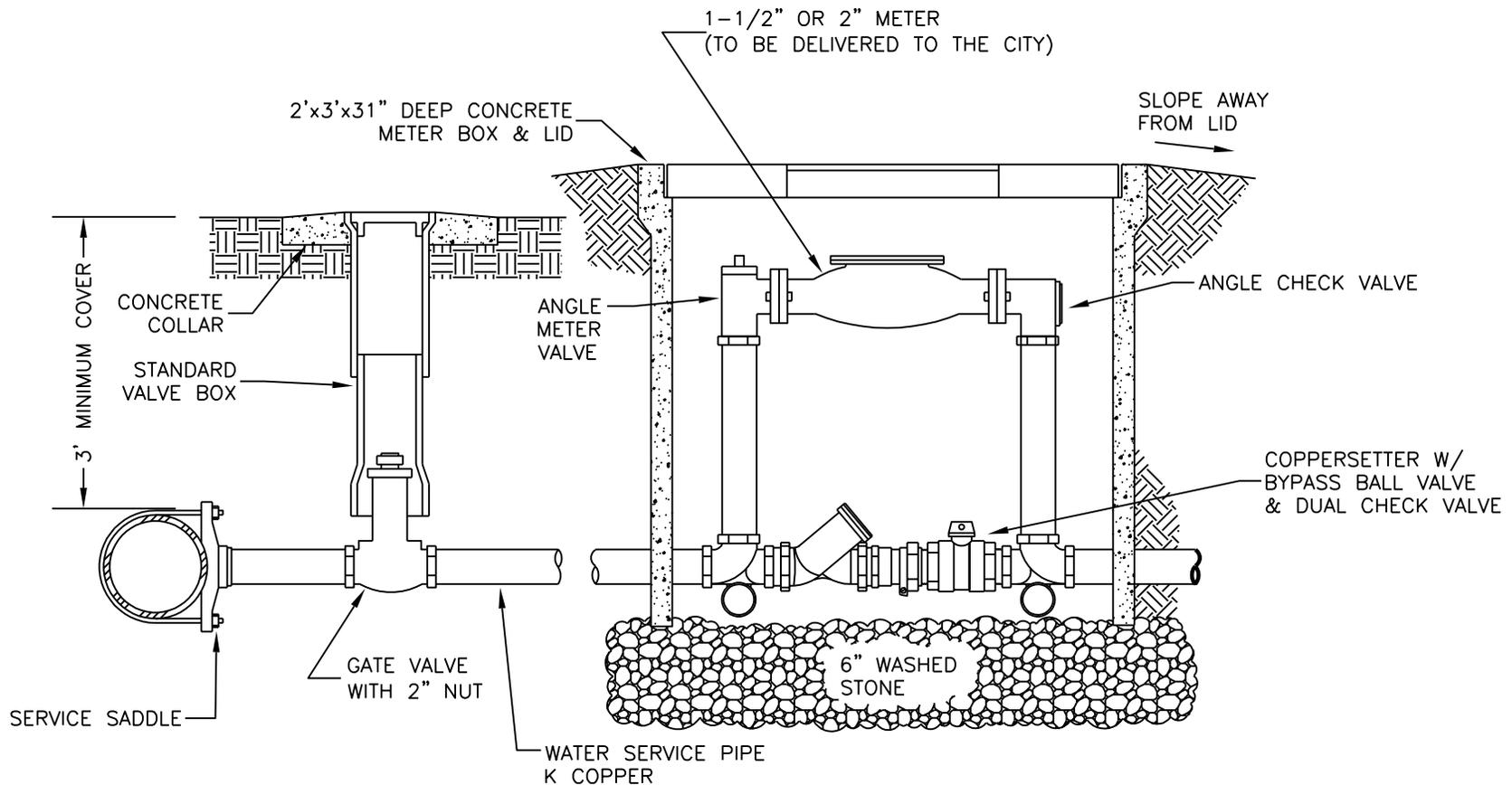
NOT TO SCALE



NOT TO SCALE



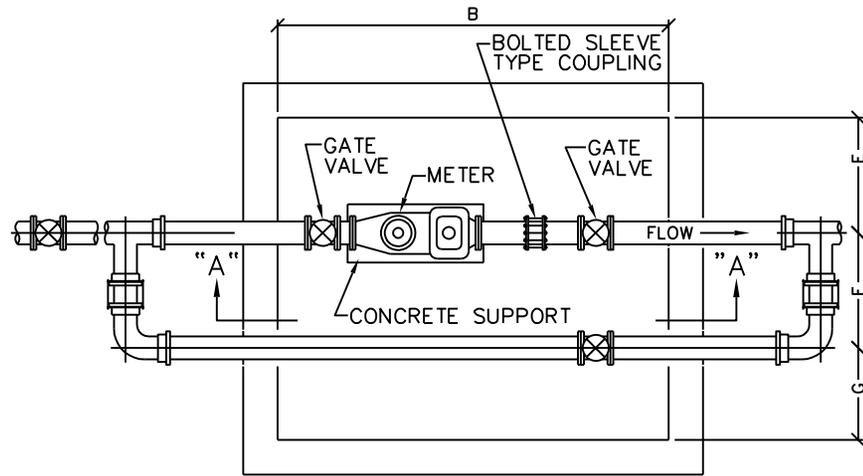
WATER SERVICE
1" WATER METER IRRIGATION CONNECTION



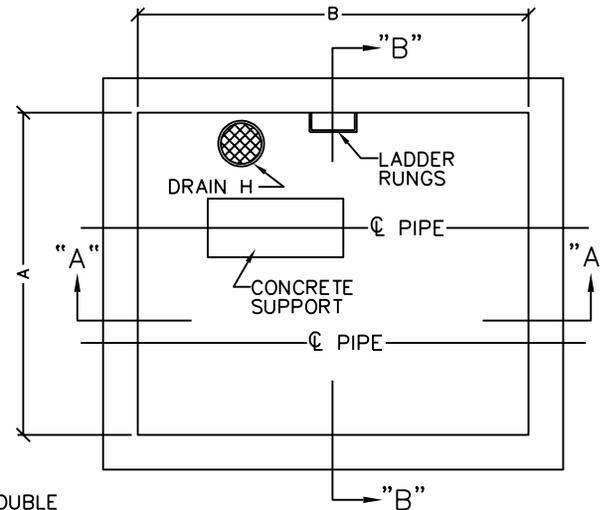
NOTES:

1. WATER METER TO BE SET DIRECTLY IN FRONT OF RIGHT-OF-WAY.
2. CONNECTION TO EXISTING PLUMBING SHALL BE THE RESPONSIBILITY OF THE HOME OWNER.
3. #12 PLASTIC COATED SOLID COPPER WIRE SHALL BE TAPED TO TOP OF WATER SERVICE PIPE.
4. METER SHALL READ IN GALLONS.
5. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

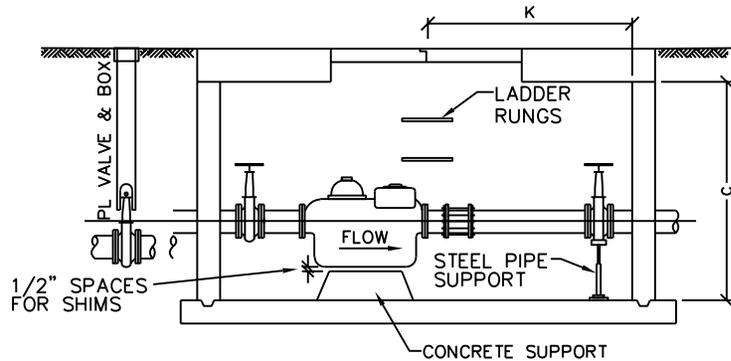
NOT TO SCALE



PLAN OF PIPING

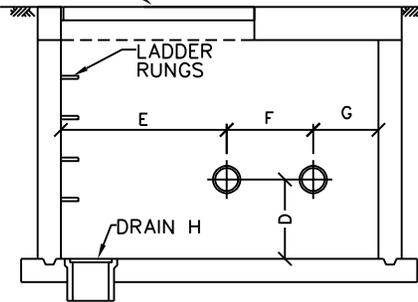


PLAN OF VAULT



SECTION "A"

ALUMINUM DOUBLE LEAF ACCESS DOOR (H-20) BILCO JD-1AL H20 OR APPROVED EQUAL



SECTION "B"

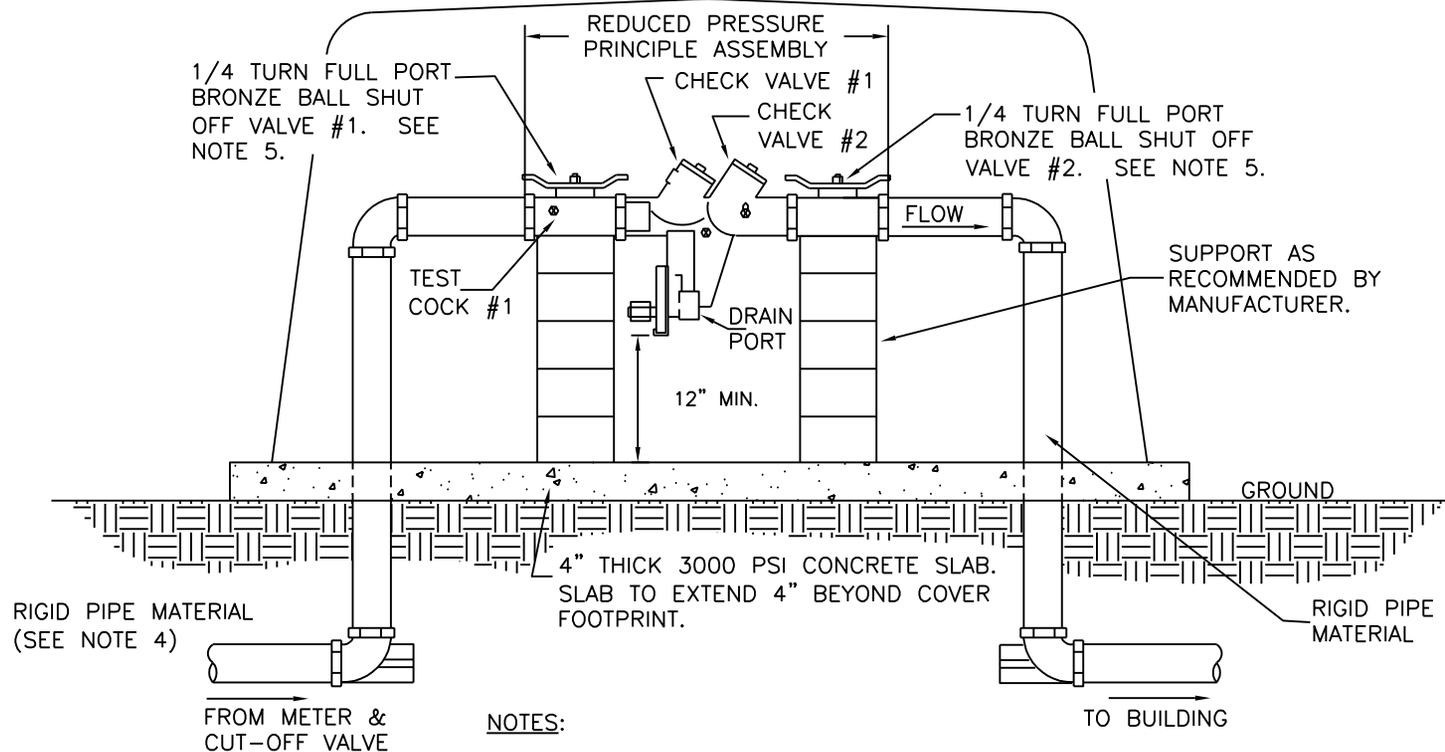
	METER SIZE		
	3"	4"	6"
A	84"	84"	84"
B	72"	72"	96"
C	72"	72"	72"
D	24"	30"	30"
E	30"	30"	30"
F	30"	30"	30"
G	24"	24"	24"
H	12"	12"	12"
K	36"	36"	48"

NOTES:

1. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.
2. METER SHALL READ IN GALLONS.
3. COORDINATE INSTALLATION OF METER AND CONNECTION TO THE MI. NET SYSTEM WITH CITY OF KANNAPOLIS.
4. CONCRETE VAULT SHALL BE DESIGNED FOR H-20 TRAFFIC LOADING.
5. ALL INTERIOR PIPE & FITTINGS SHALL BE FLANGED.
6. ALL EXTERIOR PIPE & FITTINGS SHALL BE RESTRAINED JOINT.
7. VAULT SHALL DRAIN TO ATMOSPHERE USING SCHEDULE 40 PVC PIPE.



WATER SERVICE
3", 4", & 6" COMPOUND WATER METER
& VAULT



NOTES:

1. REDUCED PRESSURE PRINCIPLE ASSEMBLIES (RP) MUST CONFORM TO CITY OF KANNAPOLIS CROSS CONNECTION CONTROL POLICY.
2. 3/4" - 2" RP INCLUDES SHUT OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED.
3. ALL RP INSTALLATIONS SHALL BE INSTALLED IN A PROTECTIVE COVERING APPROVED BY THE CITY OF KANNAPOLIS BACKFLOW PREVENTION ADMINISTRATOR.
4. RIGID PIPE AND FITTINGS SHALL BE 3/4" TO 2" BRASS OR K-COPPER.
5. TEST COCK #1 SHALL BE UPSTREAM OF SHUT OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY.
6. HEATED ENCLOSURES ARE REQUIRED FOR ALL FIRE LINE CONNECTIONS.
7. ALL BACKFLOW DEVICES SHALL BE LEAD-FREE AND BE APPROVED BY THE UNIVERSITY OF SOUTHERN CALIFORNIA.
8. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

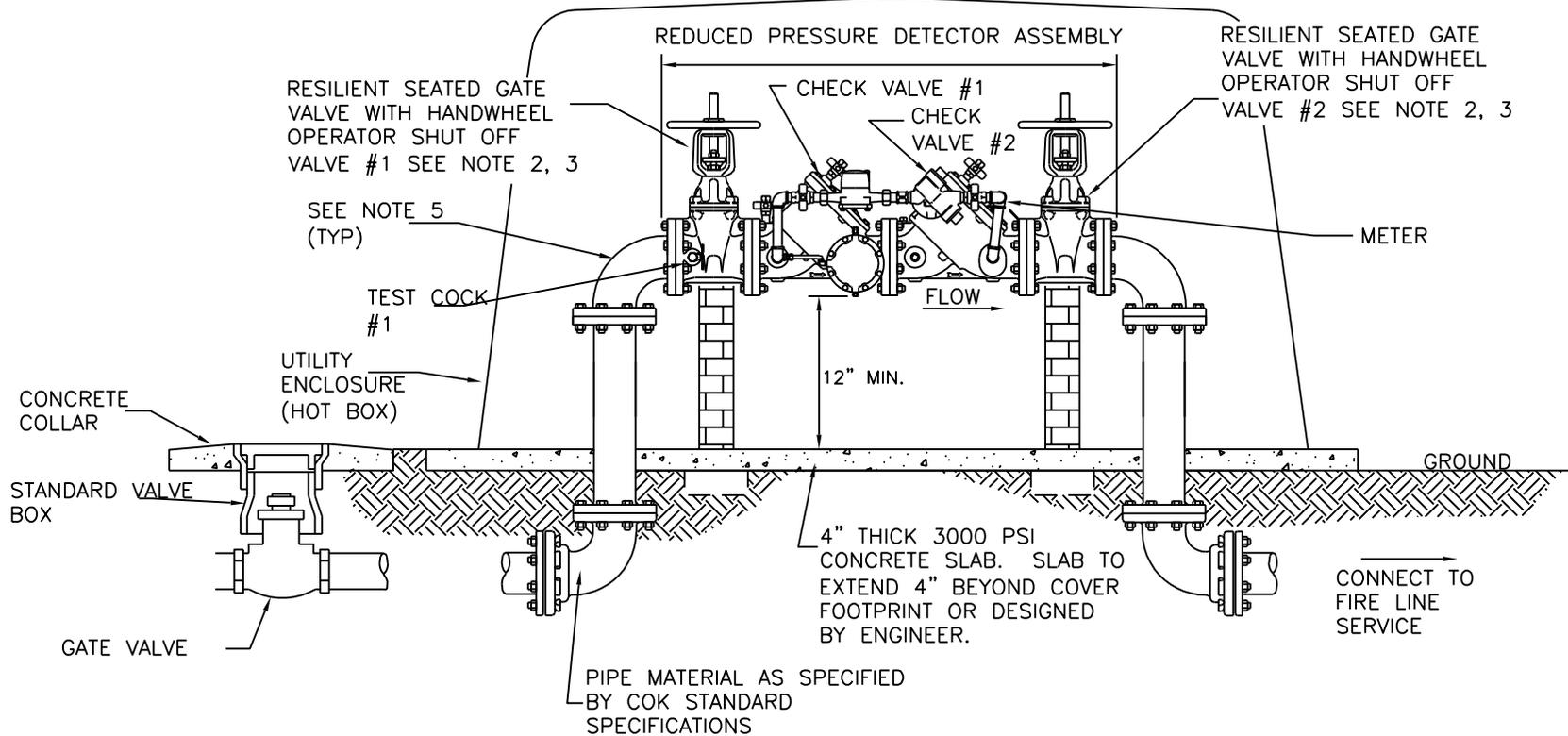
NOT TO SCALE



BACKFLOW PREVENTION
3/4"-2" REDUCED PRESSURE PRINCIPLE
ASSEMBLY (RP)

November 2018

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NOTES:

1. REDUCED PRESSURE PRINCIPLE ASSEMBLIES (RP) MUST CONFORM TO CITY OF KANNAPOLIS SPECIFICATIONS.
2. APPROVED RP INCLUDES SHUT OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED.
3. FIRE LINE SERVICES SHALL HAVE OUTSIDE STEM AND YOKE (OS & Y) HAND WHEEL OPERATORS.
4. 8"- 10" RP SHALL BE SUPPORTED AT CENTER WITH BRICK PEDESTAL.
5. RESTRAINED JOINTS SHALL BE WITH MEGA LUG RESTRAINTS OR APPROVED EQUAL.
6. TEST COCK #1 SHALL BE UPSTREAM OF SHUT OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY.
7. HOT BOX SHALL BE A 20 MIL. ORTHOTHALIC POLYESTER GELCOAT WITH ULTRA-VIOLET INHIBITORS. GELCOAT SHELL IS BACKED WITH 1/4" CHOP-STRAND POLYRESIN BONDED FIBERGLASS AND LINED WITH POLYURETHANE INSULATION (MIN. R FACTOR 8.5).
8. HEATED ENCLOSURES ARE REQUIRED FOR ALL FIRE LINE CONNECTIONS.
9. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

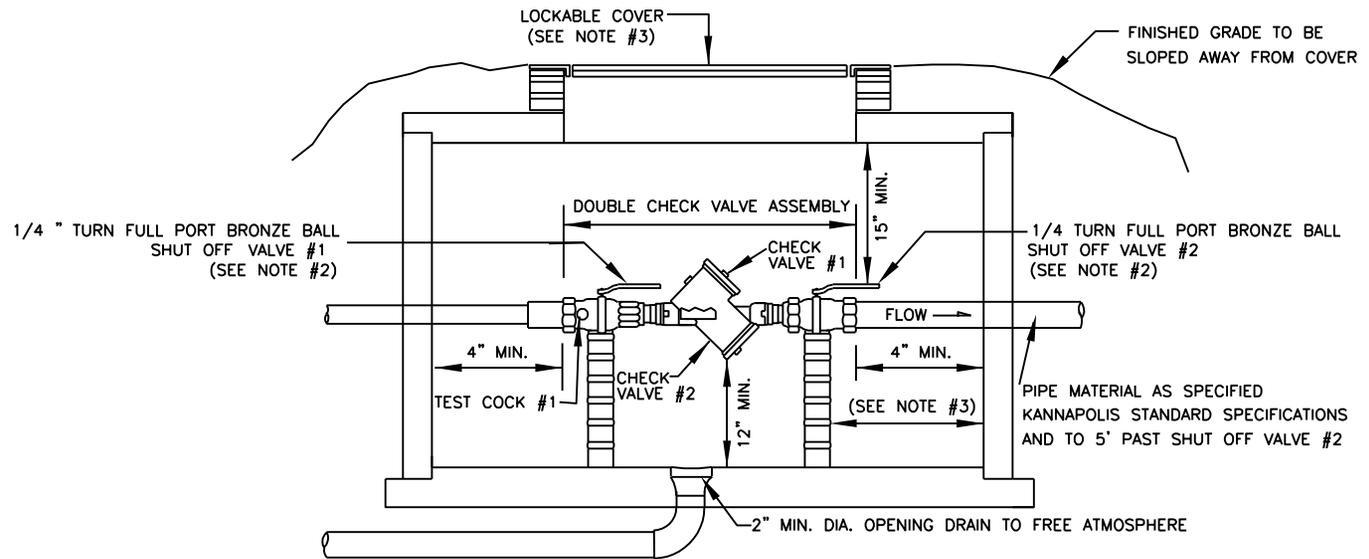
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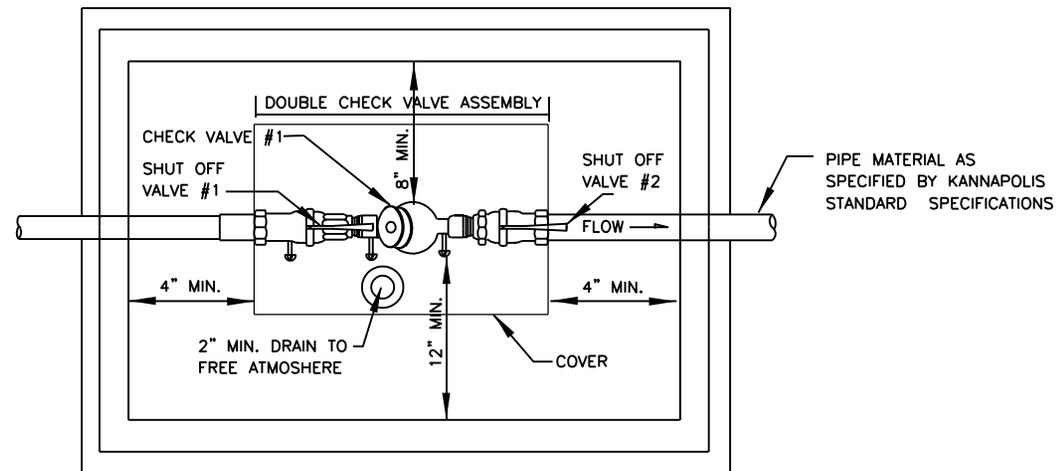
BACKFLOW PREVENTION
3"-10" REDUCED PRESSURE DETECTOR
ASSEMBLY (RPDA)

November 2018

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ELEVATION VIEW



PLAN VIEW

NOT TO SCALE

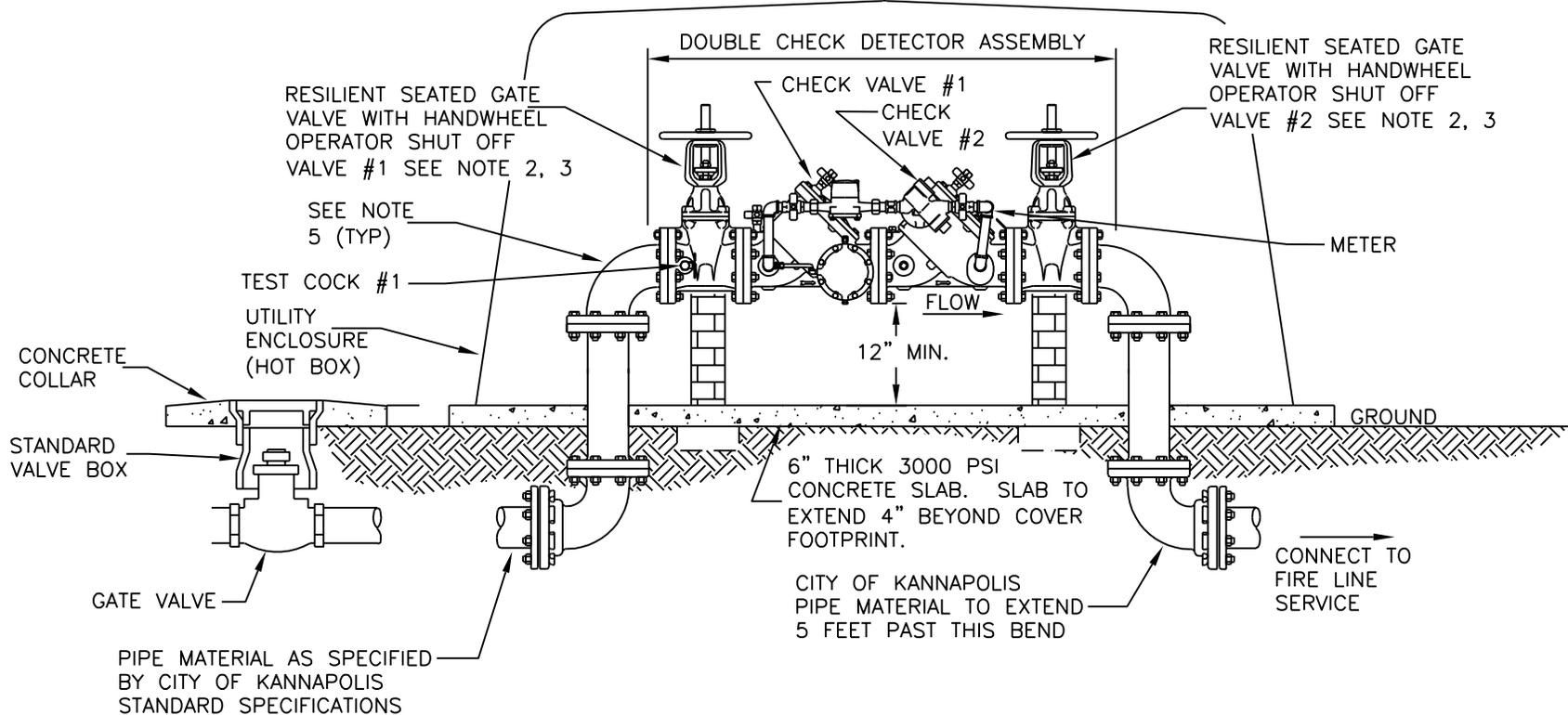
NOTES:

1. DCVA MUST CONFORM TO CITY OF KANNAPOLIS SPECIFICATIONS FOR BACKFLOW PREVENTION ASSEMBLIES 3/4"-2".
2. KANNAPOLIS APPROVED DCVA'S INCLUDE SHUT OFF VALVE #1 AND VALVE #2 NO SUBSTITUTION SHALL BE PERMITTED.
3. VAULT, DOORS OR COVERS AND SUPPORT OF ASSEMBLY SHALL BE DESIGNED BY OWNER AND AS REQUIRED.
4. IF DRAINAGE CANNOT BE PROVIDED TO FREE ATMOSPHERE OR STORM DRAINAGE, THE DCVA'S SHALL BE INSTALLED ABOVE GROUND.
5. TEST COCK #1 SHALL BE UPSTREAM OF SHUT OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY.
6. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

BACKFLOW PREVENTION

3/4"-2" DOUBLE CHECK VALVE ASSEMBLY (DCVA)

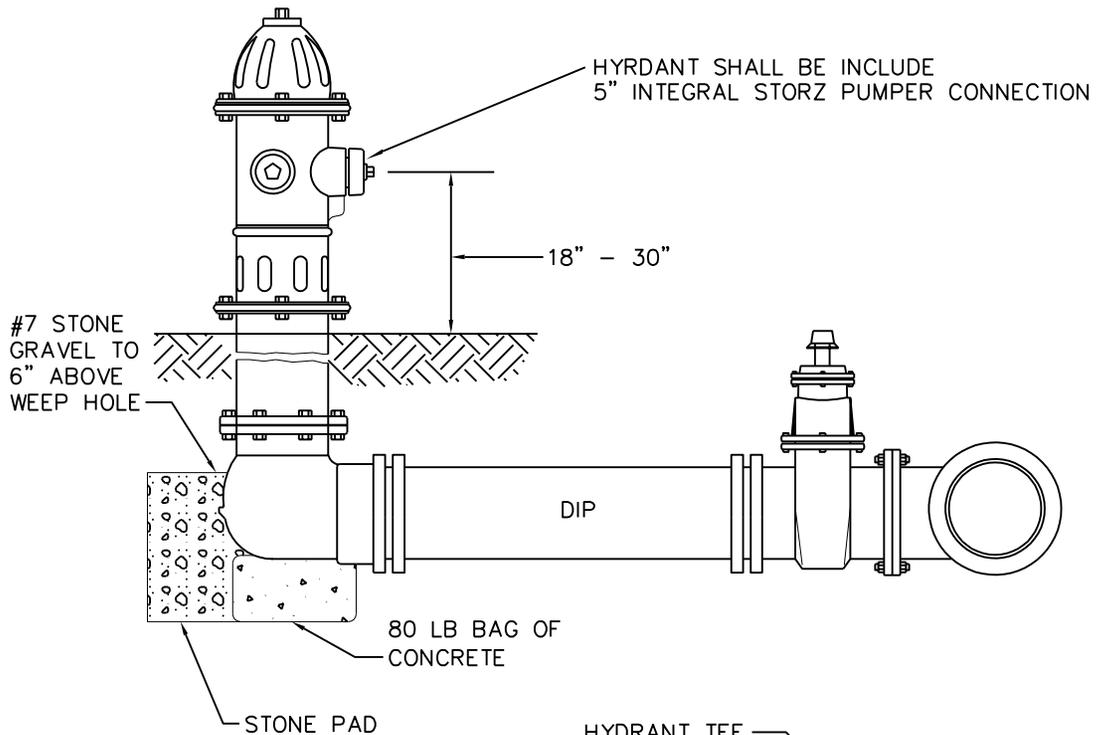




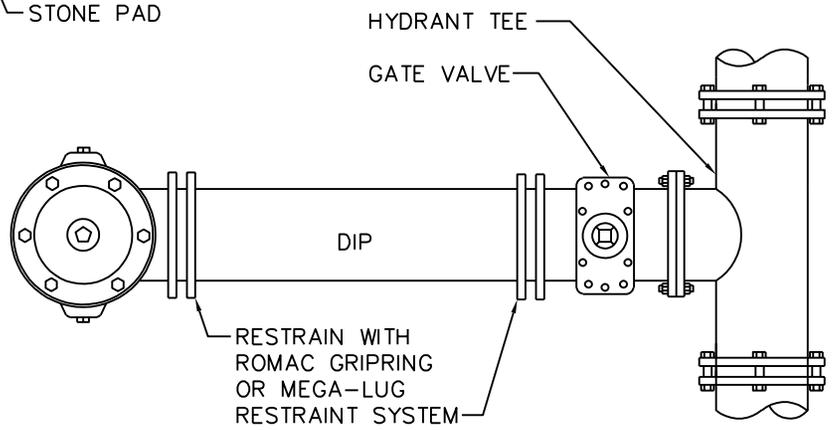
NOTES:

1. DOUBLE CHECK DETECTOR ASSEMBLIES (DCDA) MUST CONFORM TO CITY OF KANNAPOLIS SPECIFICATIONS.
2. APPROVED DCDA INCLUDES SHUT OFF VALVES #1 AND #2 AS PART OF THE ASSEMBLY. NO SUBSTITUTIONS SHALL BE PERMITTED.
3. FIRE LINE SERVICES SHALL HAVE OUTSIDE STEM AND YOKE (OS & Y) HAND WHEEL OPERATORS.
4. 8"- 10" DCDA SHALL BE SUPPORTED AT CENTER WITH BRICK PEDESTAL.
5. RESTRAINED JOINTS SHALL BE WITH MEGA LUG RESTRAINTS OR APPROVED EQUAL.
6. TEST COCK #1 SHALL BE UPSTREAM OF SHUT OFF VALVE #1 AND IS PART OF THE APPROVED ASSEMBLY.
7. HOT BOX SHALL BE A 20 MIL. ORTHOTHALIC POLYESTER GELCOAT WITH ULTRA-VIOLET INHIBITORS. GELCOAT SHELL IS BACKED WITH 1/4" CHOP-STRAND POLYRESIN BONDED FIBERGLASS AND LINED WITH POLYURETHANE INSULATION (MIN. R FACTOR 8.5). SEE SPECIAL PROVISIONS FOR CLEARANCE SPECIFICATIONS.
8. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

NOT TO SCALE



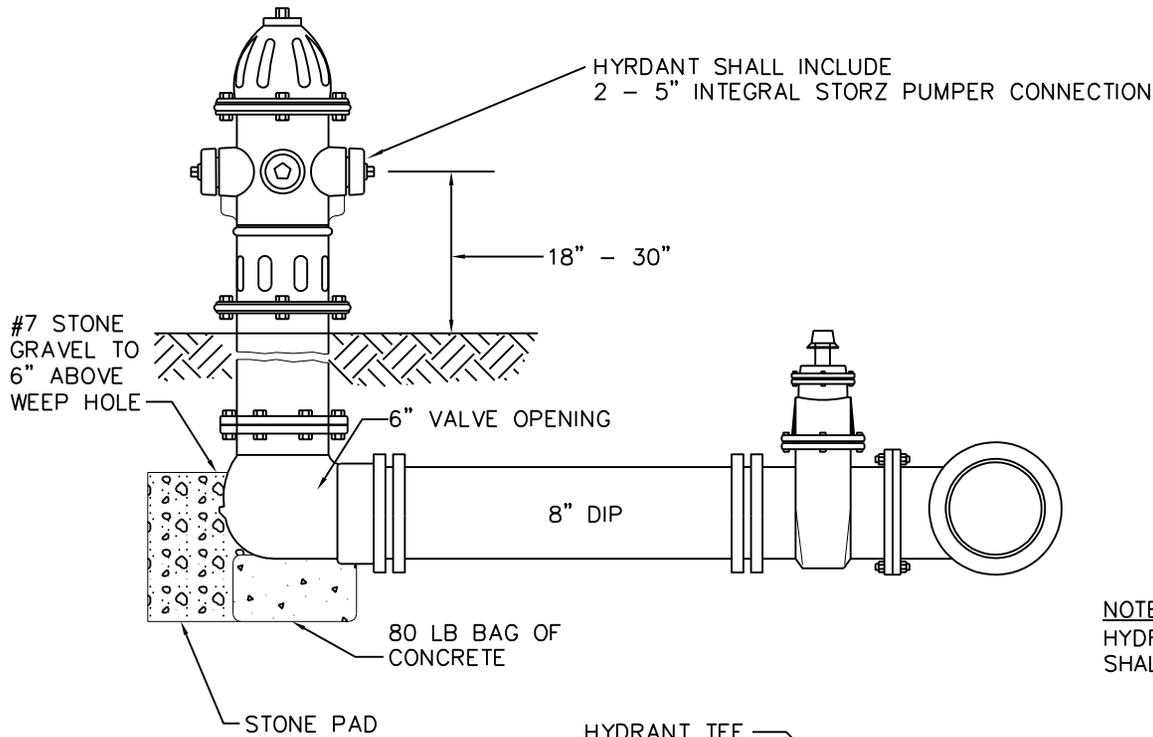
NOTES:
HYDRANTS SHALL HAVE 5-¹/₄" VALVE OPENING AND SHALL CONFORM TO WSACC SPECIFICATIONS



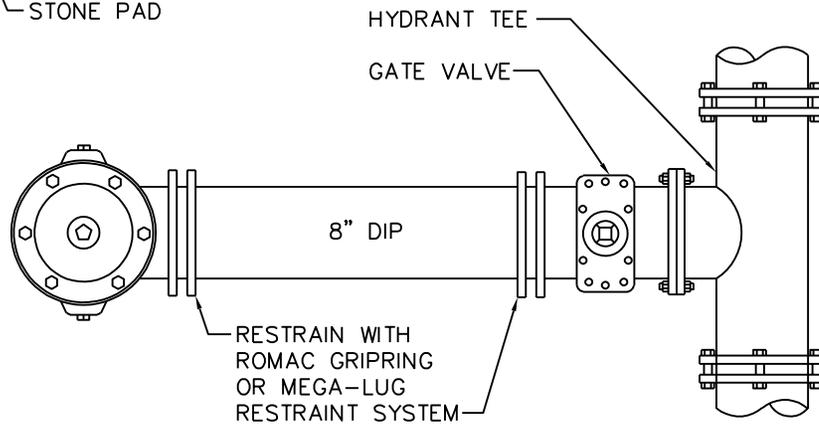
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FIRE HYDRANT

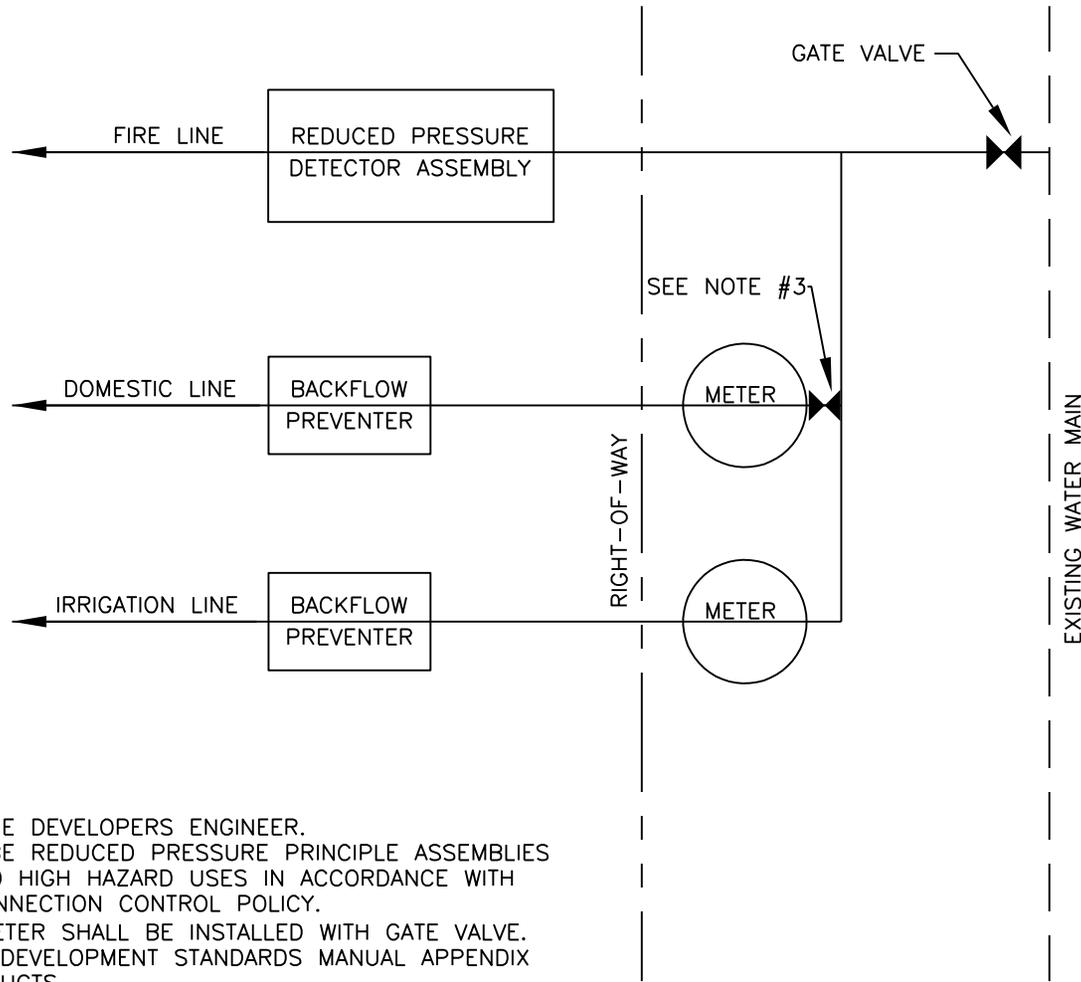


NOTES:
HYDRANTS SHALL HAVE 6" VALVE OPENING AND SHALL CONFORM TO WSACC SPECIFICATIONS



NOT TO SCALE

6" FIRE HYDRANT WITH 2 STORZ CONNECTIONS

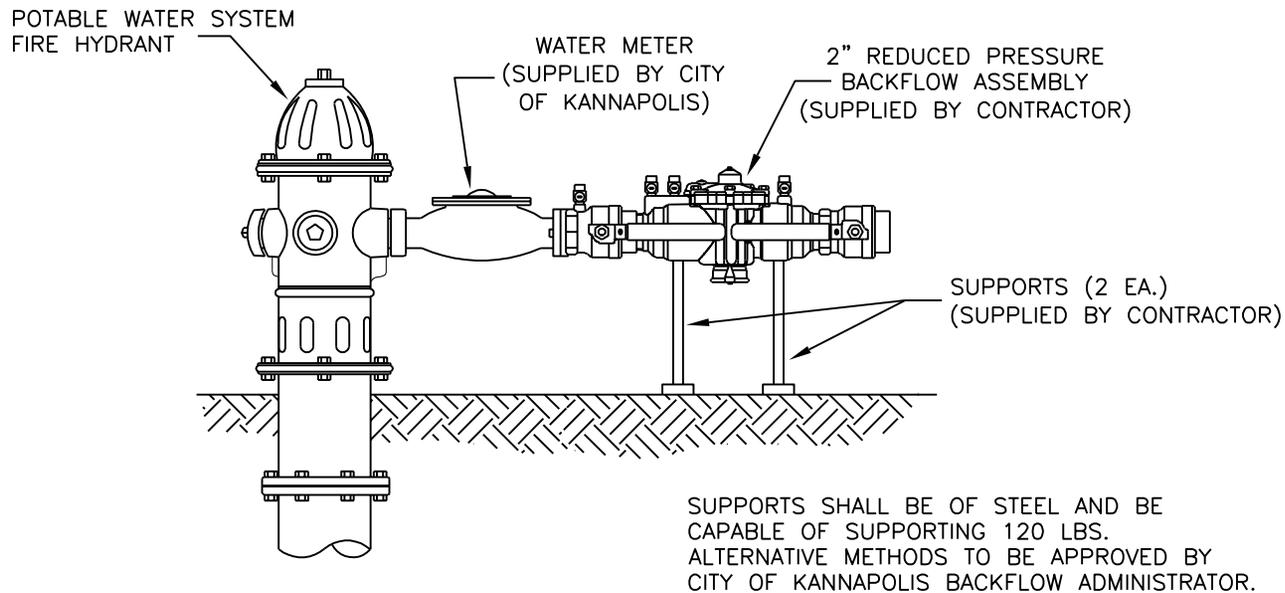


NOTES:

1. SIZES SHALL BE VERIFIED BY THE DEVELOPERS ENGINEER.
2. BACKFLOW PREVENTERS SHALL BE REDUCED PRESSURE PRINCIPLE ASSEMBLIES WHEN LINES ARE CONNECTED TO HIGH HAZARD USES IN ACCORDANCE WITH CITY OF KANNAPOLIS CROSS CONNECTION CONTROL POLICY.
3. 1-1/2" & LARGER DOMESTIC METER SHALL BE INSTALLED WITH GATE VALVE.
4. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

**WATER SERVICE
TYPICAL FIRE LINE CONNECTION**

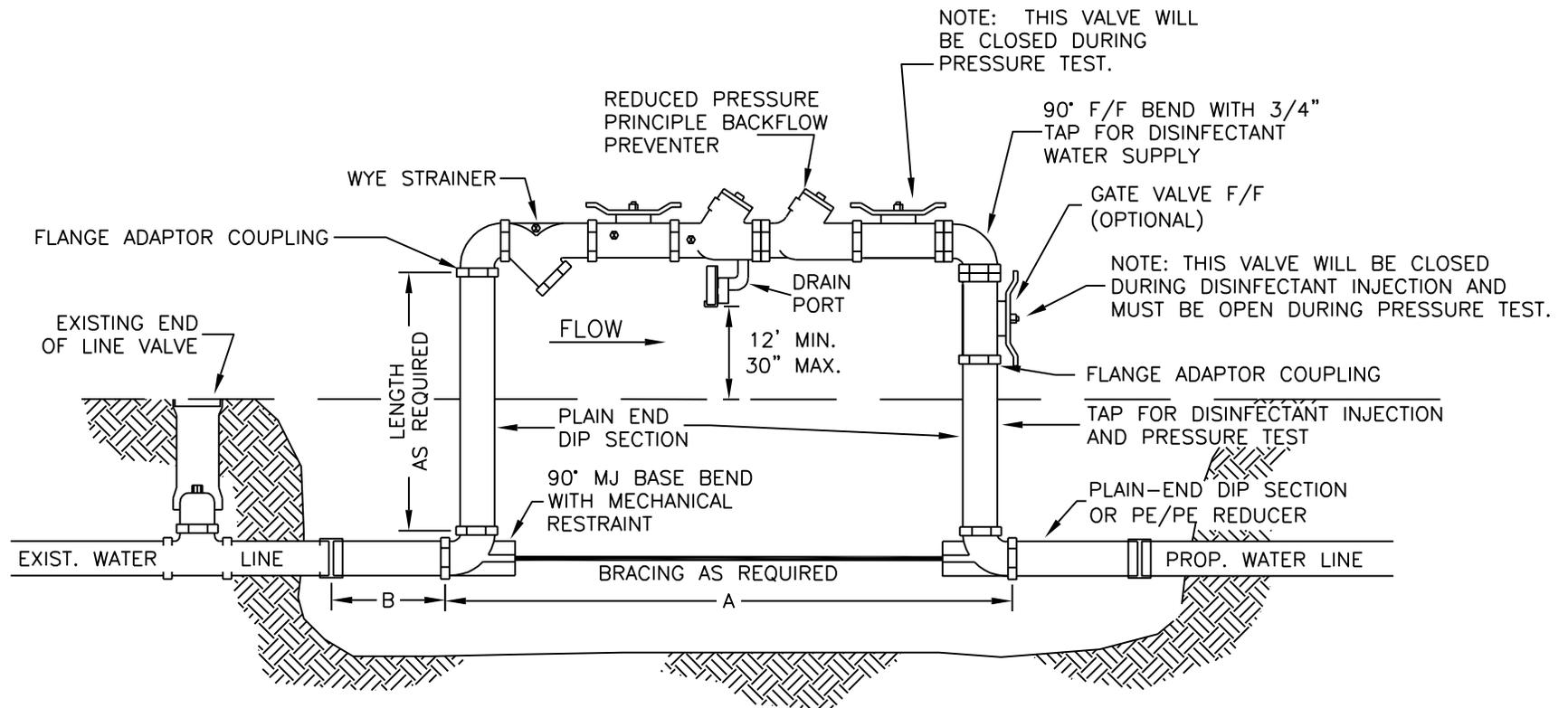




GENERAL NOTES

1. THE CONTRACTOR MUST INSTALL A REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY (RP) IMMEDIATELY AFTER THE HYDRANT METER IS SET.
2. BACKFLOW ASSEMBLIES MUST BE TESTED BY A CERTIFIED TESTER PRIOR TO USE.
3. PRIOR TO USE AN INSPECTION BY THE CITY IS REQUIRED FOR ALL HYDRANT METER BACKFLOW PREVENTION ASSEMBLIES.
4. EACH TIME THE HYDRANT METER BACKFLOW PREVENTION ASSEMBLY IS RELOCATED IT MUST BE TESTED.
5. THE CONTRACTOR WILL BE BILLED TO REPLACE AND INSTALL ANY PARTS NOT RETURNED WITH HYDRANT METER.
6. HYDRANT, BACKFLOW ASSEMBLY, AND METER SHALL BE ADEQUATELY INSULATED TO PREVENT FREEZING.
7. HYDRANT WRENCH ONLY, NO PIPE WRENCH ALLOWED
8. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

NOT TO SCALE



BACKFLOW DEVICE	A
4"	6'-3"
6"	9'
8"	11'-2"

NOTE: SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

WATER MAIN SIZE	B
6"	17"
8"	19"
12"	22"
16"	26"
24"	32"

WATER MAIN SIZE	MIN. BACKFLOW DEVICE SIZE	MIN. END OF LINE BLOWOFF
6" OR 8"	2"	2"
12"	4"	2.5
16"	6"	4"
24"	8"	6"

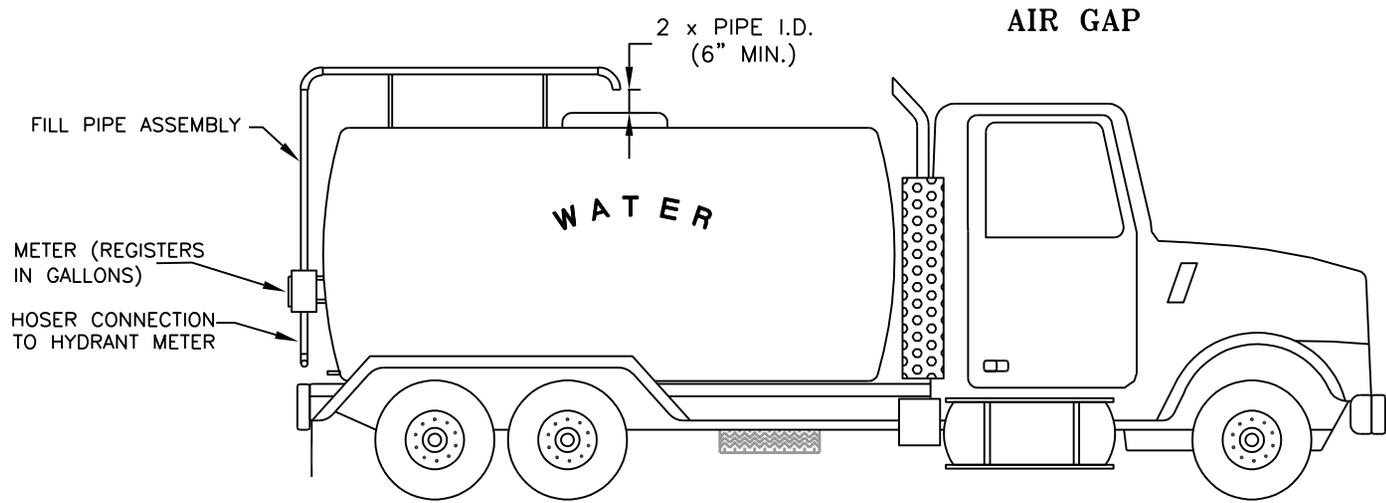
NOT TO SCALE



BACKFLOW PREVENTION BY-PASS CONNECTION FOR FILLING NEW WATER MAINS

November 2018

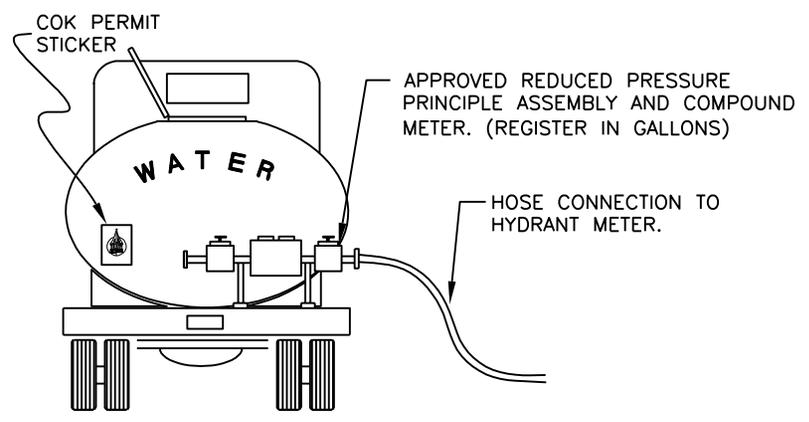
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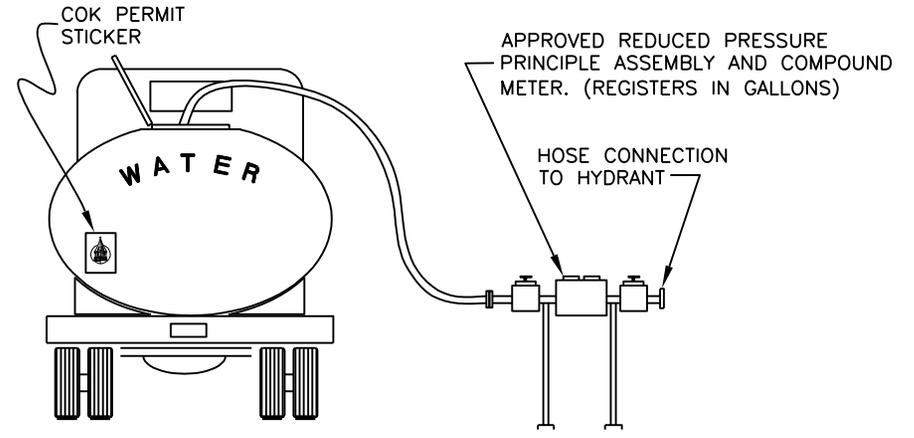
AIR GAP

NOTE:
 SEE CITY OF KANNAPOLIS
 LAND DEVELOPMENT
 STANDARDS MANUAL APPENDIX
 D FOR LIST OF APPROVED
 PRODUCTS.

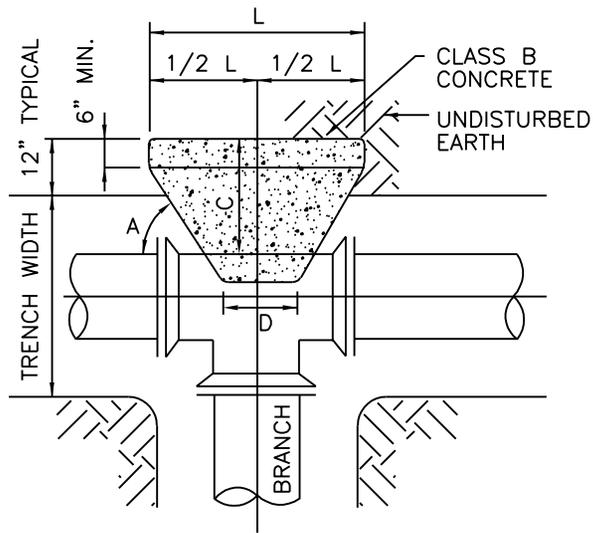
TRUCK MOUNTED ASSEMBLY



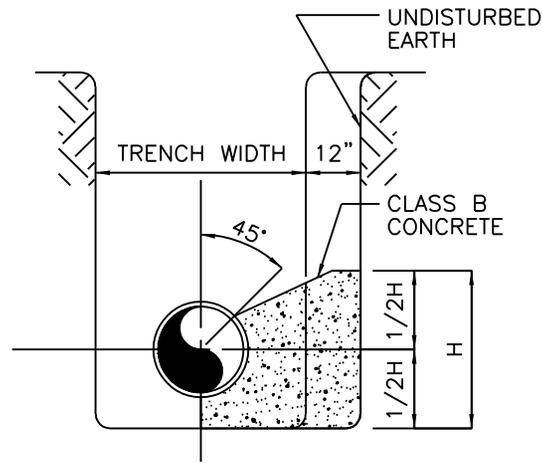
PORTABLE ASSEMBLY



MINIMUM PROTECTION FOR FILLING TANKER TRUCK



PLAN - TEE



SECTION

BUTTRESS DIMENSIONS				
B. D.	L	H	C	D
6"	1'-3"	1'-0"	SEE NOTE NO. 1	SEE NOTE NO. 2
8"	1'-6"	1'-4"		
12"	2'-3"	2'-0"		

B. D. = BRANCH DIAMETER

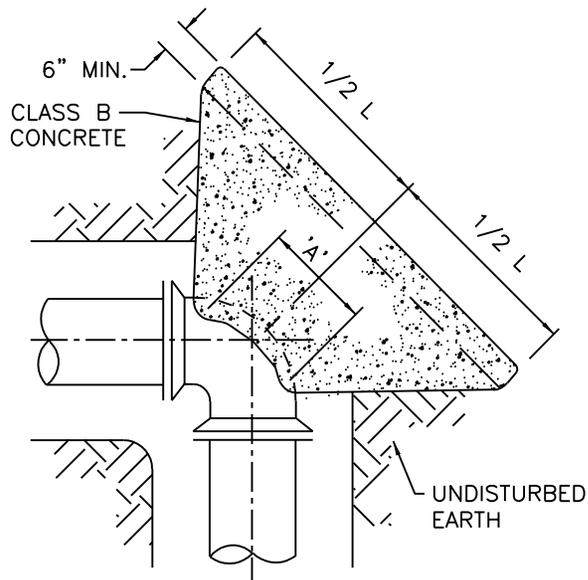
NOTES:

1. DIMENSION 'C' SHOULD BE LARGE ENOUGH TO MAKE ANGLE 'A' EQUAL TO OR GREATER THAN 45°.
2. DIMENSION 'D' SHOULD BE AS LARGE AS POSSIBLE WITHOUT INTERFERING WITH THE MECHANICAL JOINTS.
3. BUTTRESS DIMENSIONS ARE BASED UPON A SOIL RESISTANCE OF TWO TONS PER SQ. FT. AND A WATER PRESSURE OF 150 P.S.I.

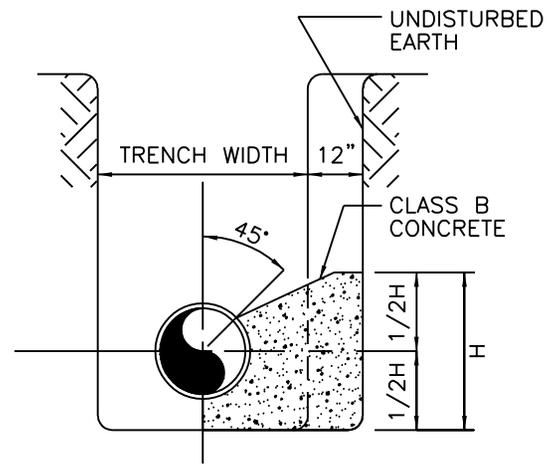
NOT TO SCALE

THRUST BLOCK - TEES





PLAN - BENDS



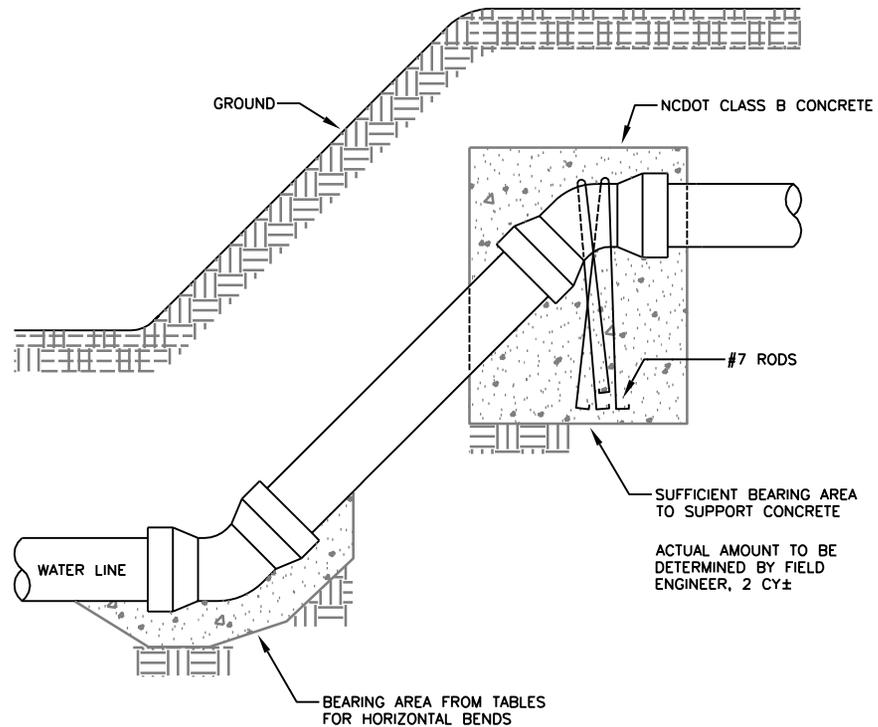
SECTION

BUTTRESS DIMENSIONS						
PIPE SIZE	22 1/2° BENDS		45° BENDS		90° BENDS	
	L	H	L	H	L	H
6"	1'-0"	1'-0"	1'-0"	1'-0"	1'-4"	1'-2"
8"	1'-0"	1'-0"	1'-4"	1'-2"	1'-10"	1'-6"
12"	1'-4"	1'-4"	1'-10"	1'-10"	2'-8"	2'-3"

NOTES:

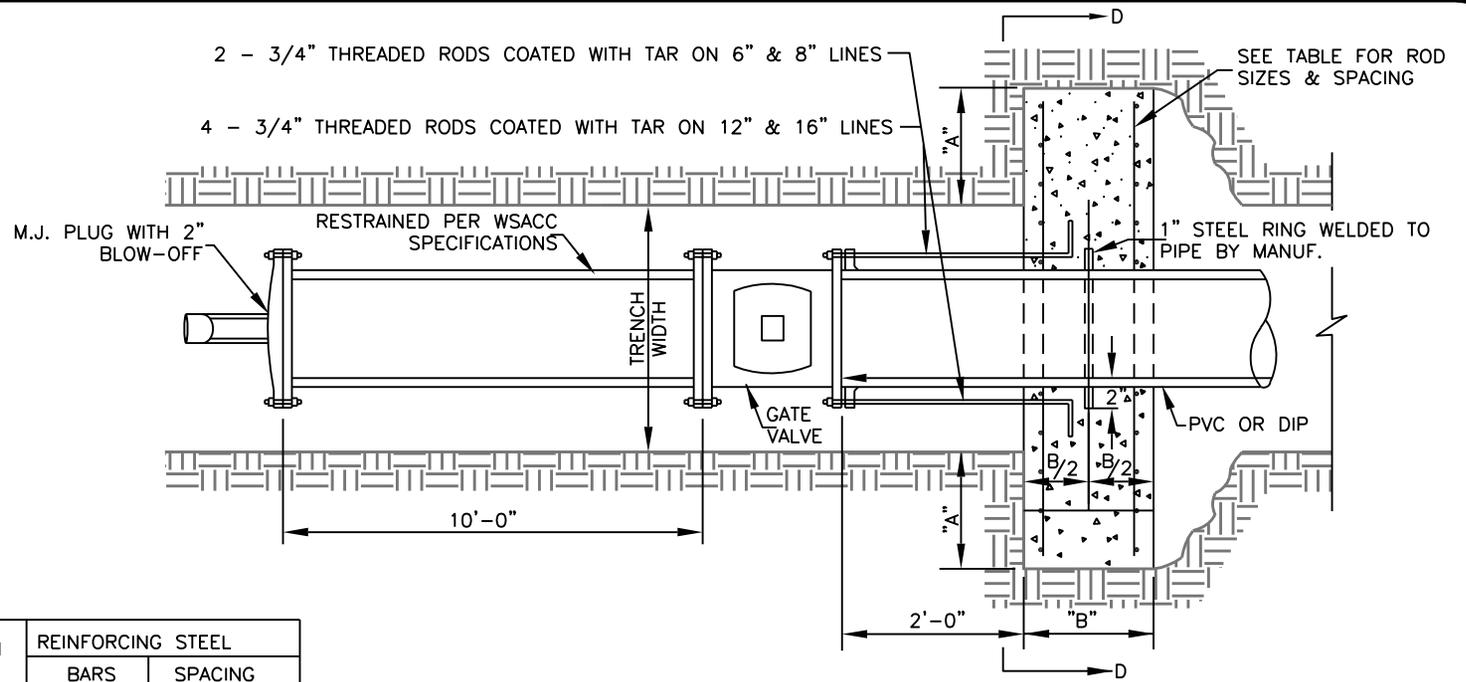
1. DIMENSION 'A' SHOULD BE AS LARGE AS POSSIBLE WITHOUT INTERFERING WITH THE MECHANICAL JOINT BOLTS.
2. THE SHAPE OF THE BACK OF THE BUTTRESS MAY VARY PROVIDED THE CONCRETE IS AGAINST FIRM, UNDISTURBED EARTH.
3. BUTTRESS DIMENSIONS ARE BASED UPON A SOIL RESISTANCE OF TWO TONS PER SQ. FT. AND A WATER PRESSURE OF 150 P.S.I.
4. INSTALL GRIPPER GASKETS WITHIN 60' OF 45° AND 90° BENDS.

NOT TO SCALE



CUBIC YARDS OF CONCRETE TO ANCHOR VERTICAL BEND						
PIPE DIA.	11-1/4' BEND		22-1/2' BEND		45' BEND	
6"	812 #	1/2 CY	1653 #	1/2 CY	3247 #	1.0 CY
8"	1444 #	1/2 CY	2939 #	3/4 CY	5773 #	1.5 CY
12"	3248 #	1.0 CY	6612 #	1-3/4 CY	12988 #	3.5 CY
16"	5775 #	1-1/2 CY	11756 #	3.0 CY	23090 #	6.0 CY

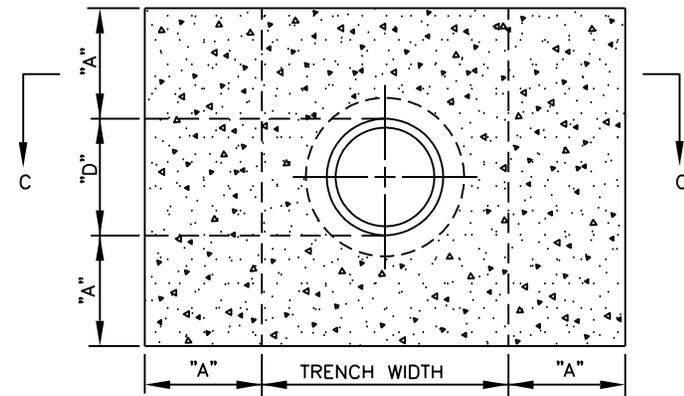
NOT TO SCALE



NOMINAL DIAMETER "D"	"A"	"B"	TRENCH WIDTH "W"	REINFORCING STEEL	
				BARS "X"	SPACING "Y"
6"	12"	12"	24"	#6	12"
8"	12"	12"	24"	#6	12"
12"	15"	12"	30"	#6	12"
16"	20"	15"	36"	#8	12"
24"	30"	18"	42"	#8	12"

NOTES:

1. POUR CONCRETE AGAINST FIRM UNDISTURBED SOIL. FILL AGAINST COLLAR TO BE COMPACTED TO 95% PROCTOR FOR 6' ALONG THE PIPE ON BOTH SIDES OF THE COLLAR.
2. COMPLETELY BACK FILL & COMPACT BEFORE PRESSURE TESTING.
3. TRENCH WIDTHS SHALL CONFORM TO STANDARD TRENCH DETAIL.
4. TIE BOLTS SHALL BE LOAD RATED 22,000 PSI PER BOLT. BOLTS SHALL MEET THE REQUIREMENTS OF ASTM A325 TYPE 3D, TENSILE STRENGTH 60,000 PSI MINIMUM.
5. TIE RODS SHALL BE PLAIN OR CONTINUOUS THREADED AND SHALL BE RATED 50,000 P.S.I.
6. ALL RODS SHALL BE COATED WITH TAR AFTER INSTALLATION.
7. VALVE BOX CONCRETE PAD SHALL BE 24" SQUARE OR 8" MINIMUM FOR EDGE OF VALVE BOX LID TO EDGE OF CONCRETE PAD.



SECTION D-D

NOT TO SCALE

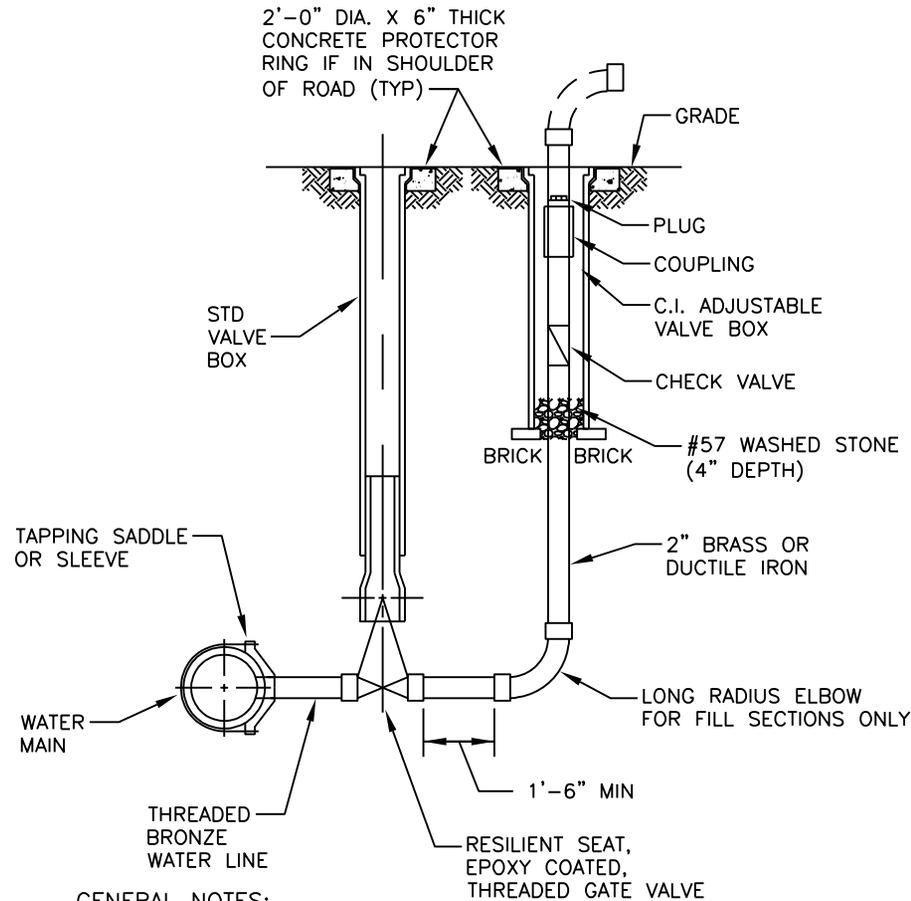


**DEAD END BLOW-OFF
WITH THRUST COLLAR**

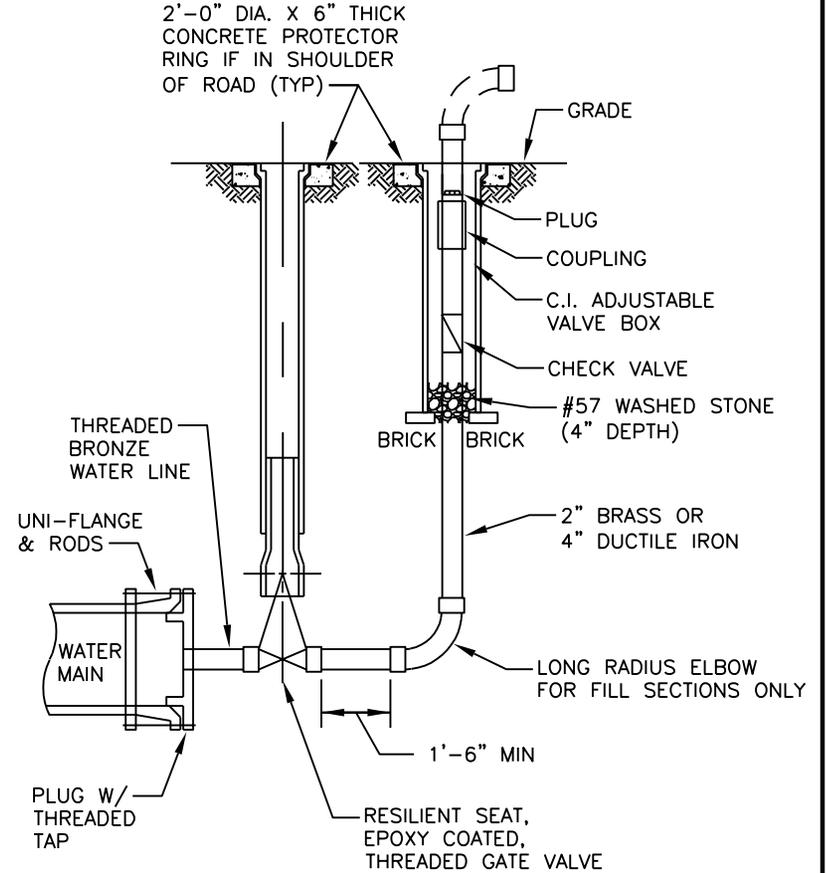
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IN-LINE BLOW-OFF



DEAD END BLOW-OFF



GENERAL NOTES:

1. INSTALL 2" BLOW-OFF ON 2" THRU 8" MAINS.
2. INSTALL 2.5" BLOW-OFF ON 12" MAINS.
3. 2" & 2.5" BLOW-OFFS TO HAVE (NPT) COUPLING
4. INSTALL 4" BLOW-OFF ON 16" MAINS.
5. INSTALL 6" BLOW-OFF ON 24" MAINS.
6. IF THE SEPARATION BETWEEN THE CONTROL VALVE AND THE BLOW-OFF DOES NOT ALLOW THE INSTALLATION OF THE CONCRETE PROTECTOR RINGS, A 24" BY 24" BY 6" THICK CONCRETE PAD SHALL BE FORMED AND POURED AROUND THE VALVE BOX. THE EDGE OF THE VALVE BOX RIM MUST BE AT LEAST 8" FROM THE EDGE OF THE CONCRETE PAD.

NOT TO SCALE

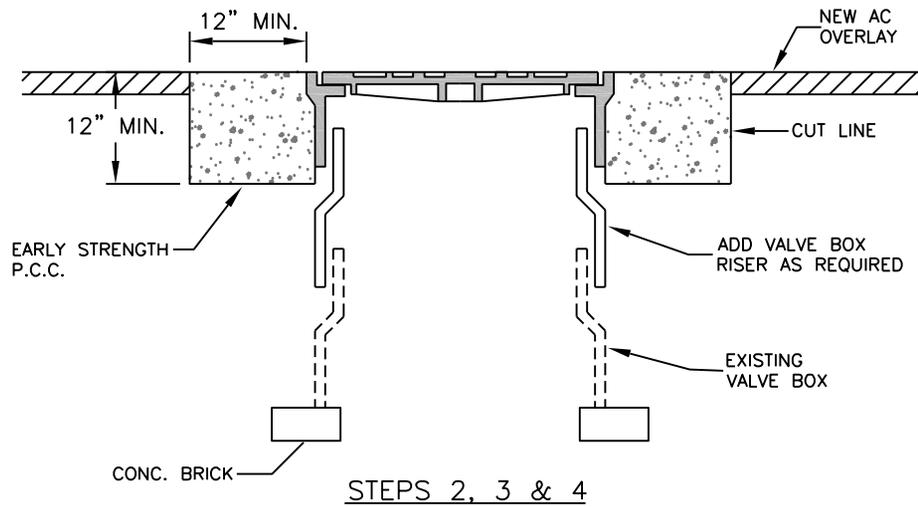
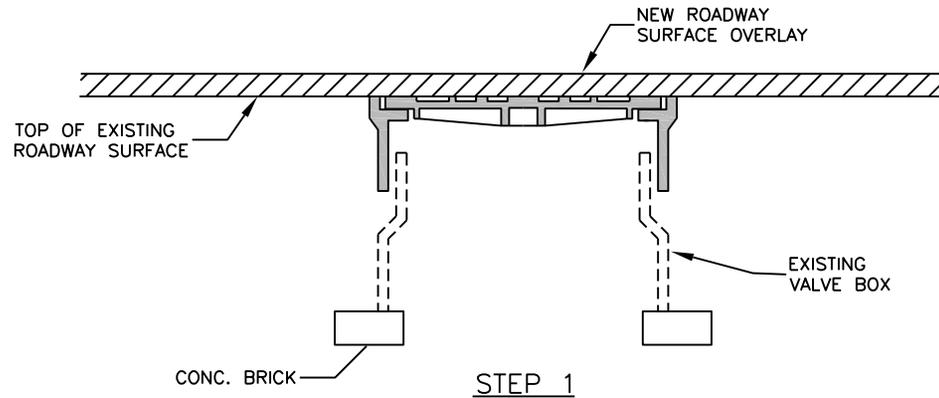


TEMPORARY BLOW-OFF ASSEMBLY

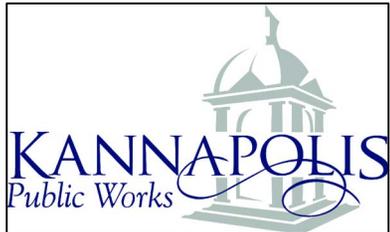
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- STEP 1 COVER EXISTING VALVE BOX WITH APPROVED MATERIAL AND CONSTRUCT OVERLAY ACROSS TOP OF VALVE BOX.
- STEP 2 SAW CUT EXCAVATION AREA AROUND VALVE BOX 12" MINIMUM FROM VALVE BOX FRAME.
- STEP 3 RAISE VALVE BOX TO FINISH PAVEMENT PROFILE AND CROSS SLOPE.
- STEP 4 BACKFILL WITH EARLY STRENGTH PORTLAND CEMENT CONCRETE (P.C.C.) TO DEPTHS AS DIRECTED.



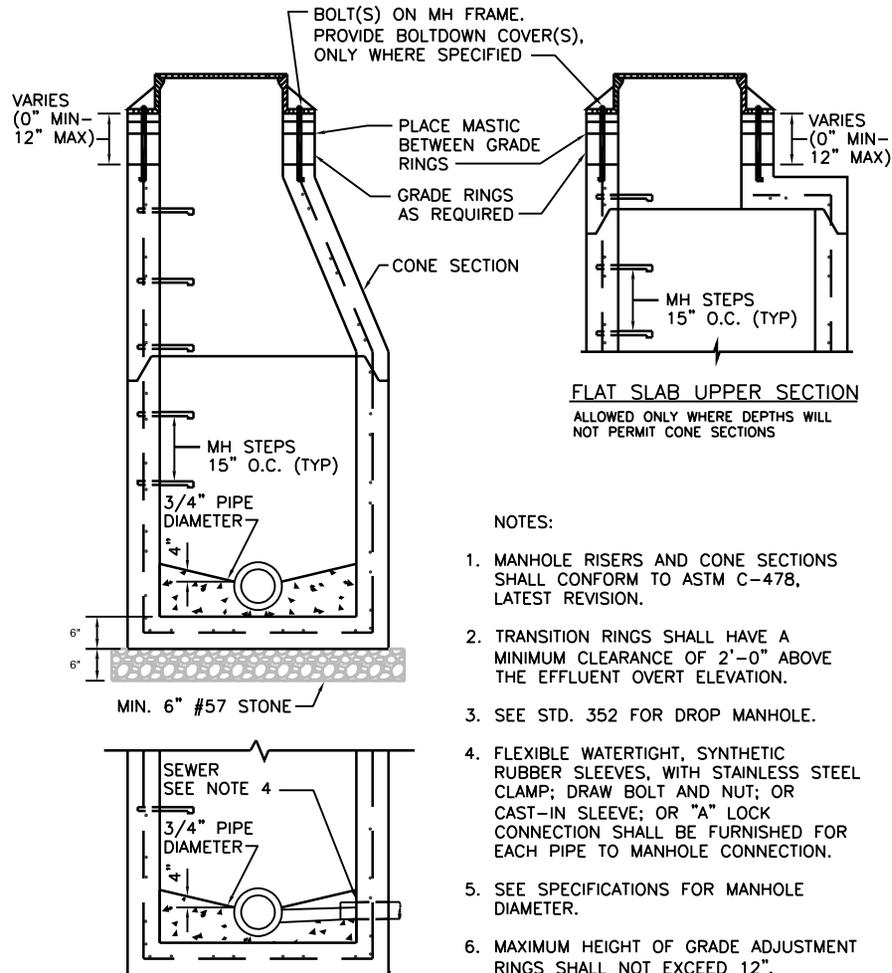
NOT TO SCALE



VALVE BOX ADJUSTMENT DETAIL

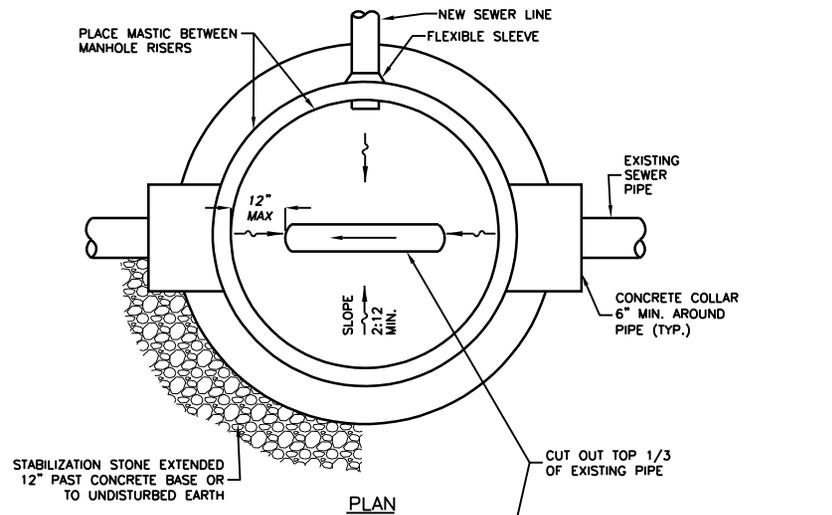
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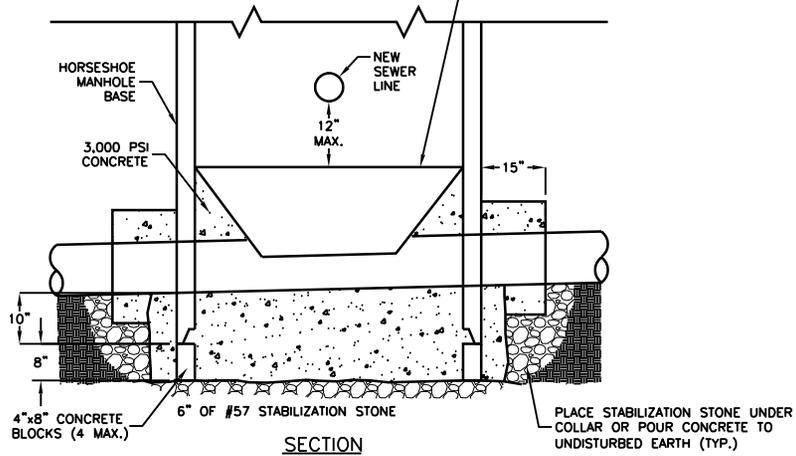


- NOTES:
1. MANHOLE RISERS AND CONE SECTIONS SHALL CONFORM TO ASTM C-478, LATEST REVISION.
 2. TRANSITION RINGS SHALL HAVE A MINIMUM CLEARANCE OF 2'-0" ABOVE THE EFFLUENT OVERT ELEVATION.
 3. SEE STD. 352 FOR DROP MANHOLE.
 4. FLEXIBLE WATERTIGHT, SYNTHETIC RUBBER SLEEVES, WITH STAINLESS STEEL CLAMP; DRAW BOLT AND NUT; OR CAST-IN SLEEVE; OR "A" LOCK CONNECTION SHALL BE FURNISHED FOR EACH PIPE TO MANHOLE CONNECTION.
 5. SEE SPECIFICATIONS FOR MANHOLE DIAMETER.
 6. MAXIMUM HEIGHT OF GRADE ADJUSTMENT RINGS SHALL NOT EXCEED 12".

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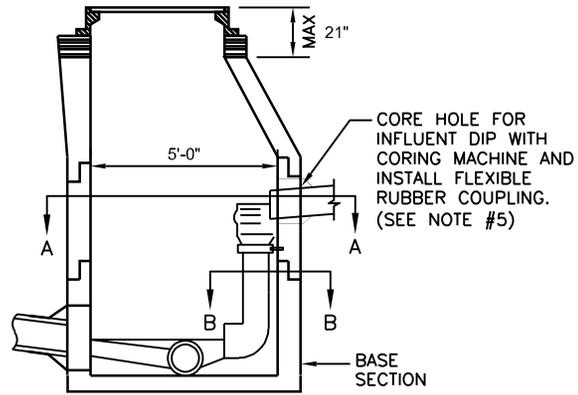


- NOTES:
1. PLACE HORSESHOE MANHOLE BASE IN WET CONCRETE (2,500 PSI).
 2. CUT OUT TOP THIRD OF EXISTING PIPE, FINISH INVERTS AND WATERPROOF ALL COLD JOINTS AND AROUND ALL PIPES.
 3. POUR CONCRETE COLLARS.

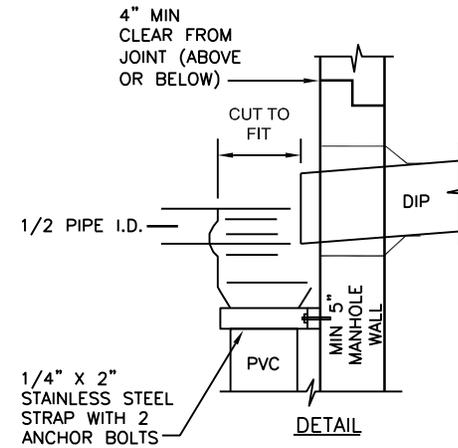
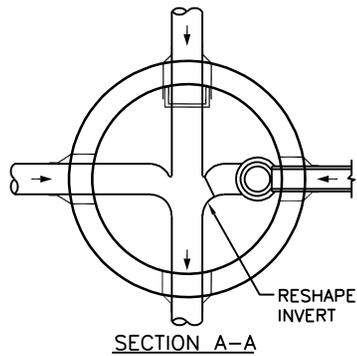
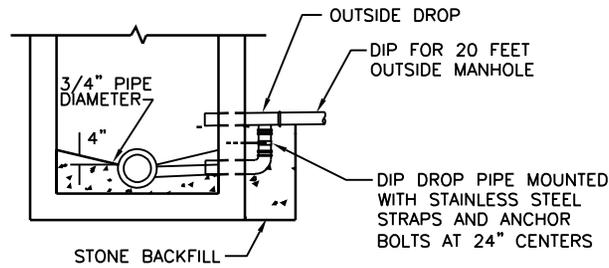
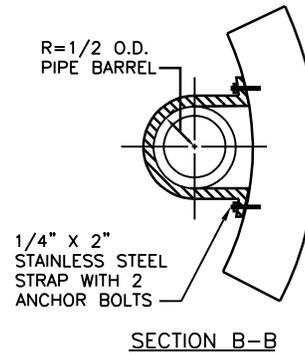


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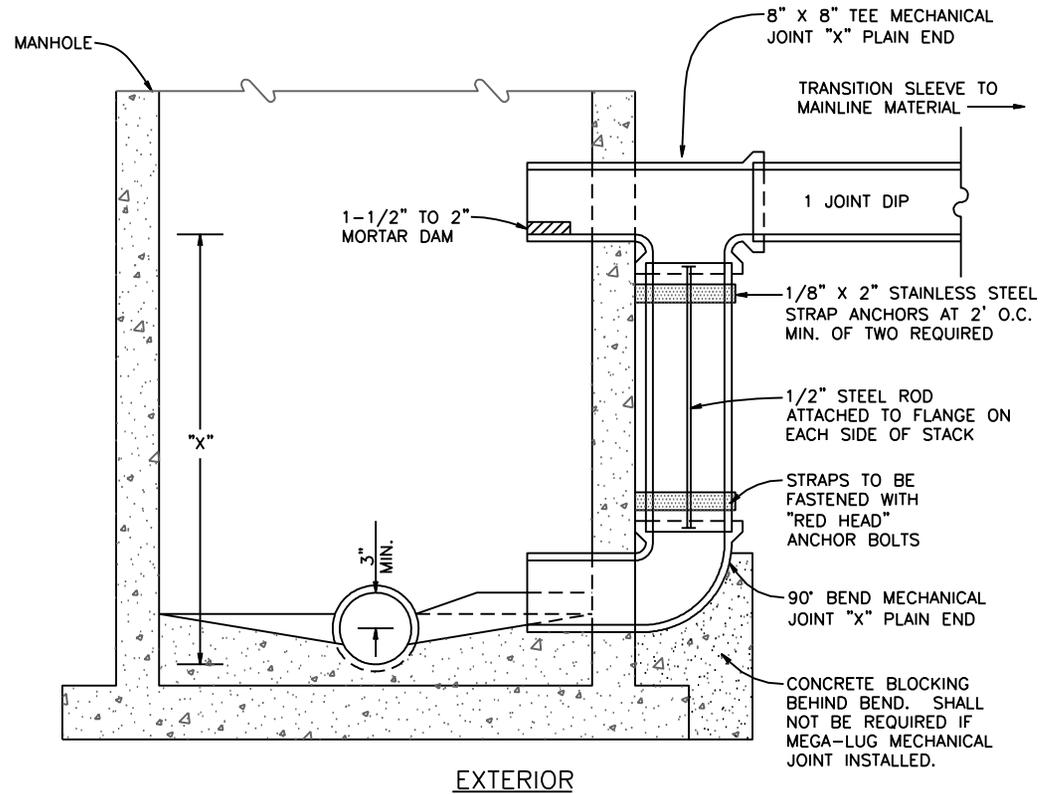
DOGHOUSE MANHOLE



ELEVATION



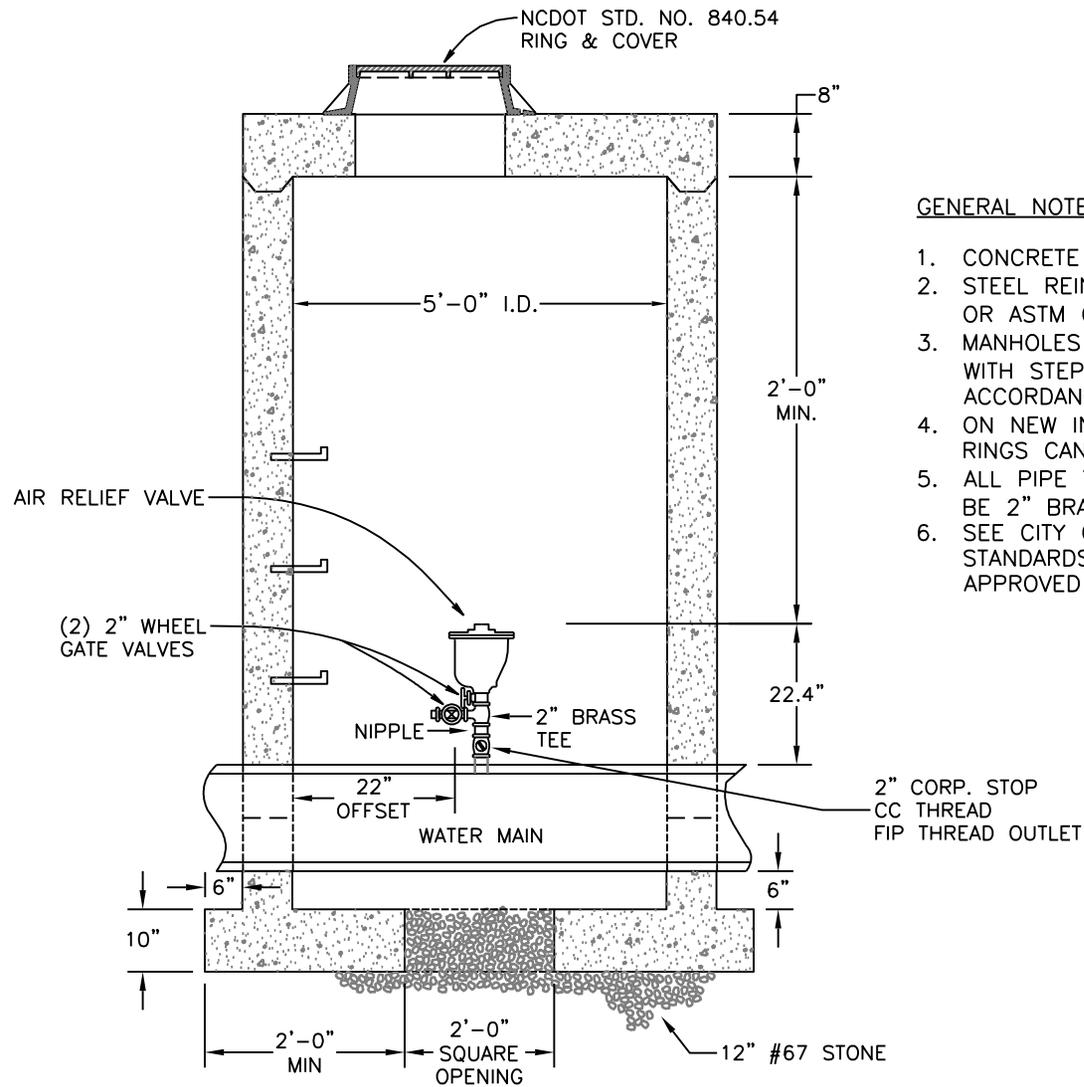
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GENERAL NOTES:

1. THIS DETAIL SHALL BE USED ONLY WHERE INDICATED ON PLANS.
2. ALL EXTERIOR DROP PIPE AND FITTINGS TO BE DUCTILE IRON.
3. MEGALUG MAY BE USED AS A METHOD OF RESTRAINT IN LIEU OF 1/2" STEEL ROD ATTACHED TO FLANGE ON EACH SIDE OF STACK.
4. ALL CONNECTIONS TO PRECAST MANHOLE STRUCTURES SHALL BE WATERTIGHT.
5. PROPOSED CONNECTION TO BE USED WHERE THE DROP EXCEEDS 2'-0" FROM INVERT IN TO INVERT OUT.
6. SEE STD. S-MH-02A & B FOR STANDARD MANHOLE.

NOT TO SCALE



GENERAL NOTES:

1. CONCRETE SHALL BE 4000 PSI AS PER ASTM C-478.
2. STEEL REINFORCING SHALL MEET ASTM C-185 (4' DIA) OR ASTM C-478 (5' DIA).
3. MANHOLES OVER 3'-6" IN DEPTH SHALL BE PROVIDED WITH STEPS 12" ON CENTERS. STEPS SHALL BE IN ACCORDANCE WITH NCDOT STD. NO. 840.66.
4. ON NEW INSTALLATION A MAXIMUM OF (2) GRADE RINGS CAN BE USED.
5. ALL PIPE TO BE MINIMUM 2" BRASS AND NIPPLES TO BE 2" BRASS.
6. SEE CITY OF KANNAPOLIS LAND DEVELOPMENT STANDARDS MANUAL APPENDIX D FOR LIST OF APPROVED PRODUCTS.

SECTION THROUGH MANHOLE

NOT TO SCALE

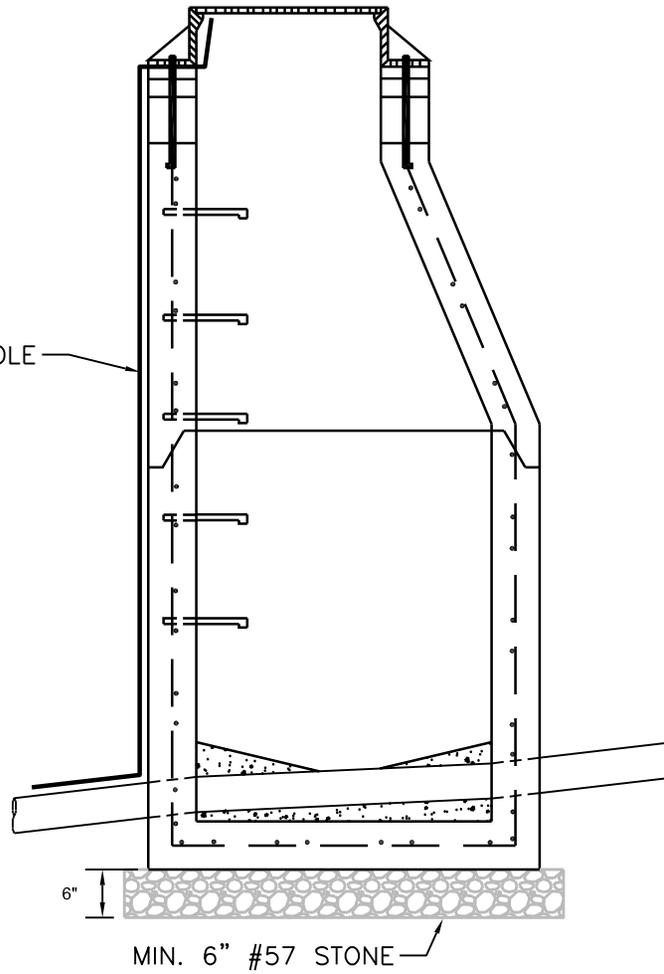


STANDARD AIR RELIEF VALVE WITH ASSEMBLY AND MANHOLE FOR WATER LINES

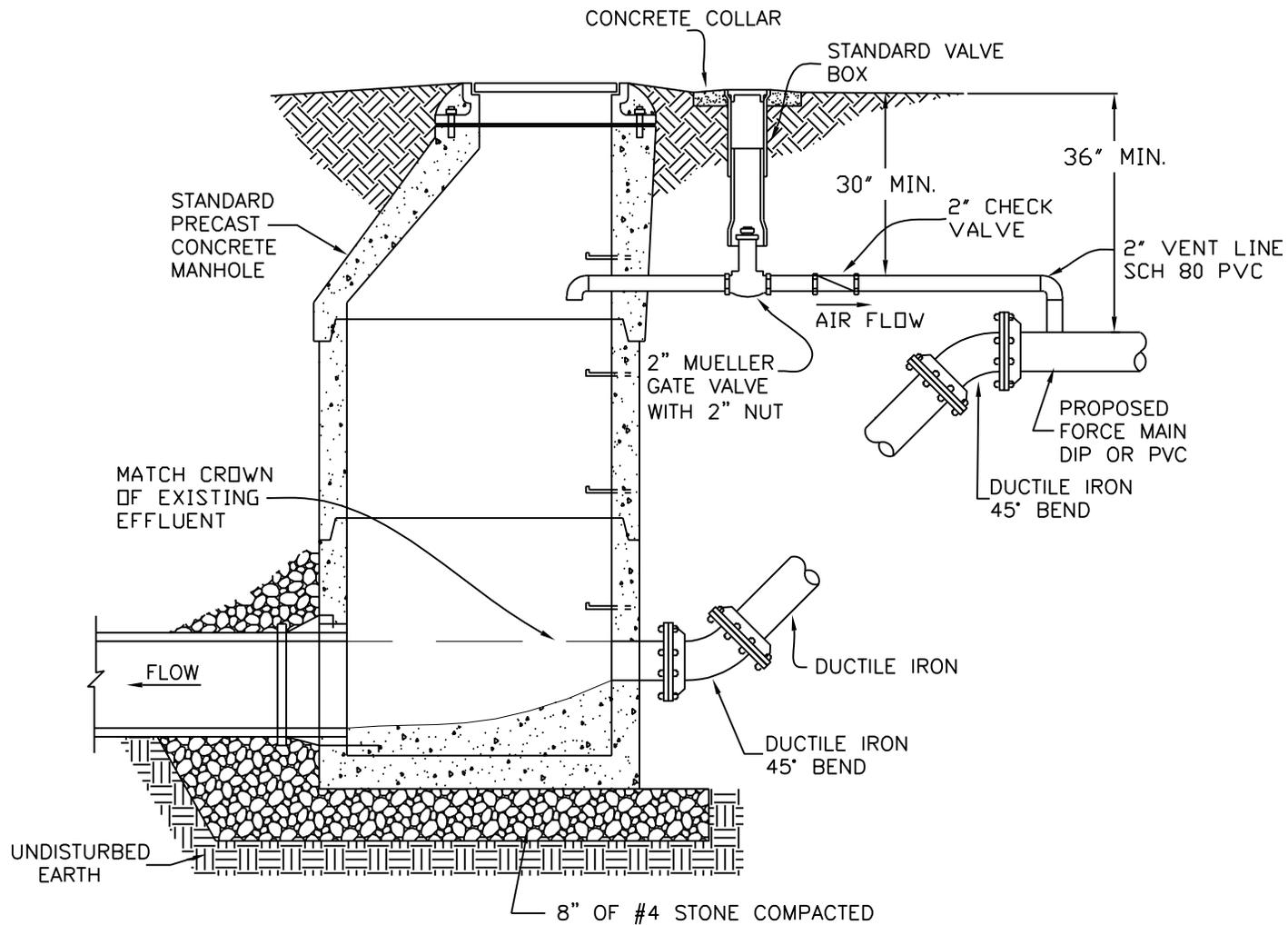
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#12 GREEN PLASTIC
COATED SOLID COPPER
WIRE TAPED TO THE TOP
OF THE PIPE AND MANHOLE

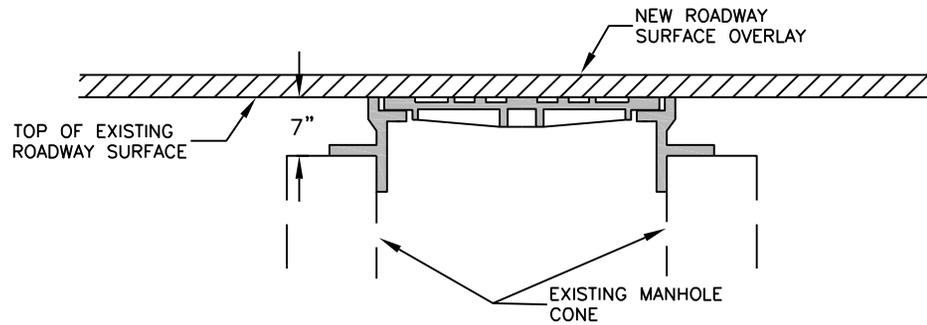


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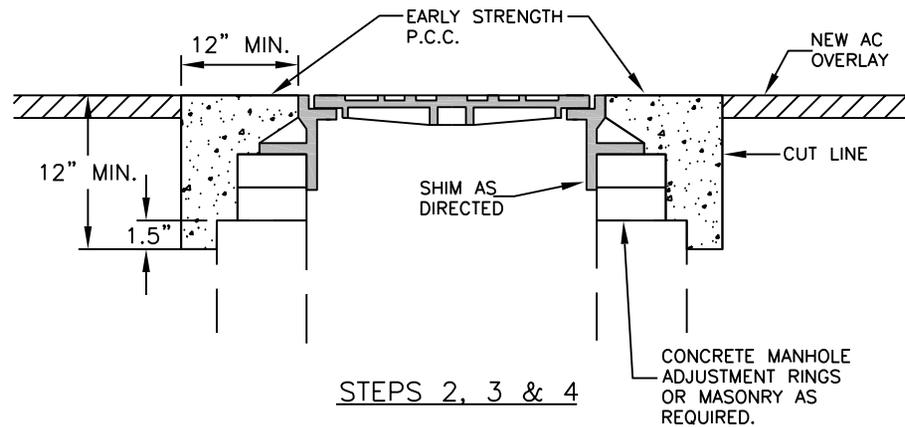
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**MANHOLE
FORCEMAIN CONNECTION**



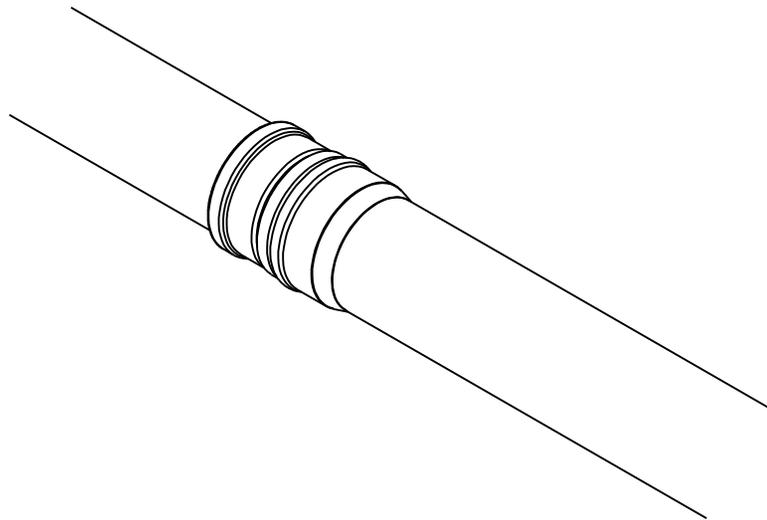
STEP 1

- STEP 1 COVER EXISTING MANHOLE WITH APPROVED MATERIAL AND CONSTRUCT OVERLAY ACROSS TOP OF MANHOLE.
- STEP 2 SAW CUT EXCAVATION AREA AROUND MANHOLE 12" MINIMUM FROM MANHOLE FRAME.
- STEP 3 RAISE MANHOLE FRAME RINGS TO FINISH PAVEMENT PROFILE AND CROSS SLOPE.
- STEP 4 BACKFILL WITH EARLY STRENGTH PORTLAND CEMENT CONCRETE (P.C.C.) TO DEPTHS AS DIRECTED.

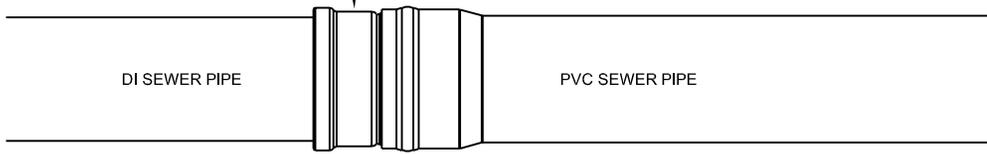


STEPS 2, 3 & 4

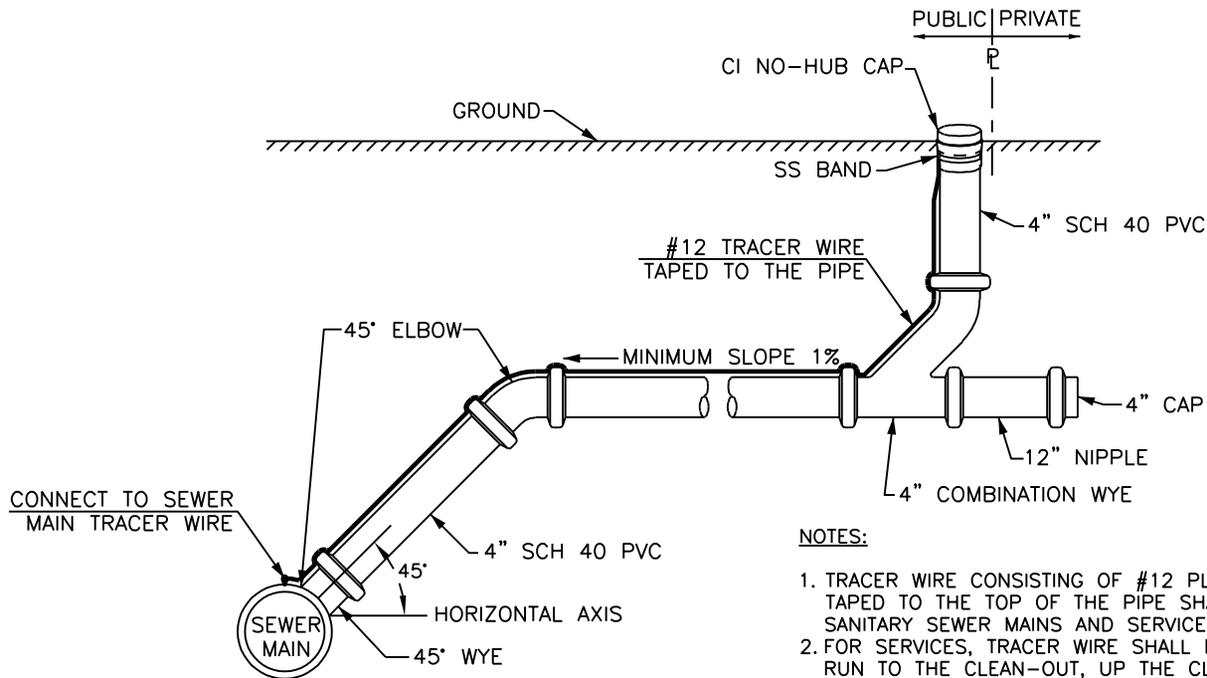
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ADAPTER COUPLING SWR x DIOD
HARCO PT # 2834
OR APPROVED EQUAL

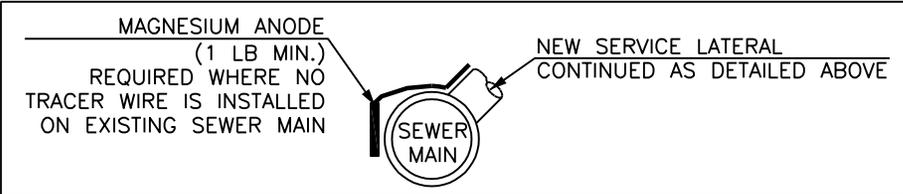


NOT TO SCALE



NOTES:

1. TRACER WIRE CONSISTING OF #12 PLASTIC COATED SOLID WIRE TAPED TO THE TOP OF THE PIPE SHALL BE INSTALLED ON ALL SANITARY SEWER MAINS AND SERVICES.
2. FOR SERVICES, TRACER WIRE SHALL BRANCH OFF AT THE WYE AND RUN TO THE CLEAN-OUT, UP THE CLEAN-OUT AND BE SECURED UNDER THE CAST IRON CAP. THE SERVICE CONNECTION WIRES SHALL BE CONNECTED TO THE MAIN LINE TRACER WIRE BY SPLICE (CRIMP STYLE) CONNECTORS.
3. THE TRACER WIRE SHALL REMAIN CONTINUOUS TO THE GREATEST EXTENT POSSIBLE. SPLICES IN THE TRACER WIRE SHOULD BE MADE WITH SPLIT BOLT CONNECTORS. WIRE NUTS SHALL NOT BE USED. A WATER-PROOF CONNECTION IS NECESSARY TO PREVENT CORROSION.
4. SERVICE LATERALS SHALL BE INSTALLED WITH A MINIMUM OF FOUR (4) FEET OF COVER AND A MINIMUM OF FIVE (5) FEET BELOW THE EDGE OF PAVEMENT, UNLESS OTHERWISE APPROVED BY THE OWNER/DEVELOPER.
5. PIPING FOR SERVICE LATERALS SHALL BE SCHEDULE 40 PVC EXCEPT FOR LATERALS OR SECTIONS OF LATERALS THAT HAVE LESS THAN TWELVE (12) INCHES OF COVER OR MORE THAN EIGHTEEN (18) FEET OF COVER. THE PIPE SHALL BE DUCTILE IRON PIPE FOR THE LATERAL OR SECTION OF LATERAL WITH LESS THAN 12 INCHES OR MORE THAN 18 FEET OF COVER.
6. ALL PVC SERVICE LATERALS SHALL BE INSTALLED USING CLASS B BEDDING. DIP SERVICE LATERALS SHALL USE CLASS C BEDDING.



NOT TO SCALE