Town of Winterville
North Carolina

Standard Specifications And Details

March 2023

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STANDARD SPECIFICATIONS AND DETAILS

Record of Revisions

- **Effective date of Standards: March 2021.**
  - **Additional standards incorporated into existing outdated document.**
  - **Jurisdictional Map Included herein.**
  - **Format changes to Section 4-6.**

- **Effective date of Amendment: August 2022**
  - **Town Council approved Administrative staff the authority to make necessary changes that will allow for the Manual to be implemented.**

- **Effective date of Amendment: March 2023**
  - **Additional standards incorporated into document.**
  - **Fire Turn Radius Section incorporated.**

INTRODUCTION

Part 1 General

1.01 Purpose of Manual

A. The purpose of this Manual is to provide a standard guideline to the contractor, developer and engineer for the design and construction of water and wastewater utility system extensions that will become a part of the Town of Winterville's water and wastewater systems. In addition, this manual also provides guidelines to the design and construction of stormwater drainage systems, pedestrian walkways, and roadway structures. This publication serves to consolidate the multitude of information on policy, design, materials, construction, and standard detail drawings used by the Town of Winterville.

B. The materials, design and construction standards contained within this Manual are established as the minimum for water and sewer extensions which will be accepted for ownership and maintenance by the Town.

C. It is the intent and purpose of this Manual to explain the requirements of the Town of Winterville relating to utility system extensions such that all can comprehend these requirements and to provide a consistent, orderly, and sound extension of the Town's utility systems.

D. Finally, this Manual contains the minimum design criteria for stormwater drainage and construction requirements for roadway designs, as well as standard details to be included on preliminary and final plats.

1.02 Organizations, Authority, and Responsibilities

A. <u>Town of Winterville</u>

1. The Town of Winterville is chartered by an act of the NC Legislature to provide public services to citizens and industry within the Town of Winterville and surrounding areas.
2. There are various utility systems operated by others throughout Pitt County including electrical, water and sewer, and gas. The areas served by the various utilities of the Town of Winterville are therefore not coterminous.
3. The Public Works Department has the responsibility to operate and maintain the streets, storm drainage, water and sewer systems and solid waste collection systems. The Public Works Department also handles issuance of permits for work within the streets.
4. The Development Review Committee is responsible for approval of all building inspections, S&EC permits, street and storm drainage design, commercial and industrial site development plans within the Town of Winterville Limits, and its Extra-territorial Jurisdiction. The Town Council is responsible for approval of all subdivisions. The Pitt County Inspections Department is responsible for the issuance of permits of actual building construction. The NC Department of Environmental Quality is responsible for issuance of sedimentation and erosion control permits.

5. The Town of Winterville Planning Department has the responsibility for ensuring zoning compliance and for approval of landscaping plans for all development which occurs within the Town of Winterville City Limits and it ETJ. The Town of Winterville Planning and zoning Board has the responsibility for recommendation of approval of all subdivisions including streets and drainage systems inside the Extraterritorial Jurisdiction and City Limits of the Town of Winterville and the Town Council is responsible for approval of all subdivisions within the Town of Winterville.
6. Town development shall be subject to requirements in this manual as all 3rd party developers, applicants, parties, etc.
7. The Building Inspection Department has the responsibility of inspecting the curb and gutter, sidewalk, and sewer cleanout box during Final Inspection for Certificate of Occupancy of structures once built.

B. Pitt County

1. Any zoning ordinances applicable to the County are administered by the County Engineering and Planning Department.

C. NC Department of Transportation (NC DOT)

1. NC DOT is the permitting authority of which the approval must be gained for projects including, but not limited: water, sewer, gas, electric, storm drainage, sidewalks and roadways occurring within NCDOT right-of-way and legal authority.

D. Greenville Utilities Commission (GUC)

1. The Greenville Utilities Commission is one of the three utility service providers adjacent to the Town of Winterville. GUC has the responsibility for approval of all subdivisions including water, sewer, electric, and natural gas services within their respective service areas within Pitt County. However, this authority may extend to within the municipal limits of some of the smaller municipalities that have delegated their responsibility to GUC.

E. Bell Arthur Water Corporation (BAWC)

1. The Bell Arthur Water Corporation is one of the three utility service providers adjacent to the Town of Winterville, specializing in drinking water utilities. Their service area extends from one mile past the Edgecombe County line (northwestern point) to West W. Gaskins Road in Grifton (southern point). Bell Arthur Water Corporation also serves the area between Hwy 11 (eastern point) to Langston Cross Roads on Hwy 13 (western point). The BAWC has the responsibility for approval of the water services of all subdivisions within this service area. However, this authority may not fully extend to every service within their municipal limits as they may have delegated their responsibility to GUC in some areas.

F. Eastern Pines Water Corporation (EPWC)

1. The Eastern Pines Water Corporation is one of the three utility service providers adjacent to the Town of Winterville, specializing in drinking water utilities. The EPWC has the responsibility for approval of the water services of all subdivisions within this service area. Extending from the western boundary of the City of Greenville and Winterville ETJ, their utilities are bounded by the Tar River on the north and the Lenior County line to the south with the western boundary largely aligning with Blackjack Simpson Road. However, this

authority may not fully extend to every service within their municipal limits as they may have delegated their responsibility to GUC in some areas.

1.03 Definitions and Abbreviations

A. Definitions: Wherever used in this Manual the following terms shall have the meanings indicated which shall be applicable to both the singular and plural thereof. There are other terms used in this document which are defined in the sections to which they apply.

1. **Approved Plans** – Water system, sewer system, stormwater and/or roadway extension and design plans which have been reviewed by and received the approval of the Town of Winterville and the appropriate state and local agencies.
2. **Contract Documents** – The term "Contract Documents" shall refer to the project plans and specifications for water system, sewer system, stormwater and/or roadway extensions and designs.
3. **Contractor** – The person, business, or corporation responsible for the performance of water, sewer, stormwater, or roadway system construction work.
4. **Town Engineer** – The term "Town Engineer" or “Town Consultant” refers to a Professional Engineer on the staff of the Town of Winterville.
5. **Developer** – The person(s) or corporations financially responsible for the design and construction of a development for which water, sewer, stormwater, or roadway service by the Town of Winterville will be requested.
6. **Engineer** – The Professional Engineer responsible for the design or construction administration of a water system, sewer system, stormwater and/or roadway extensions and designs.
7. **The Professional Engineer** – A person who has been duly registered and licensed as a Professional Engineer by the North Carolina State Board of registration for Professional Engineers and Land Surveyors.
8. **Manual** – The term "Manual" shall refer to all applicable standards, specifications, standard details, and policies contained in or referenced by this document.

B. Abbreviations

1. AASHTO – American Association of State Highway Transportation Officials
2. ANSI – American National Standards Institute
3. ASTM – American Society for Testing and Materials
4. AWWA – American Water Works Association
5. DEQ – Department of Environmental Quality
6. GUC – Greenville Utilities Commission
7. NCDEH – North Carolina Division of Environmental Health
8. NCDOT – North Carolina Department of Transportation
9. NCDWQ – North Carolina Division of Water Quality

C. Standards

1. Where reference is made by this Manual to published standards such as ASTM, ANSI, AWWA, etc., the latest revisions of such standard shall apply.

Part 2 Guidelines for the Construction Phase

2.01 General

A. This section shall describe certain conditions and requirements of the Town of Winterville concerning water and wastewater system extension construction, as well as street and storm drainage improvements, which shall be addressed in all Contract Documents receiving the approval of the Town of Winterville.

2.02 Preconstruction Conference

A. Prior to commencing any water or sewer extension construction work, the Town Engineer shall be contacted to schedule a preconstruction conference. No construction shall occur until after the preconstruction conference is held. As a minimum, the Engineer and the Contractor shall attend the preconstruction conference. Prior to the scheduling of the preconstruction conference both the "pigging" plan and the executed "Indemnification and Hold Harmless Agreement" shall be submitted and approved by the Town of Winterville.

2.03 Utilities Location Services

A. NC One Call Center shall be contacted a minimum of seventy-two (72) hours prior to any excavation. The utilities contacted shall have the opportunity to take the steps which they deem necessary to protect their utilities. The Contract Documents shall note that utilities location by NC One Call Center is not valid after the expiration of a ten (10) day period beginning on the date of such location.

2.04 Normal Work Hours

A. Unless approved otherwise by the Town of Winterville, all construction shall be performed during the regular office hours of the Town of Winterville, i.e. 8:00 a.m. to 5:00 p.m. After hours, holiday, or weekend work should include only such tasks that do not require observation by the Town of Winterville's Representative. Under certain conditions, the Town of Winterville may agree to provide construction observation after hours or on weekends and holidays. The Contractor shall bear the costs of provision of such construction observation.

2.05 Operation of Existing Facilities

A. The Contractor performing water or sewer extension work shall contact the Town Engineer or the Public Works Supervisor whenever operation of the Town of Winterville's valves or hydrants is necessary to request scheduling of such operation. The Town of Winterville shall require the contractor to estimate the length of time service will be interrupted and the number of customers to be affected.

B. Facilities and equipment belonging to the Town of Winterville may not be operated or adjusted without the express permission of the Town of Winterville's Representative. In the case of any emergency, the Contractor shall be allowed

to take such steps with valves and hydrants as necessary for the protection of life and property.

C. Valves which control networks not yet accepted but which are connected to the existing system shall be considered system valves. Valves within a network not yet accepted and which do not control the flow of water between new and existing systems are not considered system valves and do not require permission to operate.

D. Notification to the Town of Winterville must be made by the Contractor upon breakage of any Town of Winterville maintained water or sewer line or appurtenance thereof. Repair of the Town of Winterville's facilities shall be made by the Contractor upon approval of the Department Engineer. Any repairs made with Town of Winterville forces will be billed to the Contractor at cost.

E. Where interruption of service is required, the Town of Winterville shall be notified to request approval and subsequent scheduling of such interruption. The Town of Winterville shall notify the affected customers should the interruption be approved. A minimum (forty-eight) 48-hour notice shall be given to the affected customers.

2.06 Quality Control

A. General

1. In order to ensure that water and sewer system extensions are constructed in accordance with the standards of the Town of Winterville; testing, inspection, and surveying for construction work shall meet the requirements set forth herein.

B. Materials Testing

1. All materials testing and testing equipment and procedures shall be in accordance with the applicable industry standards.

C. Inspection Services

1. The Developer shall provide complete engineering services, including design, survey and grade control, and construction observation. These services shall be rendered by competent, experienced, personnel with a clear understanding of the work at hand. The Town of Winterville's Representative shall periodically observe the work while the construction is in progress. It shall not be the duty of the Town of Winterville's Representative to supervise construction, establish grades, or to provide solutions to grade, construction, or design problems. The Developer shall ensure that the installation of the water or wastewater system extensions is in accordance with the approved Contract Documents. Failure of the Town of Winterville's Representative to discover deficiencies at the time of construction shall not relieve the Developer of responsibility to correct such defects. Each construction crew of the Contractor shall always have a set of Contract Documents bearing the Town of Winterville's stamp of approval at the project site.
2. Contractors must provide assistance with opening material (i.e manholes, water boxes, valve boxes, storm drains, etc.) during the Final Inspection and any walk throughs done during the construction time frame.

D. Construction Staking

1. The Contract Documents shall require that construction staking be performed by a Registered Land Surveyor at least twenty-four (24) hours and three hundred feet (300') in advance of construction and shall identify the party responsible for payment for same.
2. The Drawings shall identify the permanent baseline and all references from which dimensions are to be measured. In addition, benchmarks shall be shown on the drawings as required by **Part 3.05 of Section 1 or Section 2** of this manual.
3. Staking
    a. The Contract Documents shall require stakes or hubs at the following locations: Along the centerline of proposed water lines, at all points of horizontal curvature and tangency and at maximum intervals of one hundred feet (100') in tangent sections and twenty-five feet (25') in curved sections.
    b. In addition to (1) above, the Town of Winterville reserves the right to require that the centerline of proposed water lines be marked by a continuous paint stripe where there is concern for the quality of work being provided.
    c. At offsets out of the way of construction operations for each point on the centerline required by (1) above.
    d. At all valves, fittings, hydrants, air release valves, cleanouts, water meters and other appurtenances. Such stakes shall have offsets out of the way of construction.
    e. Hubs shall be provided for all pump station plot property or easement corners and at the wet well and valve vault locations.
    f. Hubs shall be provided at all manhole locations. Each hub shall have a guard stake indicating the manhole number and station number and shall have an offset out of the way of construction.
    g. The Contract Documents shall require the Contractor to stake the easement line location when requested to do so by the Town of Winterville.

2.07 Project Close-Out

A. Pre-Final Inspection

1. Upon completion of construction, the Contractor or Developer shall contact the Town of Winterville's Representative to schedule a pre-final inspection. At the scheduled pre-final inspection, the Town of Winterville's Representative shall perform a visual inspection of the work in the presence of the Contractor. Any deficiencies discovered shall be recorded by the Town of Winterville's Representative and the Contractor. Any defective items noted shall be corrected prior to the final inspection.

B. Final Inspection

1. Upon completion of the items on the pre-final punch list, the Contractor or Developer shall contact the Town of Winterville to schedule the final inspection. The final inspection will not be scheduled until the following requirements are met:

a. The work shall be in accordance with the requirements of the Town of Winterville.

b. A copy of the final estimate has been submitted and approved by the Town of Winterville.

c. The easements and dedicated property required for the work by this Manual have been obtained and are recorded at the Register of Deeds.

d. The as-built plans for the work have received the approval of the Town Engineer.

e. All fees applicable to the project have been received by the Town of Winterville.

f. When a project includes sewer system extensions, the Town of Winterville has received certification by a Professional Engineer stating that the sewer system installation conforms with the requirements of the approved Contract Documents as required by the DEQ regulations (G.S. 143-215.1).

g. When a project includes water system extensions, the Town of Winterville has received certification by a Professional Engineer stating that the water system installation conforms with the requirements of the approved Contract Documents as required by the DEQ regulations (G.S. 130A-315; 130A-317).

2. At the scheduled final inspection, the Town Engineer or his Designated Representative shall perform a visual inspection in the presence of representatives of the Contractor and the Engineer. The Engineer or his representative shall prepare a detailed punch list of any deficiencies discovered and provide copies to the Developer, Contractor, and the Town of Winterville. Any defective items noted shall be corrected prior to acceptance.

3. No service shall be provided prior to project acceptance.

C. As-Built Drawings

1. No Service shall be provided until after the as-built plans are reviewed and accepted. The initial submittal shall consist of two (2) prints. Upon approval, the Contractor shall submit to the Town either a mylar reproducible or a digital copy of the approved as-built drawings. One (1) print of the final as-built drawing shall also be provided. The as-built shall include both water and sewer combined on each drawing. The sewer as-built shall include plan and profile. The Contractor shall submit two (2) prints of the as-built drawings with each partial pay estimate to the Owner's engineer. The minimum sheet size for as-built drawings shall be 18” x 24”.
2. The Town shall require at least two (2) weeks from date of receipt to complete its review and a reasonable time for review of any resubmittals.
3. The scale for as-built plans shall be the same as that of the construction plans.
4. Revised construction plans are acceptable if standard drafting techniques and practices are followed.
5. If the project has developed in phases, all lines should be clearly indicated and the title block of the plan sheets shall indicate the phase number and section number (where applicable) and all building units/lots being served with the particular phase being submitted. Lots and building unit numbers must reflect

the numbers that will later accompany the service application (request for service).

6. The as-built drawings shall show the location by station number, referenced to the downstream manhole, and the length of all services and shall indicate by lot, unit number or address of the unit which each connection will serve.
7. The plans shall indicate street names, pavement widths, rights-of-way, and easements.
8. Apartments, condominiums, and other developments with walkways and off-street parking shall have these facilities shown on the as-built drawings.
9. New water lines shall be located by horizontal dimensions from highly visible, permanent, fixed objects; such as the back of the street-curb and gutter, the edge of a walkway, street centerline, etc.
10. Valves shall each be located by reference to two (2) permanent, visible objects, such as right-of-way monuments, fire hydrants, manholes, catch basins, etc.
11. Indicate the type and size of each water line, sewer line, and service installed.
12. Station numbers identifying location of services, fittings, crossings, etc., shall begin at zero at each in-line valve. The distance between valves shall be shown.
13. Where more than one (1) type of material is used for water or sewer pipe, note the station of change from one material to another at the beginning of each change.
14. Designate on the as-built drawings if metallic detectable tape has been installed.
15. All appurtenances of water mains and force mains such as valve boxes and blow-offs shall be provided with station numbers. Indicate by station the location of all fittings for water mains and wastewater force mains.
16. Lengths of gravity sewer between manholes shall be shown on the drawings. The plan section should indicate lengths as measured horizontally between manhole centerlines. The profile section should indicate grades as measured from inside manhole wall to inside manhole wall (invert out to invert in).
17. The actual elevation, based on USGS datum only, of manhole tops, inverts (including services and taps) and the actual gravity sewer slopes shall be shown.
18. Sewer services are to be stationed from the center line of the downstream manhole ring and cover.
19. All privately owned sewer and water lines shall be indicated “as private”.
20. As-built drawings shall be prepared by and bear the seal and signature of a Professional Engineer.
21. The recorded plat or standard easement forms conveying easements and rights-of-way for the property to be served shall accompany the as-built drawings. Drawings submitted without the required plat or easement document will be returned as incomplete.

2.08 Contractor's and Developer's Bill of Sale

A. The Town of Winterville will not accept any new water or sewer system extensions until the Developer has submitted an executed Bill of Sale. Blank copies are available from the Town of Winterville.

2.09 Satisfactory Completion

A. If all required documentation has been obtained and the final inspection by the Town of Winterville reveals no defects in materials or workmanship, the Town of Winterville may issue a Certificate of Satisfactory Completion. The Town of Winterville shall be responsible for the general maintenance of the water and sewer system from the date of issuance of the Certificate. All damages occurring to the work prior to issuance of the Certificate shall be repaired by the Contractor at no expense to the Town of Winterville.

2.010 Warranty

A. The Developer shall warrant the project work to be free of defects in materials and workmanship for a period of one (1) year from the date of the Town of Winterville's acceptance of the water or sewer system for permanent operation and maintenance.

Part 3 Preamble to Water and Sewer Systems

3.01 Initial Conference

A. Prior to finalizing any plans for water or wastewater system extensions, the Developer or his Engineer shall consult the Town Engineer so that he may determine if an initial conference will be necessary prior to the submission of plans for approval. If the scope of the proposed development, in the opinion of the Town Engineer, is such that an initial conference will be beneficial prior to the development of final plans and specifications, the Developer or his Engineer will request scheduling of an initial conference. The Developer or his Engineer shall present, at the time of this conference, conceptual schematics or layouts of the proposed extensions and the estimated water and wastewater demands resulting from the proposed development. The Developer or his Engineer shall also provide the Town of Winterville with all other information necessary to determine the probable effect of the proposed development on the Town of Winterville's existing facilities. This data shall include a projected cost estimate of the extensions, the nature of water usage (domestic, commercial, etc.), the probable character of the wastewater generated, a description of any proposed private water distribution and sewer collection systems, and other pertinent information.

B. The Town Manager and his/her staff will take under study and consideration the proposed plans and decide if, in the best interest of the Town of Winterville, the plan is satisfactory as presented, needs to be revised, or is not at the present time feasible.

3.02 Pre-Application Package

A. When required by the Town, the Town Engineer shall file a pre-application package with the Town Manager. The purpose of the pre-application package is to present to the Town Manager and his staff sufficient and detailed information concerning the proposed water and sewer extensions and to permit the determination of their compatibility with and impact upon the overall Town's water and wastewater systems. The pre-application package shall include the following information and any other information deemed necessary by the Town Manager and his/her staff to enable them to make a determination of the acceptability of the proposed plans. All information shall be submitted to the

Town Manager and his/her staff in a package and not in a "piece-meal" manner. After review of the entire pre-application package, the Town Manager will advise the applicant if the proposed project is acceptable to the Town.

1. Conceptual Plans
   a. The applicant shall submit two (2) copies of subdivision plans or site plans at a scale of 1-inch equals 400 feet (or larger scale) showing the proposed layout of the water, and sewer extensions. The conceptual plans should show all proposed pipelines and sizes, manholes, valves, fire hydrants and pump stations and the nearest existing water and sewer facilities to which the proposed new extensions will connect. All proposed easements shall be shown.
2. Design
   a. The applicant shall submit in his pre-application package preliminary engineering design calculations used to determine line and pump station sizes and fire protection requirements including expected initial and future populations to be served.
3. Estimated Time Schedules
   a. The applicant shall submit in the pre-application package estimated time schedules identifying the expected dates of completion of the final plans and specifications and expected beginning and completion dates of construction.
4. Projected Cost Estimate
   a. The applicant shall submit in the pre-application package a cost estimate prepared by an engineer for the proposed water and sewer extensions. The cost estimate shall be as detailed as possible with estimated quantities of specific items of work and their projected unit costs.

3.03 Required Fees and Charges

A. The Developer and his Engineer shall thoroughly familiarize themselves with the fees and charges established by the Town of Winterville. Based upon the submittal of the pre-application package, the Town Manager and his/her staff shall determine and furnish the applicant in writing the estimated fees and charges relating to the proposed water and sewer extensions. A final value of the fees and charges will be determined by the Town Manager and his/her staff upon approval of the plans and specifications.

3.04 Requirements for Planning Board Approval

A. The Town of Winterville shall require approval of a proposed development by the Town of Winterville Council, whichever has jurisdiction for the proposed development site, prior to acceptance of Contract Documents for review and approval.

END OF INTRODUCTION

SECTION 1: SANITARY SEWER SYSTEM

Part 1 General

1.01 Section Includes

A. Work under this section includes, but is not limited to piping, valves, pumps, generators, and appurtenances for a complete sanitary sewer collection system.

B. The Engineer and Developer shall become familiar with the sewer extension policies of the Town of Winterville prior to making conceptual plans for developments which will require sewer service by the Town, and in particularly to the policy in regard to sewer extensions.

C. It shall be the responsibility of the Engineer or Developer to obtain the approval of the Town of Winterville Council any proposed projects under their respective jurisdiction prior to submission of Contract Documents for Town approval.

Part 2 Design Considerations

The purpose of this part is to provide the Developer or Engineer with a guideline to assist in the development of plans and specifications for sewer system extensions which will meet the requirements and objectives of the Town of Winterville. As a minimum, the Contract Documents for any proposed extension must address satisfactorily the topics contained herein.

Private sewer collection systems shall be designed and constructed in accordance with the standards and requirements of the NCDWQ. In addition, all private sewer mains which connect to the Town of Winterville's system shall be tested in accordance with the requirements of **Part 2.04 of Section 1, Sanitary Sewer System**.

2.01 Location and Alignment

A. Depth of Cover

1. Sanitary sewers shall have a minimum cover of three feet (3') as measured from the top (crown) of the pipe to the finished grade. Where this requirement is impossible to meet, special precautions such as the use of ductile iron pipe shall be taken to insure protection of the sewer from physical damage. The Town of Winterville shall determine the acceptability of such installations.
2. Wherever feasible, gravity sewer shall be installed at such depths as required to allow all discharges to the sewer system to occur without the use of pump stations.
3. As required by the Town of Winterville, all sewers will be installed at the maximum depth in order to allow for maximum service area.

B. Relationship of Mains to Property Lines and Rights-of-Way

1. All sanitary sewers shall be located within dedicated rights-of-way or permanent sewer easements such that the Town of Winterville has unrestricted access to the line and all appurtenances thereof.
   a. Approval of sanitary sewer extension plans shall be contingent upon procurement of the easements and encroachment agreements necessary

to meet this requirement. See **Part 3.06 of Section 1, Sanitary Sewer System**, for the requirements for submission of easement documents.

b. Sanitary sewers shall be centered in a permanent easement of adequate width to allow excavation and maintenance of the line. In no case shall the permanent easement for sewers be narrower than that given by the following table (Table 1-1):

Table 1-1
Minimum Cover Depth and Easement Widths

Sewer Type	Depth of Cover (feet)	Minimum Easement (feet)
Force Main	All	10
Gravity Sewers	0 to 6	20
	> 6 to 15	30
	> 15	40

c. Wider permanent easements may be required by the Town of Winterville where, in the opinion of the Town Engineer, conditions warrant. Such easement shall be centered on the main.

2. In order to provide instances for future extension, developers must extend sewer mains to the end of dead-end streets within their subdivisions.

C. Relationship of Sanitary Sewers to Water Mains and Wells

1. Sewer mains shall be laid at least ten feet (10') laterally from existing or proposed water mains, unless local conditions or barriers prevent a ten-foot (10') lateral separation, in which case:

   a. The sewer main shall be laid in a separate trench, with the elevation of the top of the sewer main at least eighteen inches (18") below the bottom of the water main; or

   b. The sewer main shall be laid in the same trench as the water main with the sewer main located at one side on a bench of undisturbed earth, and with the elevation of the top of the sewer main at least eighteen inches (18") below the bottom of the water main.

2. A sewer main that crosses a water main shall be laid to provide a minimum vertical distance of eighteen inches (18") between the outside of the water main and the outside of the sewer main. The water main may either be above or below the water main but, if practicable, the water main shall be located above the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.

3. All sewers shall be located a minimum of one hundred feet (100') away from any well. In those cases where a sewer is located within one hundred feet (100') of a well, ductile iron pipe with mechanical joints shall be specified. In no case shall a sewer be located within fifty feet (50') of a well.

D. Relationship of Sanitary Sewers to Structures and Pipes

1. Sanitary sewers shall not be installed within twenty feet (20') of any part of permanent buildings or other structures.
2. Except by special consent of the Town of Winterville, the lateral separation between gravity sewer, storm sewers and force mains shall not be less than ten feet (10').
3. When underground structures or storm sewers are encountered, twenty-four inches (24") of vertical separation shall be maintained. Where the minimum separation cannot be maintained, the location and the corrective action specified shall be shown on the plans so that the Town of Winterville may determine the acceptability of the planned corrective measures.
4. When a sanitary sewer must be installed under a storm sewer and twenty-four inches (24") of vertical separation cannot be obtained, ductile iron pipe shall be specified and blocking supports shall be provided for the storm sewer in accordance with the Standard Details.

E. Relationship of Sanitary Sewers to Impoundments and Creeks

1. Sanitary sewers shall not be installed under any part of Impoundments.
2. Sanitary sewers (including manholes) shall be located such that their centerlines are a minimum of forty feet (40') from the top of the nearest bank of adjacent streams, creeks, ditches, etc. This distance shall be increased by the Town of Winterville as it deems appropriate if the bank shows evidence of instability. If documentation satisfactory to the Town of Winterville is provided which demonstrates that the sanitary sewer can be more closely located to a particular drainageway without detrimental consequences, the Town of Winterville may agree to permit this.
3. Whenever practical sanitary sewers shall be protected from inflow of stormwater runoff by locating manholes in areas which are not subject to flooding. When manholes must be constructed in areas subject to flooding, the elevation of the manhole top shall be two feet (2') above the elevation of the one-hundred (100) year flood elevation or the manhole ring and cover shall be watertight and vents shall be provided at intervals no greater than 1,000 feet. The vents shall extend a minimum of two feet (2') above the elevation of the one hundred (100) year flood. Manholes which are subject to being pressurized by surcharging or which are likely to be vandalized shall have mechanically restrained covers. Manholes having restrained, watertight covers which are subject to pressurization by surcharging shall be designed to withstand the maximum potential surcharge without damage. For design purposes, the maximum potential surcharge shall be that surcharge which would result from a prolonged outage of the nearest downstream pump station.

F. Manhole Location and Grade

1. The maximum distance between manholes measured horizontally along the centerline of the gravity sewer shall be 425 feet.
2. Manholes shall be provided at all horizontal and vertical changes in alignment of a gravity sanitary sewer.
3. Any changes in the nominal pipe diameter of a gravity sewer must be accomplished by installation of a manhole.

4. Manholes installed in pavement shall have their cover set flush with finished grade and be located outside of designated parking spaces. Whenever practical, manholes located in streets shall be located in the center of the street.
5. The minimum elevation difference between the "invert in" and the "invert out" of manholes shall be 0.1'. Exceptions are 1) when there is a change in flow direction of greater than 90 degrees the minimum difference shall be 0.2', and 2) when pipes of different sizes converge in a manhole, the inside tops of the pipes shall be at the same elevation.
6. The elevation difference between the "invert in" and invert out" of manholes shall be either (1) < 0.5' or (2) > 2.5'. Manholes having pipes entering at elevations > 2.5' above the outlet shall be drop manholes. Manholes shall not be designed utilizing a difference in invert elevations between 0.5' and 2.5' except as follows. A difference in the "invert in" and the "invert out" elevations of up to 1.0' will be allowed in instances where there is sufficient justification, the incoming sewer is installed at a grade which exceeds the minimum by at least 50% and a smooth flow path is constructed between the influent and effluent piping.
7. Where a natural slope will permit the use of a sewer grade in excess of the NCDWQ minimum slope, as long as the extra slope does not decrease the sewershed or when approved by the Town, the Engineer shall use the available grade to increase the slope of the gravity sewer rather than designing for the minimum slope with large invert drops. The use of invert drops greater than 0.5' shall be unacceptable (except as provided in **Subsection 6 in Part 2.01F**) where the line may be steepened to absorb all or a portion of the excess grade without exceeding the maximum slope allowable by the NCDWQ.
8. Invert drops shall be accomplished by providing an invert channel of constant slope which meets the elevations of the influent and effluent pipes.

G. Location of Sewer Services

1. Plans for projects which propose the creation of lots shall include the provision of individual sewer services to each lot including any residual parcels and areas reserved for future lots. The size and location of services shall be based upon the anticipated use of the lot and require the Town of Winterville's approval.
2. Services shall be installed at right angles to the gravity sewer. The maximum cleanout spacing as measured along the service line centerline shall be seventy-five feet (75') for four-inch (4") and six-inch (6") services.
3. The service cleanout shall be placed at the right-of-way limit, or edge of the easement, five feet (5') downstream (with respect to sewer flow) of the water meter unless otherwise directed by the Town of Winterville. All residential services get boxes once the structure is built.
4. When project design dictates that electric cables are to be placed on the same side of the roadway with the sidewalks the cleanout for that side shall be placed 6" behind the edge of the sidewalk.
5. Cleanouts shall be installed with a sewer cleanout box set to finished grade as shown in the Standard Details.
6. Inverts of services discharging into manholes shall be shown on the plans.

7. Sewer services that include discharges from car washes and similar facilities shall include an oil and sand separator in accordance with the plumbing code.
8. Grease interceptors shall be required for food service facilities in accordance with the Standard Details.
9. Sewer services that include flow subject to Winterville and CMSD pretreatments requirements shall be required to maintain all equipment and methods pertinent to satisfy the requirements for continued discharge compliance.

H. Location of Force Main Appurtenances

1. Automatic air-release valves as specified in **Part 4.04D of Section 1, Sanitary Sewer System**, shall be located at all peaks of wastewater force mains A peak shall be defined as the point of maximum elevation of the force main invert which slopes upward toward the hydraulic grade line. If possible, force mains should be designed without high points and with the top of the force main below the hydraulic grade line at the minimum pumping rate so that air release valves will not be needed. If elimination of high points is not feasible, a manual air-release valve should be installed at each significant high point where air could become trapped. A high point may be considered significant if it is two feet or more above the minimum hydraulic grade line or when pumping is intermittent above the static head line.
2. The maximum interval between air release valves should not exceed 1,500 feet as measured horizontally along the pipe centerline.
3. Where the invert elevation of a force main exceeds the hydraulic grade line, the Engineer shall ensure that the force main pipe is of sufficient strength to withstand the internal vacuum which will exist in the line during maximum service discharge. Upon request, the Engineer shall supply the Town of Winterville with documentation demonstrating that the deflection of the pipe due to vacuum will not cause leakage.
4. Air release valves for wastewater force mains shall be installed in standard manholes as shown in the Standard Details.
5. Install tracer wire for non-metallic pressure pipe. Bury tracer wire with pipe. Wire shall be looped into valve boxes to allow access for direct contact location. Tracer wire shall be #12 solid copper wire. All connections shall be by wire nuts and taped. Splices in tracer wire are to be kept to a minimum and joined with copper split nuts of appropriate size.

2.02 Sizing of Sewer Mains and Appurtenances

A. Sizing of Gravity Sewers

1. The minimum gravity main size shall be 8 inches nominal inside diameter. Unless otherwise directed or permitted by the Town of Winterville, all gravity sewers shall be designed and sized to serve the entire natural drainage basin area which is adjacent to the route of the proposed main, (i.e. the gravity main shall be of sufficient size and placed on an adequate grade to allow extension to the natural basin ridge line).
2. Sanitary sewer design capacity for extensions serving dwelling units shall be based upon a wastewater discharge of 120 gallons per day per bedroom. The minimum design discharge per dwelling unit shall be 240 gallons per day.

When the occupancy of a dwelling unit exceeds two (2) persons per bedroom, the volume of sewage shall be determined by the maximum occupancy at a rate of sixty (60) gallons per person per day. Selection of design capacity for sanitary sewers shall be in accordance with the latest NCDWQ guidelines.

3. Sanitary sewer design for non-residential developments shall be in accordance with the latest NCDWQ guidelines and shall be subject to the approval of the Town of Winterville.
4. The following table (Table 1-2) shall be used to obtain design flows for areas without existing development. Table 1-2 is intended only as a minimum design standard for the classification listed. The Engineer shall be responsible for insuring that the design discharges utilized in sizing sewer collection facilities are adequate for the area which the extension is to serve.

Table 1-2
Average Design Sewer Discharges for Undeveloped Residential, Commercial and Industrial Areas

Residential at 80 qpcd	**GPD/Ac**
High Density – 12 persons/acre	960
Medium Density – 10 persons/acre	800
Low Density – 7 persons/acre	560
Commercial	880
Industrial (within and adjacent to existing Industrial Park)	1600
Other Industrial Areas	500

5. Gravity sewers shall be sized to carry average design discharge at one-half full flow. Gravity sewers shall also be evaluated as to their ability to carry the peak design (average design discharge X 2.5) at full flow.
6. The slopes of sanitary sewers shall, whenever feasible, exceed the NCDWQ minimum requirements by a factor of 1.5. The NCDWQ minimum slopes for sanitary sewers shall be used only when necessary to serve the required area without the use of a pump station or when other factors make steeper slopes impossible or infeasible. The Engineer shall in all cases strive to use the steepest available slope in the upper reaches of collection systems where further extension is not possible due to topography or other circumstances.
7. Gravity sewers shall be designed to provide mean velocities, when flowing full, of not less than 2.0 feet per second, based on Manning's formula using an "n" factor of 0.013 provided however; that the minimum slopes which shall be used are as set forth in Table 1-3.

Table 1-3 NCDWQ Minimum and Maximum Design Slopes for Gravity and Sanitary Sewers		
Pipe Diameter (inches)	**Minimum Slop**	**Maximum Slope**
4	1.0%	NA
6	0.60%	NA
8	0.40%	8.2%
10	0.28%	6.1%
12	0.22%	4.8%
14	0.17%	3.9%
15	0.15%	3.5%
16	0.14%	3.3%
18	0.12%	2.8%
21	0.10%	2.3%
24	0.080%	1.9%
27	0.067%	1.6%
30	0.058%	1.4%
36	0.046%	1.1%

8. Construction Tolerances/Acceptance of Sewer Lines

   a. The Town of Winterville recognizes that a good portion of projects designed in its service area are in flatlands with little or no natural fall to allow design at greater than NCDWQ minimums. Therefore, acceptable grade tolerances after installation have been established based on the Manning formula utilizing an “n” factor of 0.013 and a required flow velocity of 2 feet per second and are shown on Table 1-4.

   b. Table 1-4 establishes grades as follows:

      1) A minimum grade that is acceptable without removing the installation or paying the Town a maintenance fee.

      2) A minimum grade that is acceptable without removing the installation but requiring payment of a maintenance fee.

      3) A maximum above the design grade which is acceptable without payment of a maintenance fee. Installations on grades steeper than the maximum above the design grade will require payment of a maintenance fee for loss of usable grade.

   c. Maintenance fee calculations are based on the number of miles of collector lines on our system and the cost of maintenance of these lines on a per foot basis.

Table 1-4 Winterville Acceptable Grades After Installation				
(1) Line Size	**(2) % Design Grade**	**(3) % Min. Grade w/o Maintenance Charge**	**(4) % Min. Grade with Maintenance Charge**	**(5) % Grade Above Design Grade w/o Maintenance Charge**
8”	0.40	0.36	0.33	0.42
10”	0.28	0.27	0.25	0.29
12”	0.22	0.21	0.19	0.23
14”	0.17	0.16	N/A	0.18
15”	0.15	0.14	N/A	0.16
10”	0.28	0.27	0.25	0.29

Notes for Table 1-4:

1) *8” – 12" lines installed flatter than minimum grade shown in Column 4 must be replaced.*
2) *14” and 15" lines installed flatter than minimum grade shown in Column 3 must be replaced.*
3) *Column 5 will apply in areas where future line extensions are feasible and usable grade has been lost due to increased slope.*

9. Construction Tolerances/Manholes

   a. The as-constructed pipe inverts at manholes shall be within 0.05 feet (plus or minus) of the elevations shown on the plans. In the determination of compliance of a sanitary sewer project with established tolerances, the more restrictive of **Subsections 8 and 9 of Part 2.02A** shall apply.

B. Sizing of Wastewater Force Mains

1. The minimum force main size shall be four inches. Force mains shall be sized such that the average velocity of flow for the pump design discharge is not less than 2.0 feet per second.
2. Unless otherwise permitted by the Town of Winterville, the friction losses due to the force main shall be calculated using the Hazen-Williams formula with a friction factor (C) of 120.

C. Sizing of Wastewater Pumps and Wet Wells

1. Pumps specified for installation in duplex pump stations shall be sized such that each pump is capable of individually pumping the peak discharge (2.5 x average design inflow) as calculated for the gravity sewer collection system(s) contributing to the system.
2. Where existing sewers will discharge to the proposed pump station, the design discharge attributable to the existing sewers shall be calculated using the same criteria for new gravity sewers as given in **Part 2.02A of Section 1, Sanitary Sewer System**.
3. Wet wells shall be sized such that 2-8 pump-on/pump-off cycles (pump starts) occur during each hour at average design sewage inflow.

D. Gravity Flows versus Pump Stations

1. Because pump stations are: (1) inherently less reliable, (2) more expensive to operate and, (3) more likely to cause environmental problems than gravity sewers, they shall be incorporated into the design of a project only as a last resort. Projects utilizing pump stations or creating a future need for pump stations will not be approved unless documentation satisfactory to the Town of Winterville is submitted justifying the installation of a pump station in lieu of a gravity sewer. In situations where no reasonable alternative exists the Town of Winterville may approve the installation of a pump station, provided the area served by gravity sewers has been maximized. In situations where a gravity sewer is not available, the Town of Winterville may approve the installation of a privately owned and maintained pump station and force main.
2. The documentation submitted for pump stations must include the following:
    a. An analysis demonstrating that the receiving sewers have adequate capacity to carry the projected discharge in accordance with **Part 2.02A of Section 1, Sanitary Sewer System**. The analysis must also include the identification of any uncommitted capacity remaining.
    b. A cost/benefit analysis which includes initial costs and projected operation and maintenance costs which clearly indicates that a pump station is less expensive than a gravity collection system.
3. The Town of Winterville may agree to accept ownership and maintenance of pump stations designed and constructed to the standards set forth in this Manual subject to the following conditions:
    a. The necessary documentation described in **Subsection 4 of Part 4.05 of Section 1, Sanitary Sewer System**, must be provided to the Town of Winterville.
    b. The Town of Winterville determines that acceptance of ownership is in its best interest.
    c. Easement, satisfactory to the Town of Winterville, is provided for unrestricted access to and operation and maintenance of the pump station.

2.03 Installation

A. General

1. The Contract Documents for sewer system extensions shall as a minimum direct attention to the following requirements in such a way that insures installation satisfactory to the Town of Winterville. Construction safety shall be addressed in a manner consistent with requirements for water system extensions contained in **Part 2.03B of Section 2, Water Distribution System**.

B. Replacement of Damaged Facilities and Structures

1. The Contract Documents for sewer extension projects shall insure that all structures, pavements, utilities, and other facilities which may possibly be damaged as a result of project work are replaced or repaired in a manner which meets the approval of the owner of such structures or facilities or any governing bodies having jurisdiction.

C. Connection of New Sewers to Existing Facilities

1. No connection to, or alteration of any existing facilities owned or maintained by the Town of Winterville shall be permitted without the express permission of the Town of Winterville and, where required, the presence of the Town of Winterville's Representative except as directed by the Town of Winterville. All new sewer connections shall be blocked with a compressed plug of the size of the sewer pipe and the plug shall be structurally blocked by timbers to prevent its removal. This blocking shall not be removed until acceptance of the sewer by the Town of Winterville.
2. Where a connection or alteration of any existing facilities is approved, the connection or alteration shall conform to the standards of the Manual for new installations.
3. Connections of new sewers to existing manholes shall be accomplished by machine coring and the installation of a flexible connector meeting the requirements of **Part 4.03E of Section 1, Sanitary Sewer System**.

D. Salvage of Town of Winterville Owned Facilities

1. When project work results in removal of Town of Winterville owned facilities or equipment, the Contractor shall be required to deliver those facilities or equipment undamaged to the Town of Winterville's Operation Center, if requested to do so by the Town of Winterville.

E. Sewer Construction and Excavation

1. Pipe installation shall be performed only in the presence of the Town of Winterville's Representative, except as authorized by the Town of Winterville.
2. The Contract Documents shall specifically address excavation, pipe foundation and bedding, pipe installation, and Haunching requirements. Satisfactory construction materials shall be identified and either construction methods or performance standards shall be specified. If standard references are cited in lieu of specific requirements, the Engineer shall furnish the Town of Winterville, at no cost, two (2) copies of the cited references, if requested to do so.
3. No deviation from line and grade shown on the Approved Plans shall be permitted by the Contract Documents without the approval of the Town of Winterville. Any proposed deviation will require submission of revised Contract Documents to the Town of Winterville for review and approval.
4. Pipe cutting, where permitted, shall be done in accordance with the written recommendations of the pipe manufacturer. Only factory cut ends shall be used for solvent weld joints.
5. The Contract Documents shall require the Contractor to prevent surface water from accumulating in the trenches. Trenches shall be free of water during pipe installation.
6. The Contract Documents shall provide for the construction of a Foundation of No. 57 crushed stone in the bottom of trenches when unstable material is encountered. Such unstable material shall be removed to the depth required by the Town of Winterville and replaced with No. 57 crushed stone such that the pipe will be adequately supported throughout the entire length. Excavation below the planned pipe invert elevation as shown on the Approved Plans shall be refilled with No. 57 crushed stone. This stabilization stone shall be in addition to the required 4" of No. 57 crushed stone bedding.

7. The Contract Documents shall ensure that trenches for wastewater force mains are excavated to provide vertical and horizontal curves which will not exceed the permissible longitudinal deflection of the pipe. Longitudinal deflections for wastewater force main pipe shall be addressed in the Contract Documents in a manner which is in accordance with the requirements for water main deflection specifications. The Engineer shall refer to **Subsection 5 of Part 2.03F of Section 2, Water Distribution System**, for these requirements.
8. The Contract Documents shall require thrust blocking at each horizontal and vertical change in direction of wastewater force mains. Trenches shall be excavated to provide uniform support of the blocking on undisturbed soil. The concrete shall be placed as shown in the Standard Details and shall not interfere with the removal of any bolts, fasteners, or fittings.
    a. In lieu of concrete thrust blocking, restrained piping systems may be used in a manner which is in accordance with the requirements for water mains as specified in **Subsection 9a of Part 2.03F of Section 2, Water Distribution System**.
9. The Contract Documents shall require trenches for gravity sewer to be excavated in straight lines and uniformly sloped between manholes or junction structures. Trenches for sanitary sewer pipe, except ductile iron pipe, shall be excavated a minimum of four inches (4") below the pipe bottom in order to receive the required Bedding of No. 57 crushed stone. Ductile iron pipe may be laid on stable undisturbed earth, or suitable loose soil compacted to a minimum of 95% Standard Proctor Density by AASHTO-T99 in lieu of No. 57 crushed stone.
10. The Contract Documents shall require excavation for manholes and wet wells to extend a minimum of twelve inches (12”) below the bottom of the structure and backfilling to the proper elevation with No. 57 crushed stone and compacted. Prior to placement of any stone, the subgrade shall be dewatered and inspected by the Town of Winterville. The subgrade shall be of undisturbed earth; the surface shall be free from mud, muck, and organics; and shall be sufficiently stable to remain firm and intact under the feet of the workmen. If, in the opinion of the Town of Winterville, the subgrade is unsuitable, soil bearing pressure testing may be required to verify the adequacy of the subgrade to support the maximum operating bearing pressure of the installed structure plus a 2.0 factor of safety. Testing, if required, shall be performed by a qualified geotechnical engineering firm.
    a. The unsuitable material shall be excavated to the depth required by the Town of Winterville’s Representative and backfilled with No. 57 crushed stone.
11. The specifications shall include the requirement that NC One Call shall be contacted prior to any excavation and shall also note that locations of existing utilities by NC One Call are good only for ten (10) days after the date of location.
12. The Contract Documents shall advise the Contractor that pavement cuts within the Town of Winterville require a permit from the Town of Winterville Public Works Department.

F. Backfilling

1. Backfilling shall be performed only with the approval of the Town of Winterville.

2. Terms used to indicate pipe backfill zones in this section are capitalized and are defined as follows:
    a. **Foundation** – That portion of the pipe support structure bounded by the undisturbed trench bottom, the trench walls, and the pipe Bedding. The construction of a pipe foundation is generally not required unless unstable materials are encountered in the trench bottom.
    b. **Bedding** – That portion of the pipe support structure bounded by the Foundation or undisturbed trench bottom, the trench walls, and the bottom of the pipe.
    c. **Haunching** – That portion of the pipe support structure bounded by the Bedding, the trench walls, the outside of the pipe and a horizontal plane having an elevation equal to that of the springline for DIP or the top of the pipe for SDR 26.
    d. **Select Initial Backfill** – That portion of the backfill lying above the springline of the pipe for DIP, and top of pipe for SDR 26, and below a horizontal plane having an elevation which is one (1) foot above the top of the pipe.
    e. **Final Backfill** – That portion of the backfill lying above the Initial Backfill.
3. Special care shall be taken in writing the Contract Documents so that backfilling for sewers and related structures will be done in a manner which will provide satisfactory support and restraint of all pipes, fittings, equipment, and structures. As a minimum, Bedding, Haunching, and Initial Backfill for sewers, manholes, junction boxes, wet wells, etc. shall be compacted to 95% Standard Proctor (AASHTO-T99).
4. Backfill material shall be free of debris, organic materials, large stones, large clods, frozen conglomerates, or other material which might in any way damage the pipe or preclude proper compaction of the backfill. The Town of Winterville reserves the right to reject material which, in its opinion, is unsuitable. Acceptable soil materials are ASTM 2487 soil types SW, SP, SM and SC.
5. The Contract Documents shall require the Bedding, Haunching and Initial Backfill of solid wall PVC to be No. 57 crushed stone compacted to 95% Standard Proctor Density (AASHTO T-99) as shown in the Standard Details.
6. The backfill for manholes, wet wells, and structures shall be brought to planned elevation in even lifts on all sides of the structures. Compaction shall be as specified for the adjacent pipe.
7. The Final Backfill shall be provided using materials and methods suitable to provide the compaction necessary to prevent settlement which would adversely affect existing or proposed land use. In all cases compaction shall be no less than 90% Standard Proctor (AASHTO-T99). Backfilling within the right-of-way of the NCDOT, the Town of Winterville, railroads, and other right-of-way owners shall be subject to the owner's requirements.
8. All force mains shall be installed with three inch (3") wide metallic detectable tape. The tape shall be clearly marked "Sewer" and shall be centered over the main twelve inches (12") below finished grade. Any breaks in the tape shall be repaired in accordance with the manufacturer’s recommendations.
9. The Contract Documents shall require the disturbed ground surface to be graded to prevent ponding of water and seeded and mulched upon completion

of backfilling operations. Seeding and mulching shall be in accordance with the requirements and recommendations of the Land Quality Section of the Division of Land Resources.

G. Installation of Manholes and Wet Wells

1. Foundations for manholes and wet wells shall be in accordance with **Part Subsection 10 of 2.03E of Section 1, Sanitary Sewer System.**
2. Ensure that crushed aggregate bedding for manholes and wet wells is properly installed and is true to line and grade. Set structure base on bedding and verify conformance with line and grade as shown on the plans and that the structure is set plumb.
3. Manholes deeper than twelve feet (12') as measured from the top of the manhole ring and cover to the lowest manhole invert or from the finished ground surface elevation at the manhole to the lowest manhole invert, whichever is greater, shall be provided with an extended base. Inverts and benches shall be built in accordance with the Standard Details.
4. The manhole inverts shall be constructed with a width and height equal to that of the effluent pipe and shall be so brushed and troweled that a minimum energy loss occurs in the manhole due to invert roughness.
5. Placement of concrete shall be limited to those days when the temperature is 34 degrees and rising unless approval to the contrary is given by the Town of Winterville.
6. Manholes less than four feet (4') in depth shall be given special design considerations. Proper access to the sanitary sewer for inspection and cleaning must be provided. Flat top manholes shall be used only with written approval from the Town of Winterville and shall require submission of shop drawings in accordance with **Part 3.04 of Section 1, Sanitary Sewer System**.

H. Installation of Services

1. Services shall be provided to each lot as required by **Part 2.01G of Section 1, Sanitary Sewer System**, and as shown in the Standard Details.
2. The minimum service size is four inches (4"). The size of services shall be subject to the approval of the Town of Winterville. Minimum slopes for services shall be in accordance with NCDWQ requirements as given in **Subsection 7 of Part 2.02A of Section 1, Sanitary Sewer System**.
3. Each service shall be provided with a cast iron box (see Detail S-3).
4. The Contract Documents shall ensure that excavation for services will conform with the requirements for mains given in **Subsection 9 of Part 2.03E of Section 1, Sanitary Sewer System**. Bedding and Haunching with No. 57 crushed stone is required for services in accordance with the Standard Details.
5. Whenever practical, services shall discharge directly into manholes. Services to existing or proposed manholes shall be installed with a rubber connection sleeve as required by **Part 4.03E of Section 1, Sanitary Sewer System**.
6. Where services are installed by dry boring, the service shall be installed within steel encasement pipe meeting the requirements of **Part 4.02 of Section 1, Sanitary Sewer System**. The encasement pipe shall extend a minimum of five feet (5') from the edge of the pavement on either side unless approval to the contrary is given by the Town of Winterville.

7. Sewer services larger than six inches (6”) shall be provided with manholes in lieu of cleanouts and shall be connected to the main by use of a standard manhole.

I. Installation of Air-Release Valves for Force Mains

1. Where air release valves are required by the Town of Winterville or **Part 2.01H of Section 1, Sanitary Sewer System**, the valves shall be installed in standard manholes.
2. For pipes between 4 and 8 inches, automatic air release valves shall be provided by tapping the main and installing a C900 service tee, a corporation stop, one-inch (1") service tubing, and a Mueller P-14258 lock wing angle meter stop in accordance with the Standard Details.
3. For pipes greater than 8 inches, installation of automatic air release valves will be the similar as those for pipe diameters between 4 and 8 inches. However, installation of a standard 2-inch saddle will take place instead of a C900 service tee.

J. Pump Installation and Site Work

1. The wet wells and valve vaults for pump stations shall be set plumb at the locations indicated on the Approved Plans. The wet well shall be no closer than twenty feet (20') plus the wet well depth to the pump station site easement, or property line.
2. The backfill around structures such as wet wells and valve vaults shall be placed in even lifts on all sides of the structure and compacted to 95% Standard Proctor Density as determined by AASHTO-T99.
3. The Contract Documents shall ensure that the pump station site area is graded smoothly with no depressions which would permit ponding of water. The slopes shall be such that the site is stable and non-eroding. Seeding and mulching shall be in accordance with the requirements and recommendations of the Land Quality Section of the Division of Land Resources.
4. The site shall feature ample turn around areas for service vehicles and a fourteen foot (14') minimum width stone access road which extends to and meets the grade of a public road or street. The turn-around areas and the access road shall have a minimum of six inches (6") of compacted ABC stone.
5. All pump controls, pump and valve vault hatches, and other access points to equipment vulnerable to vandalism shall be secured by a padlock or other locking device subject to the approval of the Town of Winterville.
6. The site shall be provided with a light-emitting diode (LED) light of 600-watt (minimum) capacity placed so as to illuminate the station area. A photocell will be installed with every LED light.
7. Installation of the pumps, controls, and related equipment shall be performed in accordance with the written instructions of the manufacturer.

K. Roadway, Street and Railway Crossings

1. Refer to **Part 2.03O of Section 2, Water Distribution System**, for the requirements for crossings. In addition to the requirements of **Part 2.03O of Section 2, Water Distribution System**, all gravity sewer main carrier pipe shall be supported in the casing by means of a steel spider assembly. (See Standard Details)

2.04 Testing

A. General

1. The Contract Documents for sewer system extensions shall provide for written requirements for thorough testing of new sewers and appurtenances.
2. All final testing and inspections shall be performed in the presence of the Town of Winterville's Representative unless otherwise directed by the Town of Winterville.
3. The Contract Documents shall require the Contractor to provide all pumps, gauges, instruments, test equipment and personnel required for inspection and testing operations.
4. The Contractor shall be required by the Contract Documents to clean and pretest the sewer system extension prior to notifying the Town of Winterville and arranging for final inspections and tests.
5. The Contractor should provide video footage of all sewer mains and laterals prior to final inspections.
6. Materials removed to correct deficiencies revealed by tests and inspections shall not be reused. Pipe removed due to faulty grade shall be replaced with new pipe at no cost to The Town of Winterville.
7. No testing is to begin on water mains until storm drains have been completed and roads have been undercut.

B. Test Sequence

1. The following test sequence shall be included in the Contract Documents for all wastewater system extensions unless otherwise permitted by the Town of Winterville.
    a. Test gravity lines between manholes.
    b. Perform a visual inspection.
    c. Correct defects revealed by visual inspection.
    d. Low Pressure Air Test
    e. Provide vacuum test for each manhole.
    f. Correct defects revealed by leakage testing.
    g. Perform deflection testing (PVC SDR 26).
    h. Correct defects revealed by deflection testing.
    i. Make the necessary retests.

C. Gravity Sewer Mains

1. Test gravity lines between manholes.
2. Infiltration shall not exceed 100 gallons per inch of diameter, per mile of pipe, per 24 hours. Engineer may require flow measurement for verification of infiltration.

D. Visual Inspection for Gravity Sewers and Services

1. Gravity sewers and services shall be visually inspected from every manhole by use of mirrors, television cameras, or other devices. Water shall be placed in the lines for flow test. No residual water may remain in the lines after being so placed. The lines shall appear circular in cross section with no noticeable

deflection. Lines which do not meet specified tolerances, or which have structural defects shall be replaced prior to leakage testing.

E. Leakage Testing for Gravity Sewers and Services

1. Low Pressure Air Test:
   a. Air testing of sewer mains shall conform to UNI-B-6 and the following requirements:
   b. Perform initial air test when each section of main is complete including services to right of way. Test as construction proceeds.
   c. Wet interior surfaces of porous pipe material prior to testing.
   d. Safety
      1) Provide a superintendent who has experience in low pressure air testing of gravity sewer mains.
      2) Follow safety recommendations of air testing equipment manufacturer.
      3) Properly brace sewer plugs during testing. Test plugs prior to use in air testing.
      4) No one shall be allowed in manhole or trench when pipe is under pressure.
      5) Pressurizing equipment shall include a regulator and a pressure relief valve, which are set no higher than 9 psig. Monitor gauges continuously to assure that the pressure does not exceed 9 psig.
   e. Equipment
      1) Sewer plugs shall be specifically designed for low pressure air testing.
      2) Use two separate air hoses.
         i. One to connect the control panel to the sealed line for introducing the air.
         ii. One from the sealed line to the control panel to provide constant monitoring of the air pressure in the line.
         iii. If Pneumatic plugs are used a separate line shall be used to inflate the plugs.
      3) As a minimum the above ground air testing equipment shall include a shutoff valve, pressure regulating valve, pressure relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range from 0 to at least 10 psig.
      4) Continuous monitoring pressure gauge shall be at least 4 inches in diameter with minimum divisions of 0.10 psi and an accuracy of +/- 0.04 psi.
      5) Monitoring gauges shall be subject to calibration as deemed necessary.
      6) Air used for testing shall pass through a single above ground control panel.
   f. Testing
      1) Groundwater Determination: Immediately prior to each air test, determine groundwater level by a method acceptable to the Engineer. Adjust pressure used in air test in accordance with groundwater level.
      2) Apply air slowly to the test section until the pressure reached is 4.0 psi plus an adjustment of 0.433 psi for each foot of ground water above the crown of the pipe. Internal air pressure, including adjustment for ground water, should never exceed 9.0 psi.

3) When the above required pressure is reached, throttle air supply to maintain internal pressure for at least two minutes to permit stabilization.
4) When pressure has stabilized at required pressure, shut off air supply.
5) While observing the continuous monitoring pressure gauge, decrease pressure approximately 0.5 psi from required pressure.
6) At this reading timing shall commence with a stopwatch and allowed to run until pressure has dropped 1.0 psi or allowable time has lapsed. Line shall be "Acceptable" if the pressure drop does not exceed 1 psig in the time prescribed for the test in Table 2-5, Low Pressure Air Testing for Gravity Sewer Mains, at the end of this section.

2. Deflection Test for SDR 26 and Ribbed (ASTM F 949) PVC pipe.
   a. Measure for deflection of pipe no sooner than thirty days after installation and backfill.
   b. Deflection shall not exceed 5 percent of pipe diameter. Maximum allowable long-term deflection shall be 5 percent.
   c. Measure deflection with an approved "GO-NO-GO GAUGE" method or by an approved recording deflectometer. Verify gauge on site prior to testing.
3. Hydrostatic Test for Gravity Sewers
   a. The source, quality, and method of disposal of water to be used in test procedures shall be approved by the Engineer.
   b. Obtain Owner's permission 48 hours prior to filling or flushing of pipe system with water from Owner's water system. Owner of water system shall operate valves connected to the existing water system.
   c. Air test line, as described above, prior to hydrostatic testing.
   d. Provide taps for filling and pressurizing the line. Service corporation stops may be used. Include cost of taps in price of testing. Leave corporation stops in place after testing and note locations on As-Built Drawings.
   e. Suitable means for thrust restraint shall be installed for testing.
   f. Test for each manhole reach.
   g. Test pipe by maintaining for a two-hour period a hydrostatic pressure of 150 psig.
   h. Test pressure shall not vary by more than +/- 5 psi for the duration of the test.
   i. Pressure test in accordance with AWWA C600 for ductile iron pipe and as described above.
   j. Hydrostatic testing for gravity sewers within 100 feet of a water supply well shall be paid for as described in Section, Basis for Payment.

F. Manhole Vacuum Testing

Vacuum test each manhole in accordance with ASTM C1244 and the following:

1. No personnel shall be allowed in manhole during testing.
2. Test manhole after assembly and prior to backfilling.
3. Plug pipes with suitably sized and rated pneumatic or mechanical pipeline plugs. Brace plugs to prevent displacement.
4. Position vacuum test head assembly to seal against interior surface of the top of cone section in accordance with manufacturer's recommendation.
5. Draw vacuum of 10 inches of mercury on manhole. Shut off the vacuum pump and close valve on vacuum line.
6. Measure time for vacuum to drop to 9 inches of mercury. Manhole shall pass if time meets or exceeds the following:

Manhole I.D. (inches)	48	60	72	84	96	120
Seconds	60	75	90	105	120	150

7. If manhole fails test, remove head assembly, coat interior with a soap and water solution, and repeat vacuum test for approximately 30 seconds. Leaking areas will have soapy bubbles. Make necessary repairs to the satisfaction of Engineer and repeat test until manhole passes.

Table 2-5											
1 Pipe Dia. (inch)	**2 Minimum Time (min:sec)**	**3 Maximum Length for Minimum Time (ft)**	**4 Time for Longer Length (sec)**	**Specification Time for Length (L) Shown (min:sec)**							
				100 ft	**150 ft**	**200 ft**	**250 ft**	**300 ft**	**350 ft**	**400 ft**	**450 ft**
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5 :40	5:40	5:40	5:40	5 :40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33

MINIMUM TEST TIME FOR VARIOUS PIPE SIZES:

$$T = 0.085 \quad \frac{(D_1)(D_1)L_1 + (D_2)(D_2)L_2 + \ldots (D_n)(D_n)L_n}{D_1L_1 + D_2L_2 + \ldots + D_nL_n} \quad \frac{K}{Q}$$

Where T = Shortest allowable time, in seconds for the air pressure to drop 1.0 psig.

$K = 0.000419 (D_1L_1 + D_2L_2 + \ldots D_nL_n)$, but not less than 1.0.

Q = 0.0015 cu. ft/min./sq. ft. of internal surface.

$D_1, D_2, \ldots D_n$ = Nominal diameters of the different size pipes being tested in inches.

$L_1, L_2, \ldots L_n$ = Respective lengths of the different size pipes being tested in feet.

If the recomputed test time is short enough to allow the section to pass, the section undergoing the test shall have passed.

8. Infiltration Test

   a. Infiltration testing shall be an acceptable test method only when the ground is fully saturated, and the area is not subject to flooding. Immediately prior to performance of the line acceptance test, the groundwater level shall be determined by the same method used for the air test (see **Subsection 2b of Part 2.04D of Section 1, Sanitary Sewer System**). The allowable infiltration rate shall be fifty (50) gallons per inch of pipe diameter, per mile of pipe, per twenty-four (24) hours.

9. Exfiltration Test

   a. The exfiltration test pressure shall be the greater of the following:

      1) the maximum depth of the sewer test section as measured from the ground surface, plus the groundwater height above the lowest invert of the test section, or;

      2) the 100-year flood elevation minus the lowest invert elevation of the test section, plus the ground water height above the lowest invert of the test section.

   b. The exfiltration of the line shall not exceed fifty (50) gallons per inch of pipe diameter, per mile of pipe, per twenty-four (24) hours. The length of the test period shall be as required by the Town of Winterville, but in no case less than fifteen (15) minutes. Where a stream is not readily available as a source of water to use for testing, the Town of Winterville may agree to provide water. Proper procedures for requesting operation of valves and hydrants will be required.

10. Deflection Testing of Gravity Sewers (PVC SDR 26)

   a. All PVC SDR 26 sewer pipe shall be tested for deflection using a rigid device (mandrel) sized to pass 5% or less deflection (or deformation) of the pipe.

      1) The mandrel shall be hand pulled by the Contractor in the presence of the Town Representative, unless directed otherwise by the Town. Any sections of the sewer not passing the mandrel shall be uncovered and the Contractor shall repair the sewer to the satisfaction of the Town. Repaired sections shall be retested in accordance with the provisions of this Section.

      2) Deflection testing shall be conducted no earlier than 30 days after reaching final trench backfill grade, provided in the opinion of the Town of Winterville that sufficient water densification or rainfall has occurred to thoroughly settle the soil throughout the entire trench depth. If this cannot be achieved in the time after installation prior to the project completion date, the mandrel size shall be increased to measure 1/3 less of a deflection allowance.

      3) The mandrel device shall be cylindrical in shape and constructed with nine or ten evenly spaced arms or prongs. Mandrels with less than nine arms will not be approved for use. The dimensions of the mandrel shall be as listed in the table (Table 1-6) below. The diameter of the mandrel shall carry a tolerance of plus or minus 0.01 inch.

Table 1-6		
Nominal Diameter	**Contact Length**	**Mandrel Diameter**
8”	8”	7.28”
10”	10”	9.08”
12”	12”	10.79”
15”	12”	13.20”
18”	15”	16.13”
21”	16”	19.00”
24”	17”	21.36”
27”	18”	24.06”

Allowances for piping wall thickness tolerances or ovality (from heat, shipping, poor production, etc.) shall not be deducted from the “D” dimension but shall be counted in as a part of the 5% or lesser defection allowance.

4) Contact length shall be measured between points of contact of the mandrel arm. This length shall not be less than that shown in the Table 1-6 above.

5) The mandrel may not be used until approved by the Town of Winterville. Proving rings provided by the Contractor shall be used to assist in obtaining this approval. Drawings of the mandrel with complete dimensions shall be furnished by the contractor to the Town of Winterville for each diameter and specification of pipe.

6) The mandrel device shall be as manufactured by H and H Fabricating of Fairfield, Ohio or Wortco, Inc. of Franklin, Ohio and shall be approved by the Town of Winterville.

11. Manhole Testing

a. The Contract Documents shall require each manhole to be tested for leakage after assembly and prior to backfilling. The test method shall be the vacuum test.

b. The Contractor shall provide all materials, labor, and equipment necessary to perform the testing. Testing equipment shall be subject to approval by the Town of Winterville.

c. The Town of Winterville shall be contacted prior to testing to schedule the test time such that the Town of Winterville's Representative may be present. The Town of Winterville’s Representative shall be present during all testing unless otherwise approved by the Town of Winterville.

d. All lift holes shall be plugged from the outside with an approved non-shrink grout.

e. All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole.

f. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturers' recommendations.

g. A vacuum of ten inches (10”) of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine inches (9”). The manhole shall pass if the time is greater than sixty (60) seconds for forty-eight-inch (48”) diameter, seventy-five (75) seconds for sixty-inch (60”), and ninety (90) seconds for seventy-two-inch (72”) diameter manholes.

h. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

i. All visible leaks shall be corrected regardless of the results of testing.

j. All leaks shall be repaired in a manner approved by the Town of Winterville.

G. Testing and Cleaning of Force Mains

1. Force mains shall be cleaned and tested in accordance with the procedures for cleaning and testing water mains given in **Parts 2.04D and 2.04E of Section 2, Water Distribution System**. The allowable leakage shall not exceed the limits given for water mains and any visible leaks shall be repaired regardless of the results of testing. When repair work is necessary to correct leakage, the hydrostatic test shall be repeated upon completion of the work.

H. Testing and Start-up of Pumps

1. The pumps shall be run under actual field conditions demonstrating that the pumps perform as specified in the Contract Documents. Any deficiencies disclosed by the pump start-up shall be corrected prior to project acceptance.
2. Two (2) copies of the operation and maintenance Manual and two (2) copies of the electrical schematic for the pumps and controls shall be provided to the Town of Winterville two (2) weeks prior to the date of the start-up test.
3. Start-up shall be performed by the manufacturer's representative in the presence of the Town of Winterville's Representative.
4. The manufacturer must submit a certified report of the pump field start-up performance (electrical and hydraulic) to the Town of Winterville as a condition of project acceptance.

Part 3 Submittals

This part shall define and describe the submittals required by the Town of Winterville prior to the approval of the Contract Documents for any water and sewer system extension, and the permits and other data which must be approved by or submitted to the Town of Winterville prior to construction of water and wastewater system extensions.

3.01 Engineering Design Calculations

A. All Contract Documents submitted to the Town of Winterville for approval must be accompanied with the necessary design calculations as specified herein. The calculations must be prepared either by Professional Engineer or by an individual under their direct supervision. All data upon which the design calculations are based shall be referenced as to its origin. The calculations shall be submitted in duplicate in a neat and orderly fashion with all steps shown such that the logic and the procedure used may be clearly understood. All

calculations shall be bound with a title sheet bearing the seal and signature of the engineer responsible for the calculations.

B. Sewer Design Calculations

1. The following calculations shall be included in the submittals required for wastewater system extensions.

   a. Gravity Sewers:

      1) Gravity sewers shall be shown to have adequate capacity to serve the entire contributing area in accordance with the requirements of **Part 2.02A of Section 1, Sanitary Sewer System**. The calculations shall be based upon the Manning Formula using an "n" factor of 0.013.

   b. Pump Station Capacity and Force Mains:

      1) Pump stations shall be shown to have adequate capacity in accordance with **Subsection 1 of Part 2.02C of Section 1, Sanitary Sewer System**. The total dynamic head for the pumps shall be determined by use of the Hazen-Williams formula with the C-factor of 120. Minor losses shall also be accounted for. The pump station cycle time shall be shown to be in accordance with **Subsection 3 of Part 2.02C of Section 1, Sanitary Sewer System**. Both pump-on and pump-off times per cycle shall be shown. The average flow velocity within the force main shall be calculated and shown. The capacity of the receiving collection system must be shown to have adequate capacity for the additional discharge due to the pump station. The hydraulic grade line and the profile of the force main shall be submitted.

   c. The pump station documentation must also include the benefit/cost comparison described in **Subsection 2 of in Part 2.02b of Section 1, Sanitary Sewer System**. The cost analysis shall compare the cost of constructing and maintaining the station and constructing and maintaining a gravity sewer extension. This analysis shall be a present worth cost comparison using an interest rate of three percent (3%). The actual interest rate available at the time of the comparison may be used in lieu of the three percent (3%) rate provided inflation is accounted for.

3.02 Contract Documents

A. General

1. The submittal of complete detailed Contract Documents is required for all water or wastewater system extensions of the Town of Winterville's existing facilities. Contract Documents shall contain the following forms unless otherwise permitted or required by the Town of Winterville.

   a. Specifications with title sheet.

   b. Drawings (Plans)*.

   c. Modifications.

   *Drawings on projects for which a Preliminary Subdivision Plat was required shall include a copy of the Approved (signed) Preliminary Plat.

B. General Requirements for Drawings

1. The plan and profile drawings shall be prepared by a Professional Engineer. Each sheet shall bear the date, sheet number, and the seal and signature of the Professional Engineer. Project phases must be shown. Contract Documents for projects which do not indicate phases shall be subject to revision if the project is constructed in phases.
2. A letter of transmittal must be included with the drawings indicating the project name and location and the design engineer.
3. The drawings shall have a title page with the name of the project, the Engineer, the date, an index of the plan sheets, revision block, and the project phase, if any.
4. The drawings shall utilize standard drafting practice and include standard symbols for which a legend shall be provided on the title sheet or other prominent location on the plans.
5. The drawings shall include a location map with the site clearly indicated.
6. The drawings shall include the layout of the new extension and its relationship to other utilities, roadways, and other pertinent structures and vegetation.
7. The profile for a particular section of the planned extension shall be included on the same sheet as the plan view with a horizontal scale of one-inch (1") = fifty feet (50') or larger for projects consisting of sewer and water or sewer extensions. The horizontal scale for projects consisting of water extension only shall be one-inch (1") = one hundred feet (100') or larger scale. The vertical scale for profiles shall be one-inch (1") = five feet (5') or larger.
8. The drawings shall include a note stating that the Contractor shall verify all existing elevations and all existing utilities in the field prior to commencement of work.
9. The 100-year flood elevation shall be shown on all plan drawings.
10. The plan drawings shall be placed on 24-inch x 36-inch plan and profile paper.
11. Projects which include new pump station(s) shall include a plot plan for each station with topographic lines of one-foot (1') contour intervals.
12. Each plan sheet shall have a title block with a title which is descriptive of the contents of the sheet.
13. Profiles for gravity sewer shall clearly indicate the actual plan slope of each reach of line given in percent slope. The actual length of each reach of gravity line shall be used to calculate pipe slope. This length shall be the distance between manhole centerlines minus the inside radius of both manholes as measured horizontally. Designs in which the distances between manhole centerlines are used as the pipe length in the calculation of pipe slopes will not be approved.
14. The length of each reach of gravity sewer shall be clearly indicated on the drawings. This length shall be the manhole centerline to centerline length as measured horizontally.

C. General Requirements for Specifications

1. The specifications shall be prepared by a Professional Engineer.
2. The specifications and all other documents listed in **Part 3.02A of Section 1, Sanitary Sewer System**, with the exception of the drawings, shall be bound in a single booklet with a title page bearing the project name and location, the Engineer, the date, and the seal and signature of the Professional Engineer who developed the documents. The title sheet shall also include a revision block.
3. As-built drawings shall be submitted with monthly pay estimates to the owner's engineer.

D. Required Permits for Construction

1. All water and sewer system extension plans must be granted the permits and encroachment agreements described herein (where applicable) PRIOR TO ANY CONSTRUCTION. The application forms for the following permits shall be obtained from the agency granting the permit and shall be completed except for signatures and notarization. All applications shall be signed by the Town Manager or his designated representative.

   a. Wastewater System Extensions

      1) A Sewer System Extension Application from NCDWQ is required for any wastewater system extension, new wastewater pump station or system modification. The NCDWR requires a processing fee for all wastewater system extension plans or existing wastewater system modifications. The required fee, one original and the appropriate number of copies of the NCDWR "Sewer System Extension Application Permit" application form, and necessary supplements shall be submitted with the Contract Documents.

   b. NCDOT Encroachment Agreements

      1) A water or sewer extension, which shall encroach upon any NCDOT right-of-way, shall require an encroachment agreement to be executed prior to approval of the plans. The Application shall be submitted on the Encroachment Agreements page of Connect NCDOT. The NCDOT Encroachment Agreement Form shall be submitted to the Town of Winterville in addition to the copies of Contract Documents required for review under **Part 3.03B of Section 1, Sanitary Sewer System**.

      2) If applicable, a letter from the Land Quality Section of the DEQ approving the Erosion Control Plan must be submitted to the Town for forwarding to NCDOT prior to their approval of the encroachment agreement. NCDOT utilizes an online submission process for the submission of encroachment agreement forms.

   c. Erosion and Sedimentation Control Plan

      1) An erosion and sedimentation control plan must be submitted to the DEQ Land Quality Section at least 30 days before land disturbance begins on any site one acre or larger.

d. Railway Encroachment Agreements

1) Whenever a proposed water or sewer extension encroaches upon a railway right-of-way, an encroachment agreement shall be executed prior to construction. The Engineer shall submit for approval copies of the Contract Documents and the encroachment agreement forms to the Town of Winterville. Fees shall be determined by the right-of-way owner, after submission of the proposed agreement, and paid by the developer.

e. Indemnification and Hold Harmless Agreement

1) Whenever construction of, or other activities associated with, water and sewer facilities for the Town of Winterville encroach within the right-of-way of any City, Town, Bell Arthur Water Corporation, Eastern Pines Water Corporation, CMSD or DOT street or highway, the Contractor shall provide to the Town of Winterville, prior to scheduling a preconstruction conference, a fully executed, "Indemnification and Hold Harmless Agreement".

3.03 Required Copies of Contract Documents

A. The Engineer should submit to the Town of Winterville two (2) sets of Contract Documents, pertinent calculations, and applicable permits, for a preliminary review prior to submission of all Contract Documents necessary. Preliminary submittals, which do not contain the required calculations and permits, will be returned as incomplete. The Town Engineer and his staff shall review such plans and make the appropriate notes and return one (1) copy of the drawings to the Engineer marked so that the necessary corrections can be made and the Contract Documents may be submitted for the approval of the Town of Winterville and the appropriate state agencies.

B. The Town of Winterville shall require submission of the following number of sets of Contract Documents for the approval of the Town of Winterville and the appropriate state agencies.

Table 1-7
Required Sets of Plans and Specifications for State Agency Approvals

Type of Project	No. of Copies of Drawings	No. of Copies of Specs.	Permit Originals	Permit Copies
Sewer Ext. Only Fast Track Form FTA 04-16	2	2	1	3
Sewer Ext. Only PSFMGSA ASEA 04-16	2	2	1	1
Sewer Ext. Fast Track Form FTA 04-16	2	2	1	3
Sewer Ext. PSFMGSA ASEA 04-16	2	2	1	1
NCDOT Encroachment	1 (electronic)	1 (electronic)	1 (electronic) 1 (hardcopy)	1 (electronic) 1 (hardcopy)

C. The Engineer shall submit all required encroachment application forms, State approval forms, and appropriate fees as outlined above with the necessary copies of Contract Documents when making a formal submission for approval.

3.04 Shop Drawings

A. The Engineer's specifications shall include a requirement for the submittal of shop drawings and certifications for the materials, equipment and prefabricated structures used in water or sewer extension projects. The Engineer shall provide the Town of Winterville an electronic copy as well as one (1) hard copy of approved shop drawings upon request.

3.05 Survey Data

A. General

1. The locations of all benchmarks and control points shall be included in the plans. Benchmarks shall be located in areas which shall not be disturbed by the construction. The Engineer or Developer shall provide all surveys necessary for the work. Survey data shall be made available for the Town of Winterville's review upon request.

B. Vertical Control

1. The elevations given in the Contract Documents and all benchmarks shall be referenced to USGS elevations. The elevations of all construction benchmarks shall be looped to verify the accuracy of the level work. All construction benchmarks shall be clearly marked on the drawings using standard drafting symbols and shall have their elevations shown.

3.06 Easements and Right-of-Ways

A. All required easements and rights-of-way shall be provided to the Town of Winterville by one of the two following methods.

1. Recorded Final Plat

   a. The Developer or Engineer may submit a recorded (20" x 24") final plat of the property to be served with all easement and right-of-way widths shown. The plat must be recorded at the Pitt County Registry and bear the seal, signature, and certification of a Registered Land Surveyor.

2. Standard Easement Form

   a. The Engineer or Developer may submit a completed standard easement form accompanied with a map of each easement acquired. Additional blank copies of the easement form are available upon request from the Town of Winterville. Easement maps accompanying standard easement forms shall be 8-1/2" X 14". They shall be drawn at a scale of 1" = 200 (or less) feet, utilizing standard drafting techniques. The maps shall include the following: (1) Name of the property owner, (2) map book and page number of the recorded property deed, (3) the name of the person(s) or company who prepared the map, (4) Certificate stating the map was prepared under the direct supervision of a registered land surveyor, (5) date of preparation, (6) scale, (7) north arrow (if magnetic, state year), and (8) all other pertinent information including existing rights-of-way, property lines, monuments, etc. Maps submitted as two or more

sheets shall have match lines which clearly indicate how the sheets fit together. Drawings which have been photographically reduced shall not be acceptable unless all the information thereon is clearly legible, and all other requirements have been met.

Part 4 Materials

The materials used for the construction of sewer extensions and all accessories and appurtenances thereof shall be new, free of defects in product workmanship and of the highest quality available in the industry. Materials not specified but deemed equal to those specified may be approved for use provided the documentation and samples necessary for approval are provided to the Town of Winterville thirty (30) days prior to the ordering of said materials. WRITTEN APPROVAL must be issued by the Town of Winterville before such material may be used in construction. Current specifications (latest revisions) shall apply in all cases where materials are described by reference to published standards such as ASTM, ANSI, etc.

4.01 Gravity Sewer Pipe and Fittings

A. Gravity sewers shall be constructed of PVC pipe (in accordance with **Parts 4.01C and 4.01D of Section 1, Sanitary Sewer System**) or ductile iron pipe, at the option of the Engineer or Developer, except for circumstances where the Manual or the Town of Winterville specifically requires a particular pipe material be utilized for an installation.

B. All castings shall be domestic made.

C. Ductile Iron Pipe

1. All ductile iron pipe shall be manufactured in compliance with ANSI Standard A21.51. The interior of the pipe shall be cement-mortar lined in accordance with ANSI A21.4.

   a. The exterior of the pipe shall have a one (1) mil bituminous coating in accordance with ANSI A21.51. The thickness class for ductile iron pipe shall be Class 50 unless required otherwise by the Town of Winterville. Pipe shall be in nominal 18 – 20 foot laying lengths. The pipe joints for ductile iron pipe shall be "push-on" manufactured in accordance with ANSI 21.11. Where fittings are required, as in the installation of drop manholes, the fittings shall conform to the requirements of **Subsection 3 of Part 4.01A of Section 2, Water Distribution System**, for water main fittings.

2. Polyethylene encasement shall be applied to all underground ductile iron pipe installations. Materials and installation procedures shall be in accordance with ANSI/AWWA C105/A21.5.88.

D. Polyvinyl Chloride (PVC) Pipe 8" – 15"

1. PVC pipe shall conform to the requirements of ASTM D3034 (SDR26). Joints and fabricated fittings shall be elastomeric (gasket) joints and shall be assembled in accordance with the pipe manufacturer's recommendations and Specification D3212. Gaskets shall meet the requirements of ASTM F477. Minimum cell class shall be 12454B.

E. Polyvinyl Chloride (PVC) Pipe 18" – 24"

1. PVC pipe shall conform to the requirements of ASTM F679 (wall thickness T-1). Joints and fabricated fittings shall be elastomeric (gasket) joints and shall be assembled in accordance with the pipe manufacturer's recommendations. Gaskets shall meet the requirements of ASTM F477. Minimum cell class shall be 12454C. PVC pipe shall be supplied in 13.0-foot lengths.

F. Sewer Service Pipe

1. Sewer service pipe shall be Schedule 40 PVC-Drain, Waste and Vent (DWV) pipe in accordance with ASTM D2665 and ASTM D1785. Cleanouts shall be constructed of pipe and fittings which also meet the ASTM requirement for Schedule 40 PVC-DWV pipe. Cleanout caps shall be Charlotte 106 or Jones P50400 cap with 2" raised nut. Cleanouts shall be installed with an 8-inch sewer cleanout box by home builder, set to finished grade as shown in the standard details. The cleanout should be left capped and 36 inches above grade until construction of house is complete. 8-inch cast iron box must be installed prior to Final Inspection for Certificate of Occupancy. Certificate of Occupancy will not be issued until all damage is corrected.

G. Service Fittings

1. Service saddles for use with ABS composite sewers shall be ABS saddle wyes as manufactured by Contech Construction Products, Inc. or approved equal. Wyes shall be chemically welded using the manufacturer's recommended primer, cement, and stainless-steel bands.
2. Services from vitrified clay sewers shall be made by means of wye branches conforming to ASTM 700.
3. Service fittings for use on PVC composite pipe shall be PVC standard gasketed wyes manufactured or approved by the pipe manufacturer and shall conform to the requirements of ASTM D2680.
4. Service fittings for use on PVC (SDR26) pipe shall be a standard gasketed wyes, manufactured or approved by the pipe manufacturer and shall conform to the requirements of ASTM D3034.
5. Service fittings for use on PVC pipe sizes 18 to 24 inches shall be standard gasketed wyes manufactured or approved by the pipe manufacturer and shall conform to the requirements of ASTM F679.

H. Manhole Vent Piping

1. Pipe and fittings used on manhole vents shall be Ductile Iron in accordance with **Part 4.01C of Section 1, Sanitary Sewer System**.

I. Transition Couplings for Gravity Sewers

1. The preferred transition connection between different sewer line materials shall be a standard manhole installation.
2. Pipe material changes between manholes may be permitted provided there is not a substantial difference in inside diameters, a smooth uniform flow line is maintained, and a watertight rubber sleeve or mechanical coupler conforming to ASTM C-425 is used to make the transition. All metal hardware shall be stainless steel. HARCO hard couplings are preferable; alternatively, transition sleeves may be manufactured by Fernco or Indiana Seal with the prior written consent from the Town of Winterville.

4.02 Steel Encasement Pipe

A. Steel encasement pipe shall be of ASTM A139 Grade B Steel. The encasement pipe shall meet the requirements of **Part 4.07 of Section 2, Water Distribution System**. The carrier pipe shall be RJDIP unless otherwise approved by Winterville staff.

4.03 Manholes

A. Manholes shall be precast and have a monolithic bottom section unless otherwise approved by the Town of Winterville in writing. Manholes with a depth greater than 6 feet shall have eccentric cones, manholes with a depth of 6 feet or less shall have concentric cone. Manholes shall conform to ASTM C-478. Joints shall be watertight and conform to the ASTM C478 standard for section joints designed for cold applied sealing compound. The sealing compound shall be CPS-210, Concrete Products Supply Company, Concrete Sealants or approved equal.

B. Flat top manholes for gravity sewers shall be used only when approved in writing on a case by case basis by the Town of Winterville. Manholes of depth less than four feet (4') as measured from the top of the ring and cover to the lowest pipe invert shall require special design considerations. Shop Drawings shall be submitted to the Town of Winterville for such manholes.

C. The minimum inside diameter of manholes shall be 4.0 feet in diameter and larger. See the Standard Details.

D. All manhole boots are to have 2 bands. See the Standard Details.

E. Manholes more than twelve feet (12') in depth, as measured from the top of the ring and cover to the lowest invert, or as measured from surrounding finished ground elevation at the manhole location to the lowest manhole invert, whichever is greater, shall have an integral precast extended base as shown in the Standard Details.

F. Points of exit and entry for all pipe including services; shall be provided with flexible manhole sleeves and all stainless steel take up clamps in accordance with ASTM C-923. Manholes exceeding twenty-three feet in depth shall require a certification from the manufacturer that the flexible sleeves provided are capable of withstanding a hydrostatic pressure equal to the depth of the installed manhole. Points of entry for mains or services which are added after fabrication of the manhole shall be provided by coring and installation of a flexible sleeve. All pipes shall extend through the manhole walls a minimum of 2 inches.

G. Manholes with preformed invert channels and benches may be utilized. Preformed invert channels must conform with **Subsections 5 and 8 of Part 2.01F of Section 1, Sanitary Sewer System**. Points of pipe exit and entry shall conform with **Part 4.03E of Section 1, Sanitary Sewer System**. Manholes with inverts that are field constructed shall be done in accordance with the Standard Details.

H. Manhole rings and covers shall be manufactured in the USA of Class 30, gray cast iron conforming to the requirements of ASTM-A48 (latest revision thereof). The manufacturer's name and part number shall be cast into each component and the words "Sanitary Sewer" shall be cast into the cover. Pick holes shall be the non-penetrating type. Bearing surfaces of both ring and cover shall be machined to ensure proper fit and to prevent rattling.

Table 1-8 Approved Manhole Ring and Covers		
	Model No.	**Manufacturer**
Standard	V-1384	East Jordan Iron Works/Vulcan Foundry
	USF 669 Frame & KL Cover	US Foundry
Low Profile	V-1384-3	East Jordan Iron Works/Vulcan Foundry
	USF 664 Frame & KL-1 Cover	US Foundry
Watertight	2027	East Jordan Iron Works/Vulcan Foundry
	USF 579 Frame & DC-SSG Cover	US Foundry
Locking	3790	East Jordan Iron Works/Vulcan Foundry
	USF 579 Frame & DC-SSG-LOC Cover	US Foundry

Watertight units, when required to be lockable, shall contain a locking device comprised of a stainless-steel pentagon head bolt locking device which functions in the manner of a quarter turn fastener, as a part of the cover. The low-profile ring is to be used only when grades will not allow use of a standard height casting. All castings shall meet industry standards in regard to appearance and tolerances for dimensions and weight.

I. Manhole steps shall be constructed of 1/2” Grade 60 steel bars with a plastic coating and shall meet Federal Specification RR--F-621C. Maximum vertical step spacing shall be sixteen inches (16") on center.

4.04 Force Main Pipe and Appurtenances

A. Sewer force main pipe shall be a minimum of Class 200 PVC pipe or Class 50 ductile iron pipe.

1. PVC shall be manufactured in accordance with AWWA Standard C-900 (latest revisions). Fittings for PVC force main shall be ductile iron meeting the requirements of ANSI A21.10 and shall be designed for a minimum working pressure of 150 psi plus 100 psi surge pressure. The interior of all fittings shall be cement-mortar lined in accordance with ANSI 21.4 and the exterior of the fittings shall be bituminous coated in accordance with ANSI 21.51.
2. Ductile iron force main and fittings shall meet the requirements for ductile iron water main set forth in **Part 4.01C of Section 1, Sanitary Sewer System**.
3. All force mains shall include installation of a tee and valve with 6” quick connect and cap outlet to allow for future temporary bypassing of the pump station. This arrangement shall be installed on the discharge side of the pump station concrete valve vault.

B. Force Main Valves

1. Plug valves for sewage service shall be non-lubricated eccentric type plug valves, with cast iron body, resilient faced plug suitable for sewage service. Valves shall utilize a corrosion resistant seat material of ninety percent (90%) welded nickel machined to a smooth surface as per AWWA C-507 All valve parts and surfaces shall be of corrosion resistant materials or have an epoxy coating sufficient to prevent corrosion. Bearings shall be sleeve-type, replaceable, stainless steel per AWWA C-507. Valve packing area shall comply with AWWA C-507 by using a multi V-ring configuration that is adjustable and field replaceable. Valves shall have flanged faces drilled in accordance with American Standard for 125 pounds and shall be suitable for an operating pressure of 175 psi.
2. Plug valves eight inches (8") and larger shall be geared to provide suitable operation of the valve. Plug valves shall be as manufactured by Dezurik or approved equal.
3. Resilient seated gate valves shall comply with the requirements of AWWA. The valve body shall be ASTM A-126 Class B cast iron. All valve parts and surfaces shall be of corrosion resistant materials or have an epoxy coating sufficient to prevent corrosion. The valves shall open counterclockwise and have non-rising stem operation with 2-inch square operating nuts. The stem shall be of corrosion resistant material and have "O" ring seals. Valves shall provide zero leakage at a working pressure of 200 psi in either direction of line flow. Valves shall be manufactured by American Flow Control, Clow, or Mueller.

C. Check Valves

1. Check valves, unless otherwise directed by the Town of Winterville, shall be lever and spring type, iron body, bronze mounted with pin, seat ring and disc of brass or bronze designed for working pressure of not less than 150 pounds per square inch. Valves shall have a suitable opening for cleaning without disconnection from the pipe. Valves shall be manufactured by American Flow Control, Mueller or Clow.

D. Air Relief Valves

1. Air relief valves shall be automatic unless otherwise required by the Town of Winterville.
    a. The control valve shall be installed in a standard manhole, and 2) the service tubing shall be SDR 9 polyethylene.
    b. The design and selection of automatic air release valves shall be in accordance with the direction of the Town of Winterville and shall be handled on a case by case basis.
2. For pipes between 4 and 8 inches in diameter, air release valves shall be HARCO air release valves or an approved equal.
    a. The air release valve assembly shall utilize HARCO's ball valve, adapters, and stainless-steel transition nipple.
    b. Air Relief Valve construction shall consist of a one-piece injection molded C900 Tapped Service Tee and pressure class 235 psi/DR18 per AWWA C907. Fittings shall be qualified as tapped service tees.

c. Polyethylene transition nipples shall consist of 316 Stainless Steel threaded pipe adapter press fit over DR11 IPS PE 4710 HDPE pipe complying with ASTM D3035 and NSF61. The ball valve made to restrain the valve and pipe shall be 200 psi rated and have an Outside Diameter of 2.375" (IPS – OD controlled).

d. Polypropylene compression fittings shall be 230 psi rated and meet or exceed the dimensional and functional AWWA C800 and comply with NSF 61 listing. All joints are to be in accordance with ASTM D3139. All threads shall meet or exceed ANSI/ASME B1.20.1 and ASTM F1498

3. For pipes greater than 8 inches in diameter, air release valves will utilize a saddle with 2" MNPT threads.

4.05 Pump Stations

A. Pumping stations shall be of the submersible pump type, unless specifically approved otherwise by the Town of Winterville. The stations shall be equipped with a minimum of two (2) pumps, each capable of pumping at a rate equal to the peak design flow. The pumps installed in duplex pumping stations shall be of equal capacity.

B. Sewage pumping stations, structures, controls, and appurtenances shall withstand the 100-year flood without physical damage. Pumping stations shall not be located in areas subject to frequent flooding (areas inundated by the 10-year or greater frequency flood).

C. All sewage pump stations which are adjacent to streams classified as A-I, A-II or B waters shall be equipped with an alternate power source. Alternate power sources include on site standby power, dual power feed from separate electric substations, or portable generator. A generator receptacle shall always be present.

D. All pump stations shall include a separate concrete valve vault suitable for an H-20 highway loading which shall house a lever and spring type check valve and pressure gauge for each pump discharge line. These valves shall be of the same size as the discharge pipes and shall meet the requirements of **Part 4.04 of Section 1, Sanitary Sewer System**.

E. Wet wells shall be constructed of precast reinforced concrete manhole sections unless otherwise directed by the Town of Winterville. The sections shall conform to ASTM Specification C 478. The inside diameter of the wet well shall be no less than that required for installation and removal of the pump equipment and in no case less than 6.0 feet inside diameter. Wet wells shall be provided with base slabs meeting all applicable requirements of the ACI Code and of sufficient dimensions to protect the wet well from settlement and from flotation. Top slab shall be suitable for H-20 highway loading. Joint sealant shall be in conformance with **Part 4.03A of Section 1, Sanitary Sewer System**. The interior of the wet well shall receive two (2) coats of Koppers "Super Service Black", or a suitable coal tar epoxy of at least 24-mil thickness. Wet wells shall be properly vented. Pipe and fittings used on vents shall be Ductile Iron.

1. Reinforced concrete used in the construction of slabs and other structures related to wet wells shall conform to applicable sections of the NCDOT Standard Specifications for Roads and Structures. Concrete used in structures shall be Class A, 4,000 psi compressive strength, in accordance with Section

900. Reinforcing steel shall conform to ASTM A615 (Grade 60. Steel-mesh reinforcement shall conform to A185. Cover slabs for wet wells and valve vaults shall be specially reinforced at hatch openings.

2. Mortar shall meet the requirements of ASTM C144 for aggregate and strength. No mortar shall be used which has been mixed longer than forty-five (45) minutes.
3. Discharge piping in pump station wet wells must be stainless steel material from the pump base to the valve vault.

F. SCADA

1. Provide a complete and fully functional pump station SCADA system for each new or rehabilitated sewer pump station. The SCADA system shall include appurtenant equipment and accessories as specified herein.
2. Contractor shall be responsible for satisfactory installation, programming, testing, and operation of the entire system. Once satisfactorily installed, programed, and tested, the SCADA system will be provided to the Town for integration in their operation and maintenance duties.
3. Contractor shall conduct a path study, design, and coordinate for proper operation with related equipment and materials furnished under other contracts and with related existing equipment to allow for full communication between pump station RTU and Town of Winterville Public Works Operation Building. The existing SCADA system was designed and installed by Lord & Company, Inc.
4. Contractor to provide necessary contacts, relays, antennas, mounting equipment, wiring, power supplies, surge protectors, grounding, and signal computers required for a complete operating system shall be provided at each location upon field inspection.
5. Contractor to provide a dry type transformer for each 120-volt service.
6. At the Owner's wastewater pump station, there will be a single RTU installed.

G. Pumps

1. Pumps shall be as manufactured by Flygt, Hydromatic, Barnes or Fairbanks Morse. The pumps shall be suitable for pumping raw, unscreened sewage. The discharge connection elbow shall be permanently installed in the wet well along with the discharge piping. The pump(s) shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter pump well. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump. A sliding guide bracket shall be an integral part of the pump unit. The entire weight of the pumping unit shall be guided by no less than two (2) guide bars and pressed tightly against the discharge connection elbow with metal-to-metal contact. Sealing of the discharge interface by means of diaphragm, 0-ring, or other devices will not be acceptable. No portion of the pump shall bear directly on the floor of the wet well. The pump, with its appurtenances and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of sixty-five feet (65').

H. Pump Construction

1. Major pump components shall be of gray cast iron, Class 30, with smooth surfaces devoid of blow holes and other irregularities. All exposed nuts and bolts shall be of stainless steel 300 series.
2. All surfaces coming into contact with sewage other than stainless steel or brass, shall be protected by an approved sewage resistant coating (Tnemec series epoxy or approved equal). All mating surfaces where watertight sealing is required shall be machined and fitted with rubber 0-rings.
3. Discharge fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces. No secondary sealing compounds, rectangular gaskets, elliptical 0-rings, grease, or other devices shall be used.

I. Cable

1. The cable entry shall be an integral part of the stator casing. As a minimum the cable entry shall be comprised of a single cylindrical elastomer grommet, flanked by washers and a ferrule designed with close tolerance fit against the cable outside diameter and the entry inside diameter, or shall be triple protected with a compression fitting and two epoxy potted areas at the power cord entry to the pump.

J. Motor

1. Pump motor shall be squirrel-cage, induction, shell-type design, housed in a watertight chamber. The stator winding and stator leads shall be insulated with moisture resistant Class F insulation which will resist a temperature of l55 degrees C (311 F). The stator shall be dipped and baked three (3) times in Class F varnish. The motor shall be designed for continuous duty, capable of sustaining a minimum of ten (10) starts per hour and shall be thermally protected. Motor shall be NEMA design B. Each unit shall be provided with an adequately designed cooling system. Thermal radiators (cooling fins) integral to the stator housing, shall be adequate to provide the cooling required by the motor. Water jackets or other devices shall not be necessary for continuous pumping at sump liquid levels below midpoint of stator housing.

K. Shaft

1. The pump shaft shall be of stainless steel 300 or 400 series. The shaft shall be designed with a constant outside diameter for its entire length and without machined shoulders for bearings.
2. Sleeve spacers between rotor and bearings shall be sufficient to provide shoulder function for the bearings. A surface finish with minimum roughness values of 12 micro-inches shall be required.

L. Seals

1. Each pump shall be provided with two separate tandem mechanical rotating shaft seal system. Seals shall run in an oil reservoir. Seal failure sensors shall be included. Lapped seal faces shall be hydrodynamically lubricated at a constant rate. The seal units shall contain one (1) stationary carbon and one (1) positively driven rotating tungsten carbide or ceramic ring. Each interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment but shall be easily inspected and replaceable. Each pump shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall be designed to assure that air is left in

the oil chamber, to absorb the expansion of the oil due to temperature variations. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside.

M. Bearings

1. The pump shaft shall rotate on two (2) permanently lubricated bearings or continuously lubricated in an oil bath with a minimum B-10 life expectancy rating. The upper bearing shall be a single row ball bearing and the lower bearing a two (2) row angular contact ball bearing.

N. Impeller

1. The impeller shall be of gray cast iron, Class 30, dynamically balanced, double shrouded non-clogging design having a long thrulet without acute turns. The impeller shall be capable of handling solids, fibrous materials, heavy sludge, and other matter found in normal sewage applications. The impeller shall be of a single- or two-vane design. The pump manufacturer shall, upon request, furnish mass moment of inertia data for the proposed impeller. The impeller shall be capable of passing a minimum 3" solid sphere. The fit between the impeller and the shaft shall be a sliding fit on a key with an impeller nut which can be tightened and locked down with a set screw or a nylok keeper.

O. Volute

1. The volute shall be of single piece design and shall have smooth fluid passages large enough at all points to pass any size solids, which can pass through the impeller.

P. Wearing Ring

1. A wearing ring system shall be installed to provide efficient sealing between the volute and impeller. The stationary wear ring shall be made of stainless steel or nitrile rubber. The rotating wear ring shall be made of stainless steel. The wear rings are to be drive fitted to the impeller and volute inlet.

Q. Power Cord

1. The electrical power cord shall be water resistant, rated 600-volt, 60°C, be UL and CSA approved. Cable sizing shall conform to NEC specifications for pump motors.
2. The pump motor cable, installed, shall be continuous without splices and shall be suitable for submersible pump application which shall be indicated by a code or legend permanently embossed on the cable.

R. Guide Bars

1. Lower guide bar holders shall be integral with discharge connection. Guide bars shall be of at least standard weight stainless steel pipe. The guide bars shall not support any portion of the weight of the pump.

S. Controls

1. For each pump motor, there shall be included: a combination overload breaker, with manual reset for dual protection against current overloads and short-circuit protection, overload relay to be pre-calibrated to match motor characteristics and factory sealed to insure trip setting is tamper proof; across-the-line magnetic starter and hand/off/automatic selector switch. Soft starts are not acceptable on applications under 25 horsepower. Variable frequency drives

may be required on certain applications as deemed necessary by the Town of Winterville.

2. A twenty-four (24) volt control circuit transformer with disconnect circuit breaker and overload protection shall be included with an automatic, electric alternator for a duplex station (providing alternating operation of pumps under normal conditions, or in cases of high level, allowing both pumps to operate simultaneously). A terminal board for connection of level sensors shall be provided. All items inside or on the panel shall be adequately labeled. Provisions shall be made to provide the following signals to an autodialer:
   a. Wet well high-water alarm.
   b. Phase failure or phase unbalance.
   c. Pump motor overload 1 & 2.
   d. Pump seal failure 1 & 2.
   e. Wet well low water alarm.
   f. Loss of electrical power.
3. The following items shall be provided with the panel:
   a. NEMA 4X stainless steel watertight, lockable enclosure with swing out panel allowing access to terminal board.
   b. High Level Alarm
      1) Alarm light with cage protector
      2) Alarm bell
      3) Panel powered contact
      4) Unpowered contact
   c. Condensation heater
   d. Running time meter(s)
   e. Pump run light(s)
   f. Lightning arrestor
   g. Pedestal mounting
   h. Pole mounting bracket
   i. 2 each 110V GFI protected duplex receptacle - minimum 25A rating
   j. Autodialer with re-chargeable batteries and charger capable of at least 4 outgoing calls with 4 sensors and alarms as approved by Town. All autodialers shall be the same model.

T. Liquid Level Sensors

1. Provide one (1) pressure transducer for the pump station. Transducers shall include the following:
   a. Operating Range: 0 – 20 ft. (0-240 in.) measurement and read out range.
   b. Electrical Characteristics: 2-wire, 4-20 mA, 9-32 Vdc excitation.
   c. Safety Classification: UL listed, intrinsically safe, Class I, Div. 1, Groups A, B, C & D.
2. Pressure transducer shall be a Retro-Pac 240 by CSI or approved equal.

3. Back up high-water level and low water level sensors shall be mercury switches encapsulated in a buoyant waterproof housing with a two (2) conductor, 16 AWA, Type SJO cable. A chain and anchor assembly of noncorrosive materials shall be provided.

U. Piping and Valves

1. Discharge piping shall be ductile iron pipe meeting the requirements of **Subsection 4 of Part 4.01A Section 2, Water Distribution System.** Fittings for discharge piping shall comply with all applicable provisions of ANSI 21.10 and have a cement-mortar lining in accordance with ANSI 21.4. Joints for discharge piping shall be flanged and shall comply with ANSI B16.1. Discharge piping shall include swing check valve(s) of the outside lever and spring type, eccentric plug valves(s) or gate valve(s) and all necessary fittings and tees. Where piping passes through a wall, non-shrink grout or other approved means shall be used to make a watertight joint.

V. Access Hatches

1. Access hatches, hinged and lockable, shall be provided for wet well and valve vault. The frames shall be a continuous aluminum or stainless-steel frame, with a continuous concrete anchor. The doors shall be 3" thick aluminum diamond plate. The doors shall be lift assisted and shall open to 90 degrees and lock automatically in that position. All hardware and hinges shall be stainless steel. Access door shall have a minimum live load capacity of 300 lbs. per SF. Access hatches shall be as manufactured by Bilco, U.S. Foundry, Halliday Products or approved equal. Hatches shall be provided with factory installed padlock hasps.

W. Safety System

1. Pump access hatches shall be provided with a rail-mounted, hinged safety system for fall through protection. The safety grate shall be designed to hinge with positive latch to maintain upright position to facilitate entry and repositioning. Secondary protective grating panel shall be 1 inch (25mm) thick aluminum "I" bar grating. Grating panel color and finish shall be Safety Orange powder- coating. Grating panel shall be hinged with tamper-proof stainless-steel bolts and shall be supplied with positive latch to maintain unit in an upright position. A 6-in. (152mm) viewing area shall be provided on each lateral unhinged side of grating panel, for visual observation and limited maintenance procedures. The grating support ledges shall incorporate nut rail feature supplied with minimum of four stainless steel spring nuts for mounting pump brackets and/or cable holders. A padlock hasp for owner-supplied padlock shall be provided.
2. Safety grate shall be manufactured by Halliday Products, or approved equal.

X. Screening Basket

1. Pump stations will be provided with one (1) type 304 stainless steel screening basket of a design approved by the Town of Winterville. The basket shall be tract mounted and retrievable by hand from a dedicated access hatch conforming to **Part 4.05V of Section 1, Sanitary Sewer System.**

Y. Emergency Transfer Switch

1. The Transfer Switch unit shall have a watertight, NEMA 4X stainless steel enclosure and shall be sized to carry the maximum station load. Connection shall be Crouse Hinds, Appleton or approved equal and shall be compatible

with the Town of Winterville's existing emergency generator connection. The transfer switch must also keep the generator set's batteries charged and ready, and have an automatic exerciser to periodically start, load-up and shut down the generator set at specified intervals.

Z. Vacuum Pump

1. In accordance with Ms. Deborah Gore's (NC Department of Environment and Natural Resources, now NC Department of Environmental Quality) e-mail dated Wednesday, March 14, 2007 for sewer lift stations over 15,000 gpd the Town of Winterville can use the vacuum pump in lieu of the generator as long as it is permanently installed at the pump station and will automatically activate and signal an alarm condition. For smaller pump stations, using a portable pump, or generator dedicated to multiple stations is okay as long as the Town has evaluated the pump station' storage capacities and the rotation schedule, including the travel times. The Town would need to show that it can get around to all of the pump stations and back to the first one before it will overflow. THEREFORE:

2. Provide adjacent to the lift station a permanently mounted Portable Trailer Mounted Vacuum Sewer Lift Pump. The vacuum pump and portable trash pump specified herein shall be used to pump raw domestic sewage. The pump and all accessories shall be supplied by the pump manufacturer. The pump shall be fitted with a fully automatic priming system incorporating an air compressor, air ejector assembly, and an air/water separation tank. The priming system shall be capable of priming the pump from a completely dry pump casing. The air ejector shall operate on the discharge side of the compressor, eliminating the possibility of water being drawn into the air source. The pump must be capable of running totally dry for periods up to 24 hours, then repriming and returning to normal pumping volumes. The priming system shall not use a vacuum or diaphragm pump, nor require the use of a foot type valve. It shall contain no moving parts or protective float gear. Priming systems that require manual water additions to facilitate pump priming are not acceptable. The pump shall demonstrate the ability to repeatedly cycle from dry suction/ pump/snore/repriming. The diesel engine driven pump unit shall be mounted on a trailer suited for highway travel at 50 MPH and wired for over the road usage per DOT Standards. The trailer shall be permanently mounted on a concrete pad at least 6 inches thick and sized for the unit. The pump and priming system shall be fully automatic, needing no form of adjustment or manual addition of water for the priming system. The pump shall be capable of static suction lifts to 28 vertical feet, at sea level. It shall also be capable of operating with extended suction lines. Equipment acceptance shall be contingent upon the pumps ability to run continuously at full speed in a completely dry condition for periods up to 24 hours. The engine and pump shall be completely enclosed with 14-gauge sheet metal backed with 1-inch layers of polydamp acoustical sound deadening engine material. The acoustical enclosure shall reduce pump and engine noise to 73 dbA or less at a distance of 30 feet. The doors shall allow for easy access to the engine and pump for maintenance and repair. For maintenance and service needs, the pump discharge side of the trailer shall have a hinged door for quick access to the engine oil fill, fuel fill port, oil dipstick and filters. All doors on the unit shall be fitted with locking mechanisms.

Operating speed maximums shall be:	2,200 RPM
Maximum solids handling size shall be	3 inches
Impeller diameter shall be	Sized for service
Suction size shall be	6 inches
Maximum suction Lift shall be	28 feet

Maximum duty point shall be based on lift station design

The set shall consist of all components, including battery charger, heater, off/on/emergency floats necessary to make it operate unattended and without external support for at least 24 hours of full load operation.

AA. Emergency Pump Provisions

1. There shall be installed provisions for the quick installation of emergency pumps including a fully functioning permanently installed emergency pump attachment point within the pump enclosure along with gate valves and check valves and quick release attachment couplings and cover. This attachment point shall be on the downstream side of the force main line valves and check valves.

BB. Odor Control

1. The need for odor control shall be evaluated and the provisions for such, if required by the Town of Winterville.

CC. Magnetic flow meter

1. Meter shall be designed such that pipe will be full flow under all operating conditions.
2. Flow Tube with flow sensors
3. Magnetic flow meter systems shall include a magnetic flow tube and a microprocessor-based "smart" transmitter that is capable of converting and transmitting a signal from the flow tube. Magnetic flow meters shall utilize the characterized field principle of electromagnetic induction and shall produce DC signals directly proportional to the liquid flow rate.
4. Each meter shall be furnished with a stainless steel or carbon steel metering tube and carbon steel flanges with a polyurethane, ceramic, neoprene, or Teflon liner as required by the application and/or as specified herein. Liner shall have a minimum thickness of 0.125 inches. The inside diameter of the liner shall be within 0.125 inches of the inside diameter of the adjoining pipe. Liner protectors shall be provided on all flow tubes.
5. The flow tube shall be provided with flush mounted electrodes. Ultrasonic electrode cleaning shall not be acceptable.
6. Grounding rings shall be provided for all meters.
7. All materials of construction for metallic wetted parts (electrodes, grounding rings, etc.) shall be minimum 316 stainless steel, but shall be compatible with the process fluid for each meter in accordance with the recommendations of the manufacturer.
8. Flow tube shall be rated for pressures up to 1.1 times the flange rating of adjacent piping. System shall be rated for ambient temperatures of -30 to +65°C. Meter and transmitter housings shall meet NEMA 4X requirements as a

minimum. When meter and transmitter are located in classified explosion hazard areas, the meter and transmitter housings shall be selected with rating to meet the requirements for use in those areas. Non-metallic transmitter housings shall not be acceptable.

9. The transmitter shall provide pulsed DC coil drive current to the flow tube and shall convert the returning signal to a linear, isolated 4-20 mA DC signal. The transmitter shall utilize "smart" electronics and shall contain automatic, continuous zero correction, signal processing routines for noise rejection, and an integral LCD readout capable of displaying flow rate and totalized flow. The transmitter shall continuously run self-diagnostic routines and report errors via English language messages.
10. The transmitter's preamplifier input impedance shall be a minimum of 109-1011 ohms which shall make the system suited for the amplification of low-level input signals and capable of operation with a material build up on the electrodes.
11. The transmitter shall provide an automatic low flow cutoff below a user configurable low flow condition (0-10%). The transmitter's outputs shall also be capable of being forced to zero by an external contact operation.
12. Each flow tube shall be factory calibrated and assigned a calibration constant or factor to be entered into the associated transmitter as part of the meter configuration parameters. Manual calibration of the flow meter shall not be required. Meter configuration parameters shall be stored in non-volatile memory in the transmitter. An output hold feature shall be provided to maintain a constant output during configuration changes.
13. The transmitter shall be capable of communicating digitally with a remote configuration device via a frequency-shift-keyed, high frequency signal superimposed on the 4-20 mA output signal. The remote configuration device shall be capable of being placed anywhere in the 4-20 mA output loop. A password-based security lockout feature shall be provided to prevent unauthorized modification of configuration parameters.
14. Accuracy shall be 0.50% of rate over the flow velocity range of 0.3 to 10.0 m/s. Repeatability shall be 0.1% of rate; minimum turndown shall be 100:1. Minimum required liquid conductivity shall not be greater than 5 uS/cm. Maximum response time shall be adjustable between 1 and 100 seconds as a minimum. Transmitter ambient temperature operating limits shall be -10 to +50°C. Power supply shall be 115 VAC, 60 Hz.
15. All flow tubes shall have continuous submergence protection up to 30 ft (IP68). This requires the user to install sealed IP68 cable glands, conduit connections, or conduit plugs and provide pre-wired potted and sealed junction box to prevent the ingress of water. All options use sealed conduits to meet IP 68 protection requirements.
16. Flow tubes shall be 150-lb flange mounted unless otherwise noted. The cables for interconnecting the meter and transmitter shall be furnished by the manufacturer. Transmitter shall be mounted integrally on flow tube, wall, or 2-inch pipe mounted as shown in the Drawings and/or as specified.
17. Flow meter shall be Rosemount 8750W Magnetic Flow Meter or approved equal.

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SECTION 2: WATER DISTRIBUTION SYSTEM

Part 1 General

1.01 Section Includes

A. Work under this section includes, but is not limited to piping, valves, fire hydrants, water service line, and appurtenances for a complete potable water distribution system.

B. The Engineer and Developer shall become familiar with the water extension policies of the Town of Winterville prior to making conceptual plans for developments which will require water service by the Town, and, in particular, to the policy in regard to water extensions.

C. It shall be the responsibility of the Engineer or Developer to obtain the approval of the Town of Winterville Council for any proposed projects under their respective jurisdiction prior to submission of Contract Documents for Town approval. It is the responsibility of DRC for the approval of site plans.

Part 2 Design Considerations

The intent of this part is to provide the Developer or Engineer with Guidelines which will assist in the development of Contract Documents for water system extensions for which acceptance by the Town of Winterville will be sought. As a minimum, the Contract Documents for any proposed extension must address satisfactorily the topics contained herein.

2.01 Location and Alignment

A. Depth of Cover

1. Water mains shall be designed to provide a cover of no less than three feet (3') but no more than five feet (5') as measured from the top (crown) of the pipe to the finished grade. Where this requirement cannot be met due to unavoidable conflicts in grade, the Town Engineer shall be consulted so that a solution acceptable to the Town may be determined. If, in the opinion of the Town Engineer, conditions warrant greater or lesser depths of cover than that required above, special measures, such as the use of ductile iron pipe for shallow installations, or additional easement widths for deeper installations may be required by the Town of Winterville. Although not required, the installation of tracer tape for water mains and sewer mains is recommended to assist utilities being located by locator services.

B. Relationship of Mains to Property Lines Rights-of-Way and Structures

1. All water mains shall be located within dedicated street rights-of-way or permanent to general utility easements such that the Town's maintenance and repair forces have unrestricted access to the line and all appurtenances thereof.

2. Water mains shall be centered in a permanent easement of adequate width to allow excavation and maintenance of the line. In no case shall the permanent

easement for water mains be narrower than that given by the following table (Table 2-1):

Table 2-1	
Pipe Diameter	**Minimum Easement**
Less than 12”	10’
12” – 24”	15’
Greater than 24”	20’

3. Under certain conditions, the Town Engineer may require additional easements as deemed by him appropriate. Such easement shall be centered on the water main unless directed otherwise by the Town.
4. Approval of water main extension plans shall be contingent upon the procurement of all easements necessary to meet the above requirements and upon the execution of an encroachment agreement with the owner of each right-of-way which the proposed main will cross. See **Part 3.06 of Section 2, Water Distribution System**, for the requirements for submission of easement documents.
5. Water mains shall be located no closer than ten feet (10’) horizontally to buildings or substantial surface structures.

C. Relationship of Water Mains to Sanitary Sewers

1. Water mains shall be laid at least ten feet (10’) laterally from existing or proposed sewers, unless local conditions or barriers prevent a ten-foot (10’) lateral separation, in which case:
   a. The water main shall be laid in a separate trench, with the elevation of the bottom of the water main at least eighteen inches (18”) above the top of the sewer; or
   b. The water main shall be laid in the same trench as the sewer, with the water main located at one side on a bench of undisturbed earth and with the elevation of the bottom of the water main at least eighteen inches (18”) above the top of the sewer.
2. A water main that crosses a sewer main shall be laid to provide a minimum vertical distance of eighteen inches (18”) from the outside of the water main and the outside of the sewer main. The water main may either be above or below the sewer but, if practicable, the water main shall be located above the sewer. One full length of water pipe shall be located so that both joints will be as far from the sewer as possible.

D. Relationship of Water Mains to Storm Sewers

1. When underground structures or storm sewers are encountered, twelve inches (12”) minimum vertical separation and five feet (5’) minimum lateral separation shall be maintained. Water main and storm sewer crossings shall be constructed in accordance with the Standard Details.

E. Location under Paved Areas

1. Water mains shall be located outside of proposed or existing paved areas except where required at intersections, cul-de-sacs, street crossings by water mains, other paved areas which must be crossed, or where structures or other obstacles make this impossible. When a new water main must be located under an existing or proposed paved area it shall have a minimum cover of three feet (3') as measured from the top of the pipe to the finished subgrade. Water mains proposed within paved areas should be designed to avoid parking spaces whenever possible. Water mains located in cul-de-sacs should be projected straight through and the main should terminate at the property corner with the hydrant or blow off located on the property corner/right-of-way. If design of the cul-de-sac does not allow this, a 90 degree bend should be used to direct the main to the property corner, thereby allowing water services to be installed in accordance with **Part 2.01I of Section 2, Water Distribution System**.

F. Location of Fire Hydrants

1. Fire hydrant spacing listed herein represents the minimum standards for public works needs; however, the developer shall confirm the proposed spacing with the Town of Winterville Fire Marshall for compliance with the latest version and requirements from Appendix C of the North Carolina Fire Code.
2. Fire hydrants shall be installed with the back of the hydrant being located at right-of-way line with preference being given to street intersections. In no case shall any portion of a hydrant be closer than five feet (5') to the back of the curb or two and one-half feet (2.5') to the backslope of a roadside ditch.
3. Hydrants shall be oriented so that the pumper nozzle faces the roadway and so that the nozzle centerline is a minimum of eighteen inches (18") and a maximum of twenty-four inches (24") above finished grade.
4. Residential areas and subdivisions (single family and/or duplex) shall require fire hydrants located such that each structure or portion thereof will be within four hundred feet (400') of a hydrant.
5. Multi-family residency areas and subdivisions (apartments, townhouses, condominiums, etc.) shall require fire hydrants located such that each structure or portion thereof will be within four hundred feet (400') of a hydrant.
6. Non-residential areas and subdivisions shall require fire hydrants to be located such that each structure or portion thereof will be within four hundred feet (400') of a hydrant.
7. The above determinations shall be made via vehicle access routes, (roadways, fire lanes, etc.) and it is preferable that fire hydrants be located at the front of the structures. When possible, fire hydrants shall be located a minimum of fifty feet (50') from any structure.
8. In proposed subdivisions, where all structures have not been constructed, hydrant spacing shall be measured along the street right-of-way with spacing provided as shown. Each phase of a project shall be designed and constructed to provide the minimum number of hydrants necessary to conform with the requirements upon completion of each phase.
9. Dead-end water mains, including cull-de-sacs, shall be provided with a fire hydrant. Water mains serving standard fire hydrants shall be six-inch (6")

diameter minimum. Dead-end water mains at the end of Cull-De-Sacs will have fire hydrants located such that each structure or portion thereof will be within four hundred feet (400') of a hydrant, unless alternate approved. Where available, the hydrant shall be located at the “neck” of the cul-de-sac. (see **Part 4.03A of Section 2, Water Distribution System, and DWG No. W-4 and W-5 of the Town of Winterville Standard Specifications and Details**)

10. The determination of distance shall be made via vehicle access routes (roadways, fire lanes, etc.) and by hose placement from the firefighting equipment located adjacent to the fire hydrant in lieu of direct measurements. The distances specified are meant to reflect the actual length of fire hose which would be laid by the fire department to reach the structure in the event of a fire at or in that structure. Distances shall be measured beginning at the point of the structure farthest from the hydrant, thence along an UNOBSTRUCTED PATHWAY to a point in the centerline of the street, thence along the centerline of the street to a point opposite the hydrant.
11. UNOBSTRUCTED PATHWAY means a route which may be taken by firemen in laying fire hose. The UNOBSTRUCTED PATHWAY shall be, and remain, free of trees and shrubs, walls, fences, well, structures, or other obstacles to the passage of firefighters, hose and equipment for a width of ten feet (10’) and a minimum vertical distance of thirteen feet six inches (13’-6”) and shall not be through, under, or over any portion of any structure, ditch or waterway per Appendix D of the North Carolina Fire Code.
12. The developer of any new subdivision, project, or development, whether it be single or multiple, or whether residential or commercial, is responsible for funding and installing the required fire hydrant(s) and water main(s) to comply with these requirements.
13. Plans for developments shall be reviewed by the Town of Winterville Fire Chief or his written designated representative. The Fire Chief shall approve the location of fire hydrants and may require more stringent hydrant locations and or separation specifications than as required here.
14. For any structure that has a fire sprinkler system or a standpipe system, a fire hydrant shall be no more than 100’ from the fire department connection. This hydrant shall be dedicated to the fire department connection and shall be in addition to the hydrants required by **Subsections 3 through 12 of Part 2.01F of Section 2, Water Distribution System**. The hydrant shall be located on the supply side of the backflow prevention device.
15. Where possible fire hydrants shall be located a minimum of fifty feet (50’) from any structure.
16. For proposed subdivisions where the location of structures is not known, hydrant spacing shall be measured along the street right-of-way with spacing provided as shown in **Subsections 3 through 12 of Part 2.01F**. Measurements across lots, which front on different streets, will not be permitted for purposes of satisfying hydrant spacing requirements.
17. Structures located on multi-lane streets or highways shall require fire hydrants located on the same side of the roadway as the structure. Multi-lane shall be defined as a street, highway, avenue, road, or thoroughfare having four (4) or more lanes including the center turn lane. Fire hydrant locations shall be staggered in relation to opposite sides of the street or roadway.

18. In the case of a water main extension along streets with four (4) or more lanes, the fire hydrants shall be required to be staggered on opposite sides of the street or roadway in accordance with **Subsections 3 through 12 of Part 2.01F of Section 2, Water Distribution System**, above.
19. Dead end mains shall be provided with a hydrant when required by **Part 2.01J of Section 2, Water Distribution System**.
20. Each phase of a project shall be designed and constructed to provide the minimum number of hydrants necessary to conform with this Section upon completion of the phase.

G. Location of Gate Valves

1. Each intersection of water mains shall have a minimum of one less main valve than the number of intersecting pipes, i.e. crosses shall have three (3) main line valves, and a tee intersection shall have two (2) main line valves. Valves shall not be located in any part of the curb and gutter.
2. A proposed connection of a new water line to an existing water line shall include provisions for the addition of sufficient valves to the existing water line to meet the intent of **Subsection 1 of Part 2.01G**. If there are existing valves located in close proximity to the proposed connection, the Town of Winterville may not require that valves be added to the existing water line except in unusual circumstances.
3. Each fire hydrant shall have a hydrant branch valve in accordance with the Standard Details. Valves on a hydrant branch shall not be located in any part of the curb and gutter.
4. In addition to the valves required at tees, crosses, hydrants, etc., in-line valves shall be provided at intervals no greater than 1,500 feet unless otherwise approved by the Town of Winterville because of unusual circumstances.
5. Valve boxes shall be installed on all valves in accordance with **Part 2.03J of Section 2, Water Distribution System**, and as shown in the Standard Details.

H. Location of Air Release Valves

1. Mains twelve inches (12”) or larger in diameter, which have a change in elevation of fifteen feet (15’) or greater, shall have an air release valve meeting the requirements of **Part 4.07 of Section 1, Sanitary Sewer System**, installed at the highest elevation of such change.
2. The Town of Winterville may also require air release valves in other instances where, in the opinion of the Town Engineer, the possibility of excess quantities of air accumulating in the proposed main exists.
3. See the Standard Details and **Part 4.07 of Section 1, Sanitary Sewer System**, for requirements of the Town of Winterville regarding taps for air release valves.
4. Manual air release valves shall be installed in a standard meter box. Automatic air release valves shall be provided with a standard manhole.

I. Location of Services

1. Plans for projects which propose the creation of lots shall include the provision of water services to each lot, including any residual parcels and areas reserved for future lots. The size and location of services shall be based upon the anticipated use of the lot and require the Town of Winterville's approval. The

Town of Winterville may agree to waive its requirement that water services be installed to each lot within nonresidential subdivisions if there is insufficient information available to permit proper sizing of services and they can be conveniently installed by the Developer at the time service is requested.

2. The Town of Winterville reserves the right to require individual water and sewer services to each building or tenant space. G.S. 143-355.4 pertains to water system connections for irrigation systems and became effective December 1, 2009. In part, the law states "Local government water systems and large community water systems shall require separate meters for new in-ground irrigation systems that are connected to their systems". The Town of Winterville Standards for water and sewer systems has been changed effective December 1, 2009 to comply with this law.
3. Water meter boxes shall be set flush with the finished grade and located on the street right-of-way limit at the center of the lot for which service is installed, unless directed otherwise by the Town of Winterville or this Manual.
4. When project design dictates that electric cables are to be placed on the same side of the roadway with the sidewalk, the water meter box for that side shall be located six feet behind the edge of the sidewalk.
5. Water meter boxes shall not be located within driveways, sidewalks, or other paved areas subject to vehicular traffic, unless approved otherwise by the Town of Winterville.
6. Water meter boxes shall not be installed within a ditch slope. Where the right-of-way limit for a street is within a ditch slope, the meter box shall be installed a minimum of 2.5 feet behind the top of the ditch bank.
7. Easement shall be provided for all water meter boxes not located in existing rights-of-way or easement.
8. Water services shall be located perpendicular to the main.
9. Plans should not propose the crossings of public and private utilities.

J. Location of Blow-Offs and Dead-End Hydrants

1. Dead ends on mains six inches (6") in diameter or larger shall be provided with a standard fire hydrant at the terminal end. Materials and installation shall be as required by the Town of Winterville for standard fire hydrants.
2. Dead ends on mains four inches (4") and smaller in diameter shall be provided with a blow-off meeting the requirements of **Subsection 2 of Part 4.03B of Section 2, Water Distribution System**, and the Standard Details.
3. All water lines shall be terminated in accordance with the Standard Details with blow-offs and hydrants located on property corners whenever possible.

K. Location of Backflow Prevention Assemblies

1. The location of backflow prevention assemblies shall be in accordance with the requirements of the following:
    a. In general, all backflow prevention assemblies shall be located outside of the structure and before any branch connections to the private system, with preference being given to the property line/right-of-way, unless otherwise approved by the Town of Winterville.

b. Backflow assemblies shall be required for any application if any possible pollution or contamination of the public water supply system could result from a backflow cross-connection.

c. The severity of the potential effects of possible pollution or contamination of the public water supply shall determine the minimum degree of protection required for Backflow assemblies. The Town of Winterville will review each case on an individual basis.

2.02 Sizing of Water Mains and Appurtenances

A. General

1. Water mains are to be sized in accordance with this Manual and good engineering practice. The standards included herein are minimum standards. The Engineer shall design the water distribution system based upon the available supply and the project needs.
2. All water lines installed should be 6-inchs or larger in diameter.

B. Pressure Requirements

1. Water mains shall be sized so that a minimum residual pressure of 20 psi is obtained during peak demand plus fire flow. Where higher pressures are required, it shall be the responsibility of the individual property owner to provide the necessary booster pumping facilities.

C. Fire Hydrants

1. All fire hydrants shall be installed on a six-inch (6") leg with a six-inch (6") hydrant branch valve.
2. All dead-end water mains must have an approved hydrant.

D. Private Mains

1. Private mains shall be sized by the Engineer in accordance **with Part 2.02E of Section 2, Water Distribution System**. Backflow prevention shall be provided in accordance with **Part 2.01K of Section 2, Water Distribution System**.

E. Minimum Fire Flows

1. General

a. Unless otherwise required or permitted by the Town of Winterville, water distribution systems shall be designed to provide the fire flow required by the guidelines contained in this Section and in coordination with the Town of Winterville Fire Marshall, Appendix B 2018 NC Fire Code (or newest version) and the FPRS.

b. The Town of Winterville's existing facilities may or may not be adequate to provide the required fire flow at the time of design and construction of the planned development; however, the Town of Winterville shall provide the Engineer with an estimated value for the system pressure at design fire flow available at the point where the planned development is to connect with the Town of Winterville's existing distribution system. This value may be based upon the actual system pressure available or calculation of the pressure which shall be available upon reinforcement of the existing system. The Developer or his Engineer shall provide the Town of Winterville with the value (subject to approval) of the design fire flow necessary to meet the requirements of this Section.

c. The value for design fire flow and supporting documentation shall be submitted with the pre-application package should the Town of Winterville require the submission of such a package. The design fire flow and supporting documentation shall also be submitted for approval with the design calculations as required by **Part 3.01 of Section 2, Water Distribution System**.

2. Fire Flow Conditions

   a. Selection of the size of the water main for fire flow capacity shall be such that the main will deliver the discharge required by **Subsections 3 and 4 of Part 2.02E of Section 2, Water Distribution System**, as applicable, including the peak user demand of the development. A minimum residual pressure of 20 psi shall be available at all points of the planned distribution system at fire flow plus peak user demand.

3. Fire Flow for Residential Areas

   a. The following guideline shall apply to all residential developments including single family dwellings, duplexes, and multi-family dwellings.

   b. Guidelines for determining peak user demand are published in the North Carolina Administrative Code, title 15A, Subchapter 18C.

      1) Where buildings are separated by less than ten feet (10') between exterior walls, the minimum draft available to any hydrant serving the development shall be 1,500 gallons per minute (gpm) plus peak user demand with a minimum residual pressure of 20 psi.

      2) Where buildings are separated by ten feet (10') or more between exterior walls, the minimum draft available to any hydrant serving the development shall be 1,000 gpm plus peak user demand with a minimum residual pressure of 20 psi.

4. Fire Flow for Commercial Areas

   a. Fire flows in areas other than residential are dependent upon the type of construction, the total floor area of the buildings and other factors within a project. In order to provide an adequate design, developers of nonresidential property should consult with the appropriate insurance carrier for required design criteria. Design shall make all available allowances to achieve 1,500 gpm.

   b. As a minimum, the recommendation of the Insurance Services Office shall be met. These recommendations include the following for commercial developments:

      1) The minimum size main shall be 8-inch with 8-inch or larger intersecting mains in each street; 12-inch or larger mains shall be used on the principal streets and for all long lines that are not connected to other mains at intervals close enough for mutual support.

      2) Arrangements using very small mains, designed for domestic service only and incapable of providing fire protection supplied by larger mains in a gridiron too wide to provide good fire protection are considered unsatisfactory. The use of dead end 6-inch and smaller mains to provide fire protection shall be avoided.

3) Guidelines for determining needed fire flow are published in the Insurance Services Office Fire Suppression Rating.

2.03 Installation

A. General

1. The Contract Documents for water system extensions shall ensure that the following standards and performance requirements are met in regard to the installation of mains and all appurtenances thereof.

B. Construction Safety

1. The Contract Documents shall address the responsibility for the safety of the workmen and the general public. The Contractor shall be required to adhere to the requirements of the NCDOT and the Town of Winterville with regard to traffic safety and traffic control devices. Additionally, the Contractor shall be required to perform all work in accordance with all applicable federal, state, and local laws. The Contract Documents shall state that the Town of Winterville has no responsibility for, nor authority to enforce, job safety requirements. The "Standard General Conditions of the Construction Contract" prepared by the Engineers Joint Contract Documents Committee may be used as a guideline for preparation of the Contract Documents.

C. Replacement of Damaged Facilities and Structures

1. The Engineer shall ensure, through the Contract Documents, that all structures, pavements, utilities and other facilities which may be damaged as a result of project work are replaced or repaired in a manner which meets the approval of the owner of such facilities or any governing bodies having jurisdiction.

D. Connection to Town of Winterville Owned Facilities

1. Language shall be included in the Contract Documents which states that no connection to or alteration (including operation of valves, hydrants, etc.) of the Town of Winterville's facilities shall be performed without the Town of Winterville's specific approval. The Contract Documents shall require that all pipe, valves, taps, fittings, etc., which could possibly contaminate the Town of Winterville's facilities be thoroughly disinfected prior to their use. The Contract Documents shall also include a requirement to keep excavations for such connections completely dewatered and to use the utmost care to avoid contamination of the Town of Winterville owned facilities.

E. Salvage of Town of Winterville Owned Facilities

1. When project work results in removal of Town of Winterville owned facilities and equipment, the Contractor shall be required to deliver those facilities or equipment undamaged to the Town of Winterville's Operations Center, if requested to do so by the Town of Winterville.

F. Water Main Construction and Excavation

1. Pipe installation shall be performed only in the presence of the Town of Winterville's Representative, except as authorized by the Town of Winterville.
2. Meter Setters are to be installed by the Contractor.
3. The Contract Documents shall specifically address excavation, pipe foundation and bedding, pipe installation and haunching requirements. Satisfactory construction materials shall be identified and either construction methods or

performance standards shall be specified. If standard references are cited in lieu of specific requirements, the Engineer shall furnish the Town of Winterville, at no cost, two (2) copies of the cited references, if requested to do so.

4. No deviation from the line and grade shown on the Approved Plans shall be permitted by the Contract Documents without the approval of the Town of Winterville. Any proposed deviation will require submission of revised Contract Documents to the Town of Winterville for review and approval.
5. Pipe cutting, where necessary and where permitted, shall be done in accordance with the written recommendations of the pipe manufacturer.
6. The Engineer shall require fittings at sufficient locations to minimize the possibility that pipe joint deflections will exceed the maximum horizontal or vertical joint deflections recommended by the pipe manufacturer. Unless the Engineer requires the use of a specific manufacturer's pipe, he shall assume, for design purposes, that the allowable deflection is the minimum found in the industry. Layout of plastic pipe larger than six inches (6") in diameter shall be based upon the assumption that no deflection can be accomplished by bending the pipe barrel.
    a. Longitudinal deflection for six-inch (6") diameter and smaller AWWA C900 pipe shall be such that the minimum bending radius (Rb) of the deflected pipe center is equal to or greater than the value obtained by use of the following relationship. R_b = 300 x D where R_b is the minimum bending radius in feet and D is the nominal pipe inside diameter in feet. Longitudinal bending of PVC pipe affected through mechanical means will not be allowed.
    b. Longitudinal deflections for ductile iron pipe shall not exceed the values given in ANSI/AWWA Standard C600 which are as follows:

Table 2-2
Maximum Longitudinal Deflections for Ductile Iron Pipe

	Type of Joint					
	Push-On			**Mechanical Joint**		
Nominal Pipe Size (inches)	**Deflection Angle (degrees)**	**Maximum Off-Set Joint (inches)**		**Deflection Angle (deg–min)**	**Maximum Deflection Joint (inches)**	
		18 ft.	20 ft.		18 ft.	20 ft.
4	5	19	21	8–18	31	35
6	5	19	21	7–7	27	30
8	5	19	21	5–21	20	22
10	5	19	21	5–21	20	22
12	5	19	21	5–21	20	22
14	3*	11	12	3–35	13.5	15
16	3*	11	12	3–35	13.5	15
18	3*	11	12	3–0	11	12
20	3*	11	12	3–0	11	12
24	3	11	12	2–23	9	10
30	3*	11	12			
36	3*	11	12			

42	3*	11	12			
48	3*		12			
54	3*		12			

*For 14-in. and larger push-on joints, maximum defection angle may be larger than shown above. Consult the manufacturer.

7. The Contract Documents shall require the Contractor to prevent surface water from accumulating in the trenches. Trenches shall be free of water during pipe installation.
8. The Contract Documents shall require trench excavation to provide vertical curve chords which will not exceed the permissible deflection of the pipe. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each joint of pipe on undisturbed soil at every point along its entire length.
9. The Contract Documents shall provide for the placement of No. 57 crushed stone in the bottom of the trenches when unstable material is encountered. Such unstable material shall be removed to the depth required by the Town of Winterville and replaced with No. 57 crushed stone such that the pipe will be adequately supported throughout its entire length. Excavation below the planned pipe invert elevation as shown on the Approved Plans shall be refilled with No. 57 crushed stone.
10. The Contract Documents shall require thrust blocking at each horizontal and vertical change in direction of a main. Trenches shall be excavated to provide uniform support of the blocking on undisturbed soil. The concrete shall be placed as shown in the Standard Details and shall not interfere with the removal of any bolts, fasteners, or fittings. Ductile iron fittings shall be wrapped in polyethylene prior to placement of the concrete blocking.
    a. In lieu of concrete thrust blocking, piping systems 12 inches and smaller in diameter may be restrained through the use of restrained joint pipe or approved joint restraint devices meeting the requirements of **Subsection 7 of Part 4.01A of Section 2, Water Distribution System**. The minimum length of piping to be restrained shall be as set forth in Table 2-3 below:

Table 2-3
Restrained Length (ft.)*

Pipe Cover (ft.)	Pipe Size (in.)				
	4	**6**	**8**	**10**	**12**
3.0	16	24	31	38	46
4.0	15	23	30	37	43
5.0	14	22	29	36	42

*Above values are the lengths of restrained pipe required on each side of fitting. Above values are for 45° horizontal bend. For other horizontal bends multiply above by the following coefficients: 90° – 2.4; 22 1/2° –- 0.48; 11 1/4° – 0.24; dead end – 2.4.

    b. The use of joint restraint devices on vertical bends and on piping systems larger than 12 inches in diameter shall not be utilized unless approved by

the Town of Winterville. The Engineer shall submit documentation to the Town of Winterville for its review and approval demonstrating that the joint restraint system to be utilized will provide the needed restraint. The Contract Documents shall specify the joint restraint method to be used and shall clearly indicate the minimum length of piping requiring joint restraint.

c. The use of combined thrust restraint systems employing concrete blocking and joint restraint devices, based on each system being designed to resist a percentage of the resultant thrust force, shall not be permitted. The use of combined systems based on each system being designed to resist all of the resultant thrust force are permitted.

11. The Contract Documents shall include the requirement that NC One Call shall be contacted seventy-two (72) hours prior to any excavation. The documents shall also note that locations of existing utilities by NC One Call are valid only for ten (10) days after the date of location.
12. The Contract Documents shall advise the Contractor that pavement cuts within the Town of Winterville require a permit from the Town of Winterville Public Works Department.

G. Backfilling

1. Backfilling shall be performed only with the approval of a Town of Winterville's Representative.
2. Terms used to indicate pipe backfill zones in this section are capitalized and are defined as follows:
   a. **Foundation** – That portion of the pipe support structure bounded by the undisturbed trench bottom, the trench walls, and the pipe Bedding. The construction of a pipe foundation is generally not required unless unstable materials are encountered in the trench bottom.
   b. **Bedding** – That portion of the pipe support structure bounded by the Foundation or undisturbed trench bottom, the trench walls, and the bottom of the pipe.
   c. **Haunching** – That portion of the pipe support structure bounded by the Bedding, the trench walls, the outside of the pipe and a horizontal plane having an elevation equal to that of the top of the pipe.
   d. **Initial Backfill** – That portion of the backfill lying above the top of the pipe and below a horizontal plane having an elevation which is one (1) foot above the top of the pipe.
   e. **Final Backfill** – That portion of the backfill lying above the Initial Backfill.
3. Special care shall be taken in writing the Contract Documents so that backfilling for water mains and appurtenances will be done in a manner which will provide satisfactory support and restraint of all pipes, fittings, valves, equipment, and structures. As a minimum, Initial Backfill for water mains shall be compacted to 95% Standard Proctor as determined by the AASHTO-T99 method.
4. The Haunching and the Initial Backfill shall be free of materials which might in any way damage the pipe or preclude proper compaction of the backfill. Acceptable soil materials are ASTM 2487 soil types SW, SP, SM and SC.

5. The Final Backfill shall be provided using materials and methods suitable to provide the compaction necessary to prevent settlement which would adversely affect existing or proposed land use. Unless otherwise permitted by the Town of Winterville, compaction shall be no less than 90% Standard Proctor as determined by AASHTO-T99. Backfilling within the right-of-way of the NCDOT, the Town of Winterville, railroads, and other rights-of-way shall be subject to the right-of-way owner's requirements.
6. All water mains shall be installed with three-inch (3") wide metallic detectable tape. The tape shall be clearly marked "Water" and shall be centered over the main, twelve inches (12") below finished grade. Any breaks in the tape shall be repaired in accordance with the manufacturer's recommendations.
7. The Contract Documents shall require the disturbed ground surface to be graded to prevent ponding of water, and to be seeded and mulched upon completion of backfilling operations. Seeding and mulching shall be in accordance with the requirements and recommendations of the Land Quality Section of the Division of Land Resources.

H. Termination of Water Mains

1. Water mains shall be terminated in accordance with the Standard Details. Provide either blow-offs or hydrants as required by **Part 2.01J of Section 2, Water Distribution System**.

I. Installation of Services

1. Services shall be provided to each lot or individual building unit as required by **Part 2.01I of Section 2, Water Distribution System**, and as shown in the Standard Details. Meter boxes and brick shall be provided by the Contractor as shown on the Standard Details. Meter boxes installed for multi-family developments and ganged together shall be marked with the unit number being served. Markings shall be permanently painted on the inside of the frame section and highly visible.
2. When service is available from two (2) or more water mains, the property shall be served by the main designated by the Town of Winterville.
3. Standard services are available utilizing 3/4", 1", and 2" meters. Service tubing for 3/4" and 1" services shall be 1" diameter. Service pipe for 2" services shall be 2" diameter. For additional information, refer to the Standard Details. Larger services such as four-inch (4"), six-inch (6"), eight-inch (8"), etc., may be specified. Services larger than two-inch (2"), if used, shall be designed as a dead-end water main except that a permanent blow-off rather than a hydrant may be provided for flushing purposes.
4. Service connections for one-inch (1") services shall be installed by one of two (2) methods. These are as follows:
    a. Service connections to PVC (C900) and ductile iron mains six inches (6") in diameter or larger may be accomplished by direct tapping of the main. Teflon tape or other approved pipe compound shall be applied to the corporation stop threads prior to installation.
    b. Service connections for mains smaller than six inches (6") and all sizes of pressure rated PVC require the use of a service clamp. A service clamp shall also be used as an alternative to tapping wherever required by the Town of Winterville.

5. One-inch (1") service tubing shall be installed with sufficient slack to prevent tension on the line. No splices (couplings) shall be allowed on a service. Tubing shall have a minimum cover of twenty-four inches (24"). See the Standard Details.
    a. Service tubing shall be installed with a minimum of six inches (6") of vertical separation from an existing or proposed storm drain.
    b. If the service tubing is damaged during construction such that its flow capacity or its life expectancy is adversely affected, the damaged portion shall be replaced.
6. Two-inch (2") diameter services shall be installed in accordance with the Standard Details. The installation of the Sch 80 PVC service pipe shall be in strict conformance with the requirements for mains, except that the service pipe shall have a minimum cover of twenty-four inches (24").

J. Setting of Valves and Valve Boxes

1. Valves shall be set at the locations directed in **Part 2.01G of Section 2, Water Distribution System**, and as shown in the Standard Details.
2. All valves shall be installed with a cast iron valve box meeting the specifications of **Part 4.02D of Section 2, Water Distribution System.** The boxes shall be set plumb with the bottom of the box resting on compacted backfill. Valve boxes for two-inch (2") ball valves shall be supported by two (2) bricks. The box shall not contact the valve or water main. The top of the box, when located in unpaved areas, shall be centered, and set in a 24-inch X 24-inch X 6-inch depth concrete pad or precast concrete collar set flush with the finished grade. See Standard Details.
3. Valve boxes shall be installed so that a minimum of four inches (4") of upward and four inches (4") of downward [total of eight inches (8")] vertical adjustment is possible without disturbing the base or removal of any box sections unless directed otherwise by the Town Engineer. Valve box extensions shall be in accordance with **Part 4.02D of Section 2, Water Distribution System**.

K. Setting of Fittings

1. The specifications shall ensure that care is taken in setting fittings so that the joints bell up properly. The fittings shall be properly supported and thrust blocked in accordance with **Subsection 8 of Part 2.03E of Section 1, Sanitary Sewer System and Subsection 9 of Part 2.03F of Section 2, Water Distribution System**.

L. Installation of Air Release Valves and Blow-offs

1. Blow-offs and drainage branches shall not be connected to any sewer, submerged in any stream, or be installed in any other manner which will permit back siphonage into the distribution system.
2. Automatic air release valves shall be installed in standard manholes free of infiltration. In cases where automatic air release valves are permitted or required by the Town of Winterville for use on a water main, such valves shall be equipped with a vacuum check device to prevent backflow in the event of main pressure loss.
3. Manual air release valves shall be installed in a standard meter box located outside of traffic areas where possible. The air release valve shall be provided

by tapping the main and installing a standard service clamp, a corporation stop, one-inch (1") service tubing and an angle meter stop as shown in the Standard Details. The one-inch (1") tubing shall have a minimum cover of twenty-four inches (24").

M. Installation of Backflow Prevention Devices

1. Backflow prevention devices shall be located in accordance with **Part 2.01K of Section 2, Water Distribution System**.
   a. Reduced Pressure Principle devices shall be installed such that they vent to the atmosphere and are not subject to submergence, or temperatures below freezing. Above ground installations shall meet the applicable requirements of the rights-of-way owner and Town zoning setbacks. The Town will not be responsible for the operation and maintenance of the device and recommends to the owner a heating device be installed to prevent freezing.
   b. Double Check Detector Check devices may be installed either in or above ground but must have positive drainage away from the vault or enclosure. Installations that do not provide positive drainage away from the vault will require the installation of a sump pump. Above ground installations shall meet the applicable requirements of the rights-of-way owner and city zoning setbacks. The Town will not be responsible for the operation and maintenance of the device and recommends to the owner a heating device be installed to prevent freezing in an above ground installation.

N. Setting of Fire Hydrants

1. Fire hydrants shall be installed in accordance with the Standard Details. All hydrant legs shall be made of DIP material and utilize grip rings. Restraint of the hydrant branch valve shall be accomplished by utilizing a locked hydrant tee meeting the requirements of **Subsection 7 of Part 4.01A of Section 2, Water Distribution System**.

O. Roadway, Street and Railway Crossings

1. Railway and NCDOT roadway crossings of water mains shall be performed in accordance with the requirements of the right-of-way owner and with the conditions set forth in the encroachment agreement. The materials as a minimum must meet the requirements of the Manual and must in addition meet or exceed the standards of the particular right-of-way owner.
2. The crossing of any street belonging to the Town of Winterville, if installed by way of open-cut, requires the installer to obtain a permit from the Town of Winterville Public Works Department. The actual patching of Town pavement shall be performed by the installer/Contractor at the expense of the permit holder. As a minimum, ABC stone shall be replaced beginning two inches (2") below the bottom of the existing stone and filled to the grade of the adjacent pavement and compacted. Upon completion of patching, the stone base shall be two inches (2") thicker than the existing stone base course and have at least a minimum of eight inches (8") of stone base and two inches (2") of S9.5B asphalt.
3. All boring and jacking installations shall be accomplished with the use of encasement pipe which, at a minimum, meets the specifications set forth in **Part 4.07 of Section 2, Water Distribution System**. The carrier pipe shall be

RJDIP with “push-on” joints in conformance with the requirements of **Part 4.01 of Section 2, Water Distribution System**. The ends of the encasement pipe shall be sealed as shown in the Standard Details.

2.04 Cleaning and Testing

A. General

1. The Contract Documents for water system extensions shall provide written requirements for thorough cleaning, testing, and disinfection of the new extension. The following guidelines are intended to aid the Engineer in developing specifications which will ensure sound and properly disinfected water lines.

B. Test Sequence

1. The following test sequence shall be included in all water system extension specifications unless otherwise directed by the Town of Winterville.
   a. Perform pretest inspection.
   b. Clean the main.
   c. Perform the hydrostatic tests.
   d. Apply the proper dosage of chlorine.
   e. Allow chlorine solution to remain in the water main a minimum of 24 hours.
   f. Flush the main.
   g. Assist the Town of Winterville in taking bacteriological samples.

C. Pretest Inspection

1. Prior to the commencement of hydrostatic testing and chlorination, the Town of Winterville shall be contacted to request scheduling of inspection and testing. A Town of Winterville's Representative shall visually inspect the completed installation prior to testing to ensure that all fire hydrants, valves, and other appurtenances have been installed. All defects disclosed by the inspection shall be corrected prior to testing.
2. No testing is to begin on water mains until storm drains have been completed and roads have been undercut.

D. Cleaning of The Main

1. Mains shall be cleaned only in the presence of a Town of Winterville Representative. No valves or hydrants owned by the Town of Winterville shall be operated without the express permission of the Town of Winterville.
   a. Cleaning of Water Mains Smaller than 4" in Diameter
      1) Mains shall be cleaned by flushing. Flushing velocity shall be adequate to remove all debris and other undesirable material and a minimum of 2-1/2 feet per second.
   b. Cleaning of Water Mains 4" and Larger in Diameter
      1) Cleaning shall be accomplished by passing through the pipe a polyurethane "pig" of the appropriate size and density (as manufactured by Poly-Pig or approved equal). Pig(s) shall be furnished by the Contractor. The procedure shall be as follows:

i. The Contractor shall prepare the main for the installation and removal of pig(s) as required:

(1) In general, this will consist of furnishing all equipment, material, and labor to satisfactorily install and remove the pig(s).

(2) Prior to scheduling a preconstruction conference, a “pigging” plan shall be submitted to the Town of Winterville for approval.

(3) Where expulsion of the pig is required through a dead end main, the Contractor shall prevent the backflow of purged water into the main after expulsion of the pig. For pipe twelve inches (12”) or less in diameter, purged water can be prevented from re-entering into the pipe by the temporary installation of pipe and fittings as required to provide a riser with an above ground discharge. On larger pipe, additional excavation of the trench may serve the same purpose.

(4) After expulsion of the pig, completion of flushing, and at the direction of the Town of Winterville, the Contractor shall complete work at openings by plugging, blocking, backfilling and completion of all appurtenant work necessary to secure the system.

ii. Under supervision of the Inspector, pig(s) shall be propelled via water pressure through the main(s) from point of insertion to point of expulsion. Where mains are in the form of a loop, the Contractor shall "pig" the complete system.

iii. As an alternative to "pigging", dead end pipes of less than 100 feet in length which are difficult to "pig" may be cleaned by flushing. Flushing shall be accomplished in the same manner as that required for pipes less than four inches (4”) in diameter in accordance with **Subsection 1a of Part 2.04D of Section 2, Water Distribution System**.

E. Hydrostatic Test

1. Unless otherwise permitted, testing shall be performed between each main line valve and corporation stop valve in accordance with AWWA C600. The Town of Winterville will, except when certain circumstances dictate otherwise, permit the lengths of test sections to be a maximum of 1500 feet in subdivisions or other areas where the new main has closely spaced valves. Testing shall be done only in the presence of a Town of Winterville’s Representative, unless otherwise directed by the Town of Winterville. Testing shall be performed using a suitable pump and an accurate gauge graduated in 1.0 psi increments. The section of the main to be tested shall be subjected to a test pressure of 150 psi for a period of two (2) hours. The leakage of the test section shall be accurately determined and compared to the schedule in Table 2-4 shown below. All visible leaks shall be repaired regardless of the amount of leakage.

Table 2-4 Leakage Schedule	
Pipe Size (inches)	**Allowable Leakage (Gallons per hour per 1,000 feet of pipe)**
2	0.16
4	0.33
6	0.50
8	0.66
10	0.83
12	0.99
14	1.29
16	1.47
18	1.66
20	1.84
24	2.21
30	2.76
36	3.31

2. If the leakage is greater than the allowable leakage as given by the above table, the Contractor shall replace any defective materials and perform all necessary work to ensure that the installation is acceptable and a retest shall be performed subsequent to any repair work performed. Remedial repair work and retesting shall be repeated until the leakage occurring during the test period is less than or equal to the allowable leakage.
3. Contractor shall ensure each section of water main between inline valves maintains pressure for a period of time as directed by Town of Winterville.
4. Testing shall include all main lines and service laterals up to the meter setter.
5. Testing shall include tapping valves, sleeves and tees and must be pressure tested at 100 psi for 20 minutes.

F. Chlorination

1. Chlorination shall be performed only in the presence of the Town of Winterville's Representative and shall be performed only after the line is complete and has tested satisfactorily for leakage.
2. Chlorination taps will be made within five (5) pipe diameters of the water main control valve at the upstream end of the line and at all extremities of the line.
3. Sufficient chlorine solution shall be applied to bring the concentration within the main to a minimum of 100 ppm free chlorine residual.
4. The chlorine solution shall be introduced to the main at a constant rate while regulating the flow of water through the main being chlorinated such that the required concentration of chlorine is achieved throughout.
5. All valves within the section of main being chlorinated shall be operated once during the contact period.
6. The chlorine solution shall remain in the lines for no less than twenty-four (24) hours, longer if so, directed by the Town of Winterville.

7. Services shall be chlorinated at the same time and by the same method utilized for the main.
8. Extreme care shall be taken to prevent contamination of existing water mains during the test period. If, in the opinion of the Town of Winterville, an existing main is contaminated, the section of main subjected to the possible contamination shall be flushed and chlorinated in accordance with the requirements for new mains.
9. The Town of Winterville will advise the Contractor when a suitable period of time has elapsed for chlorine contact. The main shall be flushed thereafter in the presence of the Town of Winterville's Representative. The flushing of the main shall be considered complete when the chlorine concentration within the main is at or below the typical North Carolina Public Water Supply standards.
10. The Contractor shall be responsible for insuring that high-strength chlorine solution is contained on-site and not allowed to make its way to any watercourse, stream, creek, lake, or other body of water.

G. Bacteriological Testing

1. After completion of chlorination and flushing, the Contractor shall assist the Town of Winterville as necessary in obtaining sufficient bacteriological samples for complete testing.
2. Required location for obtaining water samples:
   a. Every 2,000 LF
   b. End of each main.
   c. A minimum of one from each branch.
   d. Mains at cut-in locations: Each side of work area. Time between samples to be determined by Engineer in field.
3. Obtain water samples at each specified location for the bacteriological testing. Take the first sample immediately after flushing of the chlorinated water.
4. A failure of any sample of a test group shall constitute failure of the entire test group from which the sample was taken. Such failure shall require two (2) successive passing test groups to substantiate that the main has been satisfactorily chlorinated.
   a. The second of the two successive test groups of samples will not be collected before nor unless the first group has passed. The Contractor may, at his option, re-chlorinate and retest the section of water main upon failure of the test group.
5. If two (2) successive bacteriological test groups fail, the section of main from which the group was taken shall be re-chlorinated and retested until the main is shown to be properly chlorinated in accordance with **Part 2.04F of Section 2, Water Distribution System**, above.

Part 3 Submittals

This part shall define and describe the submittals required by the Town of Winterville prior to the approval of the Contract Documents for any water and sewer system extension, and the permits and other data which must be approved by or submitted to the Town of Winterville prior to construction of water and wastewater system extensions.

3.01 Engineering Design Calculations

A. All Contract Documents submitted to the Town of Winterville for approval must be accompanied with the necessary design calculations as specified herein. The calculations must be prepared either by Professional Engineer or by an individual under their direct supervision. All data upon which the design calculations are based shall be referenced as to its origin. The calculations shall be submitted in duplicate in a neat and orderly fashion with all steps shown such that the logic and the procedure used may be clearly understood. All calculations shall be bound with a title sheet bearing the seal and signature of the engineer responsible for the calculations.

B. Water Design Calculations

1. The following calculations shall be included in the submittals required for water extension projects. The Town of Winterville will furnish the designer with information regarding the available flow and pressure to the project.

   a. Minimum Pressure Requirements:

      1) Calculations shall be submitted which demonstrate that the water main extension as planned will provide a minimum residual pressure of 20 psi at its termination and at all critical points calculated at peak user demand plus fire flow. The calculations shall be based upon an energy balance accounting for friction losses and minor losses. Friction losses shall be estimated using the Hazen-Williams formula with the C-factor equal to 120.

   b. Minimum Fire Flow:

      1) Calculations demonstrating that the new extension will provide the minimum required fire flow plus peak user demand in accordance with **Part 2.02E of Section 2, Water Distribution System**, shall be submitted. The calculations shall demonstrate that each phase of a project is designed to provide the minimum fire flow. The calculations shall be based upon an energy balance taken from the origin at the existing line to the termination or critical high points of the proposed extension. The friction losses shall be based upon the Hazen-Williams formula with a C-factor of 120.

3.02 Contract Documents

A. General

1. The submittal of complete detailed Contract Documents is required for all water or wastewater system extensions of the Town of Winterville's existing facilities. Contract Documents shall contain the following forms unless otherwise permitted or required by the Town of Winterville.

   a. Specifications with title sheet.

   b. Drawings (Plans)*.

   c. Modifications.

   *Drawings on projects for which a Preliminary Subdivision Plat was required shall include a copy of the Approved (signed) Preliminary Plat.

B. General Requirements for Drawings

1. The plan and profile drawings shall be prepared by a Professional Engineer. Each sheet shall bear the date, sheet number, and the seal and signature of the Professional Engineer. Project phases must be shown. Contract Documents for projects which do not indicate phases shall be subject to revision if the project is constructed in phases.
2. A letter of transmittal must be included with the drawings indicating the project name and location and the design engineer.
3. The drawings shall have a title page with the name of the project, the Engineer, the date, an index of the plan sheets, revision block, and the project phase, if any.
4. The drawings shall utilize standard drafting practice and include standard symbols for which a legend shall be provided on the title sheet or other prominent location on the plans.
5. The drawings shall include a location map with the site clearly indicated.
6. The drawings shall include the layout of the new extension and its relationship to other utilities, roadways, and other pertinent structures and vegetation.
7. The profile for a particular section of the planned extension shall be included on the same sheet as the plan view with a horizontal scale of one-inch (1") = fifty feet (50') or larger for projects consisting of sewer and water or sewer extensions. The horizontal scale for projects consisting of water extension only shall be one-inch (1") = one hundred feet (100') or larger scale. The vertical scale for profiles shall be one-inch (1") = five feet (5') or larger.
8. The drawings shall include a note stating that the Contractor shall verify all existing elevations and all existing utilities in the field prior to commencement of work.
9. The 100-year flood elevation shall be shown on all plan drawings.
10. The plan drawings shall be placed on 24-inch x 36-inch plan and profile paper.
11. Projects which include new pump station(s) shall include a plot plan for each station with topographic lines of one-foot (1') contour intervals.
12. Each plan sheet shall have a title block with a title which is descriptive of the contents of the sheet.

C. General Requirements for Specifications

1. The specifications shall be prepared by a Professional Engineer.
2. The specifications and all other documents listed in **Part 3.02A of Section 2, Water Distribution System**, with the exception of the drawings, shall be bound in a single booklet with a title page bearing the project name and location, the Engineer, the date, and the seal and signature of the Professional Engineer who developed the documents. The title sheet shall also include a revision block.
3. As-built drawings shall be submitted with monthly pay estimates to the owner's engineer.

D. Required Permits for Construction

1. All water and sewer system extension plans must be granted the permits and encroachment agreements described herein (where applicable) PRIOR TO

ANY CONSTRUCTION. The application forms for the following permits shall be obtained from the agency granting the permit and shall be completed except for signatures and notarization. All applications shall be signed by the Town Manager or his designated representative.

a. Water System Extensions

1) An "Application for Approval of Plans and Specifications" is required for any extension of water distribution systems. The form may be obtained from the NCDEQ. Three (3) copies of the application form shall be submitted to the Town of Winterville with the Contract Documents.

b. NCDOT Encroachment Agreements

1) A water or sewer extension, which shall encroach upon any NCDOT right-of-way, shall require an encroachment agreement to be executed prior to approval of the plans. The Application shall be submitted on the Encroachment Agreements page of Connect NCDOT. The NCDOT Encroachment Agreement Form shall be submitted to the Town of Winterville in addition to the copies of Contract Documents required for review under **Part 3.03B of Section 2, Water Distribution System**.

2) If applicable, a letter from the Land Quality Section of the DEQ approving the Erosion Control Plan must be submitted to the Town for forwarding to NCDOT prior to their approval of the encroachment agreement. NCDOT utilizes an online submission process for the submission of encroachment agreement forms.

c. Erosion and Sedimentation Control Plan

1) An erosion and sedimentation control plan must be submitted to the DEQ Land Quality Section at least 30 days before land disturbance begins on any site one acre or larger.

d. Railway Encroachment Agreements

1) Whenever a proposed water or sewer extension encroaches upon a railway right-of-way, an encroachment agreement shall be executed prior to construction. The Engineer shall submit for approval copies of the Contract Documents and the encroachment agreement forms to the Town of Winterville. Fees shall be determined by the right-of-way owner, after submission of the proposed agreement, and paid by the developer.

e. Indemnification and Hold Harmless Agreement

1) Whenever construction of, or other activities associated with, water and sewer facilities for the Town of Winterville encroach within the right-of-way of any City, Town, Bell Arthur Water Corporation, Eastern Pines Water Corporation, CMSD or DOT street or highway, the Contractor shall provide to the Town of Winterville, prior to scheduling a preconstruction conference, a fully executed, “Indemnification and Hold Harmless Agreement”.

3.03 Required Copies of Contract Documents

A. The Engineer should submit to the Town of Winterville two (2) sets of Contract Documents, pertinent calculations, and applicable permits, for a preliminary review prior to submission of all Contract Documents necessary. Preliminary submittals, which do not contain the required calculations and permits, will be returned as incomplete. The Town Engineer and his staff shall review such plans and make the appropriate notes and return one (1) copy of the drawings to the Engineer marked so that the necessary corrections can be made and the Contract Documents may be submitted for the approval of the Town of Winterville and the appropriate state agencies.

B. The Town of Winterville shall require submission of the following number of sets of Contract Documents for the approval of the Town of Winterville and the appropriate state agencies.

Table 2-5
Required Sets of Plans and Specifications for State Agency Approvals

Type of Project	No. of Copies of Drawings	No. of Copies of Specs.	Permit Originals	Permit Copies
Water Ext. Fast Track Form FTA 04-16	4	4	1	3
Water Ext. PSFMGSA ASEA 04-16	4	4	1	3
Water Ext. Only	4	4	1	3
1 (electronic) 1 (11”x17”)	1 (electronic) 1 (hardcopy)	1 (electronic) 1 (hardcopy)	1 (electronic) 1 (hardcopy)	1 (electronic) 1 (11”x17”)

C. The Engineer shall submit all required encroachment application forms, State approval forms, and appropriate fees as outlined above with the necessary copies of Contract Documents when making a formal submission for approval.

3.04 Shop Drawings

A. The Engineer’s specifications shall include a requirement for the submittal of shop drawings and certifications for the materials, equipment and prefabricated structures used in water or sewer extension projects. The Engineer shall provide the Town of Winterville copies of approved shop drawings upon request.

3.05 Survey Data

A. General

1. The locations of all benchmarks and control points shall be included in the plans. Benchmarks shall be located in areas which shall not be disturbed by the construction. The Engineer or Developer shall provide all surveys necessary for the work. Survey data shall be made available for the Town of Winterville’s review upon request.

B. Vertical Control

1. The elevations given in the Contract Documents and all benchmarks shall be referenced to USGS elevations. The elevations of all construction benchmarks shall be looped to verify the accuracy of the level work. All construction benchmarks shall be clearly marked on the drawings using standard drafting symbols and shall have their elevations shown.

3.06 Easements and Right-of-Ways

A. All required easements and rights-of-way shall be provided to the Town of Winterville by one of the two following methods.

1. Recorded Final Plat

   a. The Developer or Engineer may submit a recorded (20" x 24") final plat of the property to be served with all easement and right-of-way widths shown. The plat must be recorded at the Pitt County Registry and bear the seal, signature, and certification of a Registered Land Surveyor.

2. Standard Easement Form

   a. The Engineer or Developer may submit a completed standard easement form, accompanied with a map of each easement acquired. Additional blank copies of the easement form are available upon request from the Town of Winterville. Easement maps accompanying standard easement forms shall be 8-1/2" X 14". They shall be drawn at a scale of 1" = 200 (or less) feet, utilizing standard drafting techniques. The maps shall include the following: (1) Name of the property owner, (2) map book and page number of the recorded property deed, (3) the name of the person(s) or company who prepared the map, (4) Certificate stating the map was prepared under the direct supervision of a registered land surveyor, (5) date of preparation, (6) scale, (7) north arrow (if magnetic, state year), and (8) all other pertinent information including existing rights-of-way, property lines, monuments, etc. Maps submitted as two or more sheets shall have match lines which clearly indicate how the sheets fit together. Drawings which have been photographically reduced shall not be acceptable unless all the information thereon is clearly legible, and all other requirements have been met.

Part 4 Materials

The materials used for the construction of water mains and all accessories and appurtenances thereof shall be new, free of defects in product and workmanship and of the highest quality available in the industry. Materials not specified but deemed equal to those specified may be approved for use provided the documentation and samples necessary for approval are provided to the Town of Winterville thirty (30) days prior to the ordering of said materials. WRITTEN APPROVAL must be issued by the Town of Winterville before such material may be used in construction. Current specifications (latest revisions) shall apply in all cases where materials are described by reference to published standards such as ASTM, AWWA, ANSI, etc.

All castings (fittings, valves, and valve boxes, etc.) must be made domestically.

4.01 Water Main and Fittings

A. Water mains shall be constructed of polyvinyl chloride (PVC) or ductile iron pipe (DIP) at the option of the Developer or Engineer, except in instances where the Manual or the Town of Winterville specifically requires a particular pipe material be utilized for an installation. All plastic pipe shall bear the seal of the National Sanitation Foundation. Restrained joint ductile iron pipe (RJDIP) shall be standard material used as the carrier pipe in steel encasement situations with Fusible PVC (FPVC) also being available with prior written approval.

1. PVC water main four inches and larger shall be manufactured in accordance with AWWA Standard C-900. The pipe shall have push-on type joints with elastomeric gaskets. The pipe shall be pressure rated at 235 psi with a dimension ratio of 18 for both bell and pipe thickness. Pipe shall be furnished in nominal twenty-foot (20') lengths.
2. Pressure Rated PVC water main 1 ½ inch to 3-inch size shall be pressure rated 200 with a standard dimension ratio of SDR 21 conforming to ASTM D1784 and ASTM D2241.
    a. Pipe shall have an integral elastomeric-gasket bell end. The joints and gaskets shall comply with ASTM D3139 and ASTM F477.
    b. Fittings for 3-inch pipe shall conform to AWWA C110, or C153 and have mechanical joints with transition gaskets as required for the pie outside diameter. Fitting shall be made of gray-iron or ductile-iron. Interior of fittings shall be cement-mortar lined with seal coat in accordance with AWWA C104.
3. Fusible Polyvinylchloride Pipe
    a. Fusible polyvinylchloride pipe shall conform too AWWA C900 or AWWA C905, as applicable. Testing shall be in accordance with AWWA standards for all of these pipe types.
    b. Pipe shall be DIPS standard dimensions with a minimum pressure rate of 235 psi (DR18) and the size as indicated on project Drawings.
    c. Piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784.
    d. Fusible polyvinylchloride pipe may conform to ASTM D3034 or ASTM F679 for non-pressure use, as indicated in the project Drawings.
    e. Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
    f. Fusible polyvinylchloride pipe shall be manufactured in standard 40-foot nominal lengths.
    g. Fusible polyvinylchloride pipe shall be blue in color for potable water use. Fusible polyvinylchloride pipe shall be purple in color for reclaim, reuse, or other non-potable distribution or conveyance. Fusible polyvinylchloride pipe shall be white in color for raw water collection and transmission, surface run-off, storm water use, or other non-potable resource or irrigation water uses, as indicated in the drawings. Fusible polyvinylchloride pipe shall be green in color for wastewater use.

h. Pipe generally shall be marked per industry standards, and shall include as a minimum:

1) Nominal pipe size
2) PVC
3) Dimension Ratio, Standard Dimension Ratio or Schedule
4) Pipe legend or stiffness designation, or AWWA pressure class, or standard pressure rating for non-AWWA pipe
5) AWWA standard designation number or pipe type for non-AWWA pipe (omit for ASTM D3034 or ASTM F679 pipe)
6) Extrusion production-record code
7) Trademark or trade name
8) Cell Classification 12454 and/or PVC material code 1120 may also be included.

i. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

4. Tees, elbows and other fittings for PVC C-900 pipe and ductile iron pipe shall be of ductile iron unless otherwise permitted or required by the Town of Winterville. Standard dimension fittings or compact fittings may be used in accordance with the requirements of this Section.

a. The interior of all fittings shall be cement mortar lined with an asphaltic coating in accordance with AWWA Standard C-104 (ANSI 21.4). The exterior of all fittings shall have a one (1) mil bituminous coating in accordance with AWWA Standard C-110 (ANSI A21.10).

b. Compact fittings shall be ductile iron with mechanical joints in accordance with ANSI/AWWA C153/A21.53-84. Cement lining and asphaltic coating shall be provided in accordance with ANSI/AWWA C104/A21.4.

c. Standard dimension fittings for PVC C-900 pipe and ductile iron pipe shall be of ductile iron with mechanical joints (See **Subsection 5 of Part 2.03F of Section 2, Water Distribution System**). The fittings shall comply with all requirements of AWWA Standard C-110 (ANSI A21.10) and shall be designed for a minimum working pressure of 150 psi plus 100 psi surge pressure.

5. Ductile iron pipe for water mains shall be manufactured in conformance with AWWA C-151 and shall be cement-mortar lined with an asphaltic coating in accordance with AWWA C-104. The exterior of the pipe shall be bituminous coated in accordance with AWWA C-151. The minimum thickness Class of pipe shall be Class 50. Pipe shall be furnished in nominal 18- or 20-foot lengths. Pipe joints for ductile iron pipe shall be “push-on” unless the additional pipe deflection allowed by mechanical joints is necessary or other considerations dictate the use of mechanical joints (**See Subsection 5 of Part 2.03F of Section 2, Water Distribution System**). The joints for ductile iron pipe shall conform to AWWA Standard C-111 revision (ANSI, A21.11).

a. Polyethylene encasement shall be applied to all underground ductile iron pipe and fitting installations. Materials and installation procedures shall be in accordance with ANSI/AWWA C-105/A21.5-88.

6. Detectable marking tape shall be installed in accordance with **Subsection 6 of Part 2.03G of Section 2, Water Distribution System**. The tape shall be three (3) inches in width with a minimum thickness of 0.5 millimeters with a minimum

solid center foil thickness of 0.35 millimeters). Color of the tape shall be blue meeting the American Water Works Association color code. Tape shall read "Caution – Buried Water Line Below". Tape shall be manufactured by Lineguard, Inc., Pro-Line Safety Products Co., Empire Level Mfg. Corp., or approved equal.

7. Restraint Devices

   a. Restraint devices for use on ductile iron and C-900 PVC "push-on" joints shall be constructed of high strength ductile iron, ASTM A536, Grade 65-45-12 and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength, low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Block Buster Series 1390-C, Star Pipe Products Allgrip series 3600 and Pipe Restrainers Series 1200S or approved equal.

   b. Restraint devices for use on mechanical joint to C-900 PVC, shall be constructed of high strength ductile iron, conforming to the requirements of ASTM A536, Grade 65-45-12, and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Series 1500, Star Pipe Products, Allgrip Series 3600, Romac Industries, Inc GripRing or approved equal.

   c. Restraint devices for use on mechanical joint ductile iron, shall be constructed of high strength ductile iron, conforming to the requirements of ASTM A536, Grade 65-45-12, and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Series 1300-C, Star Pipe Products, Allgrip Series 3600, Romac Industries, Inc. GripRing or approved equal.

8. Locked hydrant tees and fittings for fire hydrants shall meet the requirements of AWWA Standard C-111 (ANSI A21-11). Locked tees shall be as manufactured by American Cast Iron Pipe Company, Clow, U.S. Pipe, or approved equal.

9. Bolted Couplings for PVC C-900 pipe and ductile iron pipe shall be constructed of a center sleeve and end rings of ductile iron in accordance with ASTM A536. Bolts and nuts shall be of high strength, low alloy steel per ASTM A242 and AWWA C-111. Center sleeve and end rings shall have a paint finish coat.

Couplings shall be Ford Style FC1, Romac 501 Series, Smith Blair 441, or JCM 201.

4.02 Main Valve and Boxes

A. General

1. Main line valves for 12-inch nominal diameter mains and smaller shall be resilient-seated gate valves. All larger water main valves shall be rubber seated butterfly valves. Valve boxes shall be cast iron with traffic bearing capability.

B. Gate Valves

1. Gate valves shall conform to the requirements of the latest revision of AWWA Specification C-509/C-515 for resilient-seated gate valves.
   a. The valve body shall be ASTM A-126 Class B cast iron or ductile iron and shall conform to ASTM A395 or ASTM A536. In addition, ductile iron shall contain no more than 0.08 percent phosphorus.
   b. All interior valve parts and surfaces shall be of corrosion resistant materials or have an epoxy coating sufficient to prevent corrosion. Such coating shall be recognized by the AWWA for potable water use. Exterior valve parts and surfaces shall be epoxy coated or have the Standard AWWA coating.
   c. The valves shall open counterclockwise and have non-rising stem operation with 2-inch square operating nuts. The maximum number of turns required to fully open or close the valve shall equal three times the pipe diameter plus two.
   d. The stem shall be of corrosion resistant material and have “O” ring seals.
   e. Valves shall provide zero leakage at a working pressure of 200 psi in either direction of line flow.
   f. Valves shall have flange connections conforming to ANSI B16.1 Class 125 or mechanical joints conforming to AWWA C-111.
   g. Valves shall be manufactured by Clow, American, Flow Control or Mueller.

C. Butterfly Valves

1. Butterfly valves shall be rubber seated manufactured in conformance with AWWA C-504.
   a. The valve body shall be ASTM A-126 Class B cast iron.
   b. All interior valve parts and surfaces shall be of corrosion resistant materials or have a suitable epoxy coating recognized by the AWWA for potable water use. Exterior valve parts and surfaces shall be epoxy coated or have the Standard AWWA coating.
   c. The shaft shall be of sufficient diameter and strength to comply with the requirements for maximum operating torque set forth in AWWA C 504 for Class 150 B.
   d. Operation shall be by way of a geared actuator suitable for direct bury installations. The maximum number of turns required to fully open or close the valve shall equal three times the pipe diameter plus two.

Access to the operating nut shall be provided by standard telescoping cast iron valve box in compliance with **Part 4.02D of Section 2, Water Distribution System**.

e. Valves shall provide a bubble tight seal with a pressure differential of 150 psi in either direction of line flow.

f. Valves shall have flange connections conforming to ANSI B16.1 Class 125 or mechanical joints conforming to AWWA C-111.

g. Valves shall be manufactured by Clow, American, Flow Control, Mueller, or Pratt.

D. Valve Boxes

1. Valves 2" through 10" – Valve boxes shall be of cast iron suitable for H-20 loading. The manufacturer's name and part number shall be cast into each component of the box. The box shall be of the telescoping (slip) type consisting of a base section, center extensions as necessary, and a top section with a cover marked "WATER". Lid shall be 5-1/4" Drop having a minimum of 1-1/2" deep. Sections shall be selected and installed such that a minimum of four inches (4") of future adjustment (upward and downward) is possible without section removal or replacement and without the use of adapters. Valve boxes and extensions shall be either of the following:

   a. Charlotte Pipe and Foundry: UTL-274 (valve boxes) and UTL-281 (extensions)

   b. Tyler Pipe: 6855 Series (valve boxes and extensions).

   c. East Jordan Iron Works Global Cast: 8555 Slip-Type Valve Box Series

   Valve boxes shall be installed in accordance with the Standard Details.

2. Valves 12" and Larger – Valve box shall consist of an East Jordan Iron Works – 157801 frame and cover with a valve box bottom and extensions, as needed in accordance with **Subsection 1 of Part 4.02D of Section 2, Water Distribution System**. Installation shall be in accordance with the Standard Details.

4.03 Hydrants

A. Fire Hydrants

1. Fire hydrants shall be in accordance with AWWA Standard C-502, latest revision thereof, suitable for an operating pressure of not less than 150 pounds per square inch and shall have a traffic breakable feature (safety flange and stem coupling), dry top, sealed lubrication reservoir and a main valve which is held closed with pressure.

2. The hydrant body shall be of cast iron with "O" ring seals and bronze threads on the seat ring and drain ring, and shall have two (2) 2-1/2-inch nozzles with caps having National Standard threads, and one (1) 5-inch nozzle pumper connections with a factory-fitted Storz connection and cap. The hydrant main valve shall be a minimum of 5-1/4 inches in diameter.

3. All continuously wetted hydrant parts and surfaces shall be of corrosion resistant materials or be epoxy coated with epoxy recognized by AWWA for potable water use. The epoxy coating shall be of a color other than black

(unless the word “epoxy” is stenciled on the base) to permit distinction between standard and epoxy coatings to be made easily.

4. Provide extension for hydrant standpipe as required to set centerline of hydrant nozzle a minimum of 18-inches and a maximum of 24-inches. Hydrants shall be American Flow Control B-84-B, Clow Medallion, or Mueller A-423.
5. The inlet shoe for a fire hydrant shall have a six-inch (6”) inside diameter and shall be cast or ductile iron with mechanical joint fittings in accordance with AWWA Standard C-110.

B. Hydrants for Blow-Offs

1. Blow-offs as provided for in **Subsection 1 of Part 2.01J of Section 2, Water Distribution System**, shall be standard fire hydrants meeting the requirements of **Part 4.03A of Section 2, Water Distribution System** (above).
2. Blow-offs as required by **Subsections 2 and 3 of Part 2.01J of Section 2, Water Distribution System**, shall be as shown in the Standard Details.

4.04 Water Services

A. Materials for 3/4” and 1” Services

1. The materials for 3/4” and 1” services are identical except for the meter which is installed by the Town of Winterville. Also, materials for 2” services are identical except for the meter which is installed by the Town of Winterville.
   a. Service saddles shall be made of materials conforming to AWWA copper alloy No. C83600 with 1” (AWWA) CC outlet thread and an O-Ring cemented in a confined groove. Service saddles shall be only those listed below.

Table 2-6

Type of Main	Diameter	Approved Saddle MFS & MOD #
PVC (IPS)	2”	Ford S70-204, Mueller H-13420, A Y McDonald Style 3801
ACP/DIP/CIP	4” – 12”	Ford Style 202B, AY McDonald 3825, Mueller BR 2 B Series
PVC (C-900)	4” – 12”	Ford S90 Series, Mueller H-13440 through H-13444 Series, A Y McDonald Style 3805
PVC (Sch 40 & IPS) Steel Pipe	4” – 12”	Ford S70 Series, Mueller H-13428 through H-13435 Series, A Y McDonald Style 3801

   b. One-inch (1”) ball-type corporation stops shall be bronze body with AWWA CC tapered threaded inlet and compression connection outlet. Stops shall be Hayes 4400CJ, Mueller P15008, Ford F1000-4, A Y McDonald 4701-22, or approved equal.
   c. Service tubing shall be one-inch (1”) diameter plastic municipal service line pipe 160-pound class, in conformance with ASTM Specifications D-2737. The pipe shall be supplied in 500-foot coil, and no joint or coupling shall be installed between the main service tap and the meter stop. All service pipes shall be NSF approved.
   d. One-inch (1”) yolk with angle ball valve meter stops shall be bronze body with compression seal inlet connection and threaded outlet for meter

connection. Yolks shall be Mueller model number 58347H143413 or approved equal. The Yolk shall be 1-inch inlet and 3/4-inch outlet.

e. Service Couplings for 1" water services shall be bronze body with compression seal inlet connections with a stainless-steel set screw. Couplings shall be Ford C44-44, Hayes 5615CJ, A Y McDonald 4758-22, Mueller P-15403, or approved equal.

f. Water meter boxes shall be manufactured of Class 30 cast iron in conformance with ASTM-A48 (latest revision thereof). The manufacturer's name and part number shall be cast into each component and the words "water meter" shall be cast into the cover. Boxes shall be Vulcan Foundry G8404-1 Frame or a Size 12 Oval Meter Box by Charlotte Pipe and Foundry. Plastic lids are not allowed. Lids must be cast iron material and have a 2-inch factory cut whole for ERT.

B. Materials for 2" Services

1. Service saddles shall be made of materials conforming to AWWA copper alloy No. C83600 with 2" (NPT) FIP outlet thread and an O-Ring cemented in a confined groove. Service saddles shall be only those listed below.

Table 2-7

Type of Main	Diameter	Approved Saddle MFS & MOD #
PVC (Sch 40 & IPS)	4" – 12"	Ford S71 Series, A Y McDonald Style 3802
ACP/DIP/CIP	4" – 12"	Ford Style 202B, AY McDonald 3826, Mueller BR 2 B Series
PVC (C-900)	4" – 12"	Ford S91 Series, Mueller H-13490 through H-13494 Series, A Y McDonald Style 3806

2. Ball valves shall be bronze body with tee head. The turn required to travel from fully closed to fully open position shall be 90 degrees. Ball valves shall incorporate a check allowing a maximum turn of 90°. Ball valves shall be Hayes 4300, Ford B11-777 A Y, McDonald 6101, Mueller B-20283 or approved equal.

3. Service pipe shall be solvent weld Sch 80 PVC with brass fittings. The pipe joints shall be of the integral bell type with rubber gaskets conforming to ASTM D3139 and F477.

a. The pipe shall bear the National Sanitation Foundation seal for potable water. Fittings shall be schedule 80 PVC with solvent weld joints.

C. Materials for Services Larger Than 2"

1. The materials for services larger than 2" shall be identical to those required for water mains.

4.05 Backflow Prevention Assemblies

A. Control assemblies such as reduced pressure principal assemblies, double check valve assemblies and double check detector assemblies shall be limited to those approved by the Town of Winterville and the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California.

Devices shall be utilized where required by **Part 5 of Section 2, Water Distribution System**.

4.06 Tapping Sleeves

A. Tapping sleeves shall be all stainless-steel body and flange with a full circumferential gasket, or ductile iron body, mechanical joint designed to accommodate a minimum operating pressure of 150 pounds per square inch. All tapping sleeves shall be pressure tested prior to tapping the main. Stainless steel tapping sleeves shall be Ford Model FAST, JCM Model 432, Mueller Model H304 or Romac Model SST. Ductile iron body, mechanical joint sleeves shall meet the requirements of **Subsection 5 of Part 4.01A of Section 2, Water Distribution System**.

1. Tapping Valves

   a. Tapping valves shall conform to the requirements of the latest revision of AWWA Specification C-509 for resilient- seated gate valves. The valve body shall be ASTM A-126 Class B cast iron. All internal valve parts and surfaces shall be of corrosion resistant materials or have an epoxy coating sufficient to prevent corrosion. Such coating shall be recognized by the AWWA for potable water use. Exterior valve parts and surfaces shall be epoxy coated or have the Standard AWWA coating. The valves shall open counterclockwise and have non-rising stem operation with a two-inch square operating nut. The maximum number of turns required to fully open or close the valve shall equal three times the pipe diameter plus two.

   b. The stem shall be of corrosion resistant material and have 0-ring seals. Valves shall provide zero leakage at a working pressure of 200 psi in either direction of line flow. Valves shall have a flange connection conforming to ANSI B16.1 Class 125 and a mechanical joint conforming to AWWA C-111. Valves shall be manufactured by Mueller, Clow or American Flow Control. Tapping valves shall be installed and pressure tested prior to tapping the water line.

4.07 Steel Encasement Pipe

A. Steel encasement pipe shall be spiral welded or smooth wall seamless, consisting of grade "B" steel with a minimum yield strength of 35,000 psi and manufactured in accordance with ASTM A139 and A283. The pipe thickness shall be in accordance with the requirements of the right-of-way owner, but in no case less than that shown in Table 2-8. The ends shall be beveled and prepared for field welding at the circumferential joints.

Table 2-8 Minimum Wall Thickness for Steel Encasement Pipe	
Nominal Diameter (inches)	**Minimum Thickness (inches)**
4 –1 2 3/4	0.188
14	0.219
16 – 18	0.250
20	0.281
22	0.312
24	0.344
26	0.375
28 – 30	0.406
32	0.438
34 – 36	0.469
38 – 42	0.500

B. The encasement pipe shall be uncoated inside and out unless required otherwise by the right-of-way owner or the Town of Winterville.

C. Encasement pipe and joints shall be of leak proof construction, capable of withstanding design loading. The inside diameter of the encasement pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe, joints or couplings, for carrier pipe less than 6 inches in diameter; and at least 4 inches greater for carrier pipe 6 inches and larger in diameter. In general, to determine the casing size you should double the size of the carrier pipe, i.e., a 6" carrier pipe requires a 12" casing pipe. The engineer shall verify the clearance is sufficient to allow the carrier pipe to be removed without disturbing the casing pipe.

Part 5 Back Flow and Cross-Connection Control

5.01 *General*

A. This Regulation shall apply to all users connected to the Town of Winterville's public water system.

B. This Regulation complies with the Federal Safe Drinking Water Act (P.L. 93-523), the North Carolina State Administrative Code (Title 15A, Subchapter 8C), and the North Carolina State Building Code (Volume II) as they pertain to cross connections with the public water supply.

C. The Town of Winterville reserves the right to require individual water and sewer services to each building or tenant space. G.S. 143-355.4 pertains to water system connections for irrigation systems and became effective December 1, 2009. In part, the law states "Local government water systems and large community water systems shall require separate meters for new in-ground irrigation systems that are connected to their systems". The Town of Winterville Standards for water and sewer systems has been changed effective December 1, 2009 to comply with this law.

1. Purpose: The purpose of this Regulation is:

   a. To define Town of Winterville as the water purveyor in the elimination of all cross-connections within the public water system.

b. To protect the public water system of the Town from the possibility of contamination or pollution by isolation within the customers internal potable water distribution system(s), or the customers' private water system(s), such contaminants or pollutants which could backflow into the public water system;

c. To promote the elimination or control of existing cross-connections, actual or potential, direct or indirect, between the Town's customers' potable water system(s) and non-potable water systems, plumbing fixtures, and industrial piping systems; and

d. To provide a continuing inspection program of cross-connection control, which will systematically and effectively prevent potential contamination or pollution of the public water system.

2. Responsibility:

a. The Town endeavors to protect its public water system from contamination or pollution due to the backflow of contaminants or pollutants through the water service connection. If the Town requires an approved backflow prevention assembly to protect the water distribution system, the Town will give notice to the customer to install an approved backflow prevention assembly(s). The backflow prevention assembly shall be installed by the customer adjacent to the water meter on the customer's side of the water meter. If the assembly(s) is not installed, as required by the Town, the water service may be disconnected until such assembly(s) has been properly installed.

5.02 Definitions

A. **Approved** – Accepted by the Town as meeting an applicable specification(s) stated or cited in this regulation, or as suitable for the proposed use.

B. **Auxiliary water supply** – Any water supply on or available to the customer's premises other than Town approved public water supply.

C. **Backflow** – The reversal of the normal direction of flow of water caused by either backpressure or backsiphonage.

1. Backpressure – Backpressure occurs when the customer's water system pressure exceeds the Water Purveyor's system pressure. This can occur through an increase in the downstream pressure, a decrease in the Water Purveyor's pressure or a combination of both. Increases in the customer's water pressure above the Water Purveyor's pressure can be created by booster pumps, temperature increases (e.g., in a boiler), head pressure caused by elevation, etc.
2. Backsiphonage – Backflow caused by negative or reduced pressure in the supply piping. Backsiphonage occurs when the supply line pressure falls below atmospheric pressure (14.7 psi). Decreases in the pressure of the potable water system can be caused by firefighting, flushing of a water main, a break in the water main, water mains being shut down for maintenance, etc.

D. **Backflow preventer** – An assembly or means designed to prevent backflow

1. Air Gap (AG) – The unobstructed, vertical, physical separation between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other vessel and the flood level rim of said receiving vessel. An

approved air gap shall be at least double the diameter of the supply pipe, as measured vertically above the overflow rim of the vessel. In no case shall the air gap be less than 1 inch.

2. Reduced Pressure Principle Assembly (RP) – An assembly consisting of two (2) independently operating spring loaded check valves with a hydraulically operating, spring loaded mechanical differential pressure relief valve, located between the check valves and, at the same time, lower than the first check valve. The assembly shall include four (4) properly located resilient seated test cocks and full flow characteristic resilient seated shut-off valves at each end of the assembly. The entire assembly shall meet the design and performance specifications as determined by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California. The assembly shall operate to maintain the pressure in the zone between the two (2) check valves at an acceptable pressure level less than the pressure on the purveyor's supply side of the assembly. At cessation of normal flow, the pressure between the two (2) check valves shall be less than the pressure on the purveyor's distribution supply side of the assembly. In case of leakage of either of the check valves, the differential relief valve shall operate to maintain the reduced pressure in the zone between the check valves by discharging to the atmosphere. When the differential pressure in the zone is two pounds per square inch or less than the supply pressure, the relief valve shall open to the atmosphere. To be approved by the Town, these assemblies shall be readily accessible for in-line maintenance and testing, and be installed horizontally, in a location where no part of the assembly will be submerged.
3. Reduced Pressure Detector Assembly (RPDA) – A specially designed assembly composed of a line-size approved reduced pressure principle assembly with a specific bypass water meter and a meter-sized approved reduced pressure principle assembly. This assembly shall be used to protect against a severe hazard.
4. Double Check Valve Assembly (DCVA) – An assembly consisting of two (2) independently operating spring loaded check valves with full flow characteristic resilient seated shut-off valves on each side of the check valves, plus four (4) properly located resilient seated test cocks for the testing of each check valve. The entire assembly shall meet the design and performance specifications as determined by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California. To be approved by the Town, these assemblies shall be readily accessible for in-line maintenance and testing, and be installed horizontally, unless specifically approved for vertical installation by the Town.
5. Double Check Detector Assembly (DCDA) – A specially designed assembly composed of a line-size approved double-check valve assembly with a specific bypass water meter and a meter-sized approved double-check valve assembly. This assembly shall be used to protect against a moderate hazard.
6. Pressure Vacuum Breaker (PVB) – An assembly approved for residential lawn sprinkler irrigation systems consisting of a spring loaded air-inlet valve and a spring loaded check valve, with full flow characteristic resilient seated shut-off valves, one on the inlet and one on the outlet side of the PVB, plus two (2) properly located resilient seated test cocks for testing the assembly. The entire assembly shall meet the design and performance specifications as determined by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California. It cannot be subjected to backpressure of

any kind and shall be installed at least twelve (12) inches above the highest irrigation head and/or downstream piping. Chemigation or aspiration of any herbicide, pesticide, fungicide, or fertilizer is not permitted for use with a PVB. To be approved by the Town, these assemblies shall be readily accessible for in-line maintenance and testing and be installed vertically in a location where no part of the assembly will be submerged.

E. **Certified Tester** – An individual who has demonstrated competency to test and repair backflow prevention assemblies as required by the Town of Winterville.

F. **Containment** – Preventing the impairment of the potable water supply by installing an approved backflow prevention assembly at the service connection.

G. **Contamination** – An impairment of the quality of the potable water which creates a potential or actual hazard to the public health through the introduction of hazardous or toxic substances or waterborne health hazards in the form of physical or chemical contaminants or biological organisms and pathogens.

H. **Cross-Connection** – Any actual or potential connection, link or structural arrangement, direct or indirect, between the Water Purveyor's water supply and any other source or system through which it is possible to introduce into any part of the potable water system any substance other than the potable water with which the system is supplied. Bypass arrangements, jumper connections, removable sections, swivel, or change-over devices and other temporary or permanent devices through which or because of which backflow can or may occur are considered to be cross-connections.

I. **Cross-Connections Controlled** – A water service connection between a potable water system and a non-potable water system with an approved backflow prevention assembly properly installed and maintained so that it will continuously afford the protection commensurate with the degree of hazard. There shall be no interconnections between any water source and any customer piping connected to the Town's water system. Valved tie-ins shall not be permitted. A physical separation must be maintained between the systems at all times. When an interconnection is found, water service shall be terminated and not restored until such time that the Town is satisfied that the interconnection has been permanently eliminated.

J. **Customer** – Any person, firm, or corporation responsible for any property at which water from the Town's public water system is received. In the absence of other parties or the failure of other persons to accept the responsibilities herein set forth, the owner of the private water system or property owner shall be ultimately responsible.

K. **Hazard, Degree of** – The potential risk to public health and the adverse effect of the hazard upon the public potable water distribution system as determined by the Town.

1. Moderate Hazard – An actual or potential threat of pollution or other adverse effect to the physical properties of the water purveyor's or the customer's potable water system.
2. Severe Hazard – An actual or potential threat of contamination of a physical or toxic nature to the water purveyor's potable water system or to a customer's potable water system that could cause a danger to health, serious illness, or death.

L. **Isolation** – The act of confining a localized hazard at the source of the said hazard within a plumbing or distribution system by installing approved backflow prevention assembly(s).

M. **Point of Service** – The point of service will generally be at the property line of the customer, adjacent to the public right-of-way where the Town's mains are located, or at a point on the customer's property where the meter is located.

N. **Pollution** – An impairment of the quality of the water to a degree that does not create a hazard to the public health, but which does adversely and unreasonably affect the aesthetic qualities of such water.

O. **Process Water** – Water that goes through various procedures in the making or treatment of a product.

P. **Public Water System** – The potable water system owned and operated by Town of Winterville. This system includes all distribution mains, lines, pipes, connections, storage tanks and other facilities conveying potable water from the water source to the service connection of each customer.

Q. **Service Connection** – A piping connection between the water purveyor's public water system and a customer's system.

R. **Water, Potable** – Water from any source, which has been approved for human consumption by the appropriate agency of the State of North Carolina.

S. **Water, Non-Potable** – Water that has not been approved for human consumption by the appropriate agency of the State of North Carolina.

T. **Water Purveyor** – The owner or operator of the public water distribution system.

5.03 Water System

A. The Water system shall be considered as made up of two parts: the Town's water system and the customer's system.

B. The Town's system shall consist of the source facilities and the distribution system; and shall include all those facilities of the water system under the complete control of the Town, up to the point where the customer's system begins.

C. The source shall include all components of the facilities utilized in the production, treatment, storage and delivery of water to the distribution system.

D. The distribution system shall include the network of conduits used for the delivery of water from the source to the customer's system.

E. The customer's system shall include those parts of the facilities beyond the termination of the Town's distribution system which are utilized in conveying potable water to points of use.

5.04 Facilities that Require Assemblies

A. Any Customer either operating or planning to operate facilities identified by the Town as having a potential for backflow into the Town's public water supply system, shall install an approved backflow prevention assembly on all such service connections according to the degree of hazard present. The following

facilities have been identified by the Town as having a potential for backflow and require backflow prevention assemblies as indicated:

1. Automotive Service Station, Dealerships.
    a. Moderate Hazard: DCVA
    b. Severe Hazard (e.g. wash pits, hydraulic equipment): RP
2. Bakeries: DCVA
3. Beauty Shops/Barber
    a. Moderate Hazard (e.g. haircuts): DCVA
    b. Severe Hazard (e.g. washing hair, chemical treatment): RP
4. Beverage Bottling Plants or Breweries: RP
5. Canneries, Packing Houses or Rendering Plants: RP
6. Chemical Processing Plants: RP
7. Church Baptismal: DCVA
8. Commercial Carwash Facilities: RP
9. Commercial Establishments using processed water:
    a. Moderate Hazard: DCVA
    b. Severe Hazard: RP
10. Commercial Greenhouses: RP
11. Concrete/Asphalt Plants: RP
12. Dairies or Cold Storage Plants: RP
13. Dentist or Orthodontist: RP
14. Dye Works: RP
15. Film Laboratories or Photo Processing: RP
16. Fire Systems: RP
17. Funeral Homes: RP
18. Hospitals, Medical Buildings or Medical Clinics: RP
19. Laboratories: RP
20. Laundries:
    a. Moderate Hazard: DCVA
    b. Severe Hazard: (e.g. Dry Cleaners): RP
21. Lawn irrigation systems:
    a. Moderate Hazard: PVB
    b. Severe Hazard: (e.g. booster pump, chemical system): RP, PVB
22. Metal Manufacturing, Cleaning, Processing or Fabricating Plants: RP
23. Morgues, Mortuaries or Autopsy Facilities: RP
24. Multi-Story Buildings:
    a. (Three or Four stories) Moderate Hazard: DCVA
    b. (Five or more stories) Severe Hazard: RP
25. Nursing and Convalescent Homes: RP

26. Oil and Gas Production, Storage or Transmission Properties: RP
27. Pest Control (exterminating or fumigating): RP
28. Power Plants: RP
29. Restaurants: DCVA
30. Restricted, Classified or other Closed Facilities: RP
31. Sand or Gravel Plants: RP
32. Schools:
    a. Moderate Hazard: DCVA
    b. Severe Hazard: RP
33. Sewage or Storm Drain Facilities: RP
34. Swimming Pools: RP
35. Veterinary Hospitals or Clinics: RP
36. Water Treatment Plants: RP
37. Waterfront Commercial Facilities and Industries: RP

refer to **Part 5.02 for definition of the above abbreviations*

Other types of facilities not listed may also be required to install approved backflow prevention assemblies if determined necessary by the Town.

B. Approved backflow prevention assemblies shall be installed on the customer's system at the point of service to any facility that the Town has identified as having a potential for backflow.

5.05 Policy

A. When it has been determined by the Town, that a requested service requires the installation of a backflow prevention assembly, the Customer shall, prior to receiving such service, submit for review and approval, plans and specifications of the proposed facilities. The submittal shall include a description of proposed processes, operations, etc., in such detail as needed to evaluate potential effects on the Town's system. Proposed assemblies shall be identified by size, manufacturer and model number or by specification.

B. When it has been determined by the Town, that an existing service may require the installation of a backflow prevention assembly, the Customer shall submit for review such information as may be necessary to permit the Town to evaluate the potential for undesirable effects on its system. Upon notification of the Customer by the Town that a backflow prevention assembly(s) is necessary, the Customer shall submit plans and specifications for approval and install or cause to be installed entirely at the customer's expense such assemblies as may be necessary.

C. If it has been determined by the Town that an imminent health hazard exist, then the water service to the facility may be terminated in accordance with the Customer Service Policy, **Part 5.02J (Section 2, Water Distribution System),** of these regulations.

D. All existing facilities which pose a potential severe hazard to the public water system shall install a reduced pressure principle backflow prevention assembly

at the point of service within 60 days of notification by the Town. All existing industrial and commercial facilities that have or may have an actual or potential cross-connection, that are not identified as a "severe hazard" shall be considered moderate hazard facilities. All existing moderate hazard facilities shall install a double-check valve assembly at the point of service within 90 days of notification by the Town.

E. When required, an approved backflow prevention assembly shall be installed on each service line to a customer's water system in accordance with the requirements of the Town.

F. Reduced pressure principle assemblies shall be installed at the point of service in a horizontal position and in a location in which no portion of the assembly will become submerged under any circumstance or be subjected to temperatures below freezing. Pit and/or below grade installations are prohibited. An RP shall be installed in accordance with detailed specifications provided by the Town's Manual on Backflow Prevention. For residential irrigation systems this RP may be installed near or adjacent to the residence however any water connection prior to the RP is strictly prohibited.

G. All double-check valve assemblies shall be installed at the point of service in drainable pits wherever below ground installation is necessary, in accordance with detailed specifications provided by the Town's Manual on Backflow Prevention. Double-check valve assemblies may be installed in a vertical position with prior approval from the Town, provided the flow of water is in an upward direction.

H. Pressure vacuum breaker assemblies shall be installed a minimum of twelve inches above the highest outlet (sprinkler head) prior to any branching of the customer's water system. PVB assemblies shall be installed in accordance with detailed specifications provided by the Town's Manual on Backflow Prevention.

I. Backflow prevention assemblies shall be installed such that periodic testing and necessary repairs can be conveniently performed by Town approved backflow testers.

J. No water service shall be provided to any facility or service that requires the installation of a backflow prevention assembly until the installed assembly has passed the test performed by a certified tester, and the test results have been received by the Town.

K. No new or existing water service connection to any premises shall be installed or maintained by the Town unless the water supply is protected by an approved backflow prevention assembly(s) as required by Federal and State Laws and Regulations, these Regulations, and the Town's Manual on Backflow Prevention.

L. Water mains served by the Town but not maintained by the Town shall be considered cross-connections. The degree of protection required shall be based upon the degree of hazard, as determined by the Town.

M. No person shall fill special use tanks or tankers from the public water system except at a Town approved location equipped with an air gap or an approved reduced pressure principle backflow prevention assembly properly installed on the Town's water supply, unless otherwise approved by the Town.

N. Ownership, testing, and maintenance of the assembly shall be the responsibility of the customer.

O. It shall be the customer's responsibility to notify the Town if the customer's water system becomes contaminated or polluted or if there is reason to believe that a backflow incident has occurred from the customer's water system into the public water system.

P. Upon notification to the customer by the Town that the existing backflow prevention assembly is not in compliance with these regulations, the customer shall replace the existing backflow prevention assembly with an approved backflow prevention assembly in accordance with the requirements of the Town.

Q. Removal of an approved backflow prevention assembly from a service connection that has been deemed a hazard by the Town may result in immediate disconnection from the Town's public water system.

R. No person shall connect a hose to a fire hydrant unless an approved backflow prevention assembly is connected to the hydrant, unless otherwise approved by the Town.

S. The customer's system shall be open for inspection at all reasonable times to Town personnel to determine whether cross-connections or other structural or sanitary hazards, including violations of these regulations, exist. When such a condition becomes known, the Town may deny or immediately discontinue service to the premise by providing for a physical break in the service line until the customer has corrected the deficiency in compliance with these regulations. Should an inspection of the premise be refused, the Town reserves the right to install, at the customer's expense, a reduced pressure principle backflow prevention assembly downstream of the water meter. The Town will bill the customer all costs associated with the installation of the backflow prevention assembly plus an additional 50% surcharge.

T. Backflow prevention assemblies that shall be connected to the Town's public water system are limited to those assemblies approved by the Town and the Foundation for Cross-connection Control and Hydraulic Research, University of Southern California.

U. Installation of all backflow assemblies shall be the customer's responsibility unless otherwise stated by the Town. Backflow prevention assemblies shall be located downstream of the meter, at the point of service or at a location approved by the Town.

V. Any facility or customer found to be in noncompliance with the provisions of these regulations and/or that neglect to correct a violation, may have their water service terminated.

5.06 Testing and Repair of Assemblies

A. Testing of backflow prevention assemblies shall be performed by a certified backflow prevention assembly tester. Such tests shall be conducted upon installation, prior to receiving service, and annually thereafter. A record of all testing and repairs is to be retained by the customer. Copies of the records shall be provided to the Town within ten (10) business days after the completion of any testing, and/or repair work.

B. Any time that repairs to backflow prevention assemblies are deemed necessary, whether through annual or required testing, or routine inspection by the consumer or by the Town, these repairs shall be completed within a specified

time in accordance with the degree of hazard. In no case shall this time period exceed:

1. Moderate Hazard Facilities – 15 business days.
2. Severe Hazard Facilities – 10 business days.

C. The Town reserves the right to conduct repairs if deemed necessary. The Town will bill the customer all costs associated with the repairs of the backflow prevention assembly plus an additional 50% surcharge.

D. Submission of falsified test results or material that is incomplete in any manner by a certified tester may result in the tester being removed from the Town's Approved Tester List.

E. Only original manufactured parts may be used to repair an assembly.

F. All backflow prevention assembly testers shall submit a copy of their tester's certification to the Town prior to testing any backflow prevention assembly(s) connected to the Town's public water system.

G. All equipment used to test backflow prevention assemblies within the Town's public water system shall be properly maintained and calibrated annually in accordance with the manufacturer's guidelines. A copy of the calibration certificate shall be submitted to the Town.

END OF SECTION 2

SECTION 3: STORMWATER DRAINAGE SYSTEM

Part 1 General

1.01 Section Includes

A. Work under this section includes but is not limited to piping and appurtenances for a complete storm drainage system.

1.02 Design Criteria

A. General

1. The Town of Winterville recognizes that there are numerous methods and computer models available to calculate peak flows, generate and route hydrographs to determine peak discharges, and to size pipes/culverts, drainage ways and emergency spillways. It is the responsibility of the design engineer to select the appropriate methods suitable for the site to design the stormwater system needed to meet the requirements of this section and the Town's Standard Specifications and Details.
2. In general, the Town recognizes and accepts the methodologies outlined in the publication entitled "Elements of Urban Stormwater Design" by H. Rooney Malcom, P.E. of N. C. State University.

B. Collection System

1. A collection system includes the inlets and pipes used to collect stormwater runoff from a parking area, street, development and/or a subdivision. It also includes ditches or channels constructed to convey runoff to inlets or pipes and to existing natural drainage features.
2. All collection system components shall be sized to adequately pass the 10-year, 10-minute recurrence interval storm. However, pipes or larger drainage structures crossing collector or arterial streets, shall be sized to accommodate the 25-year recurrence interval storm. Pipe capacities and design will be determined using Manning's Equation.
3. Pipes must be sized no smaller than 15 inches.

C. Stormwater Detention

1. Permanent detention facilities shall conform to the requirements stated herein and to the Town's Standard Specifications and Details.
2. The facility shall be designed such that the 10-year, 24-hour peak discharge after development is no greater than the 10-year, 24-hour discharge from the same area prior to development. The detention pond shall be of adequate size/volume to detain the excess runoff volume.
3. A pipe or weir may be used as the primary outlet device.
4. An emergency by-pass spillway will be provided that will pass the runoff generated by the 100-year storm, after the impoundment area has reached its capacity.
5. Emergency by-pass shall be open, broad-crested weirs. Spillways constructed or earthen fill embankments must be asphalt or concrete lined with sufficient

approach and exit sections provided to prevent any possible erosion. Earthen embankments constructed in cut areas will require only a vegetated spillway.

D. Private Agreements

1. Senate Bill 469 made the following impervious surface requirements in G.S. 143-214.7(b3) applicable to all local governments, effective December 27, 2018:
   a. "Stormwater runoff rules and programs shall not require private property owners to install new or increased stormwater controls for (i) preexisting development or (ii) redevelopment activities that do not remove or decrease existing stormwater controls. When a preexisting development is redeveloped, either in whole or in part, increased stormwater controls shall only be required for the amount of impervious surface being created that exceeds the amount of impervious surface that existed before the redevelopment. This subsection applies to all local governments regardless of the source of their regulatory authority."
   b. MS4 permits include a provision that the permittee must develop and implement a Stormwater Management Plan to the extent allowable under State and Local law. Therefore, post-construction ordinance changes enacted to comply with Senate Bill 469 shall not constitute and NPDES MS4 permit violation.

E. Easements

1. All storm sewers shall be constructed in dedicated street rights-of-way or permanent easements. Minimum width of easement shall be as follows:
   a. 15-inch ..... 10 feet
   b. 18-inch through 24-inch pipe ... 15 feet
   c. 30-inch through 36-inch pipe ... 20 feet
   d. 42-inch through 48-inch pipe ... 25 feet
   e. 54-inch through 72-inch pipe ... 30 feet
   f. >72-inch pipe..... To Be Determined by Town
   g. Constructed Drainageways ..... To Be Determined by Town
2. Accessibility and drainage easements shall be maintained by the property owner and/or developer.

F. Design Procedure for Runoff Determination: There are two distinct and separate steps to storm water design. The first is to determine the amount of water discharged at the point of design. There are two acceptable methods: (1) Rational Method (good for areas less than 150 acres) and (2) Soil conservation Service Method using Curve Numbers. This first step is basic to the design of any structure. The second step is the selection of a size and design of the system or structure itself.

G. Determination of Discharge: The most widely used method for determining discharge in storm drainage is the Rational Method and shall be the method used for the purpose of this manual. It should be noted, however, that this method should be used with caution since it does not adequately recognize all of the complications of the runoff process. This basic formula may be reduced to "Q = CIA", where:

1. C – Runoff Coefficient (unitless): The runoff coefficient is the proportion of the total rainfall which runs off the basin area into the drainage system. The runoff coefficients to be used for the Winterville area are listed in Chart 3, which can be found in Attachment 2, Stormwater Charts:
2. I – Intensity of Rainfall (inches per hour): Values for the rainfall intensity for the Winterville area may be derived from the NOAA Precipitation Frequency Data Server, based on the design storm for a duration of T_C. If the height of the most remote point above the outlet and length of travel are known, determine the time of concentration (Tc) via the following formula:

$$T_C = \frac{\left(\frac{L^3}{H}\right)^{0.385}}{128}$$

   The time of concentration can then be set as the duration through which the intensity may be derived from the NOAA Precipitation Frequency Data Server. The design procedures for runoff for the Town of Winterville shall be based on a 10-year, T_C-duration rainfall for normal collection system components and on a 25-year, T_C-duration rainfall for pipes or larger drainage structures on dead-end streets.
3. A – Drainage Basin Area (acres): The drainage basin areas can be calculated with the use of topographic maps by marking the basin ridgeline and planimetering the designated areas. When marking the basin ridgeline, it should be remembered that water runoff flows perpendicular to contour lines.
4. Q – Discharge (cubic feet per second): After determining the coefficient of runoff, rainfall intensity, and drainage basin area: the discharge can be computed by the use of the rational formula “Q = CIA”.

H. Catch Basin Design

1. The following procedure for the location and design of catch basins for the Town of Winterville is based on the actual hydraulic characteristics of the standard catch basin for the Town as depicted in **Chart 4 in Attachment 2, Stormwater Charts**. Catch Basin design shall be based on a 2-year storm. Double basins are permitted.
   a. Determine Drainage Limits: The drainage limits should be calculated by the use of topographic maps by marking the basin ridgeline. It should be noted that the centerline of the streets will usually represent a ridgeline on a normal crown.
   b. Determine Depth of Flow: The depth of flow allowed is the depth of the water in the gutter line which will be tolerated in flooding conditions. For catch basins and curbs-and-gutter assemblies, the maximum depth allowed will be 6 inches for a standard curb and 4 inches for a roll curb.
   c. Determine Longitudinal Slope (S_L) of the Street: Determine the slope of the street, in percent, from profile plans or topographic maps. Minimum slope utilized in calculations must be 0.3%.
   d. Determine Transverse Slope (S_T) of the Street: This can be determined from the typical section of the street and will usually consist of the vertical distance from the gutter line to the crown of the street divided by the

horizontal distance from the gutter line of the crown of the street. Minimum slope utilized in calculations must be 0.3%.

e. Determine Capacity of the Basin: The capacity of the basin can be determined by **Chart 4 in Attachment 2, Stormwater Charts**. Enter the bottom of the chart with the transverse slope and draw a vertical line to the longitudinal slope. Then, using this as a turning point, draw a horizontal line to intersect the "K" factor. Then use the equation:

1) $Q = KD^{5/3}$, where $D = S_T T$

Q = the inlet capacity of the basin in cubic feet per second

K = a dimensionless factor determined from said chart

D = the depth of flow in the gutter line in feet

T = Width of Flow or Spread in feet

= maximum of 6 feet for travel lane

= maximum of 7 feet for valley gutter

= maximum of 8 feet for curb and gutter

The maximum "T" shall always be based on 4" or 6" depth regardless if a travel lane, valley gutter, or curb and gutter is involved.

2) With this information, complete the columns of the catch basin design data sheet **(Chart 5) in Attachment 2, Stormwater Charts**.

f. Determine Area Served by the Basin:

1) Assume a trial coefficient and a trial intensity for the design area. At this point, an approximate area served by the catch basin may be determined by dividing the catch basin capacity by the trial coefficient of runoff and the trial intensity (i.e. catch basin capacity / (trial coefficient x trial intensity). This derived area gives an approximate area served by the catch basin. With this area and the topographic lines, a trial location of the proposed basin should be made.

2) To ensure that the location as derived in Step No. 1) is appropriate and that the trial coefficient of runoff and trial intensity are in order, the runoff for the area determined by the proposed location of the basin should be calculated. This is accomplished by calculating the runoff as established in the stormwater design procedures listed in **Parts 3.01A and 3.01B** and estimating the following: length of drainage area, height above most remote point, actual runoff coefficient, time of concentration (Tc), actual intensity, and maximum allowable drainage area. If the maximum allowable drainage area varies by more than 10% from the derived area, this would indicate that the trial coefficient and/or trial intensity were not in line with the actual coefficient and intensity, and therefore, the basin is not properly located. The procedure in Step No. 1) should then be repeated and then adjust the trial coefficient of runoff and trial intensity accordingly. Once all the basins have been properly located, the pipe design associated with these basins may be completed according to the **Part 3.01E, Pipe Systems Design**.

2. Utilize the following equation to calculate the gutter flow rate:

   $Q = [0.56/n]S_T^{5/3}S_L^{1/2}T^{8/3}$, n = 0.016 for concrete curb and gutter.

I. Culvert Design

1. There are two steps in storm drainage design. The first step is to determine the amount of water discharged at the point of design. This can be accomplished by using **Part 3.01B** of this manual (Q = CIA). The second step is the actual selection of a size for the structure, based on the calculated discharge.

2. Determination of Structure Size:

   a. There are essentially two types of control which must be considered in every culvert design situation: inlet control and outlet control. Both types of control must be considered separately in the design of culverts.

3. Inlet Control:

   a. Inlet control exists in cases where the culvert is not flowing full. The inlet control charts (**Charts 8 – 13 in Attachment 2, Stormwater Charts**) have headwater depth as the controlling criteria. Headwater depth is the depth of the water on the upstream side of the culvert, expressed in diameters of the pipe under study.

   b. The maximum allowable headwater is limited by either the controlling flood elevation or existing or proposed development. However, the maximum headwater depth should not exceed 1.2 times the open height of the culvert for a 10-year, 24-hour storm.

4. Outlet Control:

   a. Outlet control exists in cases where the culvert is flowing full. Before using the outlet, control charts (**Charts 14 – 18 in Attachment 2, Stormwater Charts**), it is necessary to determine the coefficient of entrance loss "K_e". These values are found in the coefficient of entrance loss table in Chart 7 of the Stormwater Charts in Attachment 2:

      The equation $HW = H + h_o - LS_o$, shown on **Charts 14 – 18 in Attachment 2, Stormwater Charts**, expresses the relationship between the inlet and outlet.

   b. A controlling criterion for outlet control is tailwater depth, which is represented in the tables by the amount of "head". Head is the difference in elevation of the water surface on the upstream side of the culvert and the downstream water surface. The tailwater elevation is determined by downstream conditions and may be calculated if these conditions are known. In any case, the tailwater elevation will not be below the design year flood elevation at the outlet. If flood data is not available, the assumption may be made that the tailwater elevation is the crown of the culvert.

J. Pipe System Design

1. Once all the catch basins have been located according to the catch basin design procedures, the next step is to design the pipe systems to serve the basins. For the purpose of this manual and for the Town of Winterville, pipes

within the system shall be designed to carry a 10-year, 24-hour storm. The sizing of these pipes shall be based on the Manning Equation. It should be noted that the velocities for pipes shall be maintained between 2.5 feet per second and 10 feet per second. In addition, points of discharge should be treated in such a manner to conform with the State and local ordinances on velocity controls. Headwalls and Flared End Sections are required for all influent and effluent pipe systems. This design is based on the sum of the individual areas served by the catch basins and not the sum of the capacities of each basin.

2. All storm sewers must be designed at a minimum slope of 0.3%.
3. The storm drainage design data sheet **(Chart 6) in Attachment 2, Stormwater Charts**, should be completed and submitted with each preliminary plat.
4. Step 1: Note the location(s) of the pipe(s).
5. Step 2: Note the individual area drained by each catch basin as well as the sum of the areas to this point.
6. Step 3: List the coefficient of runoff for this type of development.
7. Step 4: List the height above the most remote point above the outlet, the maximum length of travel, and determine the time of concentration according to the standard runoff calculation procedures. In turn, derive an intensity and place it in the proper location of Chart 6. Alternatively,
8. Step 5: Determine the runoff for the area served by each pipe.
9. Step 6: Utilizing manning's coefficient (i.e. the "n" factor), pipe slope, length, and diameter, calculate the velocity through Manning's Equation. Multiply the velocity to determine the pipe's capacity in cubic feet per second. If the pipe capacity is greater than the discharge of the area, then pipe design is O.K. (An alternate method to determine the pipe size and slope would be to begin with a velocity and then determine the slope or size).

1.03 References

A. Publications are referred to in the text by basic designation only.

1. American Society for Testing and Materials (ASTM)
   a. A48 Standard Specification for Gray Iron Castings
   b. A536 Standard Specification for Ductile Iron Castings
   c. C55 Standard Specification for Concrete Building Brick
   d. C76 Reinforced Concrete Culverts, Storm Drain and Sewer Pipe (latest)
   e. C443 Flexible Watertight Joints for Circular Concrete Pipe and Precast Manhole Sections (latest)
   f. C478 Precast Reinforced Concrete Manhole Sections (latest)
   g. C858 Underground Precast Concrete Utility Structures (latest)
   h. C890 Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures (latest)
   i. C913 Precast Concrete Water and Wastewater Structures (latest)

j. C923 Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals (latest)

k. C990 Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants (latest)

l. D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3))

m. D1248 Polyethylene Plastics Molding and Extrusion Materials (latest)

n. D1586 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils

o. F2881 ADS HP Storm 12" – 60" Pipe

2. American Association of State Highway and Transportation Officials (AASHTO)

a. M 170 Standard Specifications for Reinforced Concrete Culverts, Storm Drain, and Sewer Pipe (latest)

b. M 294 Standard Specifications for Corrugated Polyethylene PipeUNI-BELL Plastic Pipe Association (UNI)

a. B-6 Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe (latest)

b. M330 ADS N-12 WT IB Pipe

4. NCDOT Standard Specifications for Roadway and Structure and Standard Details.

5. Elements of Urban Stormwater Design; H. Rooney Malcom, P.E. (available from N.C. State Industrial Extension Service).

1.04 Submittals

A. All related Design Calculations must be sealed by a N.C. Professional Engineer.

B. Submit the following to the Town's Public Works Department prior to beginning work:

1. Affidavit of Compliance: Affidavit shall attest that supplied products conform to the referenced standard and this specification and that tests set forth in each applicable referenced publication have been performed and that test requirements have been met. Submit for each of the following materials:

a. Pipe

1) Advanced Drainage Systems (ADS) Pipe

2) Pipe Reinforced Concrete Pipe

3) Corrugated Polypropylene Pipe (HDPP)

b. Pre-cast concrete manholes

c. Pre-cast concrete boxes

d. Concrete blocks

2. Catalog Data: Submit manufacturer's standard drawings or catalog cuts for the following. Clearly indicate equipment to be furnished for the Project including options to be provided.
    a. Pipe
        1) Advanced Drainage Systems (ADS) Pipe
        2) Reinforced Concrete Pipe
        3) Corrugated Polypropylene (HDPP)
    b. Pre-cast Concrete Manholes and the following appurtenances:
        1) Manhole steps
        2) Pipe connectors
        3) Joint material
    c. Pre-cast Concrete Boxes and the following appurtenances:
        1) Manhole Steps
        2) Pipe Connectors
        3) Joint material
3. Prior to Final Acceptance submit the following report:
    a. Field test report for each section of pipe for the following:
        1) Video inspection of all storm drain piping. (See **Section 3, Part 2.03** below)

1.05 Delivery, Storage, and Handling

A. All materials and equipment shall be handled and stored in accordance with the manufacturer's recommendations.

1.06 Quality Assurance

A. All parts and materials incorporated into a project shall be new and unused.

B. Contractors must be licensed by the N.C. Licensing Board for General Contractors and have a classification and a cost limitation appropriate for the work to be performed.

1.07 Warranty

A. Line Work

1. All materials and workmanship shall have a one-year warranty from the date of final acceptance by the Town. A warranty inspection will be made jointly by the Town and Contractor/Developer approximately eleven (11) months after acceptance to identify needed repairs.

Part 2 Allowable Products and Materials

2.01 Reinforced Concrete Pipe

A. Reinforced Concrete Pipe shall conform to ASTM C76 (or the latest revision), AASHTO M170, and to the following requirements:

1. Pipe lengths shall be not less than 8 feet.

2. Pipe installed within the street right-of-way shall be Class III minimum per ASTM C76.
3. Pipe shall be designed for a Type 2 (ASTM C1479) laying condition at the design depth of cover.
4. Storm Sewer Mains:
    a. Joint shall be modified tongue and groove.
    b. Use flexible plastic joint material

B. Concrete Flared End Sections shall be reinforced and meet all applicable requirements of ASTM C76.

C. Mortar mix of one-part Portland cement and two parts sand shall be applied to the outside of all pipe joints and to both inside and outside of joints of pipe eighteen inches (18") in diameter and larger. Joints shall be wiped smooth.

D. A roughness coefficient of 0.013 ("n" factor) shall be used in the design of reinforced concrete pipe drainage systems.

E. Compaction for reinforced concrete pipe to be in accordance with Sections 300-6 and 235-4(C) of the NC-DOT Standard Specifications for Roads and Structures.

2.02 High-Performance Plastic Pipe

A. Polypropylene pipe shall be provided by Advanced Drainage System (ADS) or approved equal and shall have a smooth interior and annular exterior corrugated polypropylene (PP) pipe meeting to support typical construction and long-term loadings.

B. 12- through 60-inch pipe shall meet the requirements of ASTM F2736, ASTM F2881 or AASHTO M300, Type S or SP.

C. A roughness coefficient of 0.012 ("n" factor) shall be used in the design of plastic pipe drainage systems.

D. Joint Performance: For diameters 12- through 60-inch, Watertight joints shall be double gasketed bell-and -spigot meeting the watertight requirements of ASTM F2764 or ASTM F2881. Gaskets shall be made of polyisoprene meeting the requirements of ASTM F477.

E. Fittings:

1. Fittings shall conform to ASTM F2764 or ASTM F2881, with the exception of meeting the watertight joint performance requirements of ASTM D3212. Bell and spigot connections shall utilize a spun-on, welded or integral bell and spigot with gaskets meeting ASTM F477.
2. Repair couplers may be utilized to connect field-cut pipe.

F. Material Properties: Polypropylene compound for pipe and fitting production shall be impact modified copolymer meeting the material requirements of ASTM F2881, Section 5 and AASHTO M330, Section 6.1.

G. Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with the exception that minimum cover in trafficked areas for 4- through 48-inch diameters shall be one foot. For 60-inch diameter the minimum cover shall be 2 ft. in single run applications. Backfill for minimum cover situations shall consist of Class 1 (compacted), Class 2 (minimum 90% SPD), Class 3 (minimum 95% SPD) or Class 4 (minimum 95% SPD) material.

Maximum fill heights depend on embedment material and compaction level; please refer to trench embedment detail. Contact your local manufacturers representative or visit the website of the pipe manufacturer for a copy of the latest installation guidelines.

H. HDPE Pipe shall be installed within rights-of-way shall be designed for traffic loadings and receive written permission from controlling agency prior to installation.

I. A minimum of 4-inches of 57 Stone must be packed underneath the pipe. Select backfill is required to the top of the pipe. Minimum cover in non-traffic applications is 12 inches from the top of the pipe to the ground surface. Additional cover may be required to prevent flotation.

2.03 High Density Polyethylene

A. This specification describes 4- through 10-inch (100 to 250 mm) ADS N-12 WT IB pipe (per AASHTO) for use in gravity-flow applications.

B. N-12 WT IB pipe (per AASHTO) shall have a smooth interior and annular exterior corrugations. 4- through 10-inch (100 to 250 mm) shall meet AASHTO M252, Type S.

C. A roughness coefficient of 0.012 (“n” factor) shall be used in the design of plastic pipe drainage systems.

D. Joint Performance: Pipe shall be joined with the N-12 WT IB joint meeting the requirements of AASHTO M252, AASHTO M294, or ASTM F2306. 4- through 10-inch (100 to 250 mm) shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

E. Fittings: Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the watertight joint performance requirements of AASHTO M252, AASHTO M294 or ASTM F2306.

F. Material Properties: Virgin and Premium recycled material for pipe and fitting production shall be high-density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch (100 to 250 mm) diameters as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294R and ASTM F2306 respectively.

G. Installation: Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with the exception that minimum cover in trafficked areas for 4- through 10-inch (100 to 250 mm) diameters shall be one foot. (0.3 m) in single run applications. Backfill for minimum cover situations shall consist of Class 1, Class 2 (minimum 90% SPD) or Class 3 (minimum 90%) material. Maximum fill heights depend on embedment material and compaction level; please refer to trench embedment detail. Contact your local manufacturers representative or visit the website of the pipe manufacturer for a copy of the latest installation guidelines.

2.04 Closed Circuit TV-ing of Gravity Lines

A. General

1. Following installation of or acquisition of new storm gravity lines, Contractor shall visually inspect each line by means of close-circuit television (CCTV). Video shall be recorded on a DVD.
2. Television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. Camera shall be operative in 100 percent humidity conditions. Components of the video system shall be capable of producing a minimum 310-line resolution. Lighting system shall minimize reflective glare. Camera shall move through at a constant rate with a maximum speed of 30 feet per minute.
3. Deliver DVD to the Town prior to final acceptance.

2.05 Manholes

A. Provide manholes made of precast concrete sections in conformance with ASTM C478, NC Department of Transportation, and the following requirements:

4. General
   a. Manhole inside diameter shall conform to the following for various size pipes:
      1) 15 inch – 18-inch pipe..... 4’ diameter
      2) 24 inch – 36-inch pipe..... 5’ diameter
      3) 42 inch – 48-inch pipe..... 6’ diameter
      4) 54-inch pipe..... 8’ diameter
      5) >54-inch pipe..... As Approved by Town

   b. Precast concrete manholes shall be as manufactured by Adams Concrete, Carolina Precast Concrete, Inc., D & M Concrete Specialties, Inc., N. C. Products Corp., Stay Right Tank, Tindall Concrete Products, Inc. or approved substitute.
5. Precast Concrete Sections
   a. Minimum wall thickness shall be 5-inches.
   b. Base: Cast monolithically without construction joints or with an approved PVC waterstop in the cold joint between the base slab and the walls. The width of the base extensions on Extended Base Manholes shall be no less than the base slab thickness.
   c. Riser: Minimum lay length of 16-inches.
   d. Eccentric Cone: Top inside diameter shall be 24-inches. Width of the top ledge shall be no less than the wall thickness required for the cone section.

e. Transition Cone: Provide an eccentric transition from 60-inch and larger manholes to 48-inch diameter risers, cones, and flat slab top sections. Minimum slope angle for the cone wall shall be 45 degrees.

f. Flat Slab Top: Designed for HS-20 traffic loadings as defined in ASTM C890. Items to be cast into Special Flat Slab Tops shall be sized to fit within the manhole ID and the top and bottom surfaces. Provide a float finish for exterior slab surface.

g. Precast or core holes for pipe connections. Diameter of hole shall not exceed outside diameter of pipe by more than 3-inches.

h. Grade Rings: May be used to adjust frame and cover to finished grade. Grade Rings shall be no less than 4-inches in height.

i. Lifting Devices: Devices for handling precast components shall be provided by the precast manufacturer and comply with OSHA Standard 1926.704.

6. Joints

a. Manufacture in accordance with tolerance requirements of ASTM C 990 for butyl type joints.

b. Minimize number of joints. Do not use riser section for manholes up to 6 feet tall and no more than one riser for each additional 4 feet in height.

c. Flexible Joint Sealants: Preformed butyl rubber-based sealant material conforming to Federal Specification SS-S-210A, Type B and ASTM C990.

d. External Seal: Polyethylene backed flat butyl rubber sheet no less than 1/16-inch thick and 6-inches wide.

7. Inverts

a. Brick and mortar or precast concrete invert.

b. Form and finish invert channel to provide a consistent slope from inlet(s) to outlet up to 4-inches.

c. Channel walls shall be formed to 3/4 of the height of the outlet pipe diameter.

d. Finish benches with a minimum uniform 1.5:12 slope. Provide a 1/4-inch radius at the edge of bench and trough.

8. Flexible Pipe Connectors: Provide flexible connectors for pipe to manhole that conform to ASTM C923 and as recommended by the pipe manufacturer. Provide stainless steel pipe clamp type band around flexible connection to sewer pipe.

9. Manhole Steps

a. Steps shall be in accordance with ASTM C478 and made of 1/2-inch grade 60 steel encapsulated by co-polymer polypropylene and have serrated tread and tall end lugs.

b. Secure steps to the wall with compression fit in tapered holes or cast-in-place. Align steps along a vertical wall and shall not be located over a pipe opening. First step shall be a maximum of 26-inches from the bottom.

c. Steps shall be by American Step Co., Inc., Bowco Industries, Inc., M. A. Industries, Inc. or approved substitute.

2.06 Castings

A. General

10. Made of gray iron, ASTM A-48 - Class 30, or ductile iron, ASTM A536, grade 65-45-12.
11. Castings shall be free from imperfections not true to pattern. Casting tolerances shall be plus or minus 1/16-inch per foot of dimension. Top shall set neatly in frame, with edges machined for even bearing and proper fit to prevent rattling and flush with the edge of frame.
12. Castings shall be as manufactured by Neenah Foundry Co., U.S. Foundry & Manufacturing Corp., or Vulcan Foundry
13. All castings (grates, frames, etc.) must be made domestically.

B. Manhole Ring and Cover:

1. Minimum clear opening shall be 22-inches.
2. Minimum weight for frame and cover shall be 310 pounds and suitable for Heavy Duty Highway Traffic Loads of H-20.
3. Frame shall have four 1-inch anchor bolt holes equally spaced.
4. "Storm Sewer" shall be cast on the cover as appropriate. Casting shall bear the name of the manufacturer and the part number.
5. Provide cover with two 1-inch perforated holes.

C. Grate and Frame:

1. Grate and Frame shall be NCDOT Standard.
2. Grate and Frame shall be suitable for Heavy Duty Highway Traffic Loads of H-20.
3. Casting shall bear the name of the manufacturer and the part number.

2.07 Precast Boxes

A. Provide precast concrete boxes made of precast concrete sections in conformance with ASTM C913 and the following requirements.

4. General

a. Precast boxes include:

1) Square/Rectangular catch basin boxes and drop inlets.

2) Non-round manhole structure.

b. Precast manufacturer shall have a professional engineer registered in the State of North Carolina on staff. Provide a certification signed and sealed by the North Carolina Professional Engineer that the boxes provided for the Project are in conformance with the reference standards and these specifications and are structurally sufficient (i.e., adequate wall thickness and reinforcing). The boxes shall be adequate for the existing site conditions as described in the soils reports provided in these Project specifications.

c. Precast concrete boxes shall be manufactured by Adams Concrete, Carolina Precast Concrete, Inc., D & M Concrete Specialties, Inc, N. C. Products Corp., Stay Right Tank, Tindall Concrete Products, Inc., or approved substitute.

5. Precast Concrete Sections
    a. General: Concrete compressive strength shall be 4,000 psi minimum and rated for H-20 loading.
    b. Base: Cast monolithically without construction joints or with an approved PVC waterstop in the cold joint between the base slab and the walls. The width of the base extensions shall be no less than the base slab thickness and shall be as indicated on the Details.
    c. Riser: Minimum lay length of 16-inches.
    d. Flat Slab Top: Designed for HS-20 traffic loadings as defined in ASTM C890. Items to be cast into Special Flat Slap Tops shall be sized to fit within the top and bottom surfaces. Provide a float finish for the exterior slab surface and a 1-inch chamfer on all exposed edges.
    e. Lifting Devices: Devices for handling precast components shall be provided by the precast manufacturer and comply with OSHA Standard 1926.704.
6. Joints
    a. Manufacturer in accordance with tolerance requirements of ASTM C 990 for butyl type joints.
    b. Minimize number of joints.
    c. Flexible Joint Sealants: Provide preformed butyl rubber-based sealant material conforming to Federal Specification SS-S-210A, Type B - Butyl Rubber or O-ring rubber gasket conforming to ASTM C443.
    d. External Seal: Provide a polyethylene backed flat butyl rubber sheet no less than 1/16-inch and 6-inches wide applied to outside perimeter of joint.
7. Flexible Pipe Connectors: Provide flexible connectors for pipe to box that conform to ASTM C923.

2.08 Concrete Brick Masonry Units

A. Concrete brick masonry units shall be solid units meeting the requirements of ASTM C55, Grade S-11.

D. Clay brick shall not be permitted for any drainage structure.

E. Concrete and mortar shall meet the requirements of the NCDOT's Standard Specifications for Roads and Structures.

Part 3 Storm Drainage Detention

3.01 Drainage Detention

A. No building structure, or use of land for other than agricultural purposes, shall be constructed on a lot or tract of land where the total impervious land cover, as proposed, shall exceed 20,000 square feet (this includes existing impervious area installed after January 1, 2002 and proposed additional imperviousness as part of the project), until a drainage plan as it relates to the proposed use of the land has been approved, in writing, by the Town Engineer. (Residential subdivision shall be calculated using 40% of each lot as impervious and the

streets as impervious. This shall apply to residential subdivisions having no built upon lots. Subdivisions with built upon lots shall use the actual impervious area. Commercial developments must show the planned impervious area.)

A. The drainage plan as required by this section shall include, but not be limited to, a site plan showing existing and proposed buildings, storm drainage facilities, ground cover, site construction plans with grading plan, and drainage system; drainage facility design data including a drainage area map, engineering calculations, area of impervious cover and total land area.

B. The drainage plan shall be prepared and approved using the standards of the Town Engineer, as set forth in the Town's Standard Specifications and Details.

C. Portions of a parcel with the intended use of customer or occupant parking shall not be utilized for temporary stormwater detention unless underground storage units are designed and sealed by a professional engineer.

D. Impervious ground cover means those surfaces that cannot effectively infiltrate rainfall including but not limited to: Asphalt, concrete, stone, brick, terrazzo, roofing, clay tile, or any other natural or man-made material that is resistant to the absorption of surface water.

E. The Town Engineer shall not approve a drainage plan where the stormwater runoff will be increased by the proposed impervious cover for storms up to and including those expected to occur one in ten years unless adequate provisions are made to control the excess runoff so that the rate of stormwater runoff is equivalent to the rate of stormwater runoff prior to the installation of the impervious ground cover. Provided however, the drainage plan as required by this section shall be waived if the tract being developed is a part of a larger tract for which the plan for control of excess has already received prior approval and has been implemented and the runoff from the site to be developed is not expected to exceed the standard used in granting said prior approval.

3.02 General Design Criteria

A. The following criteria will be used for the design and construction of all stormwater impoundment facilities within extraterritorial boundaries of the Town of Winterville.

1. <u>General:</u>

   a. Design and installation of all stormwater impoundment facilities must comply with applicable Federal, State, and local laws. Attention should be given to the NC DEQ Stormwater Design Manual and he North Carolina Dam Safety Law of 1967.

   b. In no case shall a habitable structure be located within the impoundment area of any stormwater storage facility.

   c. Storm drainage must have a minimum slope of 0.3%.

   d. No utilities (sewer lines, power lines, water lines, etc.) shall be located within or immediately around any impoundment facility.

   e. All impoundment facilities will be considered permanent.

   f. All facilities shall be protected by a "Drainage Detention Easement" recorded at the Pitt County Register of Deeds office.

g. An operation and maintenance agreement shall be executed for all designed detention and stormwater control devices specifying the minimum required remedial actions and frequencies to promote successful operation of the device. The agreement shall name a specific party (HOA, developer, etc.) as the responsible party. The Town of Winterville shall not be named as the responsible party without prior written consent from the Town Engineer. The responsible party shall submit an annual inspection report to the Town of Winterville no later than June 1 of the submitting year. The report shall document compliance with the operation and maintenance agreement as well as describe any known improvements to the device, if applicable.

2. Site Location:

   a. It is recommended that stormwater impoundment facilities be located on the site from which the runoff to be controlled is generated.

   b. Off-site impoundments facilities are acceptable provided the land area involved with the facility is delineated on an acceptable map and officially recorded at the Pitt County Register of Deeds office as a permanent "Drainage Detention Easement". Also, an official commitment to maintenance of the facility will be required.

3. Site Plan:

   a. A site plan acceptable by the Town Engineer's standards will include the following:

      1) Development Plan

         i. Map Features:

            (1) Legend

            (2) North Arrow

            (3) Vicinity Map

            (4) Title block with development name, owner, engineering firm, engineer's seal, and signature

            (5) Scale

         ii. Topographical Features:

            (1) Original contours at not more than 1' intervals

            (2) Existing drainage patterns, including streams, ponds, etc.

            (3) Boundary lines

            (4) Existing streets and buildings

            (5) 100-year flood line or building restriction floodlines, where applicable

         iii. Site Plan:

            (1) Proposed structures, roads, buildings, paved areas

            (2) Storm drainage system, including locations, size, lengths, and all structures with drainage area maps and calculations

            (3) Location and grade of all swales and berms

(4) Identify all critical areas

(5) Show type and placement of all permanent erosion control measures

(6) Contours of proposed sites

(7) Grading plan

(8) Existing and planned ground cover

(9) Typical street cross-section

(10) Proposed profiles of roadways

(11) Off-site water bodies

(12) Total impervious area in square feet (existing and planned)

(13) Soil types

2) Narrative

i. Calculations of runoff

ii. Calculations for design of a stormwater impoundment facility

iii. Staging of the project

iv. Soil conditions:

(1) Soil type

(2) Susceptibility to erosion and preventative measures

(3) Seeding formula

v. Detention Maintenance Responsibilities

(1) Standard Maintenance Agreements

4. Storage Volume:

a. Various methods of which impoundment storage volume is approximated may be utilized; however, the result must at least equal that volume approximated using the method described within this manual, using the ten (10) year, twenty-four (24) hour storm.

b. All required storage volume approximations must be included with submitted design.

5. Primary Outlet Device:

a. All outlet devices must be constructed adhering to current construction standards as described in the Town of Winterville's “Standard Specifications and Details”.

b. Alternate outlet devices not referred to in this publication may be approved at the discretion of the Town Engineer. Such approval must be specifically requested upon submittal of the drainage plan.

6. Secondary Outlet Device:

a. It is recommended that all vegetated spillways be constructed in nonfilled or cut areas.

b. Emergency spillways may be constructed in fill areas provided they are asphalt or concrete lined and have sufficient approach and exit areas.

c. Any emergency spillways as a minimum must safely pass the peak 100-year flood after the storage facility has reached its capacity.

7. Facility Life:

a. All stormwater impoundments are to be permanent facilities.

b. All materials used in the construction of a stormwater impoundment facility must have a life expectancy equal to that of the total facility or a regularly scheduled replacement program must be provided.

F. Determination of Impoundment Storage Volume

1. On-site detention involves the storage of stormwater runoff and the controlled release of that runoff and is applicable for all proposed sites having 20,000 square feet or more of impervious cover. The excess runoff must be controlled so that the rate of stormwater runoff from the developed site is less than or equal to the rate of stormwater runoff prior to the installation of the impervious cover for storms up to and including the 10-year, 24-hour storm. All impoundments will have an emergency device or "spillway" that will safely pass the 100-year storm. The weir will be sized to carry the 100-year storm safely with an additional one foot of freeboard.

2. Flood routing is an algebraic method for determining the time and magnitude of a particular flood situation with regard to the rate of inflow storage versus the rate of outflow discharge. For the purpose of this manual, the routing procedure is based on the procedure described in the "Design Approaches for Stormwater Management in Urban Areas" by Dr. H. Rooney Malcom, Jr. of N. C. State University.

G. Maximum Permissible Release Rate

1. The maximum release rate must be limited to that rate of runoff discharged from the site immediately prior to the proposed development during the 10-year, 24-hour storm. This rate can be calculated according to the Rational Method described in this manual.

2. A group of hydrographs can be developed where the intensity is varied by using storms with different durations. The volume of runoff associated with each hydrograph is calculated by multiplying the maximum runoff rate with the respective storm duration (Note that runoff is measured in cubic feet per second and the duration is in minutes).

3. Once the hydrographs have been developed it is necessary to convert the maximum runoff rates for each rainfall to storm runoff volumes. These volumes should be computed in cubic feet.

4. This is only an approximation which is applicable to small basins. Many different methods may be used in the design of impoundment facilities and innovative designs will be considered by the Town Engineer provided the maximum permissible release rate and the storage facility requirements are met with a safety factor. In all cases, the design will be routed for confirmation.

Table 3-1
Advantages and Disadvantages of Measures for Reducing and Delaying Stormwater Runoff

Measure	Advantages	Disadvantages

Table 3-1
Advantages and Disadvantages of Measures for Reducing and Delaying Stormwater Runoff

Measure	Advantages	Disadvantages
A. Cisterns and covered ponds	1. Water may be used for: a. Fire protection b. Watering lawns c. Industrial processes d. Cooling purposes 2. Reduce runoff while only occupying small area 3. Land or space above cistern may be used for other purposes	1. Expensive to install 2. Cost may be restrictive if the cistern must accept water from large drainage areas 3. Require slight maintenance 4. Restricted access 5. Reduced available space in basements for other areas
B. Rooftop gardens	1. Esthetically pleasing 2. Runoff reduction 3. Reduce noise levels 4. Wildlife enhancement	1. Higher structural loadings on roof and building 2. Expensive to install and maintain
C. Surface pond storage (usually residential areas)	1. Controls large drainage areas with low release 2. Esthetically pleasing 3. Possible recreation benefits: a. Boating b. Ice skating c. Fishing d. Swimming 4. Aquatic life habitat 5. Increases land value of adjoining property	1. Require large areas. 2. Possible pollution form stormwater and siltation 3. Possible mosquito breeding areas 4. May have adverse algal blooms as a result of eutrophication 5. Possible drowning 6. Maintenance problems
D. Ponding on roof by constricted downspouts.	1. Runoff delay 2. Cooling effect for building: a. Water on roof b. Circulation through 3. Roof ponding provides fire protection for building (roof water may be tapped in case of fire)	1. Higher structural loadings 2. Clogging of constricted inlet requiring maintenance 3. Freezing during winter (expansion) 4. Waves and wave loading 5. Leakage of roof water into building (water damage)
E. Increased roof roughness: a. Rippled roof b. Gravel on roof	1. Runoff delay and some reduction (detention in ripples or gravel)	1. Somewhat higher structural loadings

Table 3-1
Advantages and Disadvantages of Measures for Reducing and Delaying Stormwater Runoff

Measure	Advantages	Disadvantages
F. Porous pavement (parking lots and alleys): a. Gravel parking lot b. Holes in impervious pavements (1/4 in.) filled with sand	1. Runoff reduction (a and b) 2. Potential groundwater recharge (a and b) 3. Gravel pavements may be cheaper than asphalt or concrete (a)	1. Clogging of holes or gravel pores (a and b) 2. Compaction of earth below pavement or gravel decreases permeability of soil (a and b) 3. Groundwater pollution from salt in winter (a and b) 4. Frost heaving for impervious pavement with holes (b) 5. Difficult to maintain 6. Grass or weeds could grow in porous pavement (a and b)
G. Grassed channels and vegetated strips	1. Runoff delay 2. Some runoff reduction (infiltration recharge) 3. Esthetically pleasing: a. Flowers b. Trees	1. Sacrifice some land area for vegetated strips 2. Grassed areas must be mowed or cut periodically (maintenance costs)
H. Ponding and detention measures on impervious pavement: a. Rippled pavement b. Basins c. Constricted inlets	1. Runoff delay (a, b, and c) 2. Runoff reduction (a and b)	1. Somewhat restricted movement of vehicles (a) 2. Interferes with normal use (b and c) 3. Damage to ripple pavement during snow removal (a) 4. Depressions collect dirt and debris (a, b, and c)
I. Reservoir or detention basin	1. Runoff delay 2. Recreation benefits a. Ice skating b. Baseball, football, etc., if land is provided 3. Esthetically pleasing 4. Could control large drainage areas with low release	1. Considerable amount of land is necessary 2. Maintenance costs: a. Mowing grass b. Herbicides c. Cleaning periodically (silt removal) 3. Mosquito breeding area 4. Siltation in basin
J. Converted septic tank for storage and groundwater recharge	1. Low installation costs 2. Runoff reduction (infiltration and storage) 3. Water may be used for: a. Fire protection b. Watering lawns and gardens c. Groundwater recharge	1. Requires periodic maintenance (silt removal) 2. Possible health hazard 3. Sometimes requires a pump for emptying after storm

Table 3-1 Advantages and Disadvantages of Measures for Reducing and Delaying Stormwater Runoff		
Measure	**Advantages**	**Disadvantages**
K. Groundwater recharge: a. Perforated pipe or hose b. French drain c. Porous pipe d. Dry well	1. Runoff reduction (infiltration) 2. Groundwater recharge with relatively clean water 3. May supply water to garden or dry areas 4. Little evaporation loss	1. Clogging of pores or perforated pipe 2. Initial expense of installation (materials)
L. High delay grass (high roughness)	1. Runoff delay 2. Increased infiltration	1. More difficult to mow
M. Routing flow over lawn	1. Runoff delay 2. Increased infiltration	1. Possible erosion or scour 2. Standing water on lawn in depressions

3.03 Sediment Basin Design

A. The management of stormwater flowing from areas exposed because of construction activity is a very important aspect of storm water management in general. Sediment discharges from unprotected construction sites are one hundred times as high as from similar areas of rural composition. Sediment control consists fundamentally of measures taken to reduce sediment production by controlling erosion, and those taken to reduce sediment discharge by entrapment of waterborne sediment. This part of the manual deals with the design of sediment basins which are intended to entrap sediment particles before they leave the site. Such basins are normally temporary facilities crudely constructed.

H. Sediment designs shall be broken into two categories: (1) A stone outlet sediment trap for drainage areas five acres or less as depicted on STD No. 20.07, and (2) A full scale sediment basin for areas greater than five acres. The design of a sediment basin is treated here as a sequence involving the design of the major basic components: The settling zone, the sediment storage zone, the inlet zone, the outlet of the settling zone, the riser/barrel combination, the dike, and the emergency spillway. This design involves fundamental applications of discrete settling theory, the hydraulics of weirs and orifices, and a routing procedure.

I. <u>Design Criteria</u>

1. The critical design condition for the basin occurs when the outflow reaches its peak. It is at this time when settling efficiency reaches a minimum and the largest particles (and the greatest numbers) are passing through the basin. It is not economically feasible to design for high improbable storms; neither is it economically feasible to attempt to settle very small particles. Therefore, for this manual, the design particle size shall be forty microns and the design particle settling efficiency shall be 75%. The settling efficiency of the design particle refers to the fraction of particles of a certain size which will be trapped in the basin under designing conditions at peak outflow. Trap efficiency refers to the fraction of material removed from all storm flows passing through the basin during its life. Trap efficiency may far exceed settling efficiency in the

design particle because most rainfall incidents are much less intense than the design and they do not tax basins so severely.

2. There are two design storms which are important: One is that storm which determines the performance requirement of the basin. For the purpose of this manual, the 10-year storm has been selected as the limit for acceptable settling performance. Above that limit, there is a range of storm intensities within which the basin is not expected to function well in settling, but it is expected to maintain structural integrity. For the purpose of this manual, the sediment basin should be required to pass the 100-year storm safely without structural damage.

   a. Design a sediment basin to control sediment discharge in the 10-year storm and to pass the 100-year storm safely. Design particle size ≈ 60 microns with a settling efficiency of 75%.

J. Design of Basin Components

1. In general, sediment basins should be shallow. As surface area increases for a given flow, settling efficiency increases. Shallow basins are also more easily fitted with baffles which increase efficiency.

   a. Inlet Zone: The inlet zone is provided to spread the flow evenly across the width of the basin. This can be done by means of a silt fence placed a few feet (say, one-tenth of the length) into the basin from the inlet end. Where an inlet baffle such as this cannot be justified, inlet flows should be directed away from the outlet to prevent short-circuiting (direct flow through the basin from inlet to outlet).

   b. Settling Zone: The "working unit" of the basin is the settling zone. This is the area of the basin where the particles are actually settled or separated from the inflow. Allen Hazen developed an equation about 1900 which can be written:

      1) $$E = 1 - \left[\frac{v_0 A}{NQ}\right]^{-N} \quad \text{or} \quad A = \frac{NQ}{v_0}\left[(1-E)^{-1/N} - 1\right]$$

         i. E = Settling efficiency of a (design) particle having a settling velocity, v_0 (expressed as a fraction)

         ii. v_o = Design-particle settling velocity (ft/sec)

         iii. A = Surface area of the settling zone (i.e. required surface area of the basin) in square feet

         iv. N = Effective number of cells in the settling zone (dimensionless)

         v. Q = Flow through the basin (cfs)

      2) The effective number of cells is not precisely equal to the number of real cells in the basin, but if an inlet baffle is provided, the effective number of cells can be approximated by the number of real cells into which the basin is divided (not counting the inlet tone). For instance, placing a silt fence across the settling zone near its center is equivalent to setting N = 2, at the level of precision of this work.

      3) Values of settling velocities for various particle sizes can be found in Table 3-2 below.

Table 3-2 Particle (Spherical) Settling Velocities in 68° Water by Stokes Law	
Particle Diameter (microns)	**Settling Velocity (ft/sec)**
8	0.00019
10	0.00029
12	0.00042
15	0.00066
18	0.00095
20	0.0012
25	0.0018
30	0.0027
40	0.0047
50	0.0074
60	0.011
80	0.019
100	0.029

4) The equation above relates the surface area of the basin to the outlet flow and to the particle characteristics.

5) The depth of the settling zone can be estimated from the volume of storage required to reduce the influent peak flow to the outflow related to the pond surface area through the equation above. For larger watersheds, the routing process is involved. For smaller watersheds, the settling zone can be designed to catch the entire runoff volume and to release it at the appropriate Q.

c. Sediment Storage Zone: The trapped sediment is held in the sediment storage zone, which is directly beneath the settling zone. The volume of sediment storage may be estimated from the Soil Conservation Service Universal Soil Loss Formula, or the following equation may be used, as taken from ""Design Approaches for Stormwater Management in Urban Areas".

1) $S = 0.151A^{0.84}$

i. S = Settling accumulation (acre feet/year of exposure)

ii. A = Disturbed area (acre)

d. Riser and Barrel Assembly: The major basin outlet is through the riser and barrel. The riser is a vertical pipe into which water flows through orifices, perforated in the sides, and over the top in weir flow. The barrel is the near-horizontal pipe which conducts the outflow through the dike to the point of release. More than one riser/barrel may be used if needed.

1) The flow through the perforations is the flow when the basin is performing as a settling device. The flow over the top of the riser is all or part of the emergency overflow.

2) Size as weir for 25-year storm, using anti-vortex plate. For routing assume sediment storage to be full. Top of riser to be at same elevation as 10-year, 24-hour storm (top of settling zone). Assume a weir head equal to the difference in elevation of the 25-yr. and 10-yr. storms.

3) The top of the riser is usually located at the top of the settling zone. The pipe size used for the riser is determined by routing the large-storm hydrograph through the basin and sizing the riser by determining the length of weir (or circumference of pipe) necessary to operate satisfactorily at peak outflow. For this purpose, the weir formula can be rearranged to yield.

4) $L = \frac{Q_0}{3.0H^{1.5}}$

   i. L = Required circumference of the riser or risers (ft)

   ii. Q_0 = Peak outflow (cfs)

   iii. H = Maximum height of water over the top of the riser during design (ft)

5) The riser should be checked to see if it acts as an orifice, if the head is large.

6) A vertical plate, called the anti-vortex plate, is installed at the top of the riser to prevent spiral flow around the riser, which will cause the water to rise to a higher level at the same outflow.

7) The barrel may be designed as a culvert under inlet control. The headwater should not back up to more than half the riser height during peak outflow.

8) The perforations in the riser are intended to limit the outflow in the riser to the flow used in the Settling Zone equation, during the design storm selected for sediment control performance. Perforations are grouped around the riser at selected levels, so that through the combination the correct flow is obtained. From the orifice formula:

   i. $Q = C_D A\sqrt{2gh}$. Using C_D = 0.60 (Chart 11) and solving for the diameter of a circular orifice, expressed in inches: $Q_0 = 0.026D^2\sqrt{h}$

   ii. Q_0 = Outflow through a single perforation (cfs)

   iii. D = Diameter of perforation (inches)

   iv. h = Water depth from the top of the riser to the center of the perforation (ft)

e. <u>Emergency Spillway:</u> If the large-storm design flow is too much for a reasonable combination of risers, an emergency spillway should be installed. If it is long enough, the weir formula can be used to determine its length. The top of the weir used for the emergency spillway should be above the top of the riser. If the emergency spillway is cut in virgin soil at the side of the dike, it may be seeded and mulched if the season is right. If not, or if it is placed in the dike, immediate protection against the high-velocity spillway should be provided to prevent failure of the dike. Set height at the 25-year storm

f. <u>Freeboard:</u> The top of the dike should be located one to three feet above the highest expected design water level, depending on the size of the pond.

g. Construction Standards for Dike: Side slopes should be three to one or flatter. The dike should be protected against erosion if its expected life is more than 30 days. The usual care for soil placement, compaction, and protection against seepage failure at the riser/barrel should be employed. The higher the dike, the greater should be the care.

h. Design Checks: Hydrographs for the sediment-control-performance storm and for the large storm should be routed through the basin. For the sediment-control-performance storm, the percent reduction of peak flow is high, so a longer storm is probably critical.

1) The basin shall be designed for a six-month design of life and should be cleaned out every six months or may be designed for the entire life of the project.

K. Design Requirements

1. Set the crest of the emergency spillway at the 25-year storm.
2. Design the riser/barrel assembly so that it will carry the 25-year storm.
3. The top of the riser shall be set at the 10-year, 24-hour storm.
4. The emergency spillway must be located in undisturbed soil.
5. The maximum permissible overtopping velocity of the emergency spillway is 5 feet per second.
6. The emergency spillway shall be designed to carry the full 100-year storm plus a minimum of one foot of freeboard to the top of the dam (For broad crested weirs, the length of the weir may quickly be determined by the formula):

$$L = \frac{Q_{100}}{4.12}$$

7. The basin shall be designed to control sediment discharge in the 10-year storm and to pass the 100-year storm safely.
8. The design particle size shall be 60 microns with a settling efficiency of 75%.

Part 4 Execution / Installation

4.01 Pipe and Accessories

A. General

1. Provide erosion control measures as required. Erosion control measures including seeding and mulching shall be designed, installed, and maintained in accordance with the N.C. Department of Environment Quality, Land Quality Section's "Erosion and Sediment Control Planning and Design Manual". The Developer/Engineer is responsible for securing all required permits.
2. Pipe installation shall meet the following general guidelines:
   a. Handle pipe and accessories in accordance with manufacturer's recommendations.
   b. Carefully inspect pipe immediately prior to laying. Do not use defective pipe. Replace pipe damaged during construction.
   c. Lay pipe to design grade and alignment.
   d. Provide proper equipment for lowering pipe into trench.

e. Provide tight closure pipe ends when work is not in progress.

f. Keep pipe interior free of foreign materials.

g. Do not lay pipe in water or when the trench or weather conditions are unsuitable for the work.

h. Clean bell and spigots before joining. Make joints in accordance with pipe manufacturer recommendation.

B. Trenching for Underground Pipe Installation

1. Definitions

a. Backfill: A specified material used in filling the excavated trench and placed at a specified degree of compaction.

1) Materials: Materials listed herein include processed materials plus the soil classifications listed under the Unified Soil Classification System, (USCS) (Method D2487 and Practice D2488). The soil materials are grouped into five broad categories according to their suitability for this application.

i. Class I: Angular, 6 to 40-mm (1/4 to 1-1/2-in.), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shell.

ii. Class II: Coarse sands and gravels with maximum particle size of 40 mm (1-1/2 in.), including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class.

iii. Class III: Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil Types GM, GC, SM, and SC are included in this class.

iv. Class IV: Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH, and CL are included in this class. These materials shall not be used for bedding, haunching, or select backfill.

v. Class V: This class includes the organic soils OL, OH, and PT as well as soils containing frozen earth, debris, rock larger than 40 mm (1 1/2 in.) in diameter, and other foreign materials. These materials shall not be used for bedding, haunching, or select backfill.

2) Backfill Zones: Each backfill zone shall extend the full width of the trench bottom.

i. Foundation: Extending down from the bottom of bedding zone as defined below.

ii. Pipe Embedment

(1) Bedding: Extending from 4-inches below the pipe bottom to the pipe bottom for 30-inch diameter and smaller and 6-inches below the pipe bottom for pipes larger than 30-inches in diameter.

(2) Haunching: Extending from the bedding (bottom of the pipe) to the pipe spring line.

(3) Select Backfill: Extending from the haunching (pipe spring line) to 1 foot above the top of the pipe.

iii. Final Backfill: Extending from the Select backfill to the finish ground elevation.

b. Laying Conditions:

1) Type 1: Flat bottom trench with loose backfill.

2) Type 2: Flat bottom trench with backfill lightly consolidated to centerline of pipe.

3) Type 3: Pipe bedded in 4-inches minimum of loose soil and backfill lightly consolidated to top of pipe.

4) Type 4: Pipe bedded on Class I material to 1/8 pipe diameter (4-inch minimum) Backfill compacted to top of pipe a minimum of 80 percent of standard proctor.

5) Type 5: Pipe bedded in compacted Class I material to pipe centerline with 4-inch minimum under pipe. Backfill to top of pipe with Class I, II, or III and compact to 90 percent of standard proctor.

c. Compaction: Process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of compaction" shall be expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D698 (Standard Proctor).

d. Excavation: The removal of soil or rock to obtain a specified depth or elevation.

e. Hard Material: Solid, homogeneous material which is not included in the definition of "rock", but which may require the use of heavy excavation equipment with ripper teeth. Amount must exceed 1 cubic yard in volume. Material having a standard penetration resistance as determined by ASTM D1586 between 60 and 150 blows per foot is defined as "hard material."

f. Lift: Layer of soil placed on top of a previously prepared or placed soil.

g. Rock: Solid, homogeneous material which cannot be removed without the systematic drilling and blasting exceeding 1 cubic yard in volume. Material having a standard penetration resistance as determined by ASTM D1586 greater than 150 blows per foot is defined as "rock." Removal of "hard material" will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

h. Pipe Springline: A line running horizontally through the center of the pipe.

i. Topsoil: Natural, friable soil, representative of productive soils in the vicinity of the site. Topsoil shall be free from roots, stones larger than 1-inch, objectionable weed seeds, toxic substances, and materials that hinder grading, planting, and maintenance operations.

2. Products

a. Stone

1) Class I material shall be #67 or #78M stone in accordance with NCDOT specifications Section 1005, General Requirements for Aggregate.

b. Warning and Identification Tape

1) Tape shall be a minimum 3-inch wide polyethylene plastic tape manufactured specifically for identification of buried utilities with means of enabling detection by a metal detector to a minimum depth of 3 feet. Tape shall be color coded and continuously imprinted with warning and identification markings in bold black letters to read "CAUTION - BURIED (utility) LINE BELOW." Color and printing shall be permanent, unaffected by moisture or soil and shall be as follows in Table 3-3:

Table 3-3

Utility	Color	Marking
Water	Blue	Caution – Buried Water Line Below
Storm/Gravity Sewer	Green	Caution – Buried Sewer Line Below
Force Main	Green	Caution – Buried Force Main Below
Electric	Red	Caution – Buried Electric Line Below
Gas	Yellow	Caution – Buried Gas Line Below
Telephone	Orange	Caution – Buried Telephone Line Below
SCADA	Orange	Caution – Buried SCADA Line Below

2) Tape shall be by Blackburn Manufacturing, Joseph G. Pollard Co., or Reef Industries Inc.

c. Tracer Wire

1) Tracer wire shall be #12 solid copper wire. All connections shall be by wire nuts and taped.

2) Splices in tracer wire are to be kept to a minimum and joined with copper split nuts of appropriate size.

3. Project Safety

a. Contractor is responsible for Project safety.

b. Perform work in conformance with applicable State and Federal safety regulations including, but not limited, to the following:

1) North Carolina Safety and Health Standards for the Construction Industry (29CFR 1926 Subpart P).

2) NC OSHA Industry Guide No. 14, Excavations.

3) NC OSHA Industry Guide No. 20, Crane Safety.

c. Provide barriers, warning lights, and other protective devices at excavations as necessary for safety of workers and the public.

d. Provide sloping of bank, shoring, sheeting, or other means of maintaining the stability of the trench in accordance with the requirements of the Associated Contractor's Manual of Accident Prevention OSHA, Part 1926.P.

4. Protection of Underground Facilities
    a. Investigate underground facility location prior to start of construction.
    b. Installer is required to contact North Carolina 811 at least 72 hours prior to start of construction.
    c. Repair damage to any existing facilities.
5. Water Control
    a. Prevent surface water from entering the trench.
    b. When trench bottom is below the existing ground water table, install a dewatering system to maintain water table 1 foot below trench bottom. Provide a man experienced in dewatering work at the job site.
    c. Maintain dewatering until backfilling has proceeded above the existing ground water level.
    d. Dispose of water from dewatering operations in accordance with the North Carolina Sedimentation Pollution Control Act.
6. Use of Explosives
    a. Explosives may not be used on any excavation unless specifically approved by the Town.
7. Excavating
    a. Excavation shall be by open cut method. Short sections of trench may be tunneled or direct bored with the approval of the Town.
    b. Stockpile excavated material in such a manner that it will not obstruct the flow of runoff, streams, endanger Work, impair the use or appearance of existing facilities, or be detrimental to the completed Work.
    c. Contractor shall segregate excavated material so as to maintain material suitable for backfill separate from material that is unsuitable.
    d. Trench dimensions at the pipe embedment and foundation zone unless noted otherwise shall be as follows:
        1) Minimum width: Pipe outside diameter plus 18-inches.
        2) Maximum width: Pipe outside diameter plus 24-inches.
        3) Sides shall be vertical to a minimum of one foot above the top of pipe.
    e. Shape trench bedding to provide uniform bearing for the full pipe length. Bottom shall be free of protrusions that could cause point loading on pipe. Provide bell holes as required for properly making pipe joint.
    f. Do not over excavate. Excavation below grade shall be backfilled with Class I material.
    g. Undercut soils that become unsatisfactory by construction activity or by being left exposed to the weather and backfill with Class I material.
    h. Remove shoring, bracing, and sheeting, unless otherwise noted, as the trench is backfilled.
    i. Excavation of trench shall not advance more than 200 feet ahead of the installation. In no case should the excavation extend beyond that which can be backfilled by the end of the workday.

j. Correct unstable soil conditions encountered at trench foundation by one of the following methods:

1) Excavate below grade as approved by Engineer and backfill with Class I material or approved substitute material.

k. Rock and Hard Material

1) Excavate rock and hard material to a minimum depth of 4-inches below the pipe for pipes smaller than 30-inches and 6-inches for pipes 30-inches and larger.

l. Gravity Lines:

1) Excavate trench to the design alignment and grade.

m. Utility Structures: Provide a minimum of 12-inches below subgrade and backfill with Class I material compacted to 95 percent maximum density. If the soil conditions are found to be unsuitable for structural stability of the manhole, Town may require additional depth of Class I material.

8. Backfilling

a. General

i. Temperature must be above freezing and rising.

ii. In windy, hot, or arid conditions with a high rate of evaporation add moisture to the material to maintain the optimum moisture content.

iii. Do not proceed in rain or on saturated subgrade.

iv. Do not place material on surfaces that are muddy, frozen, or contain frost.

v. Maintain backfill operation within 200 feet from pipe laying operation.

vi. Backfill trench to existing ground surface with select excavated material at the specified compaction.

vii. If excavated material is unsuitable to obtain specified compaction, provide suitable off-site borrow material for backfill.

viii. Re-excavate trenches improperly compacted. Backfill and compact as specified.

ix. Provide appropriate tamping equipment, and water to obtain proper moisture content, to achieve specified compaction of backfill.

x. Conduct operation of heavy equipment above pipe installation as to prevent damage to pipe.

xi. Install warning / identification tape over utilities. Bury tape one foot below finished grade above the utility.

b. Backfill in pipe embedment zone (bedding, haunching, and select backfill).

i. General

i. Backfill with material as specified below. Material shall be free from objects larger than 2-inches.

ii. Where rock and hard material has been excavated below pipe bottom, backfill and compact bedding with Class I

material. Class II or III material may be used for bedding with Engineer's approval.

iii. Place backfill material to assure placement of material under pipe haunches.

iv. Take care during placement and compacting of material to avoid movement of pipe.

ii. Place backfill in bedding and haunching zones in 6-inch maximum lifts and compact to 90 percent density. Provide backfill material in pipe embedment zone as specified below.

i. Storm Sewer Lines, Rigid Pipe

(1) Excavation in Class I, Class II, Class III, and stable Class IV soils suitable for bedding, the bedding surface shall provide a firm foundation of uniform density. Backfill with select excavated material.

(2) Excavation in Class V, unstable Class IV soils, running water, and other unstable soil conditions, excavate a minimum of 4-inches below pipe bottom and provide Class I material for bedding and haunch zone. Backfill with Class I, II, or III material in select backfill.

ii. Storm Sewer Lines, Flexible (HDPP)

(1) Depth 0 to 14 ft: Provide Class I material for bedding and haunching. Backfill with Class I, II, or III material in select backfill.

(2) Depth over 14 ft: Provide Class I material for bedding, haunching, and select backfill.

c. Final Backfill

i. Backfill with materials free of stones and free of debris larger than 6-inches in dimension. Place backfill in lifts not exceeding the thickness and compacted to the minimum density specified below.

ii. Trench backfilled with non-cohesive materials may be compacted with water flooding; except under roadways, shoulders of roadways, and other areas subject to vehicular movement, provided the method of compaction is approved by the Town and provides the degree of compaction required.

iii. Lifts and density:

i. Undeveloped areas (i.e., forests, fields, and, croplands): Trench may be filled with bulldozer blade provided material fall will not damage pipe. Mound soil over the trench area sufficiently to settle level over time. Degree of compaction shall be 85 percent.

ii. Lawns: Backfill in 12-inch lifts and compact to 90 percent. Top 12-inches shall be free of material with a dimension over 2-inches.

iii. Roads (including Rights-of-way), drives, parking areas (including areas within 20 feet), and adjacent to existing utilities: Backfill in 6-inch lifts compact to 95 percent.

iv. Within 20 feet of foundations: Backfill in 6-inch lifts compacted to 95 percent.

d. Utility Structures: Bring backfill to grade in even lifts on all sides. Lift depths and compaction densities shall be as specified according to area of installation for pipe above. Backfill against cast-in-place concrete structure only after concrete has attained the specified 28-day compressive strength.

4.02 Manholes

A. General

2. Set base plumb and level. Align manhole invert with pipe invert.
3. Secure pipe connectors to pipe in accordance with manufacturer's recommendation.
4. Clean bells and spigots of foreign material that may prevent sealing. Unroll the butyl sealant rope directly against base of spigot. Do not stretch. Follow manufacturer's instructions when using O-ring seals.
5. Set precast components so that steps align.
6. Plug lift holes using a non-shrink grout. Cover with a butyl sealant sheet on the outside and seal on the inside with an application of an epoxy gel 1/8-inch thick extending 2-inches beyond the opening.
7. Set manhole frames to grade with grade rings. Seal joints between cone, adjusting rings, and manhole frame with butyl sealant rope and sheet.
8. Apply external seal to the outside of joint.
9. Finish the interior by filling fractures greater than 1/2-inch in length, width, or depth with a sand cement mortar.
10. Clean the interior of the manhole of foreign matter
11. Ring and Cover shall be installed in accordance with Standard Details.

4.03 Precast Boxes

A. Catch basins and drop inlets shall receive 12-inches of No. 67 stone base to extend 6-inches beyond the base.

C. Set base plumb and level. Align box invert with pipe invert.

D. Secure pipe connectors to pipe in accordance with manufacturer's recommendation.

E. Clean bells and spigots of foreign material that may prevent sealing. Unroll the butyl sealant rope directly against base of spigot. Do not stretch.

F. After joining box sections, apply the butyl sealant sheet around the outside perimeter of the joint.

G. Plug lift holes using a non-shrink grout. Cover with a butyl sealant sheet on the outside and seal on the inside with an application of an epoxy gel 1/8-inch thick extending 2-inches beyond the opening.

H. Finish the interior by filling fractures greater than 1/2-inch in length, width, or depth with a sand cement mortar. Do not fill the joints between the precast components.

I. Clean the interior of the structure of foreign matter.

J. Fill precast boxes with concrete to the pipe inverts. Form the bench to provide positive drainage towards the pipe.

4.04 Concrete Masonry Units Box

A. Construct in accordance with Standard Details.

4.05 Testing

A. General

1. Town will determine if, and to what level, testing is required.
2. Clean and flush pipe system of foreign matter prior to testing.
3. Notify Town a minimum of 48 hours prior to testing.
4. Perform tests in the presence of Town.
5. Length of line to be tested at one time shall be subject to approval of Town.
6. Pipe sections shall not be accepted and placed into service until specified test limits have been met.
7. Repair defects in the pipe system. Make repairs to the same standard as specified for the pipe system.
8. Retest repaired sections until acceptance.
9. Repair visible leaks regardless of the test results.

K. Storm Drainage

1. Test gravity lines between manholes or junction boxes.
2. Light Testing: Mains will be checked by Town for displacement after the trench has been filled to two feet above the pipe and tamped as specified, and upon completion of the project. Test will be as follows:
   a. A light will be flashed between the ends of the pipe section being tested.
   b. If the illuminated interior shows any misalignment, or other defects as designated by Town, defects shall be repaired.
3. General
   a. Infiltration shall not exceed 100 gallons per inch of diameter, per mile of pipe, per 24 hours. Town may require flow measurement for verification of infiltration.
   b. Verify that maximum infiltration rate shall not be surpassed by video testing as follows.

4.06 Preliminary and Final Plat

A. In order that the Engineering Department may adequately review preliminary subdivision plats, the following items should be indicated or accounted for on all plans submitted for approval:

4. All storm drainage facilities shall comply with the requirements as stated in the Storm Drainage Policy.

END OF SECTION 3

SECTION 4: STREETS AND SIDEWALKS

Part 1 General

1.01 Section Includes

A. Work under this section includes, but is not limited to, the design and construction of all streets, curbing and sidewalks which shall become part of the Town of Winterville's street system.

B. Unless otherwise provided herein, all materials and street construction methods shall conform to the applicable requirements contained in the "Standard Specification for Roads and Structures", latest edition, as published by the NCDOT.

1.02 Design Criteria

A. General

1. Street design shall conform to the standards set forth in A Policy on Geometric Design of Highways and Streets as published by AASHTO, Standard Specifications for Roads and Structures as published by the NCDOT, Roadway Design Manual as published by the NCDOT and the requirements outlined herein.

B. Pavement & Right-of-Way Widths

1. Minimum street widths are shown in the Town's Standard Specifications and Details. The Town may require additional widening and related work as deemed necessary to provide for the safety and quality of roadway for the traveling public.

C. Grades

1. Unless necessitated by exceptional topography and approved by the Town, street grades shall not exceed 0.5%, nor be less than 0.3%, on any street.
2. Grades approaching intersections shall not exceed 5 percent for a distance of not less than 100 feet from the right-of-way of such intersection unless otherwise approved by the Town.
3. All changes in street grade shall be connected by vertical curves of at least 100 feet or calculated by use of Table 4-1.

D. Radii of Curvature

1. Where a street centerline deflection of more than five (5) degrees occurs, a curve shall be introduced with the minimum centerline radius as shown in Table 4-1.

Table 4-1					
		Horizontal Curve Controls		Vertical Curve Controls	
Classification	Max. Grade	Max. Super Elevation	Min. CL Radius	Min. Length Crest	Min. Length Sag
Thoroughfare	0.5%	6%	850 ft	85A ft	100A ft
Major Collector	0.5%	4%	550 ft	30A ft	50A ft
Minor Collector / Residential Street	0.5%	NC	150 ft	12A ft	30A ft

A = Algebraic Difference in grades.
NC = Normal Crown – A parabolic crown with an average cross slope of the 1/4" per foot measured outward from the centerline.
Grades shall not exceed 5% within 100 feet of intersections unless approved by the Town.
Minimum grade shall be 0.3% unless approved by the Town.

2. Table 4-1 outlines minimums for roadway design. Sound engineering judgement should be exercised when using minimum design standards for roads. Alternative designs shall be in accordance with the latest edition published by AASHTO: A policy on Geometric Design of Highways and Streets.
3. At intersections, all streets and commercial driveways shall be rounded with an edge of pavement or face of curb radii not less than the following:
   a. Thoroughfares 50 feet
   b. Collectors 40 feet
   c. Residential 30 feet

E. Tangents
1. A centerline tangent of not less than 100 feet shall be provided between reverse curves on all streets. Reverse curves on super-elevated streets shall have a sufficient centerline tangent to accommodate entry and exit run-out, but not less than 100 feet.

F. Sight Triangle
1. A sight triangle easement shall be provided at all intersections. No obstructions 30 inches higher than the elevation of the roadway's centerline intersection shall be allowed in the sight triangle.
2. Sight triangle easements shall not be less than 10 feet by 70 feet. The 10-foot dimension shall be the setback from the right-of-way of the major street, and the 70-foot dimension shall be measured along the right-of-way of the major street.
3. Sight triangle distances shall be increased by the Town if appropriate for traffic conditions and speed limits.
4. Sight triangle easements shall be shown on the final plat for the developed tract.

G. Pavement Design

1. The pavement design thickness shown in the Standard Details shall be considered as the minimum design requirements.
2. If soil conditions and/or projected traffic volumes warrants, the Town may require a pavement design in excess of the minimum requirements.
3. If the Design Engineer believes that a more economical pavement design may be provided without sacrificing the structural integrity or 15-year design life of the pavement, an alternate pavement design based on actual Soil Support Values as determined by California Bearing Ratio (CBR) or other acceptable method may be proposed. All design data sealed by a Professional Engineer licensed by the State of North Carolina must be submitted to the Town for review and approval.

H. Curb and Gutter, Sidewalks

1. Curb and gutter, where required, shall be standard 24-inch combination standard or roll curb and gutter unless otherwise approved by the Town.
2. Sidewalks shall be a minimum of 5 feet wide. The minimum thickness of a sidewalk shall be 4-inches except where the sidewalk crosses a driveway, in which case it shall be 6-inches thick. Sidewalks shall have a uniform slope perpendicular to the curb of not greater than 1/2-inch per foot (2.0%) toward the roadway. The utility strip between the sidewalk and the back of curb shall not slope less than 1/2-inch per foot or greater than 1-inch per foot toward the roadway.
3. All sidewalks and ramps shall meet the current Americans With Disabilities Act (ADA) requirements.

I. Traffic Calming Devices

1. Traffic calming devices are prohibited unless approved by the Town's fire code official.

1.03 References

A. The latest revision of the publications listed below form a part of this specification.

1. N.C. Department of Transportation – Specification for Roads and Structures
2. American Society for Testing and Materials (ASTM)
   a. C39 Test for Compressive Strength of Cylindrical Concrete Test Specimens
   b. C94 Ready Mixed Concrete
3. American Concrete Institute (ACI)

1.04 Submittals

A. Submit the following to the Town's Public Works Department prior to beginning work:

1. Affidavit of Compliance: Affidavit shall attest that supplied products conform to the referenced standard and this specification and that tests set forth in each

applicable referenced publication have been performed and that test requirements have been met. Submit for the each of the following materials:

a. Asphalt concrete

b. Aggregate Base Course

c. Concrete

d. Structural Fabric

2. Test Reports:
   a. Concrete Tests: Report for 7-day and 28-day concrete compressive strengths.

B. Submittals must be in the form of hardcopies or PDFs.

1.05 Quality Assurance

A. Contractors must be licensed by the N.C. Licensing Board for General Contractors and have a classification and a cost limitation appropriate for the work to be performed.

1.06 Warranty

A. Unless otherwise required, all materials and workmanship shall have a one-year warranty from the date of final acceptance by the Town. A warranty inspection will be made jointly by the Town and Contractor/Developer approximately twelve (12) months after acceptance to identify needed repairs. All labor, equipment and materials needed to make these repairs shall be the responsibility of the Contractor.

1.07 Street Standards

A. Street or road signage shall be installed (including temporary signage) when construction of a new roadway allows passage by any vehicle.

B. All streets shall be constructed such that the lowest element of the street (the gutter line if curb & gutter or the edge of pavement if no curb & gutter) is at or above the base flood elevation (i.e. 100-year flood level).

C. All asphalt roads are required to have a minimum of 8 inches of base and 2 inches of surface course.

D. The following table (Table 4-2) is a guideline for the determination of classification of streets based on average daily traffic.

Table 4-2				
	Street Classification	**R/W or Easement***	**Pavement Width**	**Average Daily Traffic**
1	Alley	*20’	16’	N/A
2	Private Street	*40’ *50’	26’ B/B 26’	< 500 < 500
3	Residential Access	60’	32’ B/B	< 480
4	Minor	60’	36’ B/B	480 – 3,500
5	Collector	70’	50’ B/B	3,500 – 5,000
6	Minor Thoroughfare	80	65’ B/B	5,000 – 10,000
7	Major Thoroughfare	100+	variable	10,000
8	Planned Industrial Street	80’	20’	N/A

E. Paving Schedule Index

1. 1” Bituminous Concrete Surface Course, S9.5C asphalt
2. 2” Bituminous Concrete Surface Course, S9.5C asphalt
3. 3½” Bituminous Concrete Base Course, Type HB
4. 1” Bituminous Concrete Surface Course, Type F-L
5. 1½” Bituminous Concrete Base Course, Type F-L
6. 2” Bituminous Concrete Base Course, Type F-L
7. 2” Bituminous Concrete Binder, Type H
8. 6” Sandy Clay Base Course
9. 4” Coarse Aggregate Base Course
10. 5” Coarse Aggregate Base Course
11. 6” Coarse Aggregate Base Course
12. 24” Concrete Curb and Gutter
13. 30” Concrete Curb and Gutter

F. Minimum requirements for Town of Winterville Streets are: 2” S9.5C Asphalt with 8” CAB Stone.

G. No dumpsters or trash contains are to be in the street at any time.

1.08 Sidewalk Standards

A. Concrete work shall conform to the requirements of ACI 318, ACI 301 and CRSI “Manual of Standard Practice” as a minimum.

B. Ready-Mix-Concrete Producer Qualifications: A firm experienced in manufacturing ready-mix concrete products and that complies with ASTM C94/C 94M requirements for production facilities and equipment.

C. Contractor, Owner, and Engineer shall inspect the entire site prior to the start of construction and mark existing damaged areas and note areas on Contractor's

plan set to be used for the Record Drawings. Remove areas of existing pavement damaged during construction. New pavement patch shall consist of re-stabilizing the subgrade and providing 8 inches of ABC and 2 inches of SF9.5C asphalt to match existing pavement surface.

D. Protect existing pavement, curb and gutter, and sidewalks during construction.

E. Repair damage to existing pavement, curb and gutter, and sidewalks.

F. Remove areas of existing curb and gutter, and sidewalks damaged during construction. Removal shall include to the nearest existing joint. Replace damaged areas with new curb and gutter, and sidewalks to match the existing section. The minimum length of the sidewalk and new curb and gutter shall be 5 feet.

G. Engineer may request at his option that certain portions of sidewalk sub-grade be tested for compaction/density conformance with the specifications. Engineer may also request at his option that the concrete be tested for, but not limited to, slump tests, entrained air tests and compressive test cylinders.

H. Refer to Part 1.02H and Part 5.08 of this section for further requirements.

I. Builder must replace any damaged curb and gutter and sidewalks before the Final Inspection for Certificate of Occupancy. Certificate of Occupancy will not be issued until all damage is corrected.

Part 2 Allowable Products and Materials

2.01 General

A. All materials used in the construction of new streets, curb and gutter and sidewalks shall be in accordance with the latest edition of the NCDOT's "Standard Specifications for Roads and Structures" and the requirements contained herein.

B. Materials and Mixes

1. Asphalt Concrete Base Course – Type B-25.0B: Conforming to materials and compositions required in NCDOT Section 610, Asphalt Concrete Plant Mix Pavements. If approved use by the Town as a base material, a minimum compacted thickness of 4-inches is required.
2. Tack Coat: Conforming to materials and compositions required in NCDOT Section 605, Asphalt Tack Coat
3. Asphalt Concrete Surface Course – Type SF9.5C: Conforming to materials and composition required in NCDOT Section 610, Asphalt Concrete Plant Mix Pavements. For higher traffic volumes, an alternate surface mixture such as S9.5D may be required by the Town. Minimum thickness of surface course shall be 2-inches.
4. Concrete for Curb and Gutter, and Sidewalks: Conforming to materials and composition required in NCDOT Section 846, Concrete Curb, Curb and Gutter, Concrete Gutter, Shoulder Berm Gutter, Concrete Expressway Gutter, Concrete Valley Gutter and Concrete Flumes, and Section 848, Concrete Sidewalks and Driveways and Wheelchair Ramps.
5. Base Course: Aggregate base course shall comply with requirements of NCDOT Section 520, Aggregate Base Course. If used as a base material, a minimum compacted thickness of 8-inches is required.

6. Structural Fabric: Provide structural fabric specifically designed and manufactured to stabilize soft soils under an aggregate base for roads and parking areas. Fabric shall provide a permeable layer, planar flow, and tensile reinforcement for retaining the soil matrix. Fabric shall be inert to commonly encountered chemicals, hydrocarbons, resistant to mildew, rot, and ultraviolet light exposure, and meet or exceed the following test standards:

	Test	ASTM
a.	Fabric weight	D-1910 ..... 6 (oz / sq yd)
b.	Grab tensile strength	D-1682 ..... 200 (lbs.)
c.	Mullen burst strength	D-3786 ..... 320 (psi)
d.	Puncture strength	D-751 ..... 80 (lbs.)

Part 3 Pavement Design

3.01 Design Procedures

A. The following tables, graphs, and procedures have been developed by the Town Engineering Department to assist developers and engineers with the design of streets within Winterville. We feel that the following design criteria is sufficient to ensure the welfare and safety of the general public and to protect the economic investment of the citizens of Winterville.

B. The following procedures are based on information provided by the North Carolina Department of Transportation, North Carolina State University Civil Engineering Department, and the Soil Conservation Service.

C. It would be cost prohibitive to construct streets within the Town with a design life of less than 20 years; therefore, all future streets within the Town's jurisdiction shall be constructed with a 20-year design life.

D. The lowest elevation of any street (i.e. the curb line) shall be at or above the 100-year Base Flood Elevation (BFE).

E. Step 1 – Determining the Soil Support Value (SSV): Either of the following three alternatives may be used to determine the soil support value (SSV).

1. Method A: Measure CBR of Soils and Calculate SSV

   a. This is the best method to determine the actual characteristic of the subgrade base material and will require a certified laboratory CBR (California Bearing Ratio) test by an approved soil laboratory. The CBR test should be performed in accordance with AASHTO designation T193 (latest edition) with the exception that if the required soil compaction density to be used during construction is known, only one specimen needs to be tested at the required density for each soil type.

   b. A sufficient number of CBR tests shall be made to ensure coverage in the range of soil conditions encountered in the area to be paved.

   c. The following minimum testing is required:

      1) Soil Borings – Perform soil borings with a maximum spacing of 250 linear feet and with at least four borings in each separate street area and with at least one boring in each soil type area identified in the

soil survey map of Pitt County. Each boring shall extend at least two feet below the finished subgrade elevation.

2) CBR Tests – A CBR test shall be performed on each soil type which will be within two feet of the finished subgrade elevation. If off-site soils are used as fill, CBR tests shall also be performed on each soil type which will occur in the upper two feet below pavement subgrade.

2. Method B: Measure CBR of Soils and Calculate SSV

a. The soil types may be determined by using the "Soil Survey of Pitt County, North Carolina" prepared by the United States Department of Agriculture (USDA), Soil Conservation Service, issued in November 1974. A copy is available for use in the Engineering Department offices. To use this publication, locate the proposed street areas on the soil maps in the back of the publication and determine the soil types along the proposed street right-of-way. Then use Table 6, Pages 50-53 of the publication, to determine the AASHTO classifications of the soil types. Alternatively, the USDA Natural Recourse Conservation Service provides the Web Soil Survey tool, which allows for municipalities to access soil data and information produced by the National Cooperative Soil Survey.

b. Soil support values (SSV) shall be assigned to these classifications using Table 4-3 below. The entire street shall be designed using the lowest SSV obtained along any portion of the street.

1) Efficient number of laboratory CBR's (California Bearing Ratio) to cover the range of soil conditions encountered within the area to be pave shall be made.

2) Certification and a report of said tests shall be submitted to the city Engineering Department by an approved soils laboratory.

3) In lieu of, the designer shall submit to the Town Engineering Department a list of the soil types encountered within the area to be paved according to the Pitt County soil survey as published by the soil conservation service.

4) A copy of the soil survey map with the boundaries of the subdivision and areas to be paved, subscribed thereon, shall also be submitted.

Table 4-3	
AASHO Soil Classification	**Assigned Soil Support Value (SSV)**
A–1–a	4.2*
A–1–b	4.2*
A–3	3.5
A–2–4	4.2*
A–2–5	4.2*
A–2–6	3.4
A–2–7	3.4
A–4	1.0
A–5	1.0
A–6	1.0
A–7–5	1.0
A–7–6	1.0

*Suggested maximum SSV by NCDOT without CBR test, although AASHO soil classification indicates higher.

c. Method B is generally much more conservative than Method A and will usually require a thicker pavement section.

3. Method C: Measure CBR of Soils to be Used as Fill and Calculate SSV

a. If the SSV of the soil types at the pavement subgrade level, as determined by either Method A or B, result in an uneconomical pavement section, the developer has the option of undercutting the existing soils to a depth of at least 18 inches below finished pavement subgrade elevations and backfilling with better soils. The SSV is then determined by performing a CBR test on each soil type used for backfilling and by calculating the SSV from the measured CBR values. The subgrade soils must be prepared as outlined in **Part 3.02, Construction Considerations**.

F. Step 2 – Derive the Design Average Daily Traffic (ADT): An average daily traffic (ADT) shall be determined according to Table 4-4 below for residential streets. A design average daily traffic shall be calculated according to the following formula:

a. $\overline{ADT} = \frac{ADT + (G)(ADT)}{2}$ where, $G = (1 + i)^n$

1) $\overline{ADT}$ = The "Design Average Daily Traffic" or the average daily traffic over the design life of the pavement

2) ADT = The average daily traffic at full development. = (Total Number of Dwellings using the Street at full development) x (the Trips/Day/Dwelling for the zone classification of the dwelling)

3) G = Growth Factor (see Table 4-5 below)

4) i = fractional rate of yearly increase

5) n = design life of pavement

Table 4-4 Trip Generation	
Zone Classification	**Trips/Day/Dwelling**
R-6 Multifamily	6.7
R-9 High Density Single Family	8.2
R-15 Medium Density Single Family	10.0
R-20 Low Density Single Family	9.5

Table 4-4 shall be used to determine the "Average Daily Traffic" (ADT) within new residential developments. The design life for all pavements shall be a minimum of 20 years. The following factors shall be used on a per lot basis, per dwelling unit basis, per use basis, or calculated on the maximum density, whichever will generate the greatest number of trips. Factors for areas zoned other than residential shall be assigned factors on an individual basis by the city Engineering Department, using the Trip Generation Intensity Factors and supplements thereof published by the Arizona Department of Transportation as a reference manual.

Table 4-5 Traffic Growth					
Facility Description	**Estimated Yearly Increase**	**Growth Factor, G**			
		20 Yrs.	**15 Yrs.**	**10 Yrs.**	**5 Yrs.**
Dead End Street	1%	1.22	1.16	1.10	1.05
Connector Street	2%	1.49	1.35	1.22	1.11
Subdivision Street					
(a) Fully Developed	0.5%	1.11	1.08	1.05	1.03
(b) 50% Developed	4%	2.19	1.80	1.48	1.22
Principal County Road	3%	1.81	1.56	1.34	1.16
Other County Roads	2%	1.49	1.35	1.22	1.11
Industrial Service Road					
(a) Undeveloped	6%	3.21	2.40	1.79	1.34
(b) 50% Developed	4%	2.19	1.80	1.48	1.22

*The above are typical values. The actual traffic growth rate for a particular facility may vary substantially from those above. If the designer has better information available, he may calculate an appropriate growth factor using $G = (1 + i)^n$.

G. Step 3 – Determine $\overline{N}$: See Table 4-6 below:

a. Tabulated values assume 1% of traffic is composed of truck-tractor semi-trailer (TTST) and 4% single-axle dual tire vehicles. When the designer has a better estimate of the actual traffic, he should use the formula:

$$\overline{N} = \overline{ADT}(0.25\frac{x}{100} + 0.60\frac{y}{100})$$

1) $\overline{N}$ = a function of the number of trucks

2) x = percent duals

3) y = percent TTST using the pavement

Table 4-6 Equivalent $\overline{N}$ and $\overline{ADT}$	
$\overline{N}$	$\overline{ADT}$
200	12,500
100	6,250
80	5,000
40	2,500
30	1,875
25	1,562
20	1,250
15	937
10	625
5	312
4	250
3	187
2	125
1	63

H. Step 4 – Determine the "Structural Number" (SN): From **Fig. 1 – Fig. 4 in Attachment 3, Roadway Charts**, derive a structural number (SN) for the pavement section (e.g. **use Fig. 2** if setting a 10-year design life). For collector streets, add 1.0 to the structural number; for minor thoroughfares, add 1.5 to the structural number; and for major thoroughfares, add 2.0 to the structural number.

I. Step 5 – Determine Pavement Section: Design the pavement according to Table 4-7 below such that the structural number obtained using the Structural Coefficients table will be equal to or greater than the structural number derived in Step 4. To use Table 4-7, multiply the thickness (in inches) of the various components of the pavement section (Base Course, Binder Course, and Surface Course) by the corresponding structural coefficient and total the results. The total must be equal to or greater than the structural number derived in Step 4. This will be the minimum pavement design allowable for the particular street in question.

Table 4-7 Structural Coefficients		
Pavement Layer	**Type of Material**	**Structural Coefficient per Inch of Thickness**
Surface Courses	Sand Asphalt	0.40
	Bituminous Concrete, S9.5C	0.44
	Bituminous Surface Treatment	0.20*
Binder Course	Bituminous Concrete Type H	0.44
Base Courses	Soil Type Base Course	0.10
	Coarse Aggregate Base Course	0.14
	Bituminous Concrete Type HB	0.30
	Sand Asphalt	0.30

*Use as shown. Do not multiply by thickness.

J. Pavement section shall be a minimum of 2” S9.5C asphalt with 8” CAB rock.

3.02 Construction Considerations

A. Subgrade Preparation

1. The soils below the aggregate base course must be compacted during construction to a density equal to or greater than the density required in the specifications. Undercut and select fill areas shall require density/compaction testing. Streets which are undercut require at least one in-place density test per 100 linear feet of street in accordance with AASHTO designation T191, T204, T205, or T238 (latest edition) by an approved soils laboratory. The test results shall be submitted to and approved by the Town Engineer before the street is paved. Soil subgrades which pass the proofroll test and do not require undercut do not require density tests. All soil subgrades require the proofroll test regardless of the density test requirement.

2. No pavement shall be placed on aggregate base course without prior inspection by the Town Engineer. The inspection shall include, but not be limited, to proof-rolling the prepared subgrade with a rubber-tired proof-roller (loaded dump truck) having a minimum gross weight of at least 20,000 pounds under the observation of the Town Engineer, density tests in accordance with previous section, and stone thickness verification. All subgrade must be proofrolled. Proof-rolling must be done within ten days prior to placement of the asphalt. The proof-roller and operator shall be furnished by the developer. All areas of the subgrade shall be covered by the wheels of the proof-roller operating at walking speed (two to three miles per hour). Any areas which rut or pump excessively under the wheels of the proof-roller shall be repaired by the developer before the street is paved. If the developer disagrees with the Town Engineer about the need for repairs to the subgrade, the developer may hire a registered professional engineer to perform CBR tests on the prepared subgrade. If the registered professional engineer certifies that the subgrade will provide adequate support for design pavement section and the anticipated traffic loading for the 20-year design life of the street, the street may be paved without making repairs to the subgrade.

3. All stone subgrade is required to be proofrolled, undergo density/compaction testing and thickness verification.

B. Pavement Structure

1. No pavement section greater than a 2-inch thickness shall be placed in a one course paving operation without prior approval of the Town engineer.

2. If soil type base course is used as part of the pavement structure, it shall be placed according to Section 530 and Section 910-5 of the N.C. Department of Transportation Standard Specifications for Roads and Structures. All asphalt roads are required to have a minimum of 8 inches of base and 2 inches of surface course. All required testing shall be performed by an approved independent testing laboratory with the following testing frequency: one gradation and plasticity index test per 1,500 square yards of material and one density test per 2,000 square feet of surface area.

3.03 Maintenance

A. The developer is responsible for maintenance and repairs of streets until such time as the Town accepts responsibility for permanent maintenance. Upon completion of all improvements, the developer may submit a letter to the city engineer, accompanied by a metes and bounds survey map of the streets to be accepted, requesting that the Town accept said streets. The Town MAY at that time accept responsibility of said streets. The developer shall provide a warranty for a period of 12 months from the date of street acceptance.

Part 4 Ground Cover

4.01 General

A. The section discusses seeding perennial grasses and legumes on critical areas for permanent cover.

B. The purpose is to stabilize the soil; reduce damage from sediment and runoff to downstream areas and improve an area for safety and beauty.

C. Seeding is applicable on sediment-producing, highly eroding or severely eroding areas where vegetation is difficult to establish with normal planting methods; such as, construction sites, cut and fill slopes, borrow areas and other areas denuded of vegetation where perennial vegetation is needed for long term protection.

4.02 Specifications Guide

A. Site Preparation

1. Install needed surface water control measures.
2. Grade and slope as feasible to use planned equipment for seeding, mulching and maintenance. Slopes steeper than 3:1 is difficult to establish vegetation on and maintain with conventional equipment. Consider retaining walls, ground cover plants, vines, or shrubs on slopes of 3:1 or steeper.
3. Chisel compacted areas and spread available topsoil 3" deep over adverse soil conditions as a final operation in grading. Where conventional seeding equipment is to be used, rip the entire area.
4. A minimum of grading and shaping is required when hydraulic seeding equipment is to be used.
5. Remove all loose rock, roots and other obstructions from the surface that will interfere with establishment and maintenance of vegetation. Leave surface reasonably smooth and uniform for final seedbed preparation.
6. Perform all cultural operations of land preparation and seeding on the general contour.

B. Lime, Fertilizer and Seedbed Preparation

1. When soil material is reasonably uniform, apply lime and fertilizer according to soil test report. In the absence of a soil test, apply lime as follows:

Table 4-8		
Soil Type	**Tons/Ac.**	**Lbs./1,000 Sq. Ft.**
Clay and Clay Loams	3	135
Sandy Loams, Loams, Silt Loams	2	90
Loamy sands, sand	1	50

Agricultural lime used shall be within the specifications of the North Carolina Department of Agriculture.

2. Rates and analysis of fertilizer if soil test is not available:
   a. Grasses alone – 800 to 1,000 pounds per acre (18-23 pounds/1,000 sq. ft.) of a 1-1-1 ratio such as a 10-10-10.
   b. Legumes alone or grass and legume mixture – 800 to 1,000 pounds per acre (18-23 pounds/1,000 sq. ft.) of a 1-2-2 ratio such as 5-10-10.
3. Phosphorous is essential for developing vigorous seeding root systems. If soil test is not available, apply 500 to 800 pounds (12-18 pounds/1,000 sq. ft.) per acre of 20% superphosphate or equivalent in addition to fertilizer listed above or use an analysis to supply the additional phosphorus.
4. When hydraulic seeding equipment is used, no seedbed preparation is required. Cut slopes and compacted areas may require scarification.
   a. The fertilizer, seed and wood cellulose fiber mulch will be mixed with water and applied in a slurry. Spread the mixture uniformly over the area.
   b. The lime will be mixed with water and applied on top of straw mulch or the lime may be combined with the top dressing when grass is 2 to 4 inches tall.
5. When conventional equipment is used, the lime and fertilizer will be applied uniformly and mixed with the soil during seedbed preparation.
   a. On field conditions or slopes that are 3:1 or flatter, prepare a seedbed 4 inches deep, excluding rock.
   b. On slopes steeper than 3:1, prepare a seedbed 1 to 4 inches deep as determined on site. Scarify the surface with suitable equipment such as a chain harrow, grader with chisels attached or by hand. The surface as a minimum will be pitted or trenched 4 to 8 inches apart for seed to lodge and germinate.
   c. Continue tillage until a well pulverized, firm, reasonably uniform seedbed is prepared.

C. Seeding

1. Select species from Table 4-9, considering plant adaption to desired use, site to be vegetated, seeding dates and maintenance requirements. Seed used shall be labeled to show they are within the requirements of the North Carolina Department of Agriculture as to purity, germination, and presence of restricted or prohibited weeds. Erosion control plans or seeding contracts should list species or mixtures to be used, planting dates, seed germination and purity that are acceptable.
   a. Conventional seeding – Seed on a freshly prepared, firm seedbed. Use equipment that will apply seed uniformly such as cultipacker seeder, drill,

or cyclone seeder by hand. Cover seed lightly with seeding equipment or cultipacker after seeding.

b. Hydraulic seeding – Mix the fertilizer, seed and wood cellulose fiber mulch with water and apply the slurry uniformly over the area being treated. The slurry must be applied within one hour after mixing the seed with fertilizer.

c. Use the inoculant prepared specifically for any legume being seeded. Twice the recommended rate will be used when seeded dry with conventional equipment and four times the recommended rate when seeded with hydraulic equipment.

d. Mulching – Mulch all permanent seedings on critical areas immediately after seeding unless sufficient mulch is present from previous temporary vegetation grown. Mulch is essential to protect seedlings and area from erosion until plant cover is established. Refer to MULCHING specifications for kinds, amounts and anchoring mulch.

e. Irrigation – Supplementary irrigation will speed up the establishment of plant cover most seasons and may prevent failure of seedings not made at optimum planting date or seedings on adverse site conditions. Where irrigation is used, water must be applied at a rate that will not cause soil movement.

D. Treatment after seeding and maintenance is the most important controllable factor in retaining an effective vegetative cover. The kind of grass or grass-legume, soil, weather, and the level of management one desires to give a seeding determine the fertilization needed after the first year.

1. Repairs – Inspect all seeded areas and make necessary repairs or reseedings within the planting season, if possible. If stand should be over 60% damaged, re-establish following original lime, fertilizer and seeding recommendations.
2. Control weed growth during establishment mechanically and/or with herbicides. When chemicals are used, follow current North Carolina Agricultural Experiment Station's weed control recommendations, and adhere strictly to instructions on the label.

Table 4-9 Permanent Seedings			
Plants and Mixtures[1]	**Planting Rates/Acres[2]**	**Planting Dates (Coastal Plain Area)**	**Notes**
1. Pensacola Bahiagrass	40-50 lbs.	1. Mar. 15 – June 15	Adapting south of line – from Rockingham to Washington, NC
2. Wilmington Bahiagrass	40-50 lbs.	1. Mar. 15 – June 15	Adapting south of line – from Shelby, Greensboro, Elizabeth, NC
3. Common Bermudagrass (hulled)	8-12 lbs.	1. April – June	Bermuda stands traffic, does not tolerate shade. In mountains keep under 2,000 elevation, on well-drained sunny sites. Refer to specifications for SODDING AND SPRIGGING
4. Common Bermudagrass (unhulled)	15-20 lbs.	1. January – March	
5. Sericea Lespedeza (scarified) Weeping Lovegrass	40-50 lbs. 4-5 lbs.	1. March – June	Lovegrass provides quick protective cover.
6. Sericea Lespedeza (scarified) Common Bermudagrass (hulled)	40-50 lbs. 6-8 lbs.	1. March – June	Bermuda provides quick cover, spreads, and heals in open areas.
7. Sericea Lespedeza (scarified) Tall Fescue	40-50 lbs. 25-30 lbs.	1. March – April	Scarified Sericea may be spring seeded on Fescue that was seeded the previous fall.
8. Sericea Lespedeza (unscarified) Tall Fescue	50-60 lbs. 25-30 lbs.	1. Dec. – Feb.	If Sericea seed unavailable at planting time, it may be over-seeded on Fescue later in the winter.
9. Sericea Lespedeza (unhulled-unscarified) Tall Fescue Millet or Sudan	60-70 lbs. 20-30 lbs. 15-20 lbs.	1. Sept. – Jan.	Include summer annuals in early seedings only. If Sudan growth exceeds 10 inches, mow.

Table 4-9 Permanent Seedings			
Plants and Mixtures[1]	**Planting Rates/Acres[2]**	**Planting Dates (Coastal Plain Area)**	**Notes**
10. Sericea Lespedeza (unhulled-unscarified) Common Bermuda (unhulled) Rye	60-70 lbs. 10 lbs. 25 lbs.	1. Sept. – Dec.	Rye used to provide quicker cover and help hold mulch. Mow rye when growth exceeds 10 inches height.
11. Tall Fescue	40-60 lbs.	1. Sept. – Nov.	Not well suited to infertile, droughty, sandy soils. Requires good maintenance. Good shade tolerance. Double seeding rate for lawn quality turf.
12. Tall Fescue and White Clover	30-50 lbs. 3-4 lbs.	1. Sept. – Nov.	Can be used where regular mowing is desired and high level of maintenance will be provided.
13. Tall Fescue and Brown Millet Or Sorghum-Sudan Hybrids	60 lbs. 35 lbs. 30 lbs.	1. Aug. – Sept.	Keep annuals cut back to 10-12 inches.
14. Tall Fescue and Rye	70 lbs. 25 lbs.	1. Dec. – Jan.	Use only when necessary to complete a job. Mulching will be necessary to provide erosion control. Keep annuals cut back to 10”-12”.
15. Weeping Lovegrass	4-5 lbs.	1. March – June	Gives quick summer cover – well adapted to droughty sites – best in mixtures with Sericea Lespedeza. Tends to become clumpy with age.

[1]There will be conditions and interest that will warrant the use of other plants or mixtures not listed in the above table. Their use should be evaluated for each site.

[2]Some rules of thumb for conversions:

Lbs./Ac. x 0.023 = Lbs./1,000 sq. ft.

Sq. ft. of area x 0.000023 = Acres (valid up to 10 acres)

3. Lime

a. Apply lime according to soil test recommendations for plants being grown. In the absence of a soil test, apply lime from October to March every 4-5 years at rate of 2 tons per acre (100 lbs./1,000 sq. ft.).

4. Fertilizer
   a. Permanent seedings will be fertilized the next growing season after planting. For the warm season plants, this would be early spring (Bermuda, sericea, etc.); for the cool season plants, early fall, or early spring (tall fescue. etc.).
   b. Follow a regular fertilizer program based on soil test reports and use being made of the vegetative cover. The following fertilization guide is the minimum level that can be expected to maintain land cover. For a quality turf that is mowed regularly or is subject to heavy use and/or irrigated, much higher fertilization rates will be required.
   c. Stand is primarily Tall Fescue, and similar cool season plants: Apply 500 pounds per acre (12 pounds per 1,000 square feet) of 10-10-10, or its equivalent in early fall annually. Additional fertilization with nitrogen or a complete fertilizer is needed in early spring. To reduce incidence of leaf diseases, do not apply N on Fescue from May to mid-August in hot humid areas.
   d. Stands of Bermuda, Bahia, Lovegrass, and similar warm season grasses: Apply 500 pounds per acre (12 pounds per 1,000 square feet) of 10-10-10 fertilizer or equivalent when the plants start to green up in the spring. Topdress with 60-90 pounds of nitrogen per acre (1-2 pounds per 1,000 square feet) during the growing season. When the higher rate is used, apply in split applications.
   e. Stands of Sericea Lespedeza and similar legumes: Fertilize in early spring with 500 pounds of 0-10-20, (12 pounds per 1,000 sq. ft.) or equivalent per acre, every 2-4 years.
   f. Mixtures of Sericea Lespedeza, Fescue, Lovegrass, or Bermudagrass: Fertilize in early spring with 500 pounds per acre (12 pounds per 1,000 sq. ft.) of 5-10-10 or equivalent every 2-3 years. In Fescue-Sericea Lespedeza mixture, apply in the fall if the Sericea Lespedeza is developing better than the Fescue.
   g. Fescue-White Clover and similar mixtures: Apply 500 pounds per acre (12 pounds per 1,000 sq. ft.) of 0-20-20 or equivalent in early fall. An additional application of nitrogen or complete fertilizer will be needed in the spring to keep plants lush and in balance. Where grass is crowding out the clover, reduce or eliminate spring application of nitrogen.

5. Mowing
   a. Mow Sericea Lespedeza, or Sericea grass mixtures only after frost or sericea seed are Mature. Tall Fescue should be mowed not closer than 3 inches. Bahia and Bermuda may be mowed at any height desired.
   b. Care should be taken not to damage the vegetation mechanically through use of improper mowing equipment or by attempting to mow with heavy equipment on steep slopes when the vegetation is lush and slippery or when the ground is soft enough to be rutted by mower or tractor wheels.
   c. Where mowing fails to control weeds satisfactorily, apply chemicals in accordance with current North Carolina Agricultural Experiment Station's

weed control recommendations and adhere strictly to instructions on label.

6. Caution
   a. Pesticides are dangerous. Use only as directed and heed all precautions on the container label. Check the registration number and be sure that the directions for use include the target pests. Drift from aerial spraying can contaminate nearby crops, lakes, and reservoirs. Improper use and careless disposal of unused portions can lead to poisoning of humans, domestic animals, desirable plants, pollinating insects, fish, and wildlife, and can contaminate water supplies.

Part 5 Execution / Installation

5.01 General

A. The construction of new streets, curb and gutter and sidewalks shall be in accordance with the latest edition of the NCDOT's "Standard Specifications for Roads and Structures" and the requirements contained herein.

B. Provide erosion control measures as required. Erosion control measures including seeding and mulching shall be designed, installed, and maintained in accordance with the N.C. Department of Environmental Quality, Land Quality Section's "Erosion and Sediment Control Planning and Design Manual". The Developer/Engineer is responsible for securing all required permits.

C. Protect existing structures, utilities and other features that are to remain.

D. Dispose of excavated material in such a manner that it will not obstruct the water flow, endanger existing improvements or work in progress or be detrimental to the completed work in any way.

E. Weather Limitations: Proceed with fill and backfill operations based on the following weather conditions:
   1. Temperature must be above freezing.
   2. In windy, hot, or arid conditions with a high rate of evaporation, add moisture to the material to maintain the optimum moisture content.
   3. Do not proceed in rain or on saturated subgrade.

F. Repair or undercut and backfill soils that become damaged by construction activity or unsuitable due to being left exposed to the weather.

G. Do not place material on surfaces that are muddy, frozen or contain frost.

H. Excavation carried below the design elevation shall be backfilled with select material and compacted to the satisfaction of the Town.

I. Remove and properly dispose of unsatisfactory and excess material from the site.

J. All streets shall be cleared and graded for the full width of the right-of-way. All stumps, roots and other objectionable material shall be completely removed from the cleared area.

K. All roadway subgrade and underground utilities must be inspected and approved by the Town prior to the placement of base course materials.

5.02 Preparation of Subgrade

A. After installation of all utilities and prior to placement of curb and gutter, the entire subgrade shall be compacted to 95% of Standard Proctor density for a depth of 8-inches. The area shall be proof-rolled in the presence of the Town representative. Areas found to be loose, yielding or composed of unsuitable material, whether located in the subgrade or located deeper, shall be undercut, backfilled with suitable material, and properly compacted. The use of a structural fabric to stabilize a soft subgrade may be allowed by the Town if it can be demonstrated that this method will provide adequate stability.

B. Subgrade compaction tests shall be performed by a qualified geotechnical firm, provided by the Contractor, and approved by the Town.

C. Compaction tests shall be made for every 3,000 square feet of roadbed. Additional tests may be required by the Town if there is uncertainty about the uniformity of the compaction.

D. Preparation and shaping of the subgrade shall be in accordance with NCDOT Section 500, Fine Grading Subgrade, Shoulders and Ditches.

5.03 Aggregate Base Course

A. The stone base shall be constructed in accordance with the applicable paragraphs of NCDOT Section 520.

B. Compacted base shall be a minimum thickness of 8-inches.

C. Town may require a greater thickness on streets projected to have higher traffic volumes.

5.04 Asphalt Concrete Base Course

A. Spreading, compaction, and finishing shall comply with the requirements of NCDOT Section 610, Asphalt Concrete Plant Mix Pavements.

B. Compacted thickness shall be a minimum of 4-inches.

C. Town may require a greater thickness on streets projected to have higher traffic volumes.

5.05 Asphalt Concrete Surface Course

A. Spreading, compaction, and finishing shall comply with the requirements of NCDOT Section 610 Asphalt Concrete Plant Mix Pavements.

B. Compacted thickness shall be a minimum of 2-inches.

C. Town may require a greater thickness on streets projected to have higher traffic volumes.

5.06 Tack Coat

A. Application rates, method of application and curing shall be in accordance with the requirements of NCDOT Section 605.

5.07 Concrete Curb and Gutter

A. Provide concrete curb and gutter where required by the Town. Curb and gutter shall be Standard 24-inch section unless otherwise approved by the Town.

B. Construct Curb and Gutter in accordance with NCDOT Section 846.

5.08 Concrete Sidewalks

A. Provide concrete sidewalks as required by the Town's Standard Specifications and Details. Construction shall be in conformity with the materials, lines, grades, thickness, and typical section as indicated herein and in the Standard Details.

B. Construct sidewalks in accordance with NCDOT, Section 848, and the following specifications.

1. Space contraction joints equal to the width of the sidewalk and to a depth of at least 1/3 of the slab thickness.
2. Place a 1/2-inch-wide expansion joint at all intersections and wherever walks abut structures and other walks.
3. Place additional expansion joints at each fifth contraction joint.
4. Walks shall receive a light broom finish.

END OF SECTION 4

SECTION 5: PLAT AND DRAWING REQUIREMENTS

Part 1 Preparation

1.01 Construction Plan Requirements

A. Scale of 1" = 200' or larger.

B. Computer-generated.

C. Size shall be 24" x 36".

D. Boundary lines shall be distinctly and accurately represented, all bearing and distances shown with an accuracy of closure of not less than one (1) in two thousand five hundred (2,500), and in accordance with the Standards of Practice for Land Surveying in North Carolina.

E. Elevation and bench markers shall be referenced to National Geodetic Vertical Datum (NGVD).

F. All drawings shall prepared by a professional engineer.

G. Multiple sheets shall be collated and stapled. Match lines shall be clearly indicated.

H. Profiles shall be drawn at a scale of not less than one (1) inch equals fifty (50) feet, horizontal, and one (1) inch equals five (5) feet, vertical.

I. <u>General Information (Cover Sheet and Plan and Profile Sheets)</u>

1. Subdivision name.
2. The name(s) of the city, township, county, and state in which the subdivision is located.
3. Name, address, and telephone number of landowner(s).
4. Name, address, and telephone number of the sub-divider and/or developer.
5. Name, address, and telephone number of the engineer preparing the plat.
6. North Carolina registration number and seal as listed per Part 1.02F above.

J. <u>Plan Information</u>

1. Cover Sheet
   a. The cover or title sheet shall be in accordance with the **Standard Details in Section 5 of this MSDD.**
2. Plan and Profile Sheets
   a. North arrow and delineation as to whether true, grid or magnetic including date.
   b. Existing, platted and proposed streets, their names and numbers (if state marked routes), right of way and/or easement widths, pavement widths, tangent distance between reverse curves, centerline curve and corner radius data, including sight distance triangles and typical cross sections.
   c. Proposed and existing lot lines within the subdivision showing approximate dimensions.
   d. Proposed and existing property lines.

e. Proposed and existing water courses, streams or ditches including centerline elevations, cross sections, and any other pertinent data.

f. Floodway zone and floodway fringe zone shown, indicating base flood elevations.

g. Elevation of proposed and existing ground surface at all street intersections and points of major change along centerline of streets, together with proposed grade lines connecting therewith.

h. The profile of each proposed street shall show clearly and accurately the mathematical relation of the established new street grades and their relation to existing street grades with which they connect.

i. The profiles shall show the finished elevation of the top of curb.

j. The profiles of each street shall contain at least one (1) typical section, indicating the particular section to which the established profile grade refers. Each profile shall show the percentage of grade, the length of vertical curve, the P.V.C. and P.V.T. Station, the P.V.I. Station, elevation, and midordinate.

k. The profiles of each storm sewer and sanitary sewer system shall contain the percentage of grade and the top and invert elevation of each catch basin and manhole.

K. Supporting Technical Information

1. All storm drainage design shall be in accordance with Section 3, Stormwater Drainage System.
2. The Catch Basin Design Data Sheet and the Storm Drainage Design Data Sheet (Fig. 2 and Fig. 3, respectively, in Section 3, Stormwater Drainage System) shall be required.

1.02 Project Close-Out

A. Maintain on-site a full set of project drawings for purpose of recording as-constructed conditions.

B. Information should be legibly recorded as construction progresses.

C. Clearly and completely identify any field changes from the original drawings.

D. Actual, as-constructed elevations shall be obtained on all structures such as manholes, wet well, etc. Invert depths shall be recorded at each structure. All elevations shall be referenced to NAVD 88.

E. Show horizontal and vertical location of any existing underground utilities encountered during construction.

F. Submit document to the Town prior to final acceptance.

G. No Service shall be provided until after the as-built plans are reviewed and accepted. The initial submittal shall consist of two (2) prints. Upon approval, the Contractor shall submit to the Town of Winterville a digital copy of the approved as-built drawings. One (1) print of the final as-built drawing shall also be provided. The as-built shall include both water and sewer combined on each drawing. The sewer as-built shall include plan and profile. The Contractor shall submit two (2) prints of the as-built drawings with each partial pay estimate to the Owner's engineer. The minimum sheet size for as-built drawings shall be 18” x 24”.

H. The Town of Winterville shall require at least two (2) weeks from date of receipt to complete its review and a reasonable time for review of any resubmittals.

I. The scale for as-built plans shall be the same as that of the construction plans.

J. Revised construction plans are acceptable if standard drafting techniques and practices are followed.

K. If the project has developed in phases, all lines should be clearly indicated and the title block of the plan sheets shall indicate the phase number and section number (where applicable) and all building units/lots being served with the particular phase being submitted. Lots and building unit numbers must reflect the numbers that will later accompany the service application (request for service).

L. The as-built drawings shall show the location by station number and the length of all services and shall indicate by lot, unit number or address of the unit which each connection will serve.

M. The plans shall indicate street names, pavement widths, rights-of-way, and easements.

N. Apartments, condominiums, and other developments with walkways and off-street parking shall have these facilities shown on the as-built drawings.

O. New water lines shall be located by horizontal dimensions from highly visible, permanent, fixed objects, such as the back of the street, curb and gutter, the edge of a walkway, street center- line, etc.

P. Valves shall each be located by reference to two (2) permanent, visible objects, such as right-of-way monuments, fire hydrants, manholes, catch basins, etc.

Q. Indicate the type and size of each water line, sewer line, and service installed.

R. Station numbers identifying location of services, fittings, etc., shall begin at zero at each in-line valve. The distance between valves shall be shown.

S. Where more than one (1) type of material is used for water or sewer pipe, note the station of change from one material to another at the beginning of each change.

T. Designate on the as-built drawings if metallic detectable tape has been installed.

U. All appurtenances of water mains and force mains such as valve boxes and blow-offs shall be provided with station numbers. Indicate by station the location of all fittings for water mains and wastewater force mains.

V. Lengths of gravity sewer between manholes shall be shown on the drawings. The plan section should indicate lengths as measured horizontally between manhole centerlines. The profile section should indicate grades as measured from inside manhole wall to inside manhole wall (invert out to invert in).

W. The actual elevation, based on USGS datum only, of manhole tops, inverts (including services and taps) and the actual gravity sewer slopes shall be shown.

X. Sewer services are to be stationed from the centerline of the downstream manhole ring and cover.

Y. All privately-owned sewer and water lines shall be indicated as “private”.

Z. As-built drawings shall be prepared by and bear the seal and signature of a Professional Engineer or Registered Land Surveyor.

AA. The recorded plat or standard easement forms conveying easements and rights-of-way for the property to be served shall accompany the as-built drawings. Drawings submitted without the required plat or easement document will be returned as incomplete.

END OF SECTION 5

SECTION 6: ATTACHMENTS

Attachment 1: Stormwater Ordinance Phase 2

1.01 General Provisions

A. Title

1. This ordinance shall be officially known as "The Phase II Stormwater Ordinance." It is referred to herein as "this ordinance".

B. Authority

1. The Town of Winterville Town Council is authorized to adopt this ordinance pursuant to North Carolina law, including but not limited to Article 14, Section 5 of the Constitution of North Carolina; The Charter of the Town of Winterville, North Carolina General Statures 143-217.7 and rules promulgated by the Environmental Management Commission thereunder, Session Law 2004-163; Chapter 160A, §§ 174, 185.

C. Findings: It is hereby determined that

1. *Development* and *redevelopment* alter the hydrological response of local watersheds and increase stormwater runoff rates and volumes, flooding, soil erosion, stream channel erosion, nonpoint and point source pollution, and sediment transport and deposition, as well as reducing groundwater recharge.
2. These changes in stormwater runoff contribute to increase quantities of water-borne pollutants and alterations in hydrology that are harmful to public health and safety as well as to the natural environment; and
3. These effects can be managed and minimized by applying proper design and well-planned controls to manage stormwater runoff from *development* sites.
4. Further, the Federal Water Pollution Control Act of 1972 ("Clean Water Act") and federal Phase II Stormwater Rules promulgated under it, as well as rules of the North Carolina Environmental Management Commission promulgated in response to federal Phase II requirements, compel certain urbanized areas, including this jurisdiction, to adopt minimum stormwater controls such as those included in this ordinance.
5. Therefore, the Town Council establishes this set of water quality and quantity regulations to meet the requirements of state and federal law regarding control of stormwater runoff and discharge. (Adapted form Stormwater Center/EPA Model Ordinance).

D. Purpose

1. General
   a. The purpose of this ordinance is to protect, maintain and enhance the public health, safety, environment and general welfare by establishing minimum requirements and procedures to control the adverse effects of increased post-*development* stormwater runoff and nonpoint and point source pollution associated with new *development* and *redevelopment* as well as illicit discharges into municipal stormwater systems. It has been determined that proper management of construction-related and post-*development* stormwater runoff will minimize damage to public and private property and infrastructure; safeguard the public health, safety, and general welfare; and protect water and aquatic resources.

2. Specific
   a. This ordinance seeks to meet its general purpose through the following specific objectives and means:
      1) Establishing decision-making processes for *development* that protect the integrity of watersheds and preserve the health of water resources;
      2) Requiring the new *development* and *redevelopment* maintain the pre-*development* hydrologic response in their post-development state as nearly as practicable for the applicable design storm to reduce flooding, streambank erosion, nonpoint and point source pollution and increases in stream temperature, and to maintain the integrity of stream channels and aquatic habitats;
      3) Establishing minimum post-*development* stormwater management standards and design criteria for the regulation and control of stormwater runoff quantity and quality;
      4) Establishing design and review criteria for the construction, function, and use of *structural stormwater SCMs* that may be used to meet the minimum post-*development* stormwater management standards;
      5) Encouraging the use of better management and site design practices, such as the use of vegetated conveyances for stormwater and preservation of greenspace, riparian buffers, and other conservation areas to the maximum extent practicable;
      6) Establishing provision for the long-term responsibility for and maintenance of *structural and nonstructural SCMs* to ensure that they continue to function as designed, are maintained appropriately, and pose no threat to public safety;
      7) Establishing administrative procedures for the submission, review, approval and disapproval of *stormwater management plans*, for the inspection of approved projects, and to assure appropriate long-term maintenance.
      8) Coordinating site design plans that include open space and natural areas with the Subdivision Ordinance of the Code of Ordinances of the Town of Winterville, North Carolina.
      9) Controlling illicit discharges into the municipal separate stormwater system.

E. Applicability and Jurisdiction

1. General
   a. Beginning with and subsequent to its effective date, this ordinance shall be applicable to all *development* and *redevelopment*, including, but not limited to, site plan applications, subdivision applications, and grading applications, unless exempt pursuant to **Subsection 2 of Part 1.01E, Exemptions.**

2. Exemptions
   a. *Development* that cumulatively disturbs less than one acre and is not part of a *larger common plan of development or sale* is exempt from the provisions of this ordinance.
   b. *Redevelopment* that cumulatively disturbs less than one acre and is not part of a larger common plan of *development* or sale is exempt from the provisions of this ordinance.

c. *Development and redevelopment* that disturbed less than one acre are not exempt if such activities are part of a *larger common plan of development or sale*, even though multiple, separate or distinct activities take place at different times on different schedules. (Adapted from the North Georgia Model Ordinance.)

d. Activities that are exempt from permit requirements of Section 404 of the federal Clean Water Act as specified in 40 CFR 232 (primarily, ongoing farming and forestry activates) are exempt from the provisions of this ordinances.

3. No Development or Redevelopment Until Compliance and Permit

a. No *development* or *redevelopment* shall occur except in compliance with the provisions of this ordinance or unless exempted. No *development* for which a permit is required pursuant to this ordinance shall occur except in compliance with the provisions, conditions, and limitations of the permit.

4. Map

a. The provisions of this ordinance shall apply within the areas designated on the map titled "Phase II Stormwater Map of Town of Winterville, North Carolina: ("the Stormwater Map"), which is adopted simultaneously herewith. The Stormwater Map and all explanatory matter contained thereon accompanies and is hereby made a part of this ordinance. (Adapted from North Carolina Model Watershed Protection Ordinance.)

b. The Stormwater Map shall be kept on file by the Stormwater Administrator and shall be updated to take into account changes in the land area covered by this ordinance and the geographic location of all *structural SCMs* permitted under this ordinance. In the event of a dispute, the applicability of this ordinance to a particular area of land or SCM shall be determined by reference to the North Carolina Statues, the North Carolina Administrative Code, and local zoning and jurisdictional boundary ordinances.

F. Interpretation

1. Meaning and Intent

a. All provisions, terms, phrases, and expressions contained in this ordinance shall be construed according to the general and specific purposes set forth in **Part 1.01, Purpose of Manual**. If a different or more specific meaning is given for a term defined elsewhere in the Code of Winterville, the meaning and application of the term in this ordinance shall control for purposes of application of this ordinance. (Provisions A through H were adapted from Town of Cary Land Development Ordinance).

2. Text Controls in Event of Conflict

a. In the event of a conflict or inconsistency between the text of this ordinance and any heading, caption, figure, illustration, table, or map, the text shall control.

3. Authority for Interpretation

a. The Stormwater Administrator has authority to determine the interpretation of this ordinance. Any person may request an interpretation by submitting a written request to the Stormwater Administrator, who shall

respond in writing within 30 days. The Stormwater Administrator shall keep on file a record of all written interpretations of this ordinance.

4. References to Statues, Regulations, and Documents
   a. Whenever reference is made to a resolution, ordinance, statute, regulation, manual (including the *Design Manual*), or document, it shall be construed as a reference to the most recent edition of such that has been finalized and published with due provision for notice and comment, unless otherwise specifically stated.
5. Computation of Time
   a. The time in which an act is to be done shall be computed by excluding the first day and including the last day. If a deadline or required date of action falls on a Saturday, Sunday, or holiday observed by the Town of Winterville, the deadline or required date of action shall be the next day that is not a Saturday, Sunday or holiday observed by the Town of Winterville. References to days are calendar days unless otherwise stated.
6. Delegation of Authority
   a. Any act authorized by this Ordinance to be carried out by the Stormwater Administrator of the Town of Winterville may be carried out by his or her designee.
7. Usage
   a. Mandatory and Discretionary Terms
      1) The words “shall”, “must”, and “will” are mandatory in nature, establishing an obligation or duty to comply with the particular provision. The words “may” and “should” are permissive in nature.
   b. Conjunctions
      1) Unless the context clearly indicates the contrary, conjunctions shall be interpreted as follows: The word “and” indicates that all connected items, conditions, provisions, and events apply. The word “or” indicates that one or more of the connected items, conditions, provisions, or events apply.
   c. Tense, Plurals, and Gender
      1) Words used in the present tense include the future tense. Words used in the singular number include the plural number and the plural number includes the singular number, unless the context of the particular usage clearly indicates otherwise. Words used in the masculine gender include the feminine gender, and vice versa.
8. Measurement and Computation
   a. Lot area refers to the amount of horizontal land area contained inside the lot lines of a lot or site.

G. Design Manual
1. Reference to Design Manual
   a. The Stormwater Administrator shall us the policy, criteria, and information, including technical specifications and standards, in the *Design Manual* as the basis for decisions about stormwater permits and about the design, implementation and performance of *structural and non-structural stormwater SCMs*.

b. The *Design Manual* includes a list of acceptable stormwater treatment practices, including specific design criteria for each stormwater practice. Stormwater treatment practices that are designed, constructed, and maintained in accordance with these design and sizing criteria will be presumed to meet the minimum water quality performance standards of the Phase II laws. (From Stormwater Center/EPA Model Ordinance.)

2. Relationship of Design Manual to Other Laws and Regulations
   a. If the specifications or guidelines of the *Design Manual* are more restrictive or apply a higher standard than other laws or regulations, that fact shall not prevent application of the specification or guidelines in the *Design Manual*.

3. Changes to Standards and Specifications
   a. If the standards, specifications, guidelines, policies, criteria, or other information in the *Design Manual* are amended subsequent to the submittal of an application for approval pursuant to this ordinance but prior to approval, the new information shall control and shall be utilized in reviewing the application and in implementing this ordinance with regard to the application.

H. Relationship to Other Laws, Regulations and Private Agreements

1. Conflict of Laws
   a. This ordinance is not intended to modify or repeal any other ordinance, rule, regulation, or other provision of law. The requirements of this ordinance are addition to the requirements of any other ordinance, rule, regulation, or other provision of law. Where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule, regulation or other provision of law, whichever provision is more restrictive or imposes higher protective standards for human or environmental health, safety, and welfare shall control. (From Metro North Georgia Water Management District Model Ordinance.)

2. Private Agreements
   a. This ordinance is not intended to revoke or repeal any easement, covenant, or other private agreement. However, where the regulations of this ordinance are more restrictive or impose higher standards or requirements than such an easement, covenant, or other private agreement, the requirements of this ordinance shall govern. Nothing in this ordinance shall modify or repeal any private covenant or deed restriction, but such covenant or restriction shall not legitimize any failure to comply with this ordinance. In no case shall the Town of Winterville be obligated to enforce the provisions of any easements, covenants, or agreements between private parties.

I. Severability

1. If the provisions of any section, subsection, paragraph, subdivision or clause of this ordinance shall be adjudged invalid by a court of competent jurisdiction, such judgement shall not affect or invalidate the remainder of any section, subsection, paragraph, subdivision or clause of this ordinance.

J. Effective Date and Transitional Provisions

1. Final Approvals, Complete Applications

a. All *development* and *redevelopment* projects for which complete and full applications were submitted and approved by the Town of Winterville prior to the effective date of this ordinance and which remain valid, unexpired, unrevoked and not otherwise terminated at the time of *development* or *redevelopment* shall be exempt from complying with all provisions of this ordinance dealing with the control and/or management of post-construction runoff, but shall be required to comply with all other applicable provisions, including but not limited to illicit discharge provisions.

b. A phased development plan shall be deemed approved prior to the effective date of this ordinance if it has been approved by all necessary government units, it remains valid, unexpired, unrevoked, and not otherwise terminated, and it shows:

1) For the initial or first phase of development, the type and intensity of use for a specific parcel or parcels, including at a minimum, the boundaries of the project and a subdivision plan that has been approved.

2) For any subsequent phase of development, sufficient detail so that implementation of the requirements of this ordinance to that phase of development would require a material change in that phase of the plan. (SL 2006-246).

2. Violations Continue

a. Any violation of provisions existing on the effective date of this ordinance shall continue to be a violation under this ordinance and be subject to penalties and enforcement under this ordinance unless the use, *development*, construction, or other activity complies with the provisions of this ordinance. (Adapted from Town of Cary Land Development Ordinance.)

1.02 Administration and Procedures

A. Review and Decision-Making Entities

1. Stormwater Administrator

a. Designation

1) A Stormwater Administrator shall be designated by the Town Council to administer and enforce this ordinance.

b. Powers and Duties

1) In addition to the powers and duties that may be conferred by other provisions of the Code of Winterville and other laws, the Stormwater Administrator shall have the following powers and duties under this ordinance:

i. To review and approve, approve with conditions, or disapprove applications for approval of plans pursuant to this ordinance.

ii. To make determinations and render interpretations of this ordinance.

iii. To establish application requirements and schedules for submittal and review of applications and appeals, to review

and make recommendations to the Town Council on applications for *development* or *redevelopment* approvals.

iv. To enforce the provisions of this ordinance in accordance with its enforcement provisions.

v. To maintain records, maps, forms, and other official materials as relate to the adoption, amendment, enforcement, and administration of this ordinance.

vi. To provide expertise and technical assistance to the Town Council, upon request.

vii. To designate appropriate other person(s) who shall carry out the powers and duties of the Stormwater Administrator.

viii. To take any other action necessary to administer the provisions of this ordinance.

B. Review Procedures

1. Permit Required; Must Apply for Permit
   a. A stormwater permit is required for all *development* and *redevelopment* unless exempt pursuant to this ordinance. A permit may only be issued subsequent to a properly submitted and reviewed permit application, pursuant to this section.

2. Effect of Permit
   a. A stormwater permit shall govern the design, installation, and construction of stormwater management and control practices on the site, including *structural SCMs* and elements of site design for stormwater management other than *structural SCMs*.
   b. The permit is intended to provide a mechanism for the review, approval, and inspection of the approach to be used for the management and control of stormwater for the *development* or *redevelopment* site consistent with the requirements of this ordinance, whether the approach consists of *structural SCMs* or other techniques such as a low-impact or low-density design. The permit does not continue in existence indefinitely after the completion of the project; rather, compliance after project construction is assured by the maintenance provisions of this ordinance.

3. Authority to File Applications
   a. All applications required pursuant to this Code shall be submitted to the Stormwater Administrator by the landowner or the landowner's duly authorized agent.

4. Establishment of Application Requirements, Schedule, and Fees
   a. Application Contents and Form
      1) The Stormwater Administrator shall established requirements of the content and form of all applications and shall amend and update those requirements from time to time. At a minimum, the stormwater permit application shall describe in detail how post-*development* stormwater runoff will be controlled and managed, the design of all stormwater facilities and practices, and how the proposed project will meet the requirements of this ordinance.
   b. Submission Schedule

1) The Stormwater Administrator shall establish a submission schedule for applications. The schedule shall establish deadlines by which complete applications must be submitted for the purpose of ensuring that there is adequate time to review applications, and that the various stages in the review process are accommodated.

c. Permit Review Fees

1) The Town Council shall establish permit review fees as well as policies regarding refund of any fees upon withdrawal of an application and may amend and update the fees and policies from time to time.

d. Administrative Manual

1) For application required under this Code, the Stormwater Administrator shall compile the application requirements, submission schedule, fee schedule, a copy of this ordinance, and information on how and where to obtain the Design Manual in an Administrative Manual, which shall be made available to the public.

5. Submittal of Complete Application

a. Applications shall be submitted to the Stormwater Administrator pursuant to the application submittal schedule in the form established by the Stormwater Administrator, along with the appropriate fee established pursuant to this section.

b. An application shall be considered as timely submitted only when it contains all elements of a complete application pursuant to this ordinance, along with the appropriate fee. If the Stormwater Administrator finds that an application is incomplete, the applicant shall be notified of the deficient elements and shall be provided with an opportunity to submit a complete application. However, the submittal of an incomplete application shall not suffice to meet a deadline contained in the submission schedule established above.

6. Review

a. Within 30 working days after a complete application is submitted, the Stormwater Administrator shall review the application and determine whether the application compiles with the standards of this ordinance.

b. Approval

1) If the Stormwater Administrator finds that the application compiles with the standards of this ordinance, the Stormwater Administrator shall approve the application. The Stormwater Administrator may impose conditions of approval as needed to ensure compliance with this ordinance. The conditions shall be included as part of the approval.

c. Fails to Comply

1) If the Stormwater Administrator finds that the application fails to comply with the standards of this ordinance, the Stormwater Administrator shall notify the applicant and shall indicate how the application fails to comply. The applicant shall have an opportunity to submit a revised application.

d. Revision and Subsequent Review

1) A complete revised application shall be reviewed by the Stormwater Administrator within 30 working days after its re-submittal and shall be approved, approved with conditions, or disapproved.

2) If a revised application is not re-submitted within thirty (30) calendar days from the date the applicant was notified, the application shall be considered withdrawn, and a new submittal for the same or substantially the same project shall be required along with the appropriate fee for a new submittal.
3) Two re-submittals of a revised application may be submitted without payment of an additional permit review fee. Any re-submittal after the second resubmittal shall be accompanied by a private review fee additional fee, as established pursuant to this ordinance.

C. Applications for Approval

1. Concept Plan and Consultation Meeting

a. Before a stormwater management permit application is deemed complete, the Stormwater Administrator or developer may request a consultation on a concept plan for the post-construction stormwater management system to be utilized in the proposed *development* project. This consultation meeting should take place at the time of the preliminary plan of subdivision or other early step in the *development* process. The purpose of this meeting is to discuss the post-construction stormwater management measures necessary for the proposed project, as well as to discuss and assess constraints, opportunities, and potential approaches to stormwater management designs before formal site design engineering is commenced. Local watershed plans, the Subdivision Ordinance of the Code of Ordinances of the Town of Winterville, North Carolina, and other relevant resource protection plans should be consulted in the discussion of the concept plan.

b. To accomplish this goal, the following information should be included in the concept plan, which should be submitted in advance of the meeting:

1) Existing Conditions / Proposed Site Plans

i. Existing conditions and proposed site layout sketch plans, which illustrate at a minimum: existing and proposed topography; perennial and intermittent streams; mapping of predominant soils from soil surveys (if available); boundaries of existing predominant vegetation; proposed limits of clearing and grading; and location of existing and proposed roads, buildings, parking areas and other impervious surfaces.

2) Natural Resource Inventory

i. A written or graphic inventory of natural resources at the site and surrounding area as it exists prior to the commencement of the project. This description should include a discussion of soil conditions, forest cover, geologic features, topography, wetlands, and native vegetative areas on the site, as well as the location and boundaries of other natural feature protection and conservation areas such as lakes, ponds, floodplains, stream buffers and other setbacks (e.g., drinking water well setbacks, septic setbacks, etc.). Particular attention should be paid to environmentally sensitive features that provide particular opportunities or constraints for *development* and stormwater management.

3) Stormwater Management System Concept Plan

i. A written or graphic concept plan of the proposed post-*development* stormwater management system including: preliminary selection and location of proposed structural stormwater controls; low-impact design elements; location of existing and proposed conveyance systems such as grass channels, swales, and storm drains; flow paths; location of floodplain/floodway limits; relationship of site to upstream and downstream properties and drainages; and preliminary location any proposed stream channel modifications, such as bridge or culvert crossings.

2. Stormwater Management Permit Approval

a. The stormwater management permit application shall detail how post-*development* stormwater runoff will be controlled and managed and how the proposed project will meet the requirements of this ordinance, including **Part 1.03, Standards**. All such plans shall be prepared by a qualified registered North Carolina professional engineer, surveyor, soil scientist or landscape architect, and the engineer, surveyor, soil scientist or landscape architect shall perform services only in their area of competence, and shall verify that the design of all stormwater management facilities and practices meets the submittal requirements for complete applications, that the design and plans are sufficient to comply with applicable standards and policies found in the *Design Manual*, and that the designs and plans ensure compliance with this ordinance.

b. The submittal shall include all the information required in the submittal checklist established by the Stormwater Administrator.

3. As-Built Plans and Final Approval

a. Upon completion of a project, and before a certificate of occupancy shall be granted, the applicant shall certify that the completed project is in accordance with the approved stormwater management plans and designs, and shall submit actual “as built” plans for all stormwater management facilities or practices after final construction is completed.

b. The plans shall show the final design specifications for all stormwater management facilities and practices and the field location, size, depth, and planted vegetation of all measures, controls, and devices, as installed. The designer of the stormwater management measures and plans shall certify, under seal, that the as-built stormwater measures, controls, and devices are in compliance with the approved stormwater management plans and designs and with the requirements of this ordinance. A final inspection and approval by the Stormwater Administrator shall occur before the release of any performance securities.

4. Other Permits

a. No certificate of compliance or occupancy shall be issued by the Town of Winterville Inspections Department without final as-built plans and a final inspection and approval by the Stormwater Administrator, except where multiple units are served by the stormwater practice or facilities, in which case the Town of Winterville Inspections Department may elect to

withhold a percentage of permits or certificates of occupancy until as-built plans are submitted and final inspection and approval has occurred.

D. Approvals

1. Effect of Approval
   a. Approval authorizes the applicant to go forward with only the specific plans and activities authorized in the permit. The approval shall not be constructed to exempt the applicant from obtaining other applicable approvals from local, state, and federal authorities.

2. Time Limit / Expiration
   a. An approved plan shall become null and void if the applicant fails to make *substantial progress* on the site within one year after the date of approval. The Stormwater Administrator may grant a single, one-year extension of this time limit, for good cause shown, upon receiving a written request from the applicant before the expiration of the approved plan.
   b. In granting an extension, the Stormwater Administrator may require compliance with standards adopted since the original application was submitted unless there has been substantial reliance on the original permit and the change in standards would infringe the applicant's vested rights.

E. Appeals

1. Right of Appeal
   a. Any aggrieved person affected by any decision, order, requirement, or determination relating to the interpretation or application of this ordinance made by the Stormwater Administrator, may file an appeal to the Board of Adjustment within 30 days.

1.03 Standards

A. General Standards

1. All *development* and *redevelopment* to which this ordinance applies shall comply with the standards of this section.

B. Development Standards for Low-Density Projects

1. *Low-density projects* shall comply with each of the following standards:
   a. Stormwater runoff from the *development* shall be transported from the *development* by vegetated conveyances to the maximum extent practicable.
   b. All *built-upon areas* shall be at a minimum of 30 feet landward of all perennial and intermittent surface waters. A perennial or intermittent surface water shall be deemed present if the feature is approximately shown on either the most recent version of the soil survey map prepared by the Natural Resource Conservation Service of the United States Department of Agriculture (USDA) or the most recent version of the 1:24,000 scale (7.5 minute) quadrangle topographic maps prepared by the United States Geologic Survey (USGS). An exception to this requirement may be allowed when surface waters are not present in accordance with the provisions of 15A NCAC 2B .0233 (3)(a) or similar site-specific determination made using *Division*-approved methodology.

c. The approval of the stormwater permit shall require an enforceable restriction on property usage that runs with the land, such as a recorded deed restriction or protective covenants, to ensure that future *development* and *redevelopment* maintains the site consistent with the approved project plans.

C. Development Standards for High-Density Projects

1. *High-density projects* shall implement stormwater control measures that comply with each of the following standards:
   a. The measures shall control and treat runoff from the first inch of rain. Runoff volume drawdown time shall be a minimum of 48 hours, but not more than 120 hours.
   b. All structural stormwater treatment systems used to meet these requirements shall be designed to have a minimum of 85% average annual removal for Total Suspended Solids (TSS).
   c. General engineering design criteria for all projects shall be in accordance with 15A NCAC 2H .1008(c), as explained in the *Design Manual*.
   d. All *built-upon areas* shall be at a minimum of 30 feet landward of all perennial and intermittent surface waters. A surface water shall be deemed present if the feature is approximately shown on either the most recent version of the soil survey map prepared by the Natural Resource Conservation Service of the United States Department of Agriculture (USDA) or the most recent version of the 1:24,000 scale (7.5 minute) quadrangle topographic maps prepared by the United States Geologic Survey (USGS). An exception to this requirement may be allowed when surface waters are not present in accordance with the provisions of 15A NCAC 2B .0233 (3)(a) or similar site-specific determination made using *Division*-approved methodology.
   e. The approval of the stormwater permit shall require an enforceable restriction on property usage that runs with the land, such as a recorded deed restriction or protective covenants, to ensure that future *development* and *redevelopment* maintains the site consistent with the approved project plans.

D. Standards for Stormwater Control Measures

1. Evaluation According to Contents of Design Manual
   a. All stormwater control measures and stormwater treatment practices (also referred to as Stormwater Control Measure or SCMs) required under this ordinance shall be evaluated by the Stormwater Administrator according to the policies, criteria, and information, including technical specifications and standards and the specific design criteria for each stormwater practice, in the *Design Manual*. The Stormwater Administrator shall determine whether proposed SCMs will be adequate to meet the requirements of this ordinance.
2. Determination of Adequacy; Presumptions and Alternatives
   a. Stormwater treatment practices that are designed, constructed, and maintained in accordance with the criteria and specifications in the *Design Manual* will be presumed to meet the minimum water quality and quantity performance standards of this ordinance. Whenever an applicant proposes to utilize a practice or practices not designed and

constructed in accordance with the criteria and specification in the *Design Manual*, the applicant shall have the burden of demonstrating that the practice(s) will satisfy the minimum water quality and quantity performance standards of this ordinance. The Stormwater Administrator may require the applicant to provide the documentation, calculations, and examples necessary for the Stormwater Administrator to determine whether such an affirmative showing is made.

3. Separation from Seasonal High-Water Table
   a. For SCMs that require a separation from the seasonal high-water table, the separation shall be provided by at least 12 inches of naturally occurring soil above the seasonal high-water table. (From SL 200-6-246, § 9(k))

E. Dedication of SCMs, Facilities & Improvements

1. The Town of Winterville will not accept dedication of any existing or future stormwater management facility for maintenance. All such facilities shall meet all the requirements of this ordinance and include adequate and perpetual access and sufficient area, by easement or otherwise, for inspection and regular maintenance, to be performed by the responsible party.

F. Design Variances

1. Any person may petition the Town of Winterville for a variance granting permission to use the person's land in a manner otherwise prohibited by this ordinance. To qualify for a variance, the petitioner must show all the following:
   a. Unnecessary hardships would result from strict application of this ordinance.
   b. The hardships result from conditions that are peculiar to the property, such as the location, size, or topography of the property.
   c. The hardships did not result from actions taken by the petitioner.
   d. The requested variance is consistent with the spirit, purpose, and intent of this ordinance; will secure public safety and welfare; and will preserve substantial justice.
2. The Town of Winterville may impose reasonable and appropriate conditions and safeguards upon any variance it grants.
3. Statutory exceptions
   a. Notwithstanding **Subsection 1 of Part 1.03G of this attachment**, exceptions from the 30-foot landward location of built-upon area requirement as well as the deep restrictions and protective covenants requirements shall be granted in any of the following instances:
      1) When there is a lack of practical alternatives for a road crossing, railroad crossing, bridge, airport facility, or utility crossing as long as it is located, designed, constructed, and maintained to minimize disturbance, provide maximum nutrient removal, protect against erosion and sedimentation, have the least adverse effects on aquatic life and habitat, and protect water quality to the maximum extent practicable through the use of SCMs.
      2) When there is a lack of practical alternatives for a stormwater management facility; a stormwater management pond; or a utility, including, but not limited to, water, sewer, or gas construction and maintenance corridor, as long as it is located 15 feet landward of all

perennial and intermittent surface waters and as long as it is located, designed, constructed, and maintained to minimize disturbance, provide maximum nutrient removal, protect against erosion and sedimentation, have the least adverse effects on aquatic life and habitat, and protect water quality to the maximum extent practicable through the use of SCMs.

3) A lack of practical alternatives may be shown by demonstrating that, considering the potential for a reduction in size, configuration, or density of the proposed activity and all alternative designs, the basic project purpose cannot be practically accomplished in a manner which would avoid or result in less adverse impact to surface waters.

G. Additional Standards for Special Situations

1. Restrictions on Pet Waste

a. It shall be unlawful for the owner or custodian of any dog to take it off the owner's own property limits without the means to properly remove and dispose of the dog's feces from any public or private property.

b. It is the responsibility of a dog's owner or custodian to clean up the dog's feces from any public or private property outside of the dog's owner's own property limits. Such property includes, but is not limited to, parks, rights-of-way, paths, and public access areas.

c. "Means to properly remove and dispose of feces" shall consist of having on or near one's person a device such as a plastic bag, or other suitable plastic or paper container, that can be used to clean up and contain dog waste until it can be disposed of in an appropriate container. Such a device must be produced and shown, upon request, to anyone authorized to enforce these ordinances.

d. This provision shall not apply to handicapped persons assisted by trained guide or assistance dogs.

e. "Public nuisance" is defined to include "a dog which deposits feces on public property or on private property without the consent of the owner or person in lawful possession of the private property, and the person owning, possessing, harboring, or having the care, charge, control, or custody of the dog fails to remove the feces so deposited. Provided, however, this definition shall not apply to any dog assisting a handicapped person.

2. Nutrient Sensitive Waters

a. In addition to the standards for stormwater handling set out in the *design manual*, *development* and *redevelopment* that drains in whole or part to class NSW waters shall design and implement the best stormwater practices that reduce nutrient loading, while still meeting the other requirements of this ordinance.

1.04 Maintenance

A. General Standards for Maintenance

1. Function of SCMs as Intended

a. The *owner* of each *structural SCM* installed pursuant to this ordinance shall maintain and operate it so as to preserve and continue its function in

controlling stormwater quality and quantity at the degree or amount of function for which the *structural SCM* was designed.

2. Annual Maintenance Inspection and Report

a. The person responsible for maintenance of any *structural SCM* installed pursuant to this ordinance shall submit to the Stormwater Administrator an inspection report from one of the following persons performing services only in their area of competence: a qualified registered North Carolina professional engineer, surveyor, landscape architect, soil scientist, aquatic biologist, or person certified by the North Carolina Cooperative Extension Service for stormwater treatment practice inspection and maintenance. The inspection report shall contain all of the following:

1) The name and address of the land *owner*;
2) The recorded book and page number of the lot of each *structural SCM*;
3) A statement that an inspection was made of all *structural SCMs*;
4) The date the inspection was made.
5) A statement that all inspected *structural SCMs* are performing properly and are in compliance with the terms and condition of the approved maintenance agreement required by this ordinance; and
6) The original signature and seal of the engineer, surveyor, or landscape architect.

All inspection reports shall be on forms supplied by the Stormwater Administrator. An original inspection report shall be provided to the Stormwater Administrator beginning one year form the date of as-built certification and each year thereafter on or before the date of the as-built certification. (Drawn from Wake County stormwater ordinance (based on Neuse Urban Stormwater program))

B. Operation and Maintenance Agreement

1. In General

a. Prior to the conveyance or transfer of any lot or building site to be served by a *structural SCM* pursuant to this ordinance, and prior to issuance of any permit for *development* or *redevelopment* requiring a *structural SCM* pursuant to this ordinance, the applicant or *owner* of the site must execute an operation and maintenance agreement that shall be binding on all subsequent *owners* of the site, portions of the site, and lots or parcels served by the *structural SCM*. Until the transference of all property, sites, or lots served by the *structural SCM*, the original *owner* or applicant shall have primary responsibility for carrying out the provisions of the maintenance agreement.

b. The operation and maintenance agreement shall require the *owner* or *owners* to maintain, repair and, if necessary, reconstruct the *structural SCM*, and shall state the terms, conditions, and schedule of maintenance for the *structural SCM*. In addition, it shall grant to the Town of Winterville a right of entry in the event that the Stormwater Administrator has reason to believe it has become necessary to inspect, monitor, maintain, repair, or reconstruct the *structural SCM*; however, in no case shall the right of entry, of itself, confer an obligation on the Town of Winterville to assume responsibility for the *structural SCM*.

c. The operation and maintenance agreement must be approved by the Stormwater Administrator prior to plan approval, and it shall reference on the final plat and shall be recorded with the county Register of Deeds upon final plat approval. A copy of the recorded maintenance agreement shall be given to the Stormwater Administrator within fourteen (14) days following its recordation. (Most of the following homeowners' association requirements are adapted from Neuse model program provisions as adopted in Wake County.)

2. Special Requirement for Homeowners' and Other Associations

a. For all *structural SCMs* required pursuant to this ordinance and that are to be or are owned and maintained by a homeowners' association, property owners' association, or similar entity, the required operation and maintenance agreement shall include all of the following provisions:

1) Acknowledgement that the association shall continuously operate and maintain the stormwater control and management facilities.
2) Establishment of an escrow account, which can be spent solely for sediment removal, structural, biological, or vegetative replacement, major repair, or reconstruction of the *structural SCMs*. If *structural SCMs* are not performing adequately or as intended or are not properly maintained, the Town of Winterville, in its sole discretion, may remedy the situation, and in such instances the Town of Winterville shall be fully reimbursed from the escrow account. Escrowed funds may be spent by the association for sediment removal, structural, biological, or vegetative replacement, major repair, or reconstruction of the *structural SCMs*, provided that the Town of Winterville shall first consent to the expenditure.
3) Both developer contribution and annual sinking funds shall fund the escrow account. Prior to plat recordation or issuance of construction permits, whichever shall first occur, the developer shall pay into the escrow account an amount equal to fifteen (15) per cent of the initial construction cost of the *structural SCMs*. Two-thirds (2/3) of the total amount of sinking fund budget shall be deposited into the escrow account within the first five (5) years and the full amount shall be deposited within ten (10) years following initial construction of the *structural SCMs*. Funds shall be deposited each year into the escrow account. A portion of the annual assessments of the association shall include an allocation into the escrow account. Any funds drawn down from the escrow account shall be replaced in accordance with the schedule of anticipated work used to create the sinking fund budget.
4) The percent of developer contribution and lengths of time to fund the escrow account may be varied by the Town of Winterville depending on the design and materials of the stormwater control and management facility.
5) Granting to the Town of Winterville a right of entry to inspect, monitor, maintain, repair, and reconstruct *structural SCMs*.
6) Allowing the Town of Winterville to recover from the association and its members any and all costs the Town of Winterville expends to maintain or repair the *structural SCMs* or to correct any operational deficiencies. Failure to pay the Town of Winterville all of its expended costs, after forty-five days written notice, shall constitute a breach of

the agreement. In case of a deficiency, the Town of Winterville shall thereafter be entitled to bring an action against the association and its members to pay or foreclose upon the lien hereby authorized by the agreement against the property, or both. Interest, collection costs, and attorney fees shall be added to the recovery.

7) A statement that this agreement shall not obligate the Town of Winterville to maintain or repair any *structural SCMs*, and the Town of Winterville shall not be liable to any person for the condition or operation of *structural SCMs*.
8) A statement that this agreement shall not in any way diminish, limit, or restrict the right of the Town of Winterville to enforce any of its ordinances as authorized by law.
9) A provision indemnifying and holding harmless the Town of Winterville for any costs and injuries arising from or related to the structural SCM, unless the Town of Winterville has agreed in writing to assume the maintenance responsibility for the SCM and has accepted dedication of any and all rights necessary to carry out that maintenance.

C. Inspection Program

1. Inspections and inspection programs by the Town of Winterville may be conducted or established on any reasonable basis, including but not limited to routine inspections; random inspections; inspections based upon complaints or other notice of possible violations; and joint inspections with other agencies inspecting under environmental or safety laws. Inspections may include, but are not limited to, reviewing maintenance and repair records; sampling discharges, surface water, groundwater, and material or water in SCMs; and evaluating the condition of SCMs.
2. If the *owner* or occupant of any property refuses to permit such inspection, the Stormwater Administrator shall proceed to obtain an administrative search warrant pursuant to G.S. 15-27.2 or its successor. No person shall obstruct, hamper, or interfere with the Stormwater Administrator while carrying out his or her official duties.

D. Performance Security for Installation and Maintenance

1. May Be Required
   a. *From Virginia Model Ordinance for Stormwater Management*
   b. The Town of Winterville may, at its discretion, require the submittal of a performance security or bond with surety, cash escrow, letter of credit or other acceptable legal arrangement prior to issuance of a permit in order to ensure that the *structural SCMs* are
      1) Installed by the permit holder as required by the approved stormwater management plan, and/or
      2) Maintained by the *owner* as required by the operation and maintenance agreement.
2. Amount
   a. Installation
      1) The amount of an installation performance security shall be the total estimated construction cost of the SCMs approved under the permit, plus 25%.
   b. Maintenance

1) The amount of a maintenance performance security shall be the present value of an annuity of perpetual duration based on a reasonable estimate of the annual cost of inspection, operation and maintenance of the SCMs approved under the permit, at a discount rate that reflects the jurisdiction's cost of borrowing minus a reasonable estimate of long-term inflation.

3. Uses of Performance Security

a. Forfeiture Provisions

1) The performance security shall contain forfeiture provisions for failure, after proper notice, to complete work within the time specified, or to initiate or maintain any actions which may be required of the applicant or *owner* in accordance with this ordinance, approvals issued pursuant to this ordinance, or an operation and maintenance agreement established pursuant to this ordinance.

b. Default

1) Upon default of the *owner* to construct, maintain, repair and, if necessary, reconstruct any *structural SCM* in accordance with the applicable permit or operation and maintenance agreement, the Stormwater Administrator shall obtain and use all or any portion of the security to make necessary improvements based on an engineering estimate. Such expenditure of funds shall only be made after requesting the *owner* to comply with the permit or maintenance agreement. In the event of a default triggering the use of installation performance security, the Town of Winterville shall not return any of the unused deposited cash funds or other security, which shall be retained for maintenance. (From Town of Cary Watershed Protection Ordinance).

c. Costs of Excess of Performance Security

1) If the Town of Winterville takes action upon such failure by the applicant or *owner*, the Town of Winterville may collect from the applicant or *owner* the difference between the amount of the reasonable cost of such action and the amount of the security held, in addition to any other penalties or damage due.

d. Refund

1) Within sixty days of the final approval, the installation performance security shall be refunded to the applicant or terminated, except any amount attributable to the cost (plus 25%) of landscaping installation and ongoing maintenance associated with the SCMs covered by the security. Any such landscaping shall be inspected one (1) year after installation with replacement for compliance with the approved plans and specifications and, if in compliance, the portion of the financial security attributable to landscaping shall be released.

E. Notice to Owners

1. Deed Recordation and Indications on Plat

a. The applicable operations and maintenance agreement or conservation easement, (whichever is applicable) pertaining to every *structural SCM* shall be referenced on the final plat and shall be recorded with the county Register of Deeds upon final plat approval. If no subdivision plat is recorded for the site, then the operations and maintenance agreement or

conservation easement shall be recorded with the county Register of Deeds so as to appear in the chain of title of all subsequent purchasers under generally accepted searching principles.

2. Signage
   a. Where appropriate in the determination of the Stormwater Administrator to assure compliance with this ordinance, *structural SCMs* shall be posted with a conspicuous sign stating who is responsible for required maintenance and annual inspection. The sign shall be maintained so as to remain visible and legible.

F. Records of Installation and Maintenance Activities
1. The *owner* of each *structural SCM* shall keep records of inspections, maintenance, and repairs for at least five years from the date of creation of the record and shall submit the same upon reasonable request to the Stormwater Administrator. (Adapted from Metro North Georgia Water Management District Model Ordinance.).

G. Nuisance
1. The *owner* of each stormwater SCM, whether *structural* or *non-structural SCM*, shall maintain it so as not to create or result in a nuisance condition.

H. Maintenance Easement
1. Every *structural SCM* installed pursuant to this ordinance shall be made accessible for adequate maintenance and repair by a maintenance easement. The easement shall be recorded, and its terms shall specify who may make use of the easement and for what purposes.

1.05 Enforcement and Violations

A. General

1. Authority to Enforce
   a. The provisions of this ordinance shall be enforced by the Stormwater Administrator, his or her designee, or any authorized agent of the Town of Winterville. Whenever this section refers to the Stormwater Administrator, it includes his or her designee as well as any authorized agent of the Town of Winterville.
2. Violation Unlawful
   a. Any failure to comply with an applicable requirement, prohibition, standard, or limitation imposed by this ordinance, or the terms or conditions of any permit or other *development* or *redevelopment* approval or authorization granted pursuant to this ordinance, is unlawful and shall constitute a violation of this ordinance. (From Town of Apex Unified Development Ordinance.).
3. Each Day a Separate Offense
   a. Each day that a violation continues shall constitute a separate and distinct violation or offense. (Adapted from Town of Cary Land Development Ordinance).
4. Responsible Persons/Entities
   a. Any person who erects, constructs, reconstructs, alters (whether actively or passively), or fails to erect, construct, reconstruct, alter, repair or maintain any structure, SCM, practice, or condition in violation of this

ordinance shall be subject to the remedies, penalties, and/or enforcement actions in accordance with this section. Persons subject to the remedies and penalties set forth herein may include any architect, engineer, builder, contractor, developer, agency, or any other person who participates in, assists, directs, creates, causes, or maintains a condition that results in or constitutes a violation of this ordinance, or fails to take appropriate action, so that a violation of this ordinance results or persists; or an owner, any tenant or occupant, or any other person, who has control over, or responsibility for, the use or *development* of the property on which the violation occurs. (Adapted from Hall County, Georgia, Unified Development Ordinance.).

b. For the purposes of this article, responsible person(s) shall include but not be limited to: (an inclusive approach to "responsible persons" drawn from the Town of Apex UDO.)

1) Person Maintaining Condition Resulting in or Constituting Violation

i. An architect, engineer, building, contractor, developer, agency, or any other person who participates in, assists, directs, creates, causes, or maintains a condition that constitutes a violation of this ordinance, or fails to take appropriate action, so that a violation of this ordinance results or persists.

2) Responsibility for Land or Use of Land

i. The owner of the land on which the violation occurs, any tenant or occupant of the property, any person who is responsible for stormwater controls or practices pursuant to a private agreement or public document, or any person, who has control over, or responsibility for, the use, development or redevelopment of the property.

B. Remedies and Penalties

1. The remedies and penalties provided for violations of this ordinance, whether civil or criminal, shall be cumulative and in addition to any other remedy provided by law, and may be exercised in any order.
2. Remedies

a. Withholding of Certificate of Occupancy

1) The Stormwater Administrator or other authorized agent may refuse to issue a certificate of occupancy for the building or other improvements constructed or being constructed on the site and served by the stormwater practices in question until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise occurred the violations described therein.

b. Disapproval of Subsequent Permits and Development Approvals

1) As long as a violation of this ordinance continues and remains uncorrected, the Stormwater administrator or other authorized agent may withhold, and the Town of Winterville may disapprove, any request for permit or *development* approval or authorization provided for by this ordinance or the zoning, subdivision, or building regulations for the land on which the violation occurs.

c. Injunction, Abatements, etc.

1) The Stormwater Administrator, with the written authorization of the Town Manager, may institute an action in a court of competent jurisdiction for a mandatory or prohibitory injunction and order of abatement to correct a violation of this ordinance. Any project violating this ordinance shall be subject to the full range of equitable remedies provided in the General Statues or at common law.

d. Correction as Public Health Nuisance, Costs as Lien, etc.

1) If the violation is deemed dangerous or prejudicial to the public health or public safety and is within the geographic limits prescribed by North Carolina G.S. § 160A-193, the Stormwater Administrator, with the written authorization of the Town Manager, may cause the violation to be corrected and the costs to be assessed as a lien against the property.

e. Stop Work Order

1) The Stormwater Administrator may issue a stop work order to the person(s) violating this ordinance. The stop work order shall remain in effect until the person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violation or violations described therein. The stop work order may be withdrawn or modified to enable the person to take the necessary remedial measures to cure such violations or violations. (Adapted form Metro North Georgia Water Management District Model Ordinance).

3. Civil Penalties

a. Violation of this ordinance may subject the violator to a civil penalty to be recovered in a civil action in the nature of a debt if the violator does not pay the penalty within 30 days after notice of the violation is issued by the Stormwater Administrator. Civil penalties may be assessed up to the full amount of penalty to which the Town of Winterville is subject for violations of its Phase II Stormwater permit, or if no Phase II Stormwater permit exists for the jurisdiction, civil penalties may be assessed up to the full amount allowed by law.

C. Procedures

1. Initiation/Complaint

a. Whenever a violation of this ordinance occurs, or is alleged to have occurred, any person may file a written complaint. Such complaint shall state fully the alleged violation and the basis thereof, and shall be filed with the Stormwater Administrator, who shall record the compliant. The complaint shall be investigated promptly by the Stormwater Administrator.

2. Inspection

a. The Stormwater Administrator shall have the authority, upon presentation of proper credentials, to enter and inspect any land, building, structure, or premises to ensure compliance with this ordinance. (From Town of Cary Land Development Ordinance).

3. Notice of Violation and Order to Correct

a. When the Stormwater Administrator finds that any building, structure, or land is in violation of this ordinance, the Stormwater Administrator shall notify, in writing, the property *owner* or other person violating this ordinance. The notification shall indicate the nature of the violation, contain the address or other description of the site upon which the

violation is occurring, order the necessary action to abate the violation, and give a deadline for correcting the violation. If civil penalties are to be assessed, the notice of violation shall also contain a statement of the civil penalties to be assessed, the time of their accrual, and the time within which must be paid or be subject to collection as a debt.

b. The Stormwater Administrator may deliver the notice of violation and correction order personally, by the code enforcement officer, by certified or registered mail, return receipt requested, or by any means authorized for the service of documents by Rule 4 of the North Carolina Rules of Civil Procedures. (From Town of Apex Unified Development Ordinance.).

c. If a violation is not corrected within a reasonable period of time, as provided in the notification, the Stormwater Administrator may take appropriate action under this ordinance to correct and abate the violation and to ensure compliance with this ordinance.

4. Extension of Time
   a. A person who receives a notice of violation and correction order, or the *owner* of the land on which the violation occurs, may submit to the Stormwater Administrator a written request for an extension of time for correction of the violation. On determining that the request includes enough information to show that the violation cannot be corrected within the specified time limit for reasons beyond the control of the person requesting the extension, the Stormwater Administrator may extend the time limit as is reasonably necessary to allow timely correction of the violation, up to, but not exceeding 30 days. The Stormwater Administrator may grant 10-day extensions in addition to the foregoing extension if the violation cannot be corrected within the permitted time due to circumstances beyond the control of the person violating this ordinance. The Stormwater Administrator may grant an extension only by written notice of extension. The notice of extension shall state the date prior to which correction must be made, after which the violator will be subject to the penalties described in the notice of violation and correction order. (From Town of Apex Unified Development Ordinance.).

5. Enforcement After Time to Correct
   a. After the time has expired to correct a violation, including any extension(s) if authorized by the Stormwater Administrator, the Stormwater Administrator shall determine if the violation is corrected. If the violation is not corrected, the Stormwater Administrator may act to impose one or more of the remedies and penalties authorized by this ordinance. (From Town of Apex Unified Development Ordinance.).

6. Emergency Enforcement
   a. If delay in correcting a violation would seriously threaten the effective enforcement of this ordinance or pose an immediate danger to the public health, safety, or welfare, then the Stormwater Administrator may order the immediate cessation of a violation. Any person so ordered shall cease any violation immediately. The Stormwater Administrator may seek immediate enforcement, without prior written notice, through any remedy or penalty authorized by this article.

1.06 Definitions

A. Terms Defined

1. When used in this Ordinance, the following words and terms shall have the meaning set forth in this section, unless other provisions of this Ordinance specifically indicate otherwise.
2. Built-upon Area (BUA)
   a. That portion of a *development* project that is covered by impervious or partially impervious surface including, but not limited to, buildings; pavement and gravel areas such as roads, parking lots, and paths; and recreation facilities such as tennis courts. "Built-upon area" does not include a wooden slatted deck, the water area of a swimming pool, or pervious or partially pervious paving material to the extent that the paving material absorbs water or allows water to infiltrate through the paving material. (From S.B. 1210).
3. Department
   a. The North Carolina Department of Environmental Quality. (From temporary rule).
4. Design Manual
   a. The stormwater design manual approved for use in Phase II jurisdictions by the *Department* for the proper implementation of the requirements of the federal Phase II stormwater program. All references herein to the *Design Manual* are to the latest published edition or revision. (Adapted from North Georgia M.O.).
5. Development
   a. Any land-disturbing activity that increases the amount of *built-upon area* or that otherwise decreases infiltration of precipitation into the soil. (From North Carolina Model Ordinance for Water Supply Watershed Protection and 15A NCAC 2B.0202(23)).
6. Division
   a. The Division of Energy, Mineral, and Land Resources in the *Department*. (From S.B. 1210.).
7. High-Density Project
   a. Any project that exceeds the *low-density* threshold for dwelling units per acre or *built-upon area*.
8. Larger Common Plan of Development or Sale
   a. Any area where multiple separate and distinct construction or land-disturbing activities will occur under one plan. A plan is any announcement or piece of documentation (including but not limited to a sign, public notice or hearing, sales pitch, advertisement, loan application, drawing, permit application, zoning request, or computer design) or physical demarcation (including but not limited to boundary signs, lot stakes, or surveyor markings) indicating that construction activities may occur on a specific plot. (Definition adapted from EPA Storm Water Phase II Compliance Assistance Guide.).
9. Low-Density Project
   a. For a project that is not located within one-half mile of and draining to *Shellfish Resource Waters*, the project is a low-density project if it has no more than two dwelling units per acre or twenty-four percent *built-upon area* (BUA) for all residential and non-residential *development*.

b. For a project that is located within one-half mile of and draining to *Shellfish Resource Waters*, the project is a low-density project only if it contains no more than twelve percent *built-upon area* (BUA).

c. A project with an overall density at or below the relevant low-density threshold, but containing areas with a density greater than the overall project density, may be considered low density as long as the project meets or exceeds the post-construction model practices for low-density projects and locates the higher density in upland areas and away from surface waters and drainageways to the maximum extent practicable.

10. 1-Year, 24-Hour Storm
    a. The surface runoff resulting from a 24-hour rainfall of an intensity expected to be equaled or exceeded, on average, once in 12 months and with a duration 24 hours. (From S.B. 1210.).

11. Owner
    a. The legal or beneficial owner of land, including but not limited to a mortgagee or vendee in possession, receiver, executor, trustee, or long-term or commercial lessee, or any other person or entity holding proprietary rights in the property or having legal power of management and control of the property. "Owner" shall include long-term commercial tenants; management entities, such as those charged with or engaged in the management of properties for profit; and every person or entity having joint ownership of the property. A secured lender not in possession of the property does not constitute an owner, unless the secured lender is included within the meaning of "owner" under another description in this definition, such as a management entity.

12. Redevelopment
    a. Any *development* on previously developed land, other than a rebuilding activity that results in no net increase in *built-upon area* and provides equal or greater stormwater control than the previous *development*.

13. Shellfish Resource Waters
    a. Class SA waters that contain an average concentration of 500 parts per million of natural chloride ion. Average concentration is determined by averaging the chloride concentrations of five water samples taken one-half mile downstream from the project site that are taken on separate days, within one hour of high tide, and not within 48 hours following a rain event. The chloride ion concentrations are to be determined by a State-certified laboratory. (From SL 2006-246).

14. Structural SCM
    a. A physical device designed to trap, settle out, or filter pollutants from stormwater runoff; to alter or reduce stormwater runoff velocity, amount, timing, or other characteristics; to approximate the pre-*development* hydrology on a developed site; or to achieve any combination of these goals. Structural SCM includes physical practices such as constructed wetlands, vegetative practices, filter strips, grassed swales, and other methods installed or created a real property. "Structural SCM" is synonymous with "structural practice," "stormwater control facility," "stormwater control practice," "stormwater treatment practice," "stormwater management practice," "stormwater control measures,"

"structural stormwater treatment systems," and similar terms used in this ordinance.

15. Substantial Progress
    a. For the purposes of determining whether sufficient progress has been made on an approved plan, one or more of the following construction activities toward the completion of a site or subdivision plan shall occur: obtaining a grading permit and conducting grading activity on a continuous basis and not discontinued for more than thirty (30) days; or installation and approval of on-site infrastructure; or obtaining a building permit for the construction and approval of a building foundation. "Substantial progress" for purposes of determining whether an approved plan is null, and void is not necessarily the same as "substantial expenditures" used for determining vested rights pursuant to applicable law. (Adapted from Town of Cary Land Development Ordinance.).

1.07 Illicit Discharges

A. Illicit Discharges and Connections

1. *Drawn from Raleigh and Greenville ordinances.*
2. Illicit Discharges
    a. No person shall cause or allow the discharge, emission, disposal, pouring, or pumping directly or indirectly to any stormwater conveyance, the waters of the State, or upon the land in manner and amount that the substance is likely to reach a stormwater conveyance or waters of the State, any liquid, solid, gas, or other substance, other than stormwater; provided that non-stormwater discharges associated with the following activities are allowed and provided that they do not significantly impact water quality:
        1) Water line flushing;
        2) Landscape irrigation;
        3) Diverted stream flows;
        4) Rising ground waters;
        5) Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20));
        6) Uncontaminated pumped ground water;
        7) Discharges from potable water sources;
        8) Foundation drains;
        9) Air conditioning condensation;
        10) Irrigation water;
        11) Springs;
        12) Water from crawl space pumps;
        13) Footing drains;
        14) Lawn watering;
        15) Individual residential car washing;
        16) Flows from riparian habitats and wetlands;
        17) Dechlorinated swimming pool discharges;
        18) Street wash water; and
        19) Other non-stormwater discharges for which a valid NPDES discharge permit has been approved and issued by the State of North Carolina,

and provided that any such discharges to the municipal separate storm sewer system shall be authorized by Town of Winterville.

Prohibited substances include but are not limited to: oil, anti-freeze, chemicals, animal waste, paints, garbage, and litter.

3. Illicit Connections
   a. Connections to a stormwater conveyance or stormwater conveyance system that allow the discharge of non-stormwater, other than the exclusions described in **Subsection 2 of Part 1.07A above**, are unlawful. Prohibited connections include, but are not limited to: floor drains, wastewater from washing machines or sanitary sewers, wash water from commercial vehicle washing or steam cleaning, and wastewater form septic systems.
   b. Where such connections exist in violation of this section and said connections were made prior to the adoption of this provision or any other ordinance prohibiting such connections, the property *owner* or the person using said connection shall remove the connection within one year following the effective date of this ordinance. However, the one-year grace period shall not apply to connections which may result in the discharge of hazardous materials or other discharges which pose an immediate threat to health and safety, or are likely to result in immediate injury and harm to real or personal property, natural resources, wildlife, or habitat.
   c. Where it is determined that said connection:
      1) May result in the discharge of hazardous materials or may pose an immediate threat to health and safety, or is likely to result in immediate injury and harm to real or personal property, natural resources, wildlife, or habitat, or
      2) Was made in violation of any applicable regulation or ordinance, other than this section.
   d. The Stormwater Administrator shall designate the time within which the connection shall be removed. In setting the time limit for compliance, the Stormwater Administrator shall take into consideration:
      1) The quantity and complexity of the work,
      2) The consequences of delay,
      3) The potential harm to the environment, to the public health, and to public and private property, and
      4) The cost of remedying the damage.
4. Spills
   a. Spills or leaks of polluting substances released, discharged to, or having the potential to be released or discharged to the stormwater conveyance system, shall be contained, controlled, collected, and properly disposed of. All affected areas shall be restored to their preexisting condition.
   b. Persons in control of the polluting substances immediately prior to their release or discharge, and persons owning the property on which the substances were released or discharged, shall immediately notify the Town of Winterville Fire Chief of the release or discharge, as well as making any required notifications under state and federal law. Notification shall not relieve any person of any expenses related to the restoration, loss, damage, or any other liability which may be incurred as

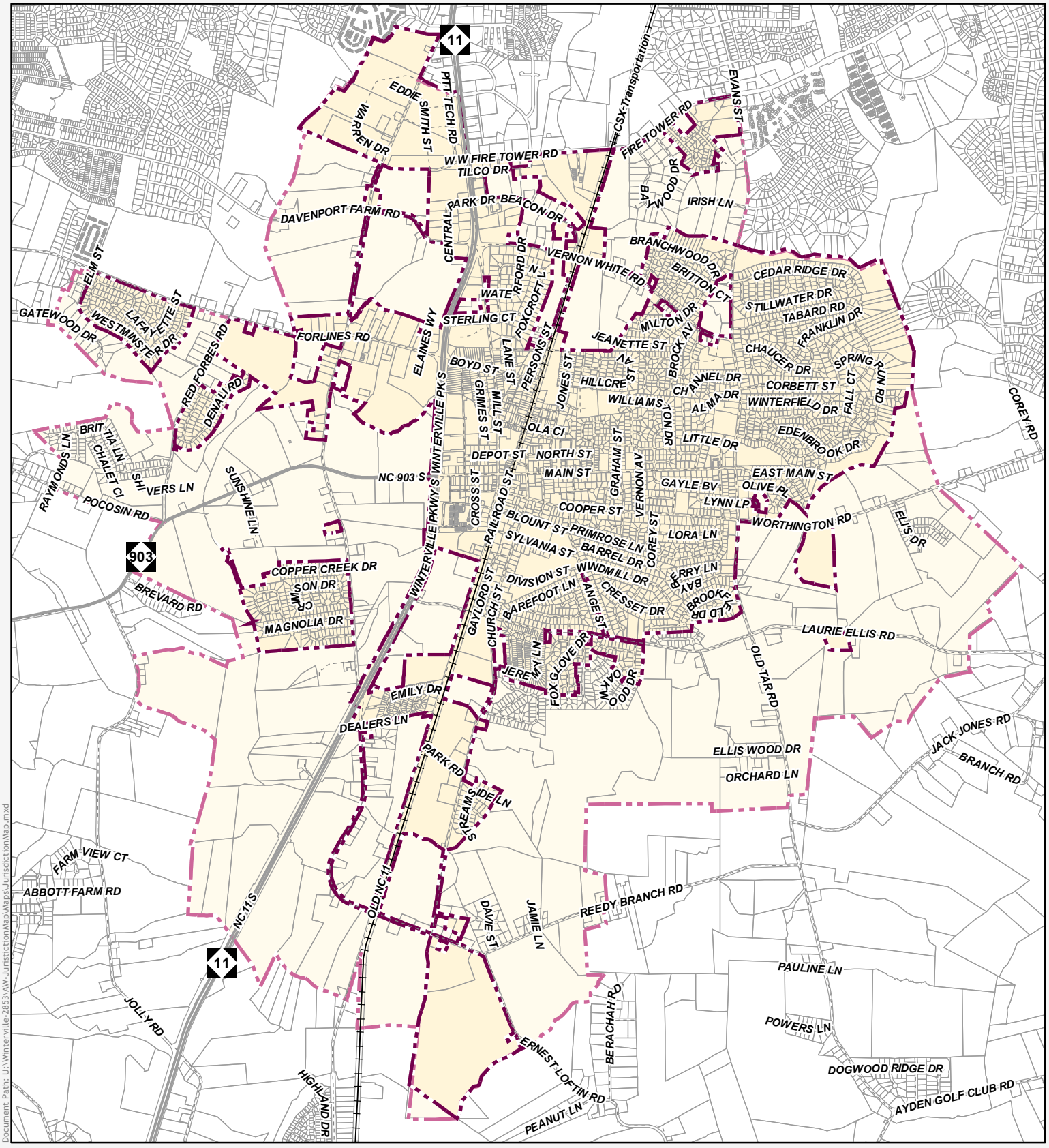
a result of said spill or leak, nor shall such notification relieve any person from other liability which may be imposed by State or other law.

5. Nuisance

   a. Illicit discharges and illicit connections which exist within the Town of Winterville town limits are hereby found, deemed, and declared to be dangerous or prejudiced to the public health or public safety and are found, deemed, and declared to be public nuisances. Such public nuisances shall be abated in accordance with the procedures set forth in Chapter 95, Section 015 (D) of the Code of Winterville, or in accordance with N.C.G.S. 160A-193.

END OF ATTACHMENT 1

Attachment 2: Standard Details



Town of Winterville

October 2022

Legend

- NC Route
- Street
- Railroad
- Parcel
- Municipal Limit
- ETJ

0 1,500 3,000

Feet

Wooten

Document Path: U:\Winterville-2853\AW-JurisdictionMap\Maps\JurisdictionMap.mxd

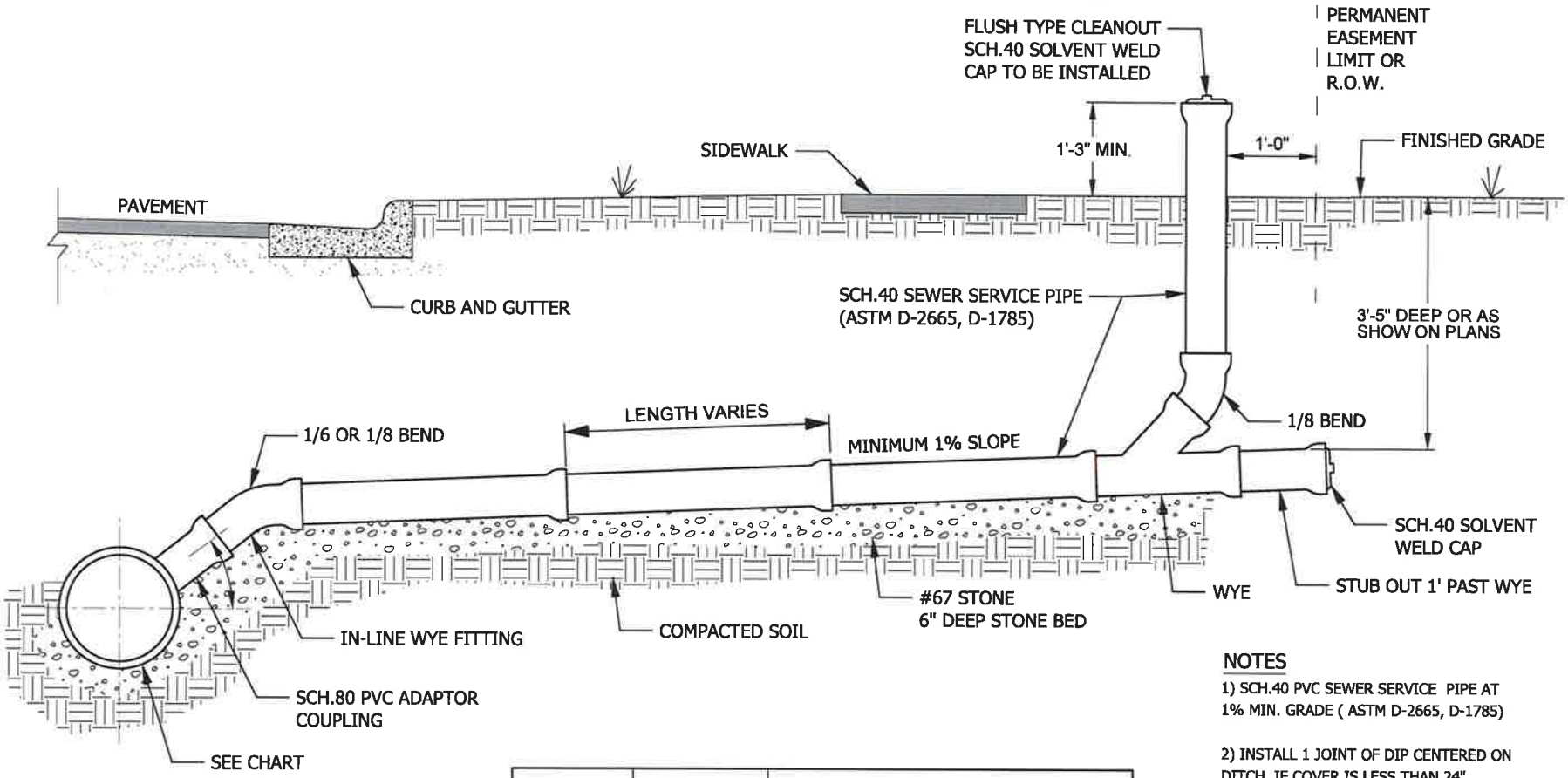
Date Saved: 10/17/2022 9:51:25 AM

Section 1

Sanitary Sewer System

Standard Detail Index

SECTION 1 - SANITARY SEWER SYSTEM



MAIN TYPE	CONNECTION	COMMENTS
ABS TRUSS	TAPPPING SADDLE	IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. MINIMUM 4" OF 57" STONE REQUIRED UNDER ALL PIPING.
PVC TRUSS	GASKETED WYE	IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. MINIMUM 4" OF 57" STONE REQUIRED UNDER ALL PIPING.
PVC SDR 26	GASKETED WYE	IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. MINIMUM 4" OF 57" STONE REQUIRED UNDER ALL PIPING.

NOTES

1) SCH.40 PVC SEWER SERVICE PIPE AT 1% MIN. GRADE (ASTM D-2665, D-1785)

2) INSTALL 1 JOINT OF DIP CENTERED ON DITCH, IF COVER IS LESS THAN 24"

3) SERVICES WITH LESS THAN 12" OF DEPTH BELOW DITCH BOTTOM ARE NOT ACCEPTABLE WITHOUT PRIOR APPROVAL

4) 8"x 8"x 4" WYE TO BE USED FOR SERVICE CONNECTIONS TO NEW SAN. SEWER MAINS.

5) AFTER SUCCESSFULLY TESTING OF SERVICE LINE, CONTRACTOR TO REMOVE STUB OUT CAP AND INSTALL SERVICE PIPE TO EX. DWELLING PLUMBING CONNECTION.

WINTERVILLE
NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

PVC SANITARY SEWER SERVICE FOR AREA WITH CURB AND GUTTER FOR MAINS WITH A MAXIMUM DEPTH OF 12'

STD. NO.	SCALE
S-1	N.T.S
SHEET	DATE
1 OF 1	5-31-19

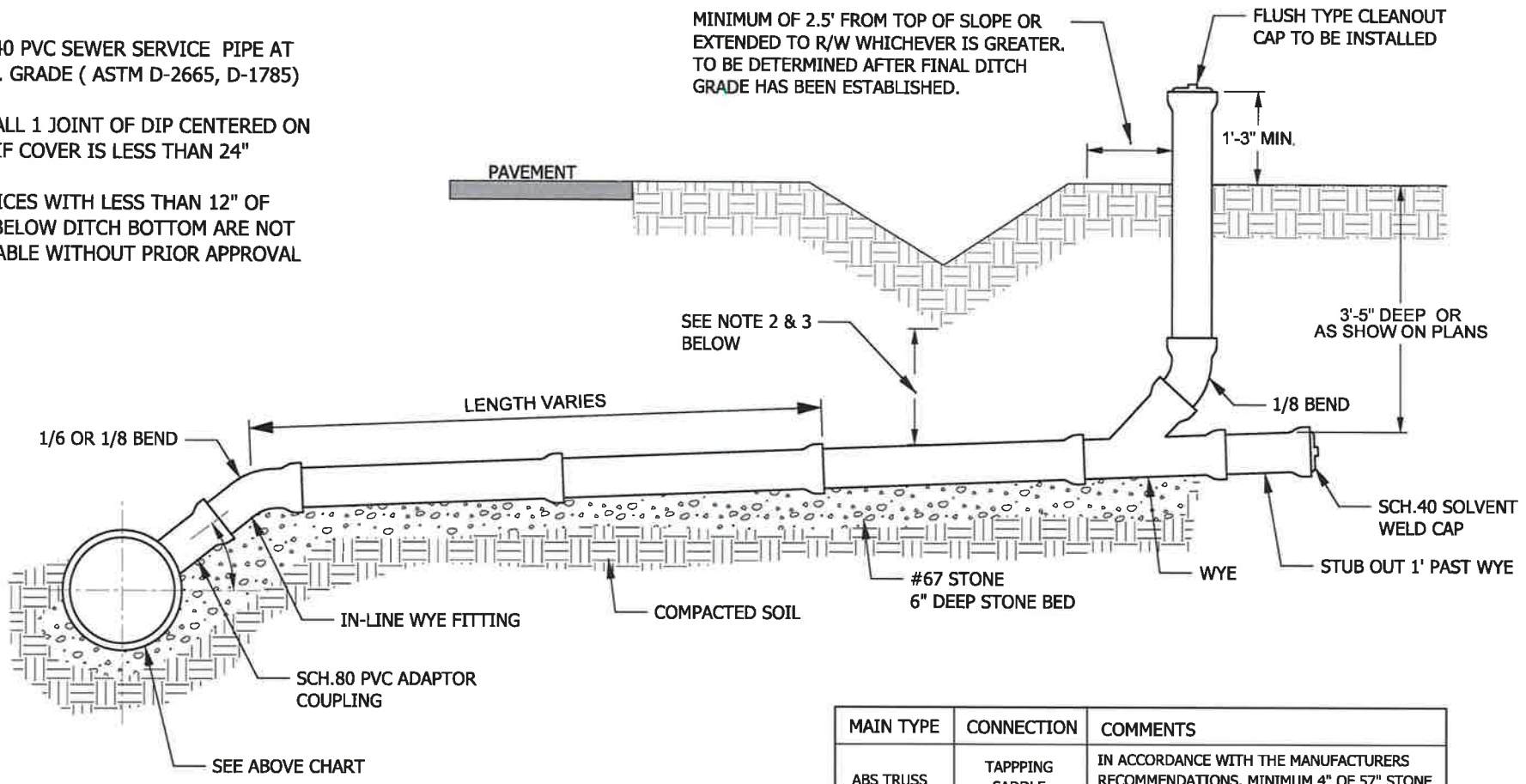
REVISIONS		
NO	DATE	COMMENT

NOTES

1) SCH.40 PVC SEWER SERVICE PIPE AT 1% MIN. GRADE (ASTM D-2665, D-1785)

2) INSTALL 1 JOINT OF DIP CENTERED ON DITCH, IF COVER IS LESS THAN 24"

3) SERVICES WITH LESS THAN 12" OF DEPTH BELOW DITCH BOTTOM ARE NOT ACCEPTABLE WITHOUT PRIOR APPROVAL



MAIN TYPE	CONNECTION	COMMENTS
ABS TRUSS	TAPPPING SADDLE	IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. MINIMUM 4" OF 57" STONE REQUIRED UNDER ALL PIPING.
PVC TRUSS	GASKETED WYE	IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. MINIMUM 4" OF 57" STONE REQUIRED UNDER ALL PIPING.
PVC SDR 26	GASKETED WYE	IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. MINIMUM 4" OF 57" STONE REQUIRED UNDER ALL PIPING.

WINTERVILLE NORTH CAROLINA

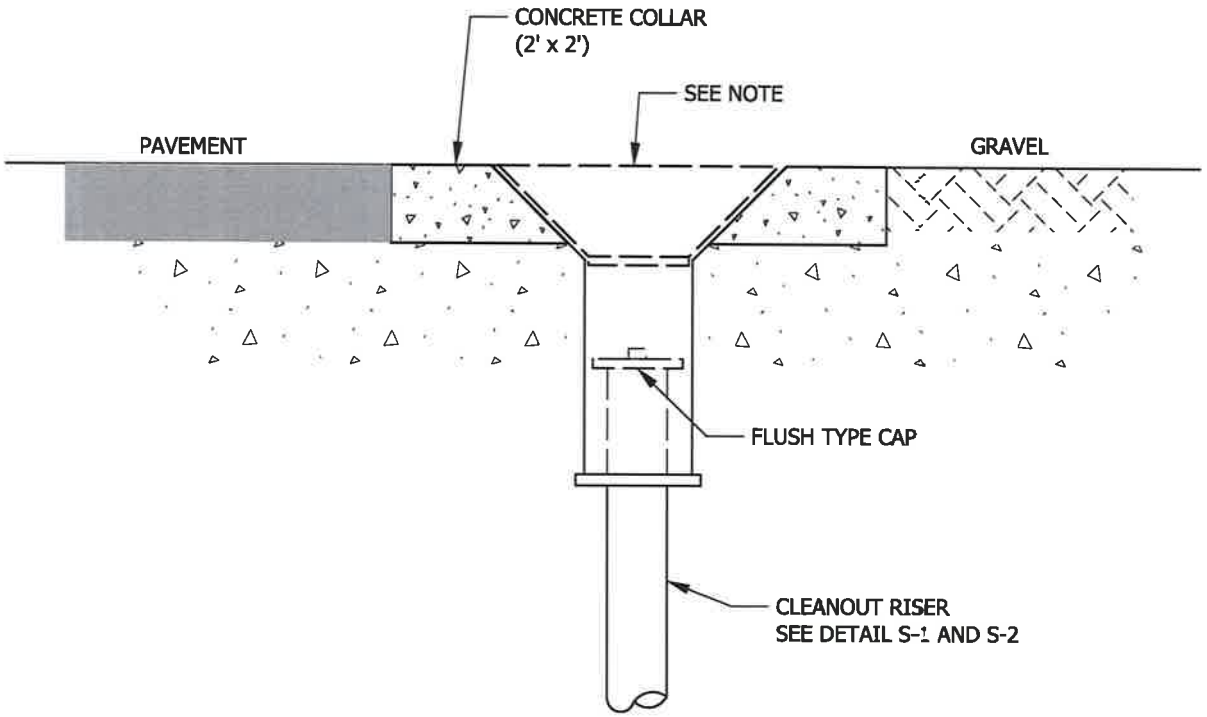
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

PVC SANITARY SEWER SERVICE FOR AREA WITHOUT CURB AND GUTTER FOR MAINS WITH A MAXIMUM DEPTH OF 12'

STD. NO.	SCALE
S-2	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

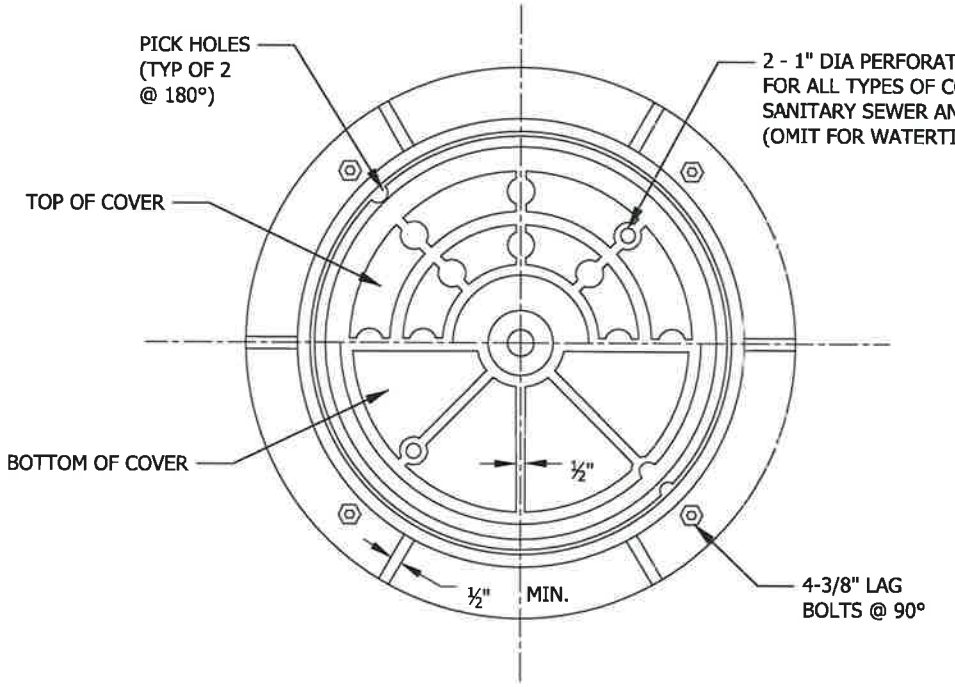


NOTES

1) FOR 4" SERVICE, BOX TO BE VULCAN MODEL *G8471 WITH #G8460 LID MARKED SEWER.

2) FOR 6" SERVICE, BOX TO BE EAST JORDAN #1574Z W/LID MARKED SEWER.

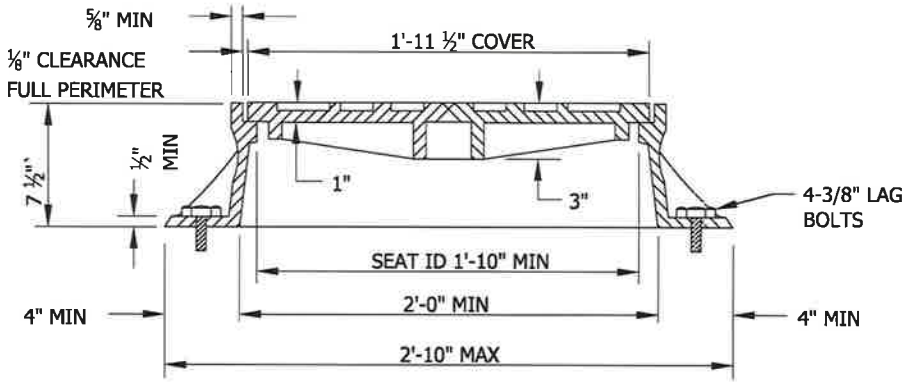
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **S-3**	SCALE N.T.S	REVISIONS	
	CLEANOUT INSTALLATION	SHEET 1 OF 1	DATE 5-31-19	NO / DATE / COMMENT	



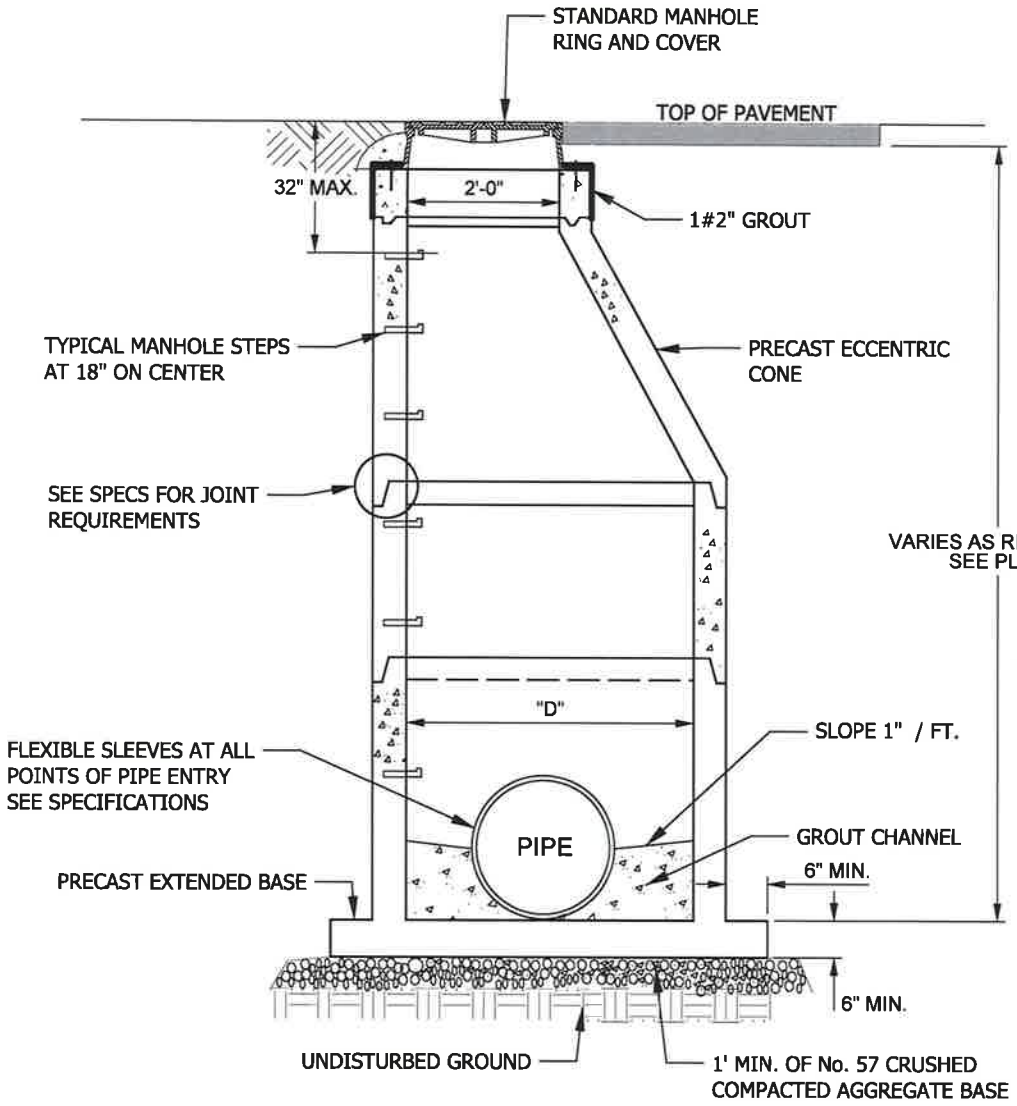
COVER LETTERING DETAIL

NOTES:

1) RING AND COVER SHALL HAVE TOTAL COMBINED WEIGHT OF 310 LB MIN. AND BE SUITABLE FOR H-20 LOADING.
2) ALL BOLTS ARE TO BE TYPE 316 STAINLESS STEEL.
3) USE COVER LETTERING AS APPROPRIATE FOR APPLICATION.



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **S-4**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	STANDARD MANHOLE RING AND COVER	SHEET 1 OF 1	DATE 5-31-19	



NOTES

1) THE DISTANCE FROM THE TOP OF MANHOLE RING AND COVER AND FINISHED GRADE MAY VARY WIDELY. SEE PLAN

2) EXTEND PIPE INSIDE MANHOLE WALL MAX. 2", DEPENDING ON PIPE SIZE.

3) MIN. (1) GRADE RING REQ'D IN NON-PAVED AREAS. IN PAVEMENT, GRADE RING NOT REQ'D EXCEPT AS NECESSARY TO MEET FINISHED ELEVATION.

4) NO MORE THAN 2-4" GRADE RINGS SHALL BE INSTALLED.

5) MANHOLES EXCEEDING 23' IN DEPTH SHALL REQUIRED CERTIFICATION IN ACCORDANCE WITH THIS MANUAL.

6) EXTENDED BASE REQUIRED FOR MANHOLES EXCEEDING 12' IN DEPTH.

PIPE SIZE	"D"
LESS THAN 20"	4'
20" OR GREATER	5'
30" OR GREATER	6'

WINTERVILLE
NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

TYPICAL PRECAST MANHOLE

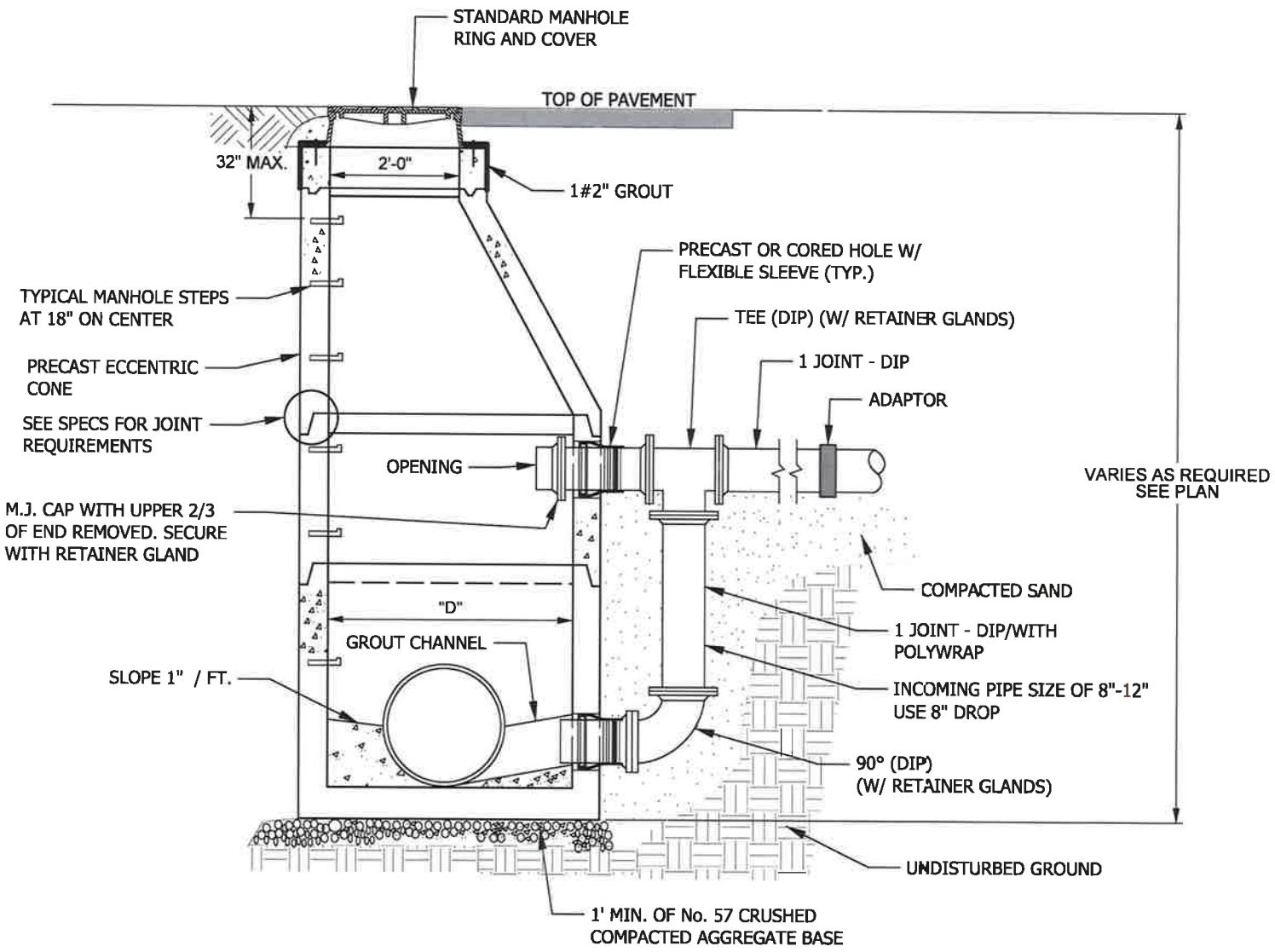
STD. NO.	SCALE
S-5	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

NOTES:

1) TO BE CONSTRUCTED FOR DROPS OVER 30".

2) DROP ASSEMBLY TO BE D.I.P.



PIPE SIZE	"D"
LESS THAN 20"	4'
20" OR GREATER	5'
30" OR GREATER	6'

WINTERVILLE NORTH CAROLINA

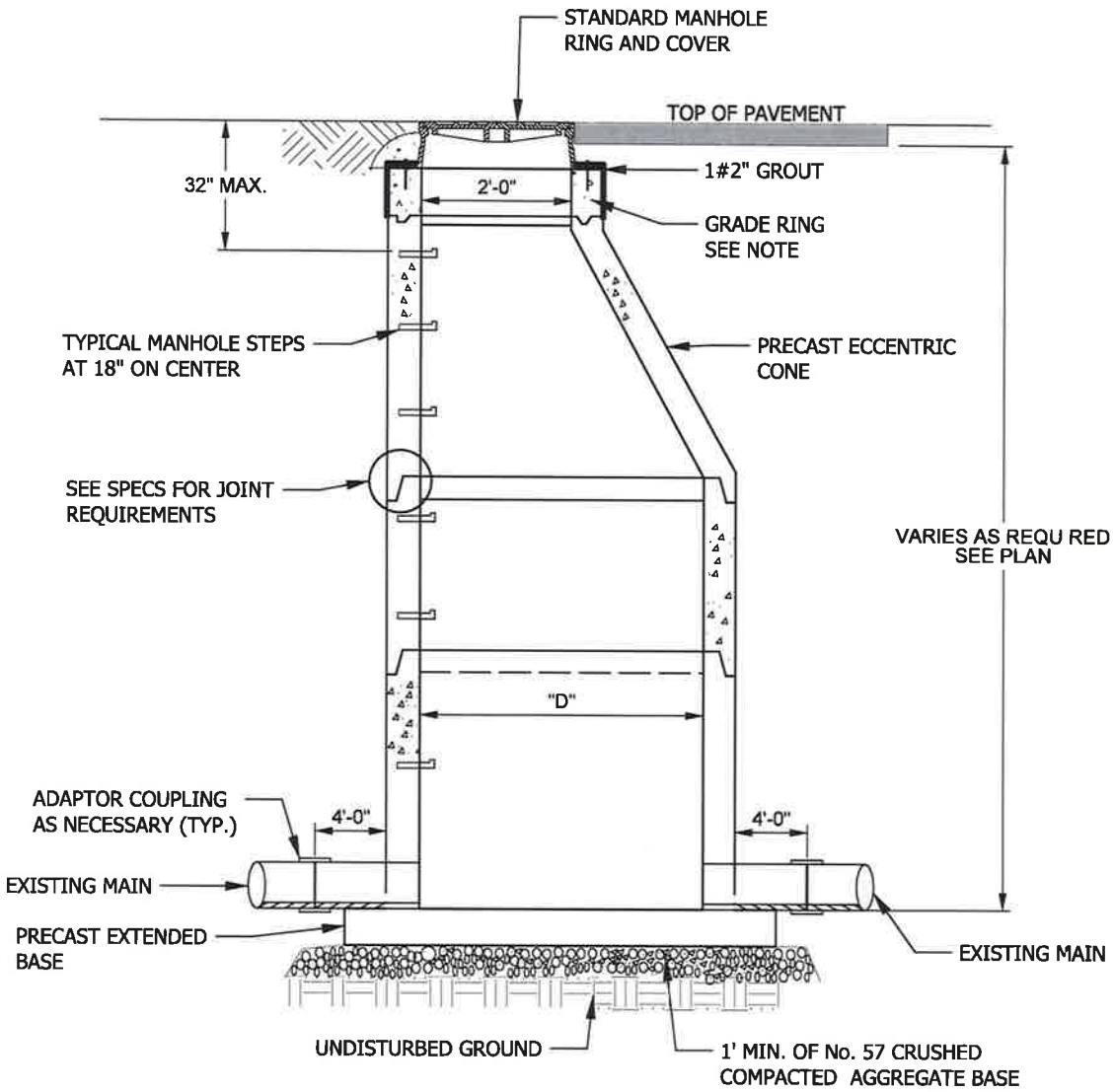
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

TYPICAL DROP MANHOLE

STD. NO.	SCALE
S-6	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



NOTES

1) SAW CUT EXISTING SEWER MAIN AND REMOVE SECTION TO ALLOW INSTALLATION OF PRECAST MANHOLE AND SEWER MAIN.

2) INSTALL ABS COUPLINGS (EXISTING MAIN TO PROPOSED MAIN) AND ADAPTOR COUPLINGS AS NECESSARY.

3) THE DISTANCE FROM THE TOP OF MANHOLE RING AND COVER AND FINISHED GRADE MAY VARY WIDELY. SEE PLAN

4) POINTS OF EXIT AND ENTRY FOR PIPE SHALL BE PROVIDED WITH FLEXIBLE SLEEVES, PREFORMED INTO THE MANHOLE.

5) MIN. (1) GRADE RING REQ'D IN NON-PAVED AREAS. IN PAVEMENT GRADE RING NOT REQ'D EXCEPT AS NECESSARY TO MEET FINISHED ELEVATION.

6) NO MORE THAN 2-4" RINGS SHALL BE INSTALLED.

PIPE SIZE	"D"
LESS THAN 20"	4'
20" OR GREATER	5'
30" OR GREATER	6'

WINTERVILLE
NORTH CAROLINA

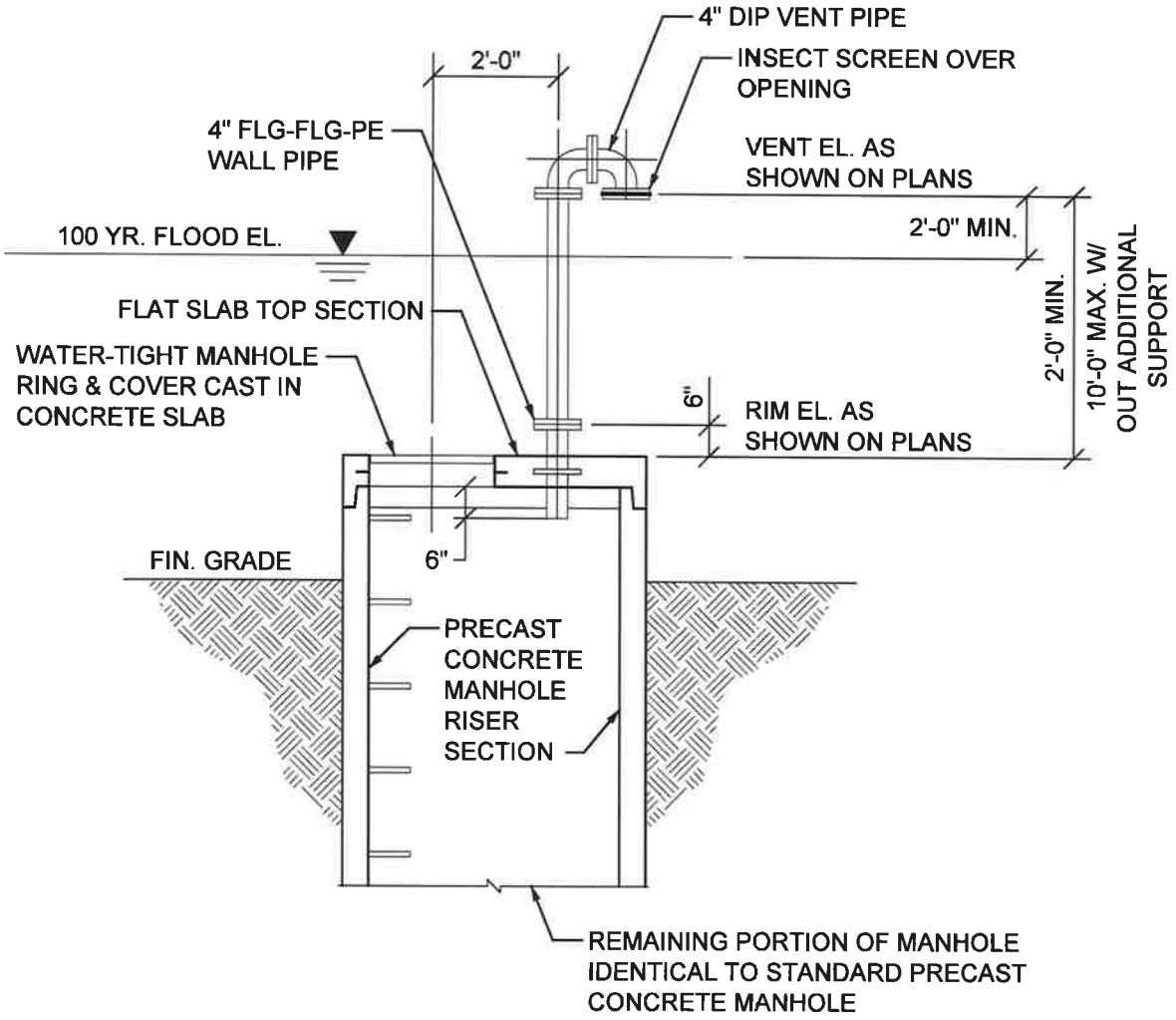
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT
2571 Railroad St. Winterville, NC 28590

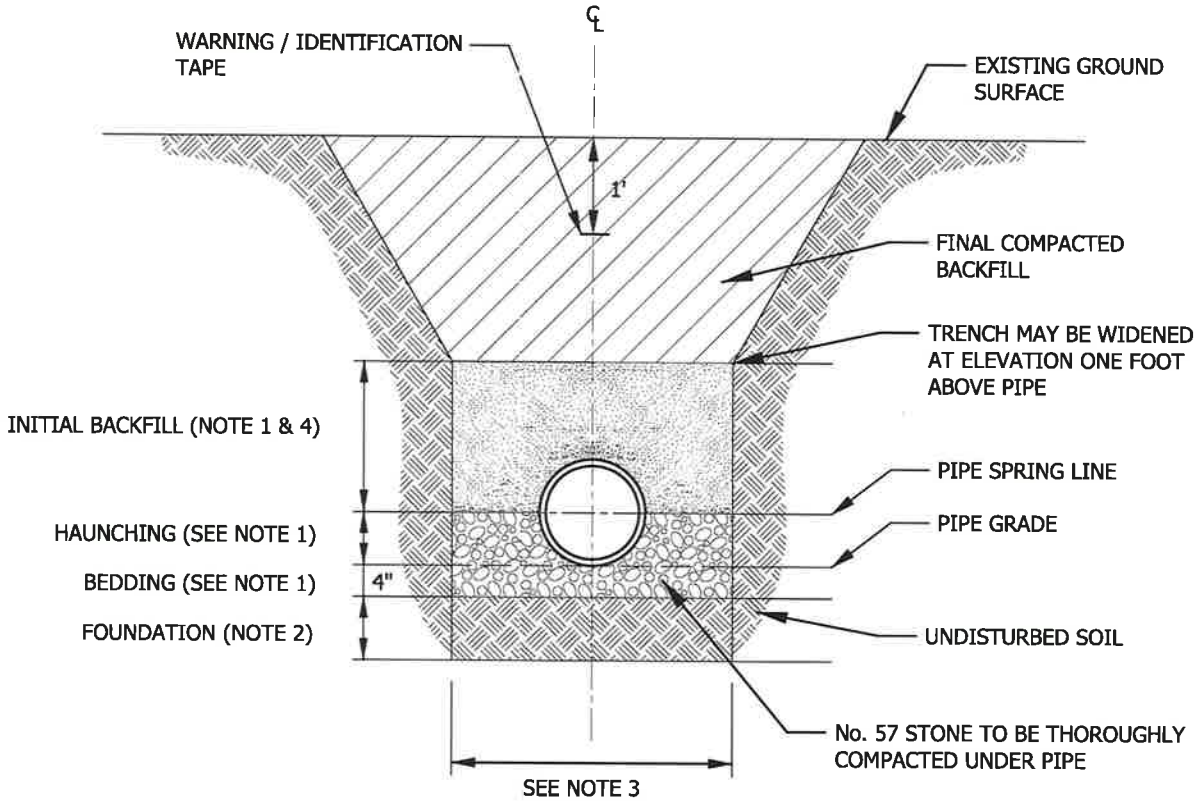
PRECAST MANHOLE INSTALLATION OVER EXISTING SEWER MAIN

STD. NO.	SCALE
S-7	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **S-8**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	FLAT TOP PRECAST CONCRETE MANHOLE W/WATERTIGHT RING AND COVER, AND VENT	SHEET 1 OF 1	DATE 5-31-19	



NOTES:

1) FOR DEPTHS UP TO 14 FEET PROVIDE CLASS I MATERIAL FOR BEDDING AND HAUNCHING. BACKFILL WITH CLASS I, II, OR III MATERIAL IN INITIAL BACKFILL. FOR DEPTHS GREATER THAN 14 FEET, PROVIDE CLASS I MATERIAL FOR BEDDING HAUNCHING AND INITIAL BACKFILL.

2) CLASS I FOUNDATION STONE SHALL BE REQUIRED WHEN SOIL CONDITIONS ARE UNSTABLE. UNDERCUT DEPTH AS DIRECTED BY TOWN.

3) TRENCH WIDTH IS MINIMUM OF THE PIPE O.D. PLUS 18" AND MAXIMUM OF PIPE O.D. PLUS 24".

4) INITIAL BACKFILL SHALL BE PLACED AND COMPACTED IN 6" LIFTS. INITIAL BACKFILL SHALL CONTAIN NO MATERIAL OVER 1 1/2" IN DIAMETER, FROZEN LUMPS, OR DEBRIS.

5) BACKFILL SHALL BE COMPACTED IN ACCORDANCE WITH SPECIFICATIONS.

WINTERVILLE NORTH CAROLINA

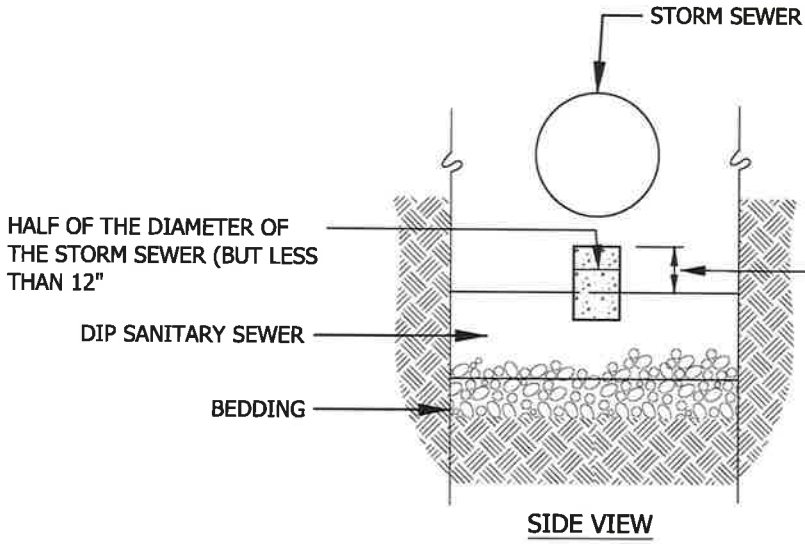
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

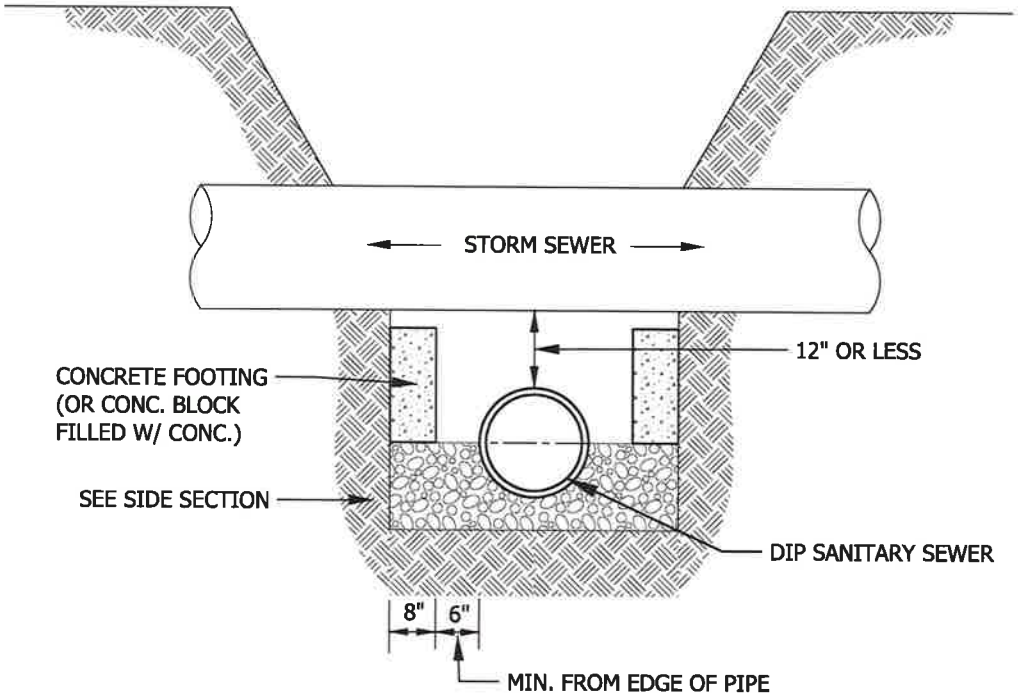
TRENCH SECTION DETAIL FOR GRAVITY SEWER

STD. NO.	SCALE
S-9	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



SIDE VIEW



NOTES:

1) WHEN A SANITARY SEWER MUST BE INSTALLED UNDER STORM SEWER AND 12" OF VERTICAL SEPARATION CANNOT BE OBTAINED, SUPORTS SHALL BE PROVIDED FOR THE STORM SEWER. WHEN SEWER IS SDR-26 PVC BEDDING SHALL BE IN ACCORDANCE WITH DETAIL S-8

WINTERVILLE NORTH CAROLINA

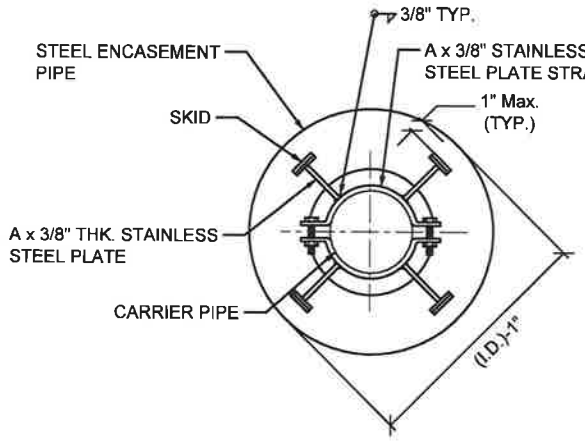
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

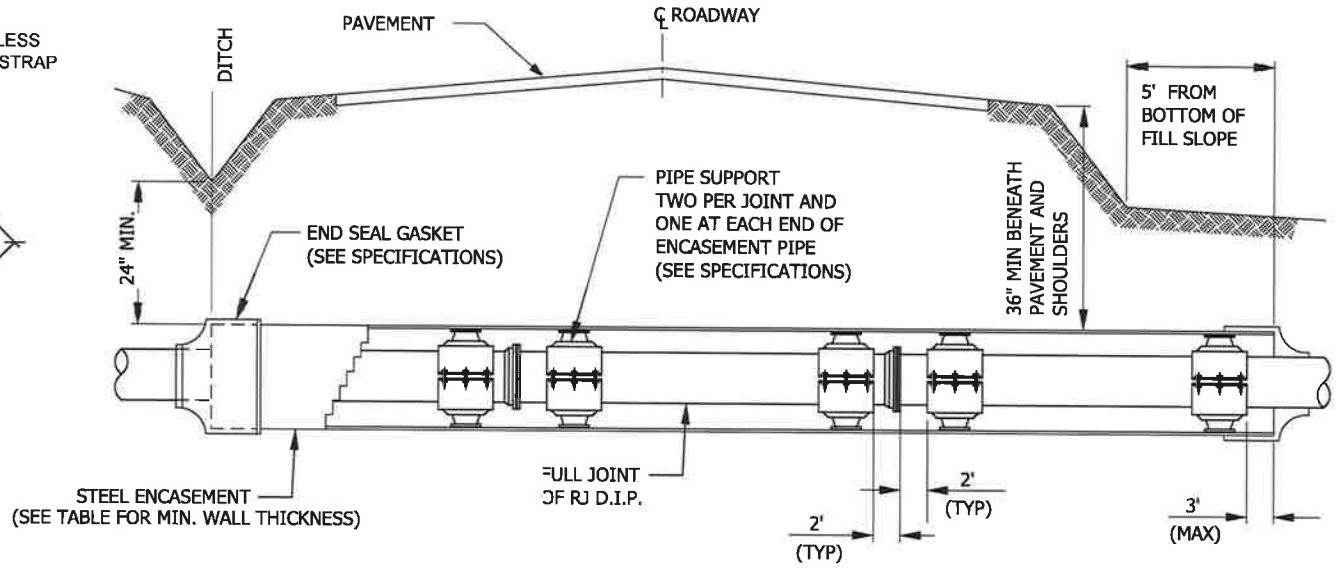
SEWER CROSSING BELOW STORM SEWER

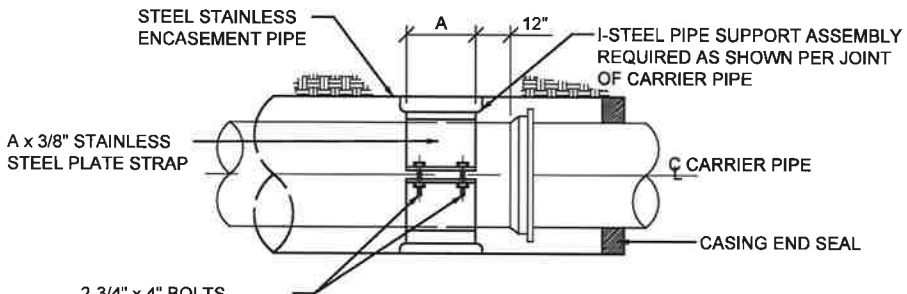
STD. NO.	SCALE
S-10	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



END ELEVATION
NOT TO SCALE





CASING SECTION
NOT TO SCALE

NOTES:

1) FOR ROADS WITH ADT <2000, ENCASEMENT TO EXTEND 3' BEHIND CURB SECTIONS.

2) ENCASEMENT TO EXTEND FROM DITCH LINE TO DITCH LINE IN CUT SECTIONS.

ENCASEMENT PIPE WALL THICKNESS			
ROADWAY		RAILROAD	
PIPE SIZE (O.D. INCHES)	WALL THICKNESS	PIPE SIZE (O.D. INCHES)	WALL THICKNESS
4 - 12 3/4	0.188	12 3/4 & UNDER	0.188
16 - 24	0.250	16	0.281
30	0.312	24	0.375
36	0.375	30	0.469
42	0.500	36	0.531
48	0.500	42	0.625
		48	0.688

NOTES:

1. "A" = 8" FOR PIPES 14" AND UNDER
   "A" = 12" FOR PIPES 16" AND OVER

2. ENTIRE PIPE SUPPORT ASSEMBLY TO BE FUSION BONDED PVC.

WINTERVILLE
NORTH CAROLINA

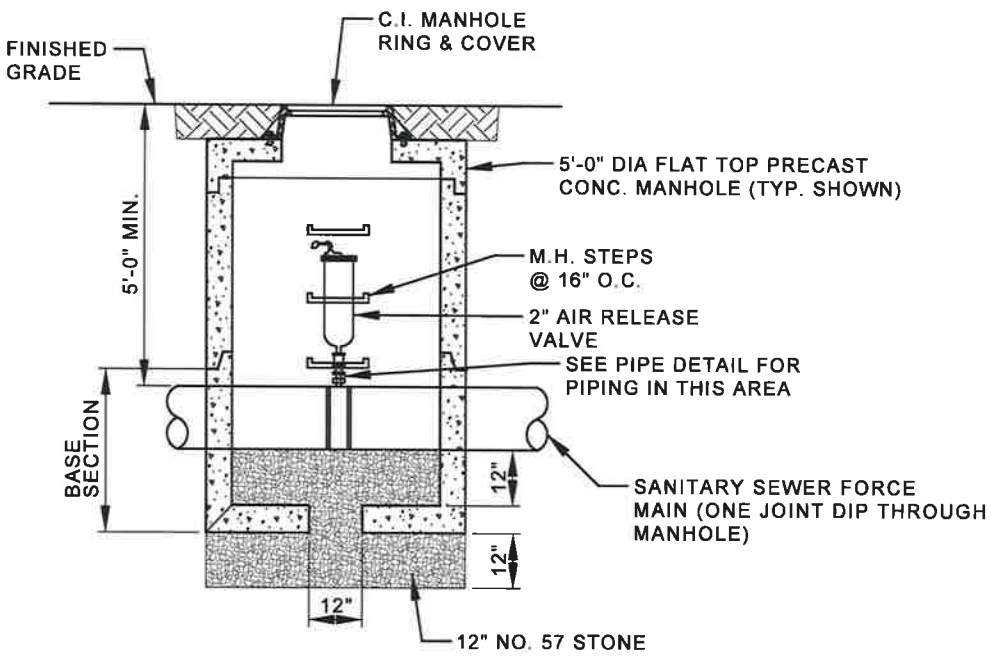
TOWN OF WINTERVILLE

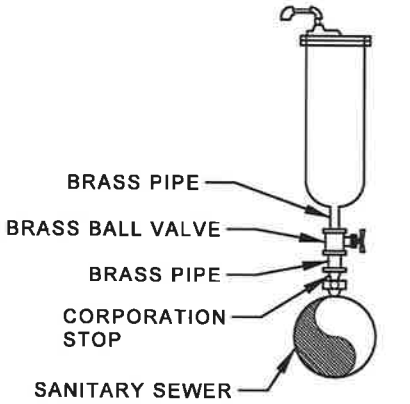
PUBLIC WORKS DEPARTMENT
2571 Railroad St Winterville, NC 28590

STEEL ENCASEMENT

STD. NO.	SCALE
S-11	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



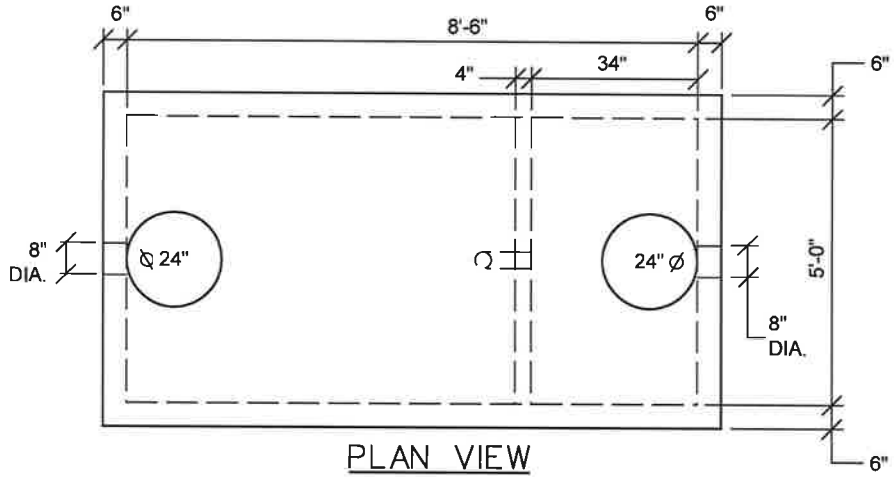


PIPE DETAIL

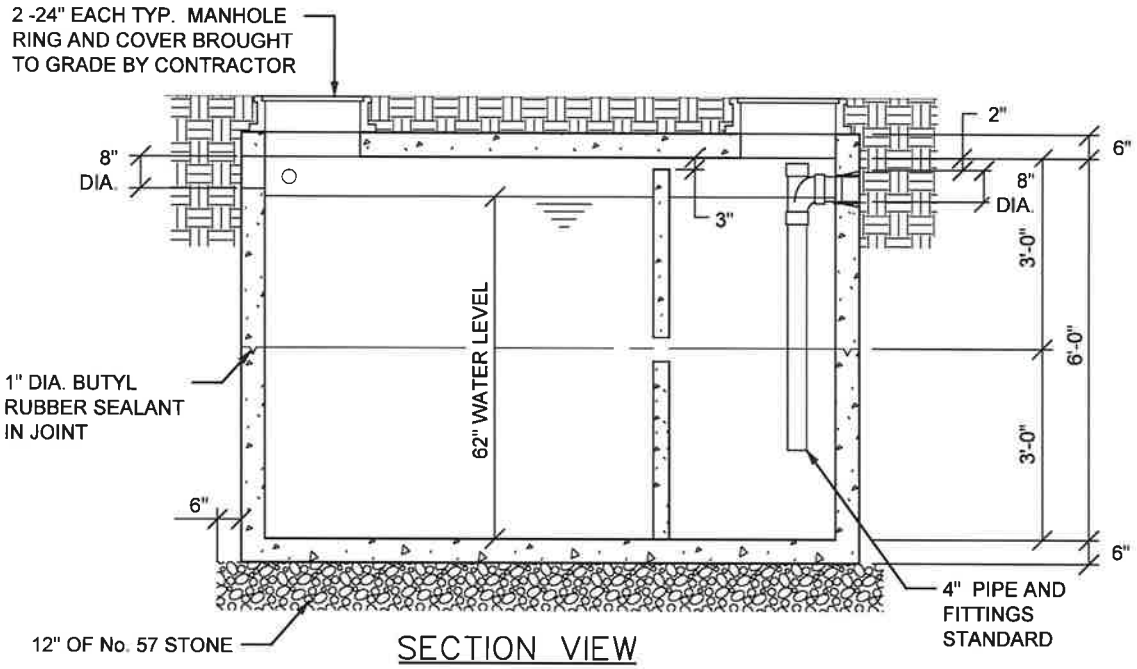
NOTES:

1. ALL MANHOLE UNITS SHALL BE CONSTRUCTED IN ACCORDANCE WITH AND REINFORCED TO EQUAL OR EXCEED AASHO SPEC M199-731 (ASTM C478) "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".
2. CONCRETE SHALL BE 4000 PSI MINIMUM.
3. MANHOLE STEPS TO BE STEEL REINF. PLASTIC OR EQUAL. MANHOLE STEPS SHALL BE PLACED 12" OC WHEN DEPTH OF MANHOLE EXCEEDS 5 FEET.
4. ALL UNITS SHALL BE POURED MONOLITHICALLY AND STEAM CURED.
5. TAP PIPE AND ISOLATION VALVE TO BE THE SAME SIZE AS AIR RELEASE VALVE.
6. FORCE MAIN SHALL BE DUCTILE IRON PIPE THOUGH THE MANHOLE.
7. MANHOLE SHALL BE COATED WITH ONE COAT OF BITUMASTIC BLACK PAINT.
8. PLACE MANHOLE OPENING OVER MANHOLE STEPS.

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **S-12**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	AIR / VACUUM RELEASE VALVE	SHEET 1 OF 1	DATE 5-31-19	



PLAN VIEW



SECTION VIEW

NOTES

1. TANKS SHALL BE INSTALLED ON ALL KITCHEN WASTE & DRAIN LINES FROM RESTAURANTS, CAFES, MEAT MARKETS, & OTHER FOOD HANDLING ESTABLISHMENTS.

2. TANK SHOWN IS 1,200 GAL. CAPACITY

3. 1,200 GAL. CAPACITY SHALL BE THE STANDARD REQUIRED SIZE.

4. SMALLER OR LARGER TANKS MAY BE APPROVED FOR SPECIFIC INSTALLATIONS.

5. PROVIDE PROTECTION FOR TANK IN TRAFFIC AREAS OR CONSTRUCT TANK TO WITHSTAND TRAFFIC LOADS.

6. PROVIDE SCHEDULE PERIODIC CLEANING OF TANK SOLIDS.

7. IN MARGINAL INSTALLATIONS, THE DECISION AS TO THE NEED OF AN INTERCEPTOR SHALL BE MADE BY TOWN OF WINTERVILLE.

8. ANY DESIGN NOT CONFORMING TO THIS DRAWING SHALL BE SUBMITTED TO THE TOWN OF WINTERVILLE FOR APPROVAL.

9. ADJANCENT SURFACE AREAS SHALL BE GRADED TO PREVENT THE DRAINING OF WATER ACROSS OR THE PONDING OF WATER OVER THE GREASE INTERCEPTOR.

10. TOP OF OUTLET TEE PIPING TO BE 10" BELOW TOP OF RING AND COVER.

CONCRETE:
3000 PSI AT 28 DAYS

REINFORCING:
H-20 BRIDGE LOADING

WINTERVILLE
NORTH CAROLINA

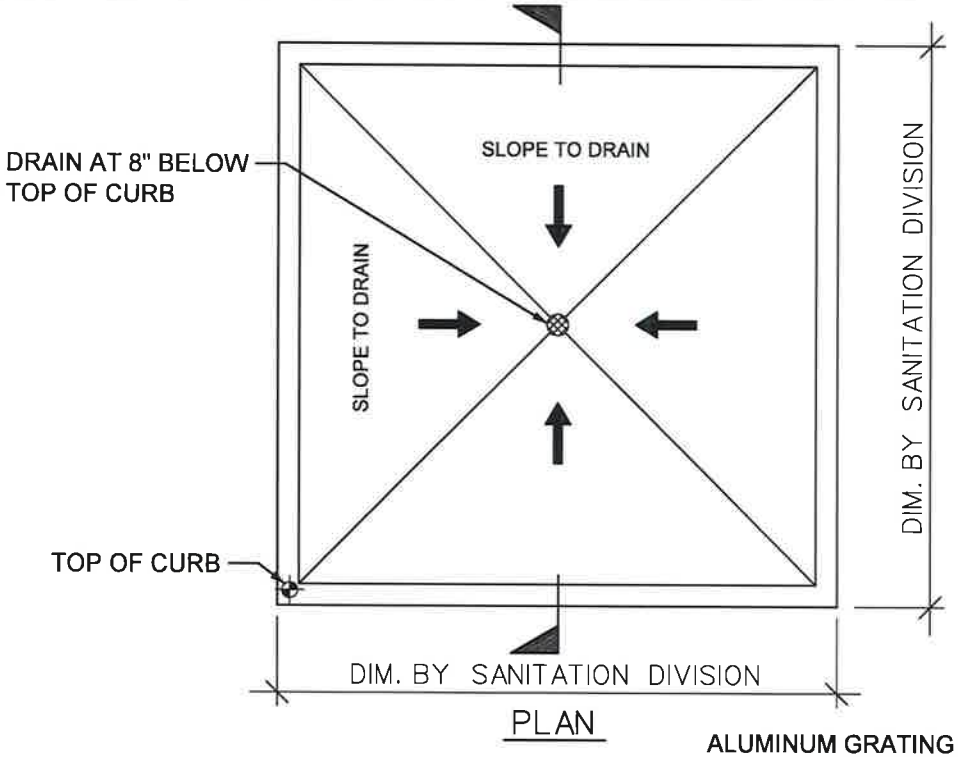
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

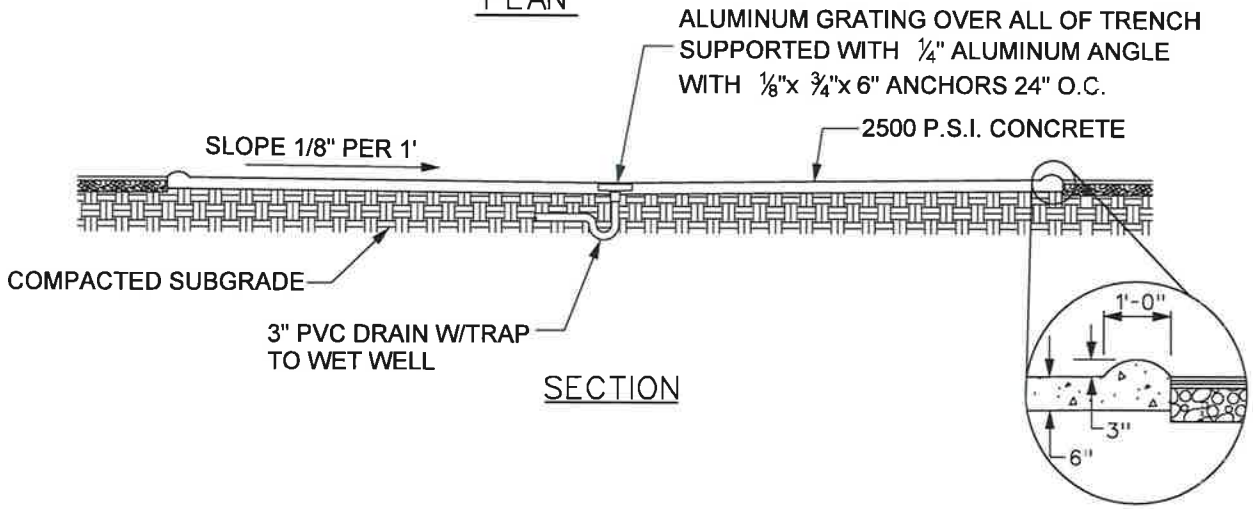
TWO COMPARTMENT GREASE INTERCEPTOR

STD. NO.	SCALE
S-13	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



PLAN



SECTION

NOTES:

1) PAD AREA SHOULD BE NO MORE THAN 50% IN EXCESS OF THE SPACE REQUIRED FOR DUMPSTER OR OTHER SOLID WASTE CONTAINERS.

2) PAD DRAINS, OF NO LESS THAN 3" DIAMETER, SHOULD BE TIED INTO THE SEWER SYSTEM OF THE SITE AND SHALL BE EQUIPPED WITH GOOSE NECK OF DESIGN SUFFICIENT TO BLOCK ODORS FROM THE SANITARY SEWER AND ELIMINATE ANY PATHWAY FOR UNDESIRABLE INSECTS, RODENTS, ETC.

3) PAD DRAINS SHALL BE ROUTED THROUGH A GREASE INTERCEPTOR PRIOR TO CONNECTION TO THE SEWER.

4) SEPARATE WATER AND/OR SEWER TAPS FROM TOWN MAINS WILL NOT BE ALLOWED UNLESS SPECIFICALLY APPROVED BY TOWN OF WINTERVILLE PUBLIC WORKS DIRECTOR.

5) PAD DRAINS ARE REQUIRED ONLY FOR FOOD HANDLING ESTABLISHMENTS, FISH MARKETS, ETC. OR AS OTHERWISE REQUIRED BY THE PITT COUNTY ENVIRONMENTAL HEALTH DEPARTMENT.

6) PAD TO BE LOCATED ON THE LOT AT SUCH A LOCATION AS TO ELIMINATE THE ENTRANCE OF RUNOFF WATER INTO THE PAD DRAIN.

7) LOCATION OF THE PAD MUST BE COORDINATED WITH TOWN OF WINTERVILLE PUBLIC WORKS.

WINTERVILLE NORTH CAROLINA

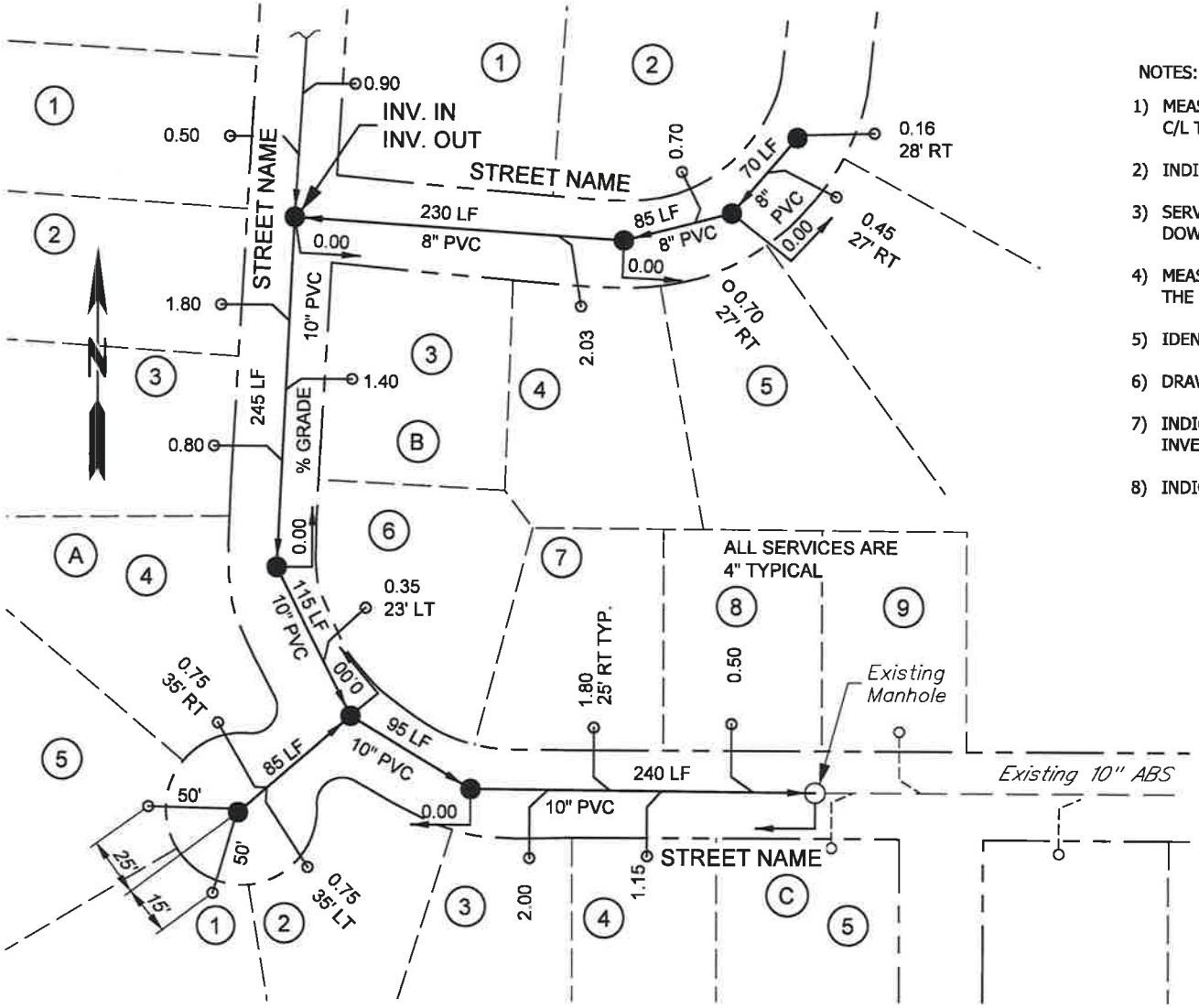
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

TYPICAL DUMPSTER PAD WITH DRAIN

STD. NO.	SCALE
S-14	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



NOTES:

1) MEASUREMENTS ON SEWER LINES ARE MADE FROM C/L TO C/L OF MANHOLES
2) INDICATE CLEANOUTS.
3) SERVICE MEASUREMENTS ARE MADE FROM THE NEAREST DOWNSTREAM MANHOLE.
4) MEASUREMENTS FOR ENDS OF SERVICES SHALL BE FROM THE CENTERLINE OF MAIN.
5) IDENTIFY EACH LOT BY LOT AND BLOCK NUMBER.
6) DRAWING SHALL BE SAME SCALE AS CONSTRUCTION PLANS.
7) INDICATE SEWER LINE GRADE BETWEEN EACH MANHOLE AND INVERTS
8) INDICATE R/W. CURB & GUTTER AND/OR PAVEMENT WIDTH.

WINTERVILLE
NORTH CAROLINA

TOWN OF WINTERVILLE

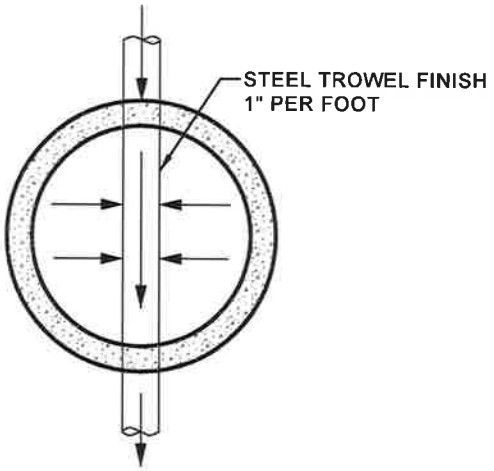
PUBLIC WORKS DEPARTMENT
2571 Railroad St. Winterville, NC 28590

TYPICAL SEWER SYSTEM "AS BUILT"

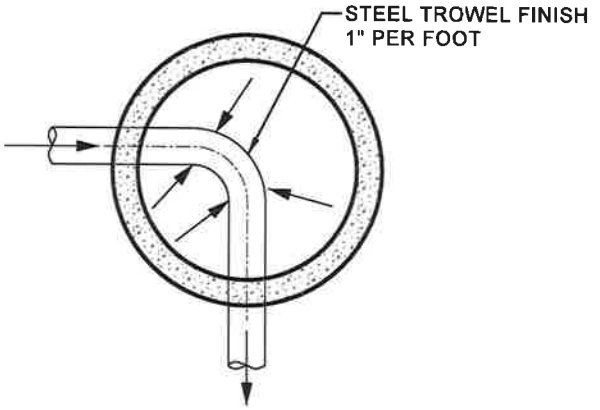
STD. NO.	SCALE
S-15	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

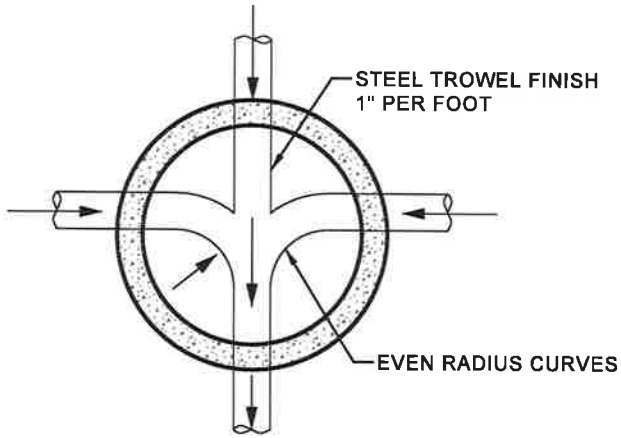
INVERTS FOR SERVICE LINE
IN MANHOLE HANDLED SAME
AS CARRIER PIPE



STRAIGHT



2 - WAY
INTERSECTION



3 OR 4 WAY
INTERSECTION

NOTE:

ACCURATELY SHAPE THE INVERTS TO A SMOOTH SEMI-CIRCLE CONFORMING TO THE INSIDE CONTOUR OF THE ADJACENT SEWER SECTIONS. ALL ENTERING BRANCHES AND CHANGES IN DIRECTIONS SHALL BE FORMED BY A CIRCULAR CURVE IN THE INVERT OF AS LARGE A RADIUS AS THE SIZE OF MANHOLE WILL PERMIT. CHANGES IN SIZE AND GRADE OF THE CHANNELS SHALL BE MADE GRADUALLY AND EVENLY. THE INVERT CHANNELS SHALL BE FORMED DIRECTLY IN THE CONCRETE OF THE MANHOLE BASE, OR SHALL BE BUILT UP WITH BRICK AND MORTAR. THE FLOOR OF THE MANHOLE OUTSIDE THE CHANNELS SHALL BE SMOOTH AND SHALL SLOPE TOWARD THE CHANNELS NOT LESS THAN 1 INCH PER FOOT NOR MORE THAN 2 INCHES PER FOOT.

WINTERVILLE
NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT
2571 Railroad St. Winterville, NC 28590

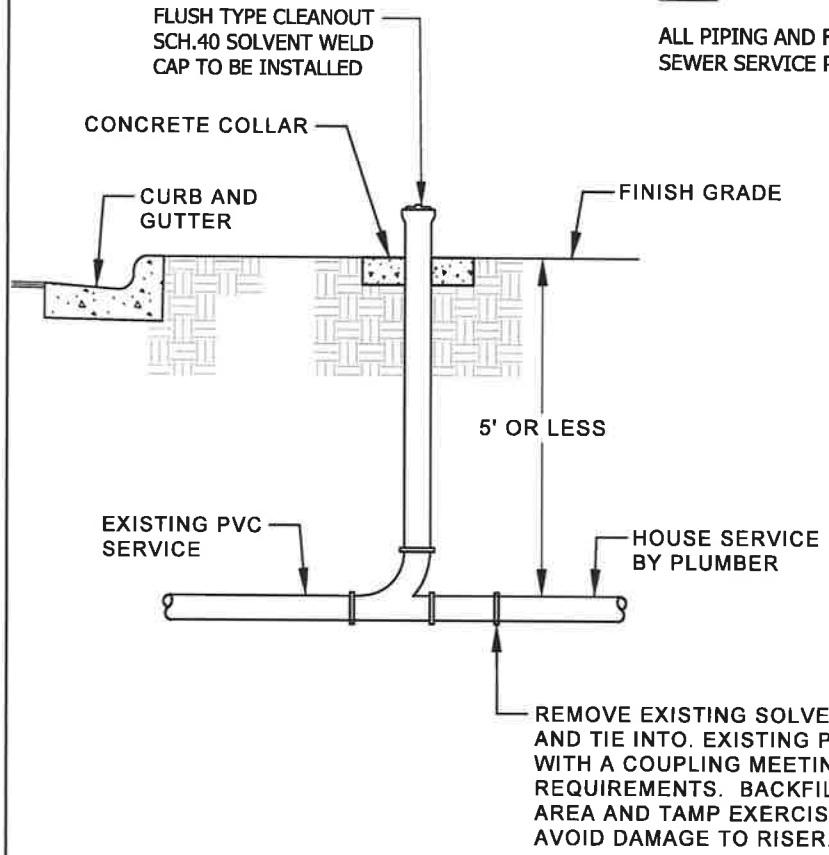
MANHOLE INVERTS

STD. NO.	SCALE
S-16	N.T.S
SHEET	DATE
1 OF 1	5-31-19

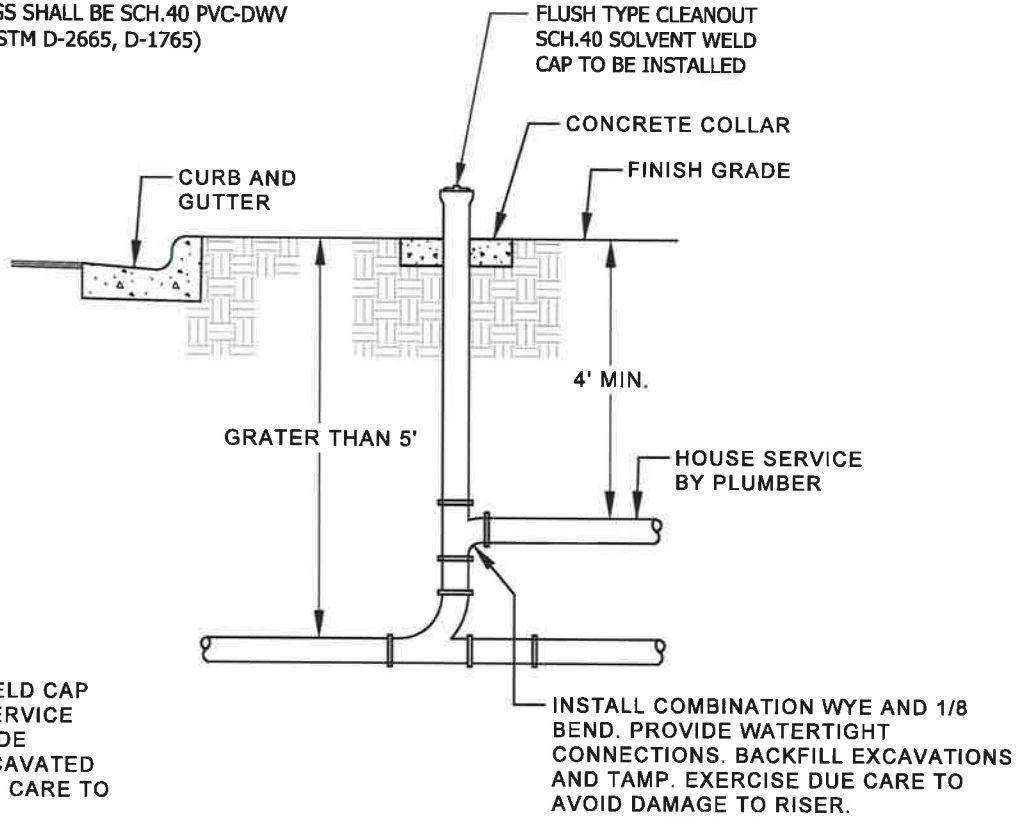
REVISIONS		
NO	DATE	COMMENT

NOTE:

ALL PIPING AND FITTINGS SHALL BE SCH.40 PVC-DWV SEWER SERVICE PIPE (ASTM D-2665, D-1765)



CONNECTION TO SEWER SERVICE 5' OR LESS IN DEPTH



CONNECTION TO SEWER SERVICE 5' GREATER THAN 5' IN DEPTH

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

PVC SEWER SERVICE CONNECTION

STD. NO.	SCALE
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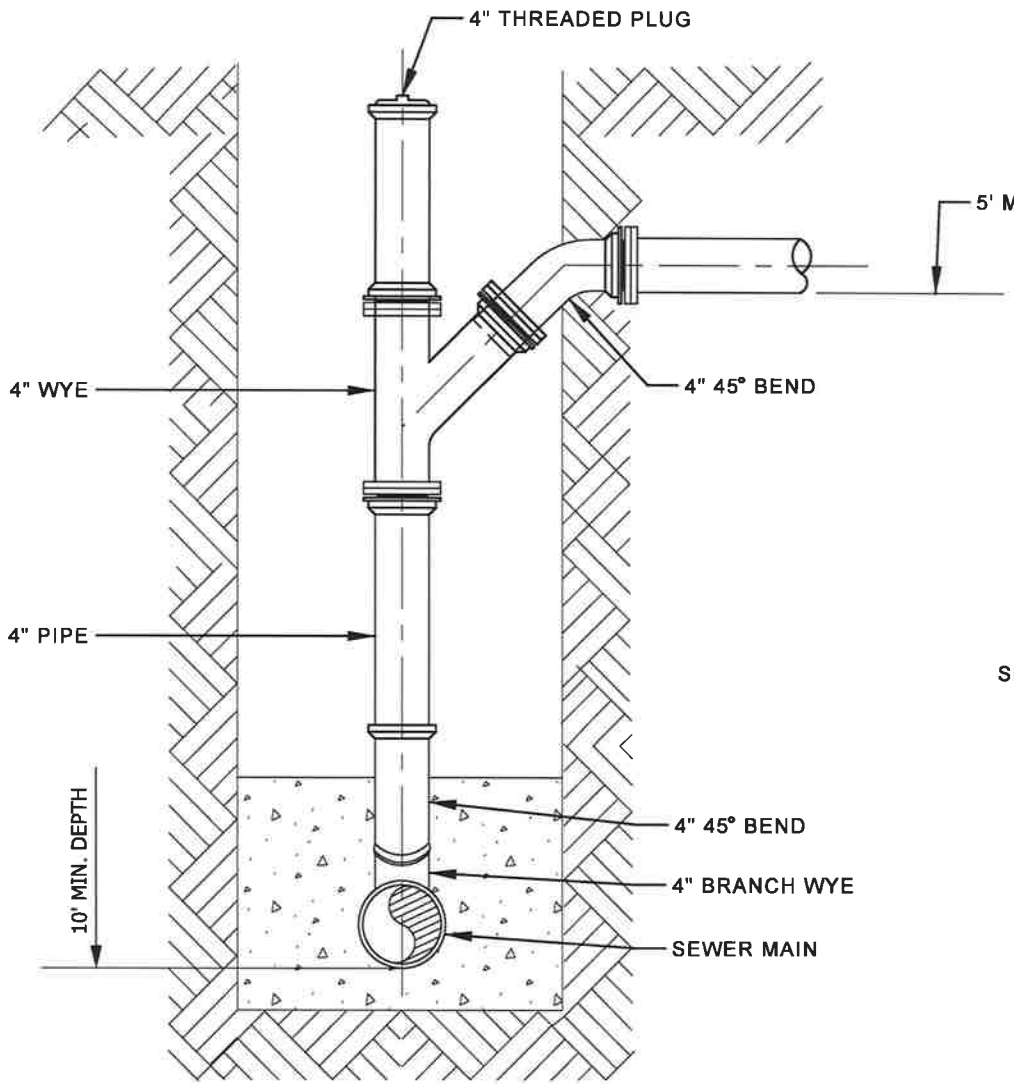
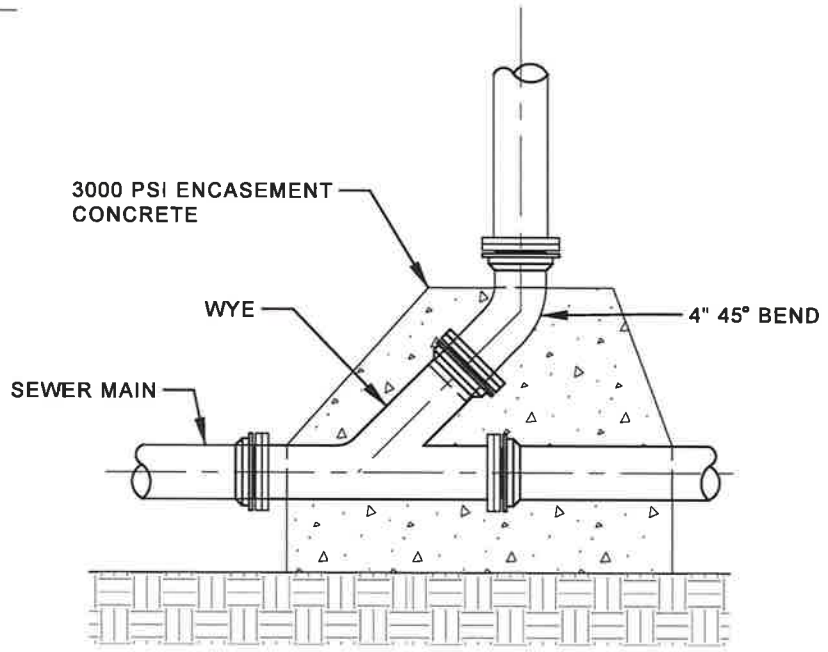
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT





TOWN OF WINTERVILLE

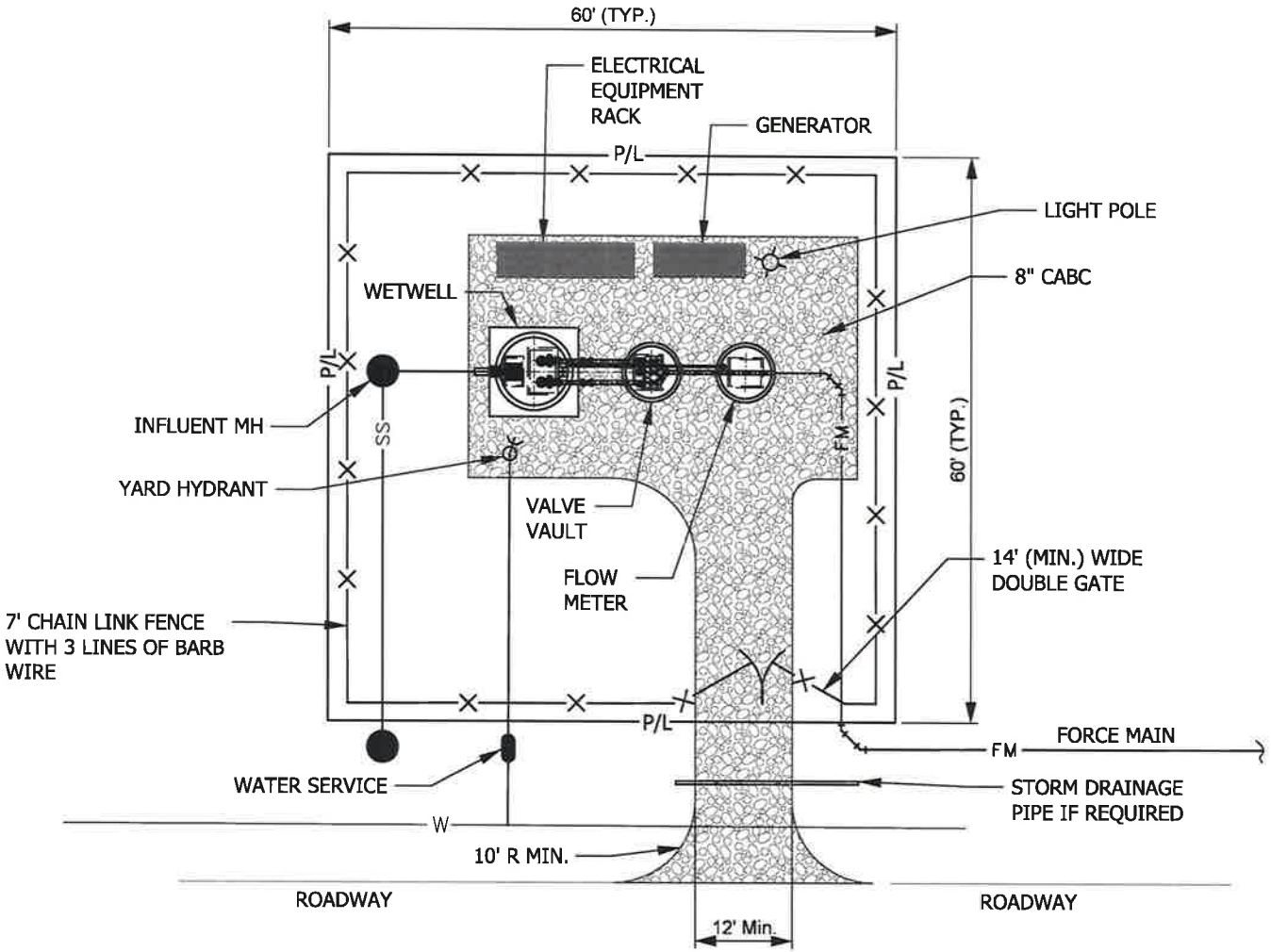
PUBLIC WORKS DEPARTMENT

2571 Railroad St. Winterville, NC 28590

VERTICAL STACK SEWER SERVICE

STD. NO.	SCALE
S-18	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



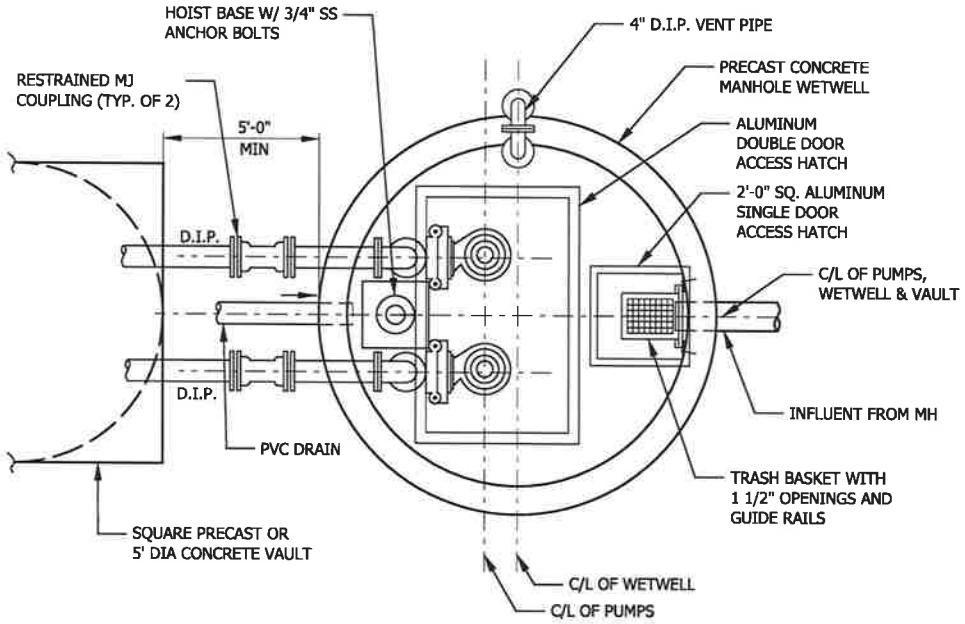
SITE PLAN

NOTES:

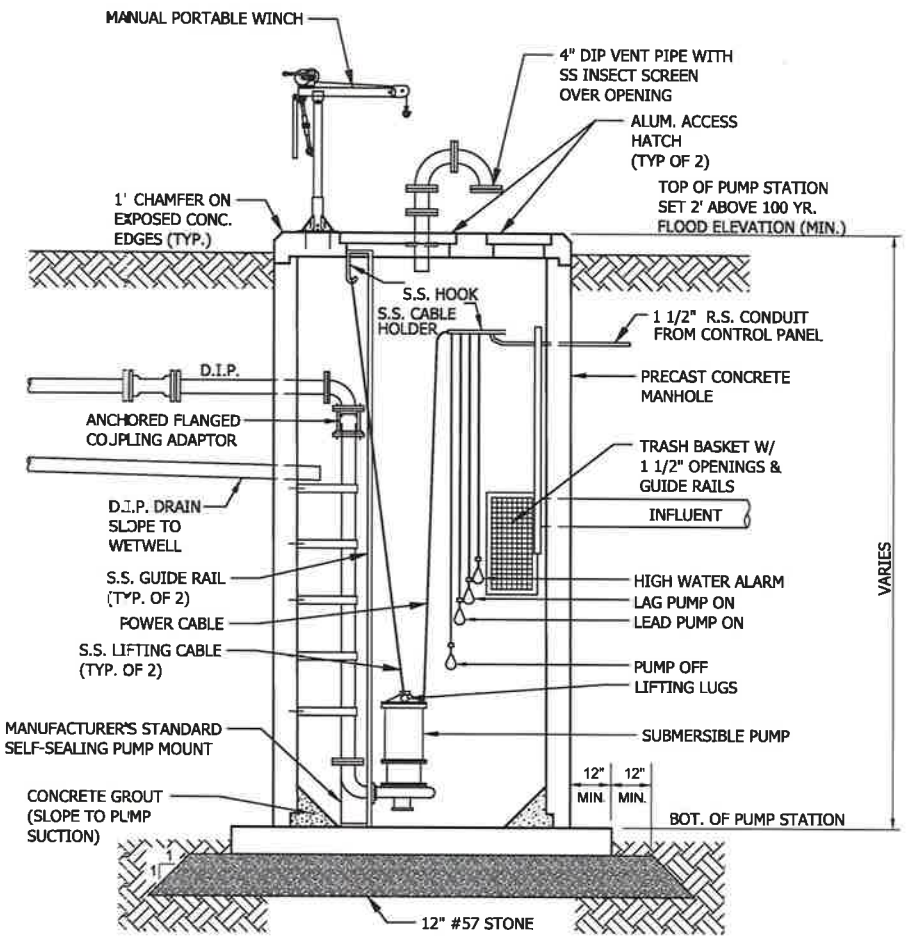
1) ORIENTATION OF COMPONENTS MAY BE ADJUSTED TO SUIT SITE CONDITIONS.

2) MAINTAIN REQUIRED SEPARATION BETWEEN SEWER AND WATER LINES.

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **S-19**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	STANDARD SEWER PUMP STATION - (PLAN VIEW)	SHEET 1 OF 4	DATE 5-31-19	



PLAN VIEW

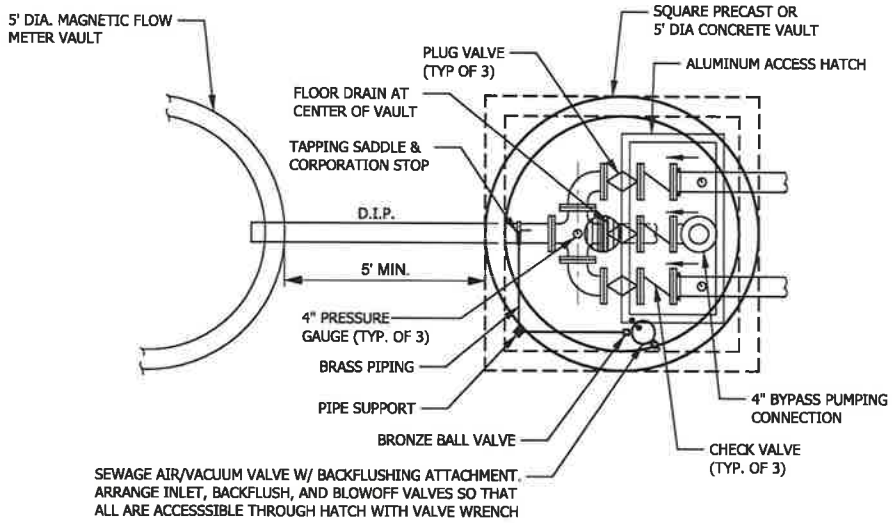


SECTION VIEW

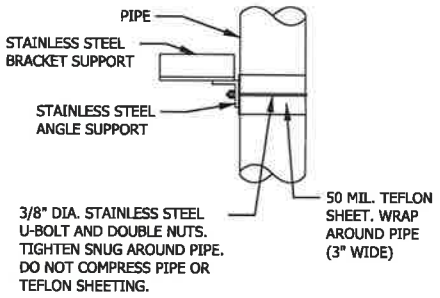
NOTES:

1) USE D.I.P. THROUGHOUT THE PUMP STATION.
2) ACCESS HATCHES TO BE SIZED TO FACILITATE THE EASY REMOVAL OF PUMPS, VALVES, ETC.
3) FINAL DESIGN AND LAYOUT OF ALL PUMP STATIONS MUST BE APPROVED BY THE TOWN.

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St Winterville, NC 28590	STD. NO. **S-20**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	STANDARD SEWER PUMP STATION - (WETWELL LAYOUT VIEW)	SHEET 2 OF 4	DATE 5-31-19	



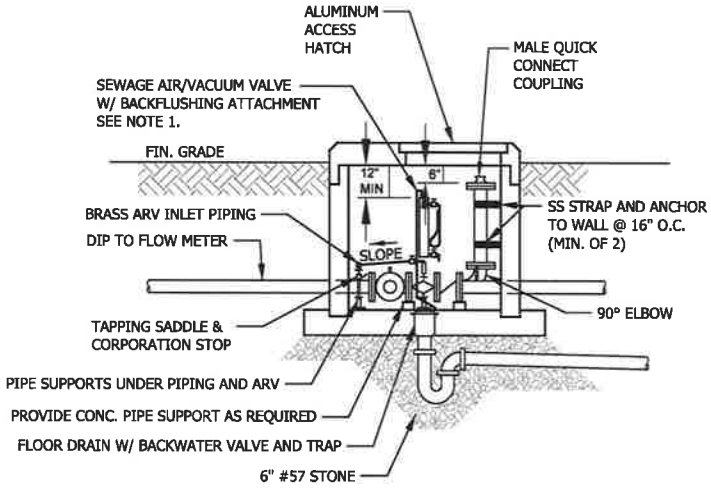
PLAN VIEW



STAINLESS STEEL PIPE SUPPORT STRAP

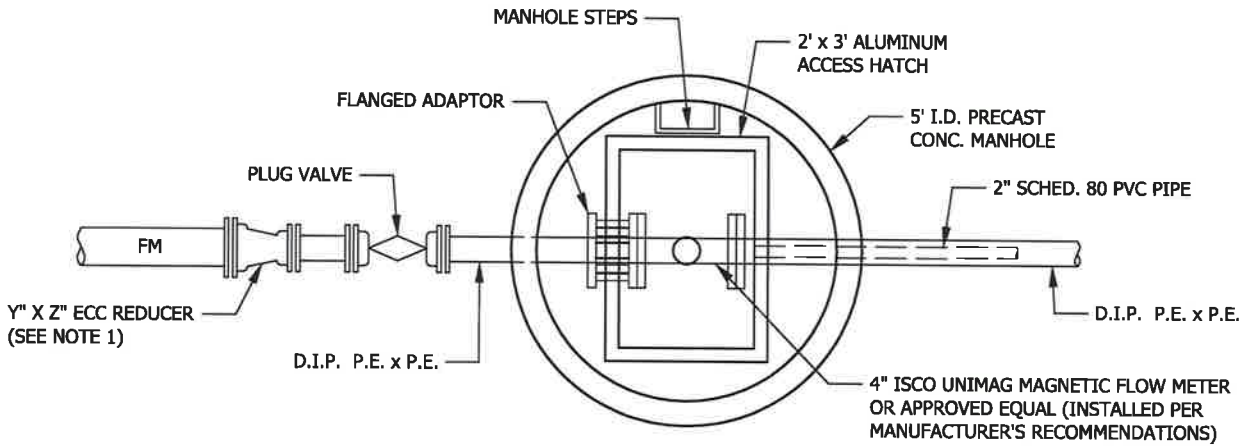
NOTES:

1) VALVE VAULT EFFLUENT PIPING IS SHOWN FOR A FORCE MAIN ON A DOWNWARD SLOPE AWAY FROM PUMP STATION. FOR A FORCE MAIN ON AN UPWARD SLOPE AWAY FROM PUMP STATION, THE DESIGNER MAY CONSIDER ROTATING THE ECCENTRIC REDUCER (IF USED) AND DELETING THE ARV.

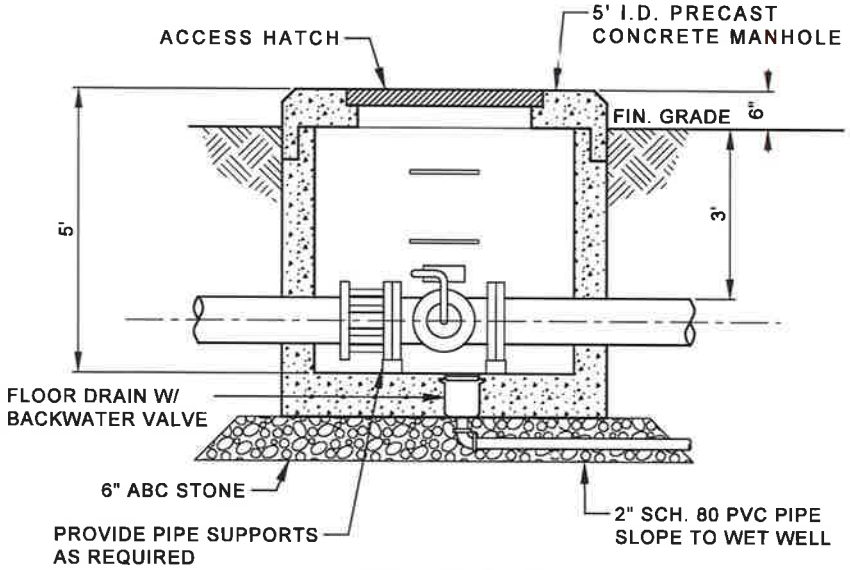


SECTION VIEW

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **S-21**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	STANDARD SEWER PUMP STATION - (VALVE VAULT LAYOUT VIEW)	SHEET 3 OF 4	DATE 5-31-19	



PLAN VIEW



SECTION VIEW

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

STANDARD SEWER PUMP STATION - (FLOW METER LAYOUT VIEW)

STD. NO.	SCALE
S-22	N.T.S
SHEET	DATE
4 OF 4	5-31-19

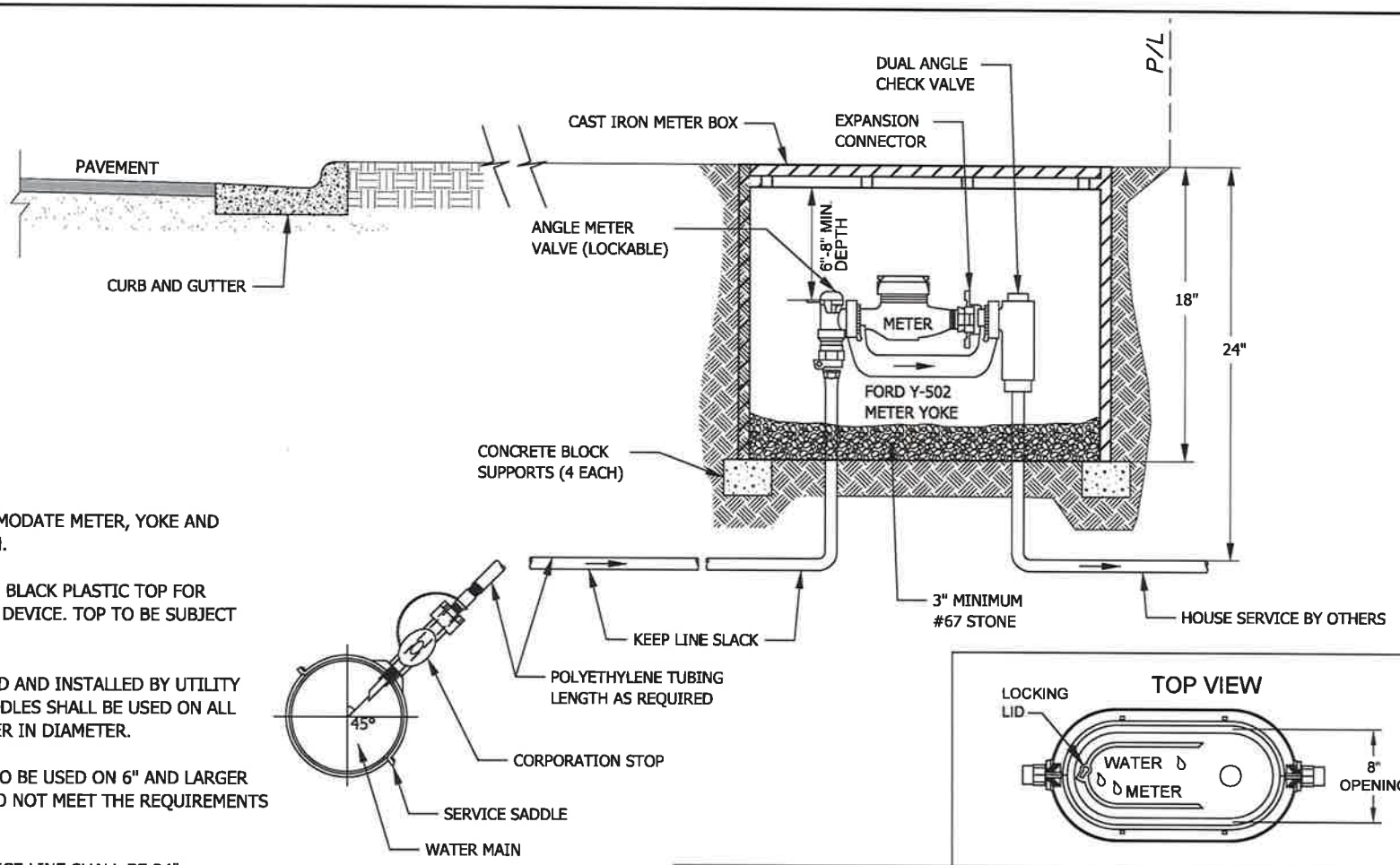
REVISIONS		
NO	DATE	COMMENT

Section 2

Water Distribution System

Standard Detail Index

SECTION 2 - WATER DISTRIBUTION SYSTEM



NOTES:

1) BOX TO BE SIZED TO ACCOMMODATE METER, YOKE AND VALVES. 18" MINIMUM DEPTH.

2) CAST IRON METER BOX WITH BLACK PLASTIC TOP FOR INSERTING METER READING DEVICE. TOP TO BE SUBJECT TO TRAFFIC LOADS.

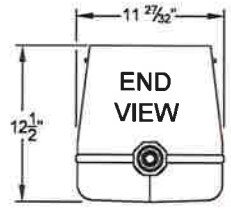
3) METER BOX TO BE FURNISHED AND INSTALLED BY UTILITY CONTRACTORS. SERVICE SADDLES SHALL BE USED ON ALL WATER LINES 4" AND SMALLER IN DIAMETER.

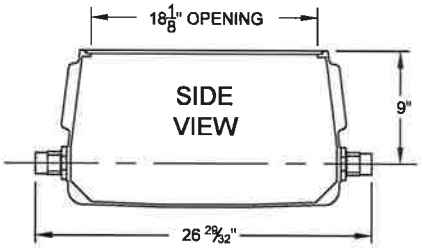
4) SERVICE SADDLES SHALL ALSO BE USED ON 6" AND LARGER PVC WATER MAINS WHICH DO NOT MEET THE REQUIREMENTS OF AWWA C-900, CLASS 150.

5) MINIMUM COVER OVER SERVICE LINE SHALL BE 24".

6) BOX AND LID SHALL BE CAST GRAY IRON, ASTM A48, CLASS 25 OR ASTM A126 CLASS B. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.

7) CASTING SHALL BE FREE OF BLOW-HOLES, SHRINKAGE, OR OTHER IMPERFECTIONS NOT TRUE TO PATTERN.





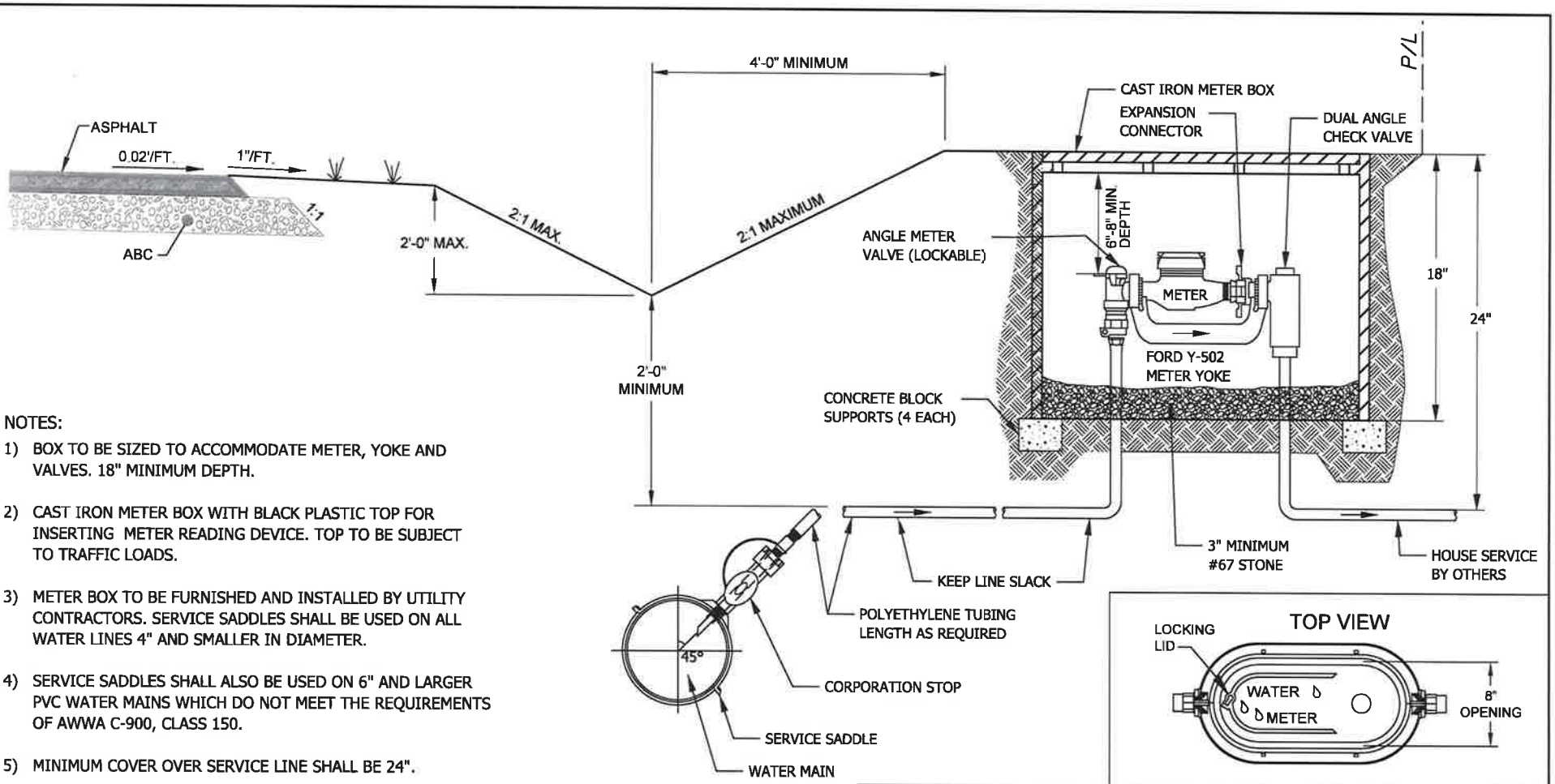
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT — 2571 Railroad St. Winterville, NC 28590

1" WATER SERVICE FOR AREAS WITH CURB AND GUTTER

STD. NO.	SCALE
W-1	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



NOTES:

1) BOX TO BE SIZED TO ACCOMMODATE METER, YOKE AND VALVES. 18" MINIMUM DEPTH.

2) CAST IRON METER BOX WITH BLACK PLASTIC TOP FOR INSERTING METER READING DEVICE. TOP TO BE SUBJECT TO TRAFFIC LOADS.

3) METER BOX TO BE FURNISHED AND INSTALLED BY UTILITY CONTRACTORS. SERVICE SADDLES SHALL BE USED ON ALL WATER LINES 4" AND SMALLER IN DIAMETER.

4) SERVICE SADDLES SHALL ALSO BE USED ON 6" AND LARGER PVC WATER MAINS WHICH DO NOT MEET THE REQUIREMENTS OF AWWA C-900, CLASS 150.

5) MINIMUM COVER OVER SERVICE LINE SHALL BE 24".

6) METER BOX SHALL NOT BE INSTALLED IN SLOPE OF DITCH.

7) BOX AND LID SHALL BE CAST GRAY IRON, ASTM A48, CLASS 25 OR ASTM A126 CLASS B. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.

8) CASTING SHALL BE FREE OF BLOW-HOLES, SHRINKAGE, OR OTHER IMPERFECTIONS NOT TRUE TO PATTERN.

WINTERVILLE
NORTH CAROLINA

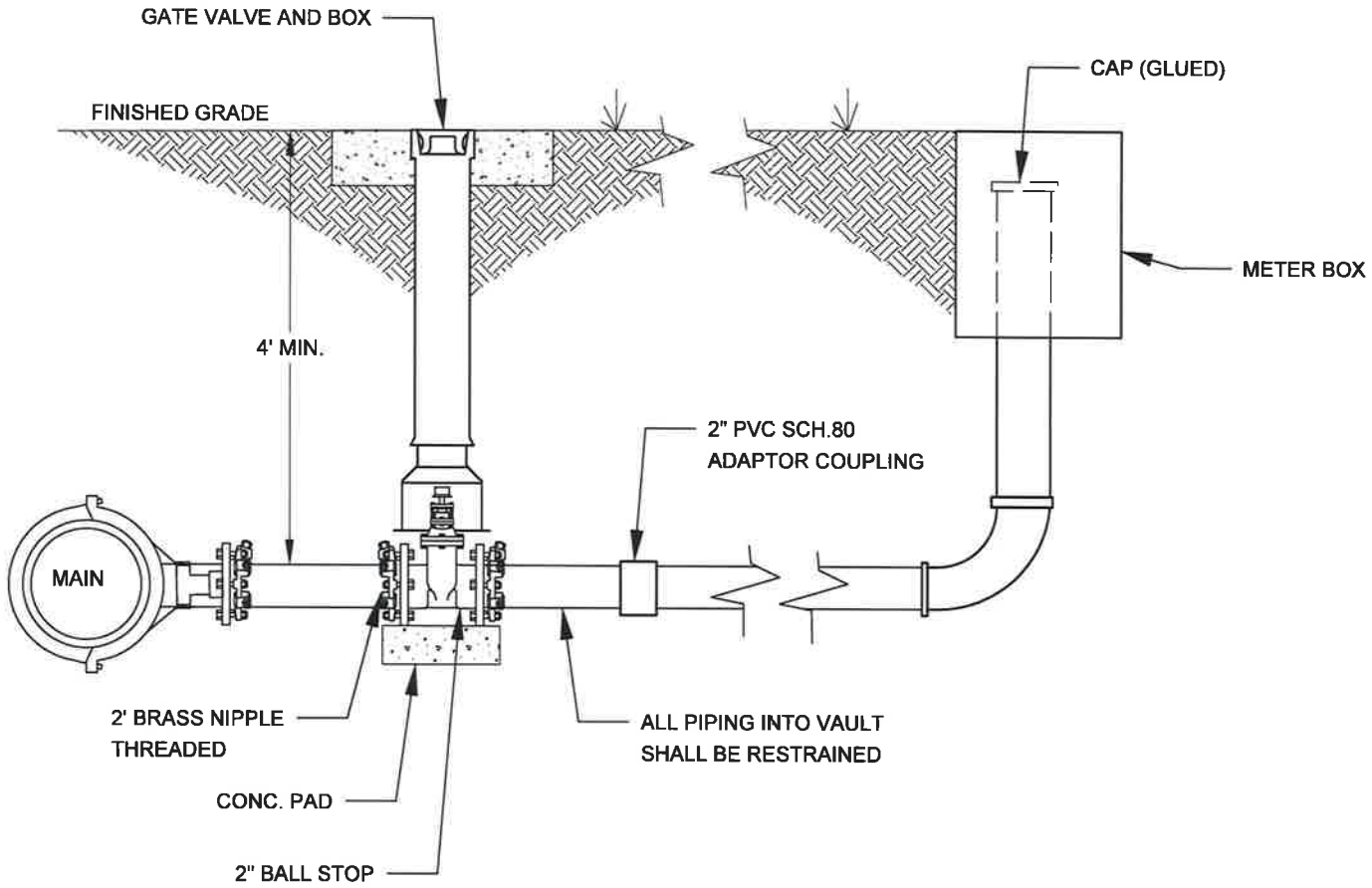
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT
2571 Railroad St. Winterville, NC 28590

1" WATER SERVICE FOR AREAS WITHOUT CURB AND GUTTER

STD. NO.	SCALE
W-2	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT

2571 Railroad St. Winterville, NC 28590

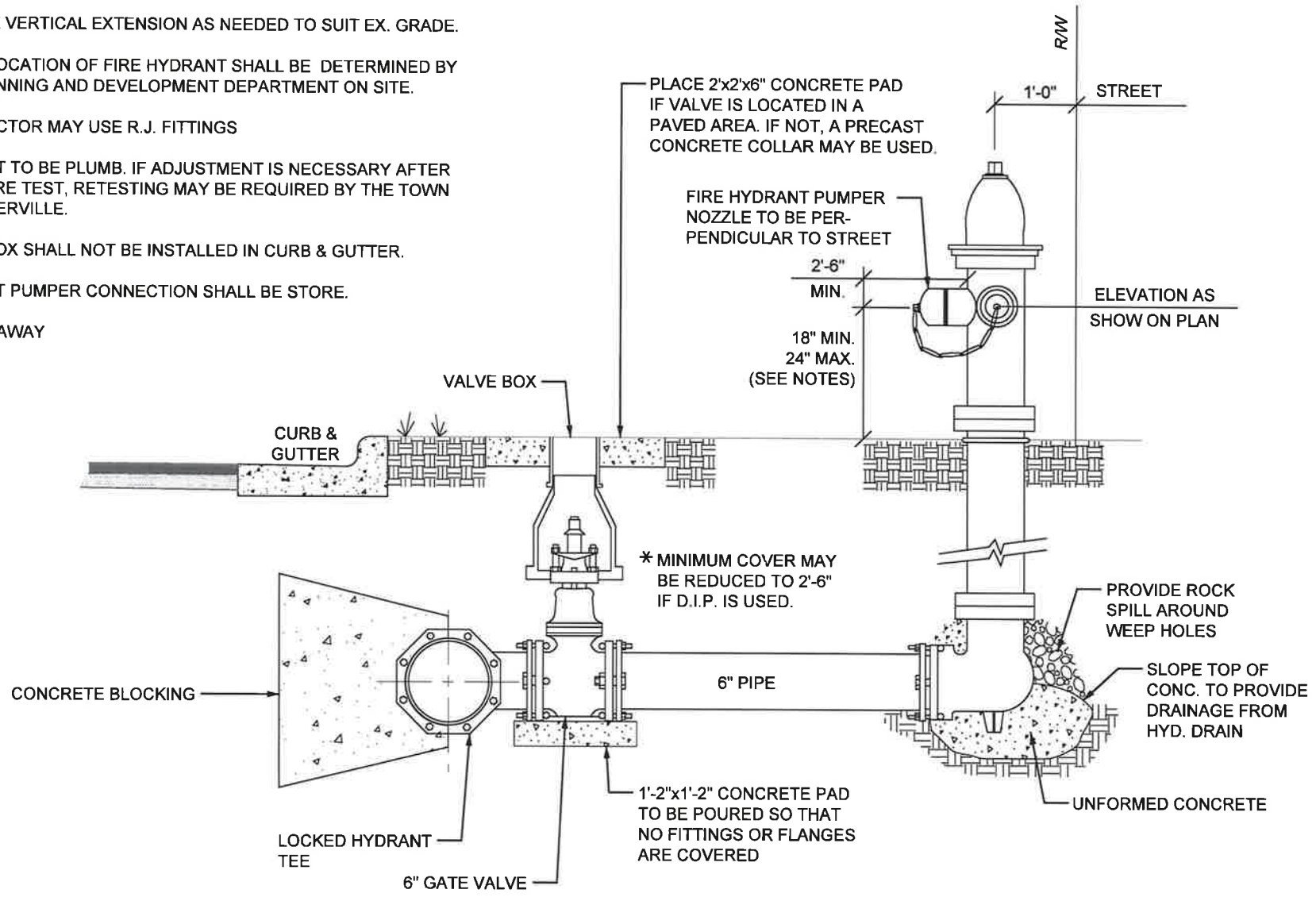
TYPICAL 1½"-2" WATER SERVICE CONNECTION

STD. NO.	SCALE
W-3	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

NOTES:

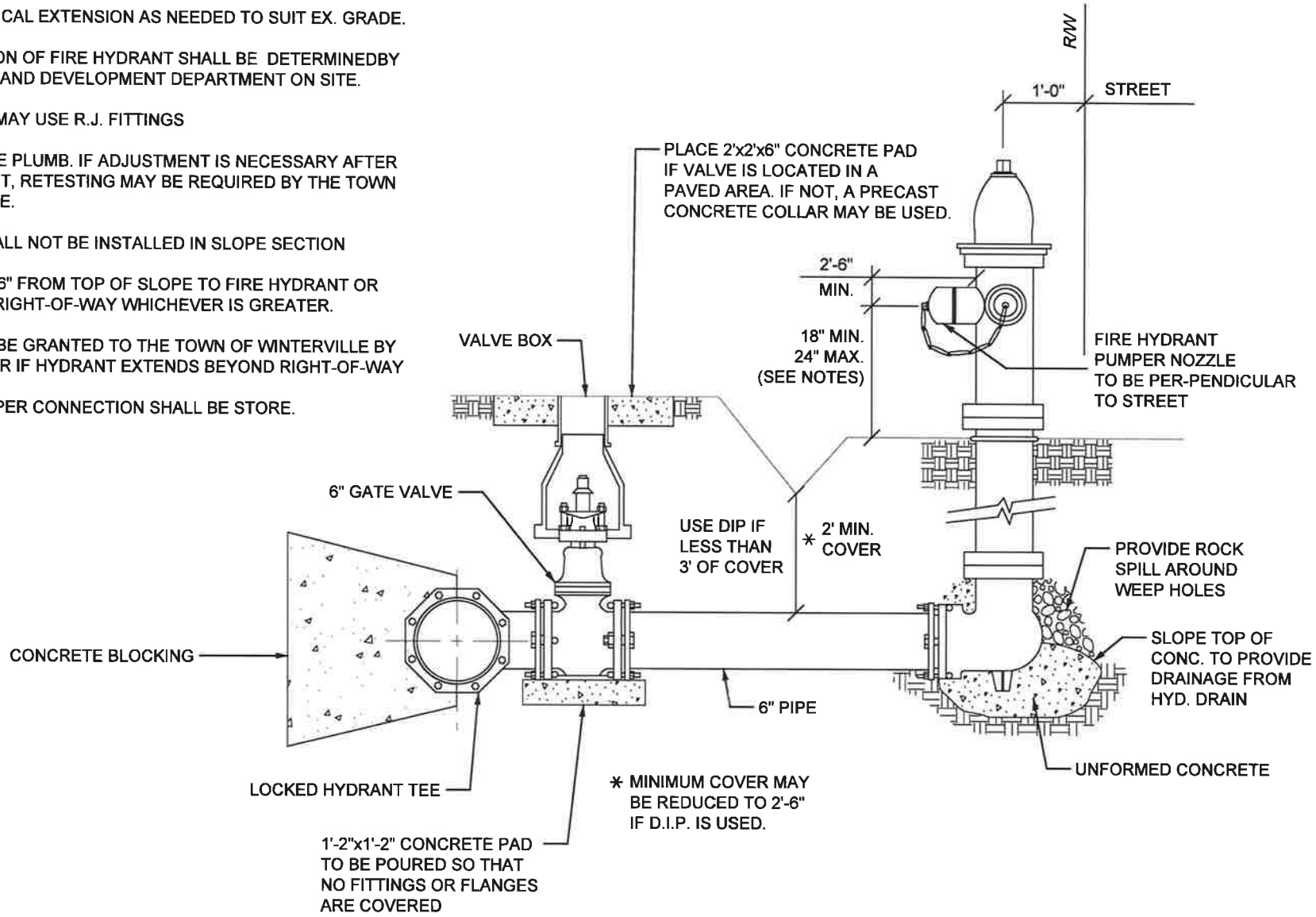
1. PROVIDE VERTICAL EXTENSION AS NEEDED TO SUIT EX. GRADE.
2. EXACT LOCATION OF FIRE HYDRANT SHALL BE DETERMINED BY THE PLANNING AND DEVELOPMENT DEPARTMENT ON SITE.
3. CONTRACTOR MAY USE R.J. FITTINGS
4. HYDRANT TO BE PLUMB. IF ADJUSTMENT IS NECESSARY AFTER PRESSURE TEST, RETESTING MAY BE REQUIRED BY THE TOWN OF WINTERVILLE.
5. VALVE BOX SHALL NOT BE INSTALLED IN CURB & GUTTER.
6. HYDRANT PUMPER CONNECTION SHALL BE STORE.
7. BREAK - AWAY



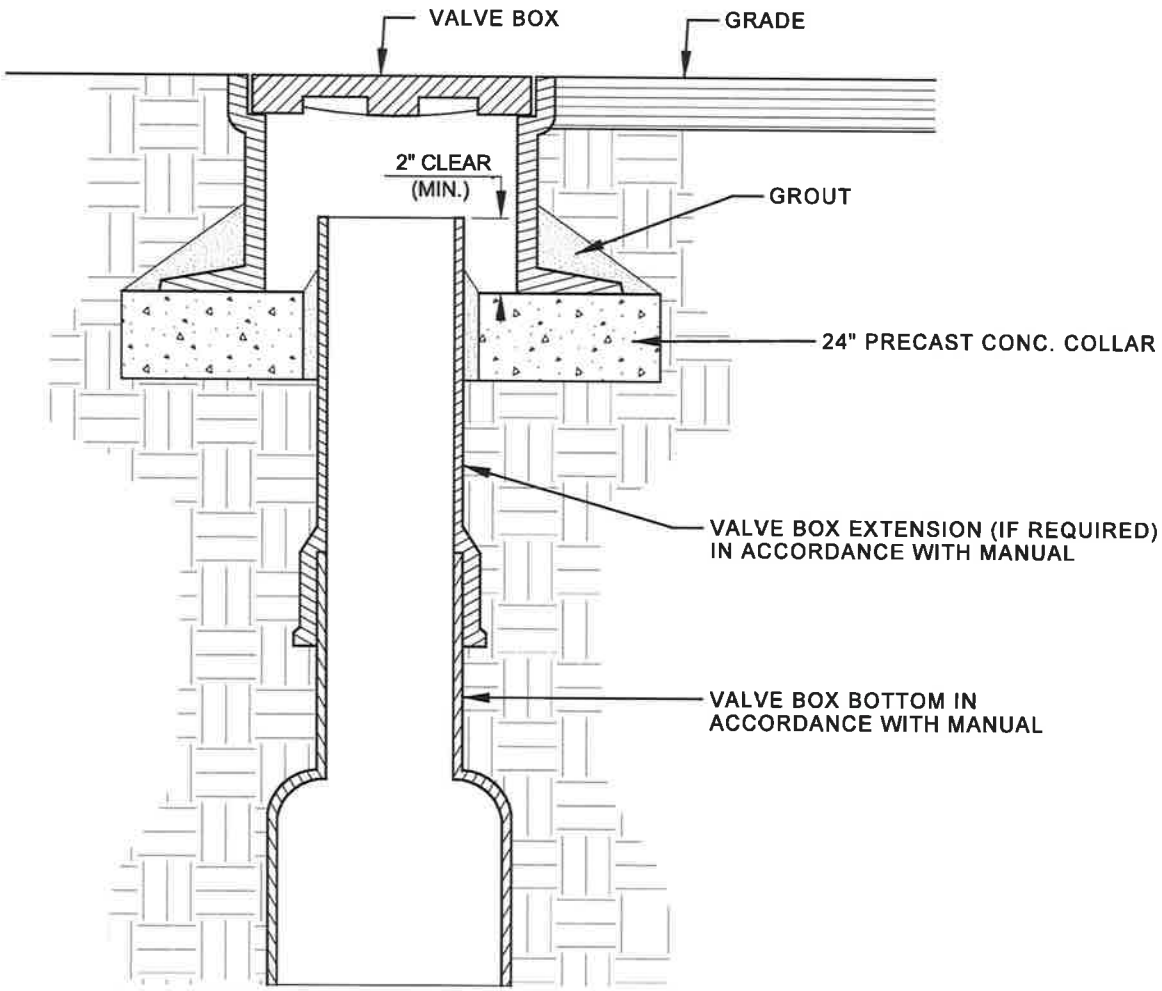
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **FIRE HYDRANT INSTALLATION (FOR AREAS WITH CURB & GUTTER)**	STD. NO. **W-4**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
		SHEET 1 OF 1	DATE 5-31-19	

NOTES:

1. PROVIDE VERTICAL EXTENSION AS NEEDED TO SUIT EX. GRADE.
2. EXACT LOCATION OF FIRE HYDRANT SHALL BE DETERMINEDBY THE PLANNING AND DEVELOPMENT DEPARTMENT ON SITE.
3. CONTRACTOR MAY USE R.J. FITTINGS
4. HYDRANT TO BE PLUMB. IF ADJUSTMENT IS NECESSARY AFTER PRESSURE TEST, RETESTING MAY BE REQUIRED BY THE TOWN OF WINTERVILLE.
5. VALVE BOX SHALL NOT BE INSTALLED IN SLOPE SECTION
6. MINIMUM OF 2'-6" FROM TOP OF SLOPE TO FIRE HYDRANT OR EXTENDED TP RIGHT-OF-WAY WHICHEVER IS GREATER.
7. EASEMENT TO BE GRANTED TO THE TOWN OF WINTERVILLE BY THE DEVELOPER IF HYDRANT EXTENDS BEYOND RIGHT-OF-WAY
8. HYDRANT PUMPER CONNECTION SHALL BE STORE.
9. BREAK - AWAY



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **FIRE HYDRANT INSTALLATION (FOR AREAS WITHOUT CURB & GUTTER)**	STD. NO. **W-5** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS: NO / DATE / COMMENT



TOWN OF WINTERVILLE

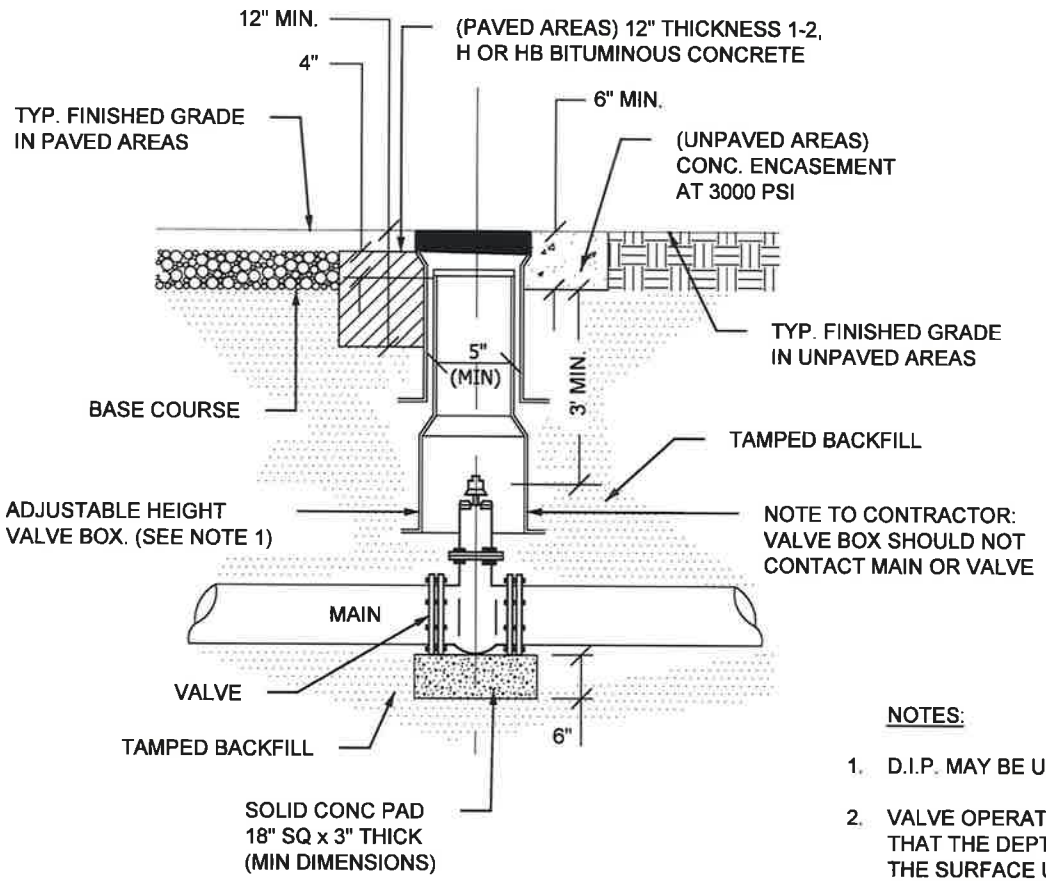
PUBLIC WORKS DEPARTMENT

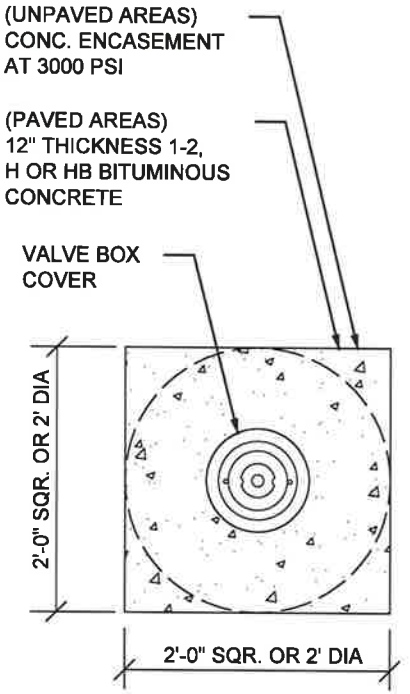
2571 Railroad St. Winterville, NC 28590

VALVE BOX DETAIL FOR VALVES 12" AND LARGER

STD. NO.	SCALE
W-6	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT





NOTES:

1. D.I.P. MAY BE USED FOR VALVE BOX EXTENSIONS.
2. VALVE OPERATING NUT MUST BE EXTENDED SO THAT THE DEPTH IS NO GREATER THAN 5' FROM THE SURFACE USING A MANUFACTURER APPROVED EXTENSION KIT.
3. PRECAST CONCRETE ENCASEMENT IS ALLOWED OUTSIDE OF THE PAVED AREAS.
4. VALVE BOX SHALL BE IN ACCORDANCE WITH MANUAL.
5. VALVE BOX SHALL BE CENTERED AND PLUMBED OVER VALVE

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

VALVE BOX DETAIL FOR VALVES SMALLER THAN 12"

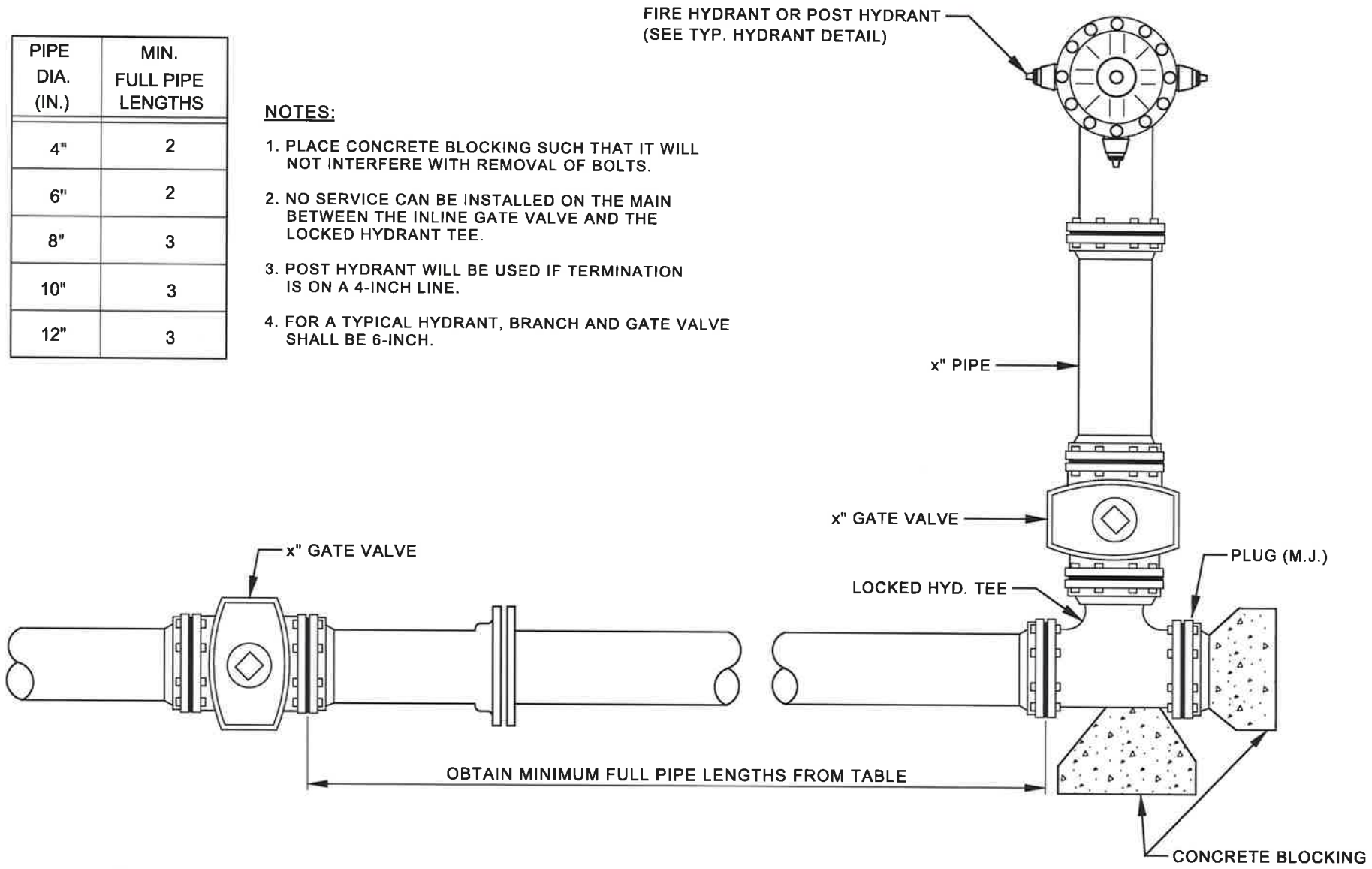
STD. NO.	SCALE
W-7	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

PIPE DIA. (IN.)	MIN. FULL PIPE LENGTHS
4"	2
6"	2
8"	3
10"	3
12"	3

NOTES:

1. PLACE CONCRETE BLOCKING SUCH THAT IT WILL NOT INTERFERE WITH REMOVAL OF BOLTS.
2. NO SERVICE CAN BE INSTALLED ON THE MAIN BETWEEN THE INLINE GATE VALVE AND THE LOCKED HYDRANT TEE.
3. POST HYDRANT WILL BE USED IF TERMINATION IS ON A 4-INCH LINE.
4. FOR A TYPICAL HYDRANT, BRANCH AND GATE VALVE SHALL BE 6-INCH.



WINTERVILLE
NORTH CAROLINA

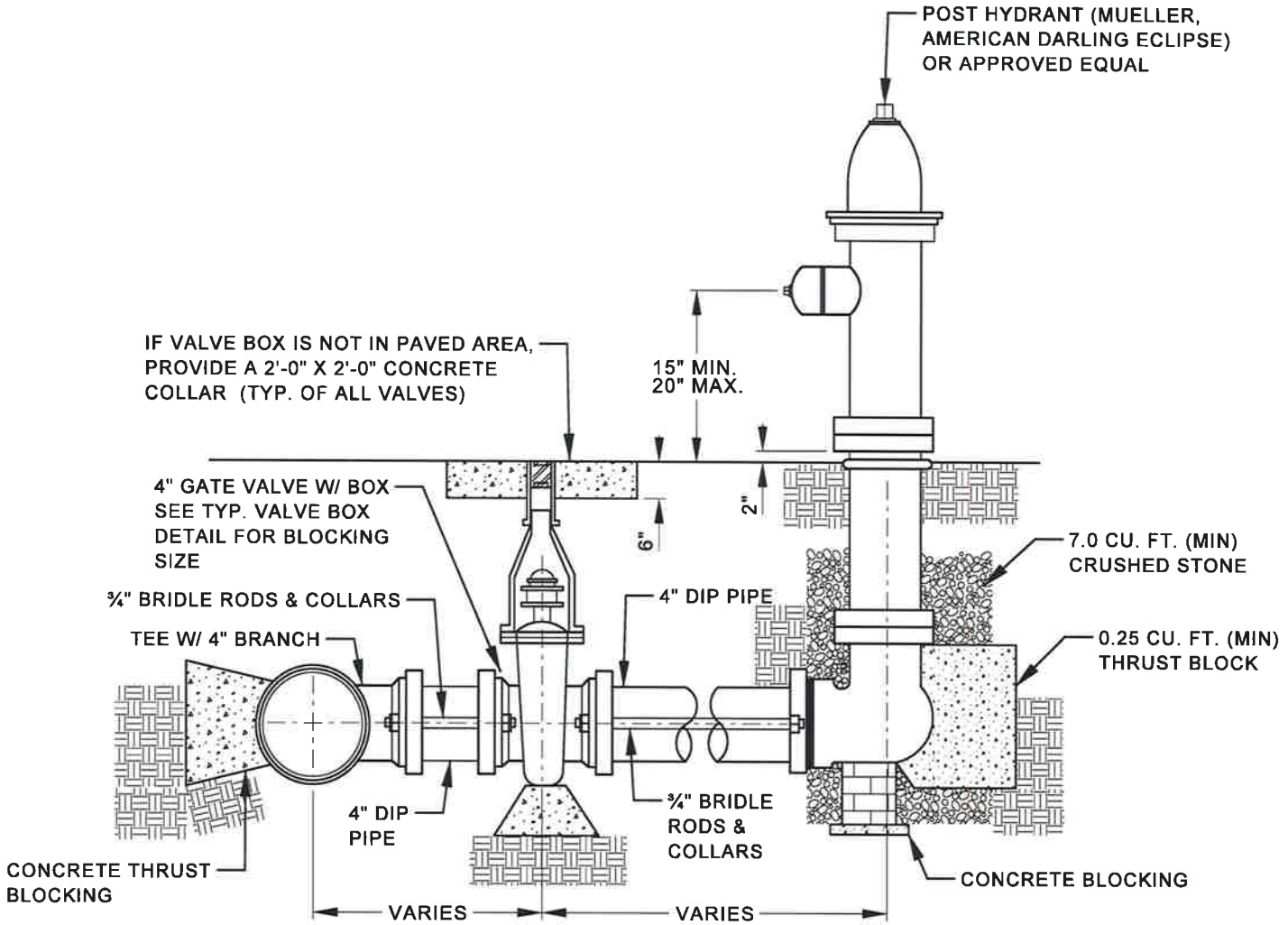
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT
2571 Railroad St. Winterville, NC 28590

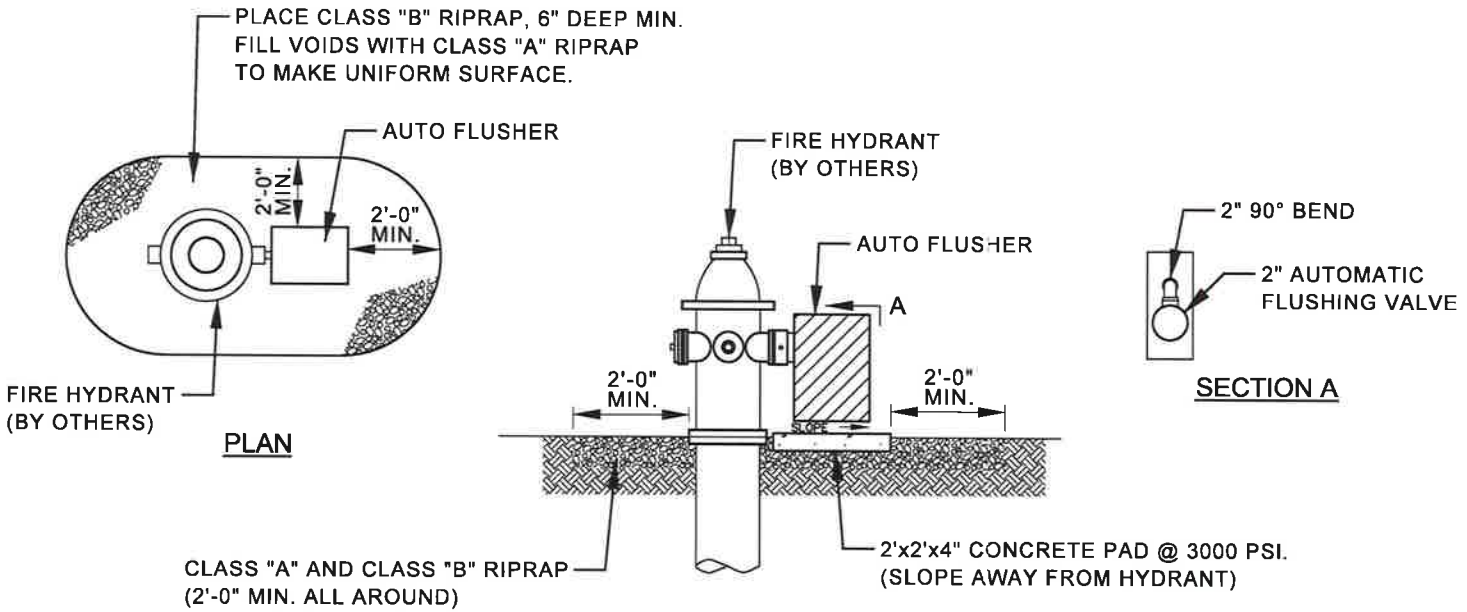
TERMINATION OF 4" - 12" WATER MAIN

STD. NO.	SCALE
W-8	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **W-9**	SCALE N.T.S	REVISIONS	
	POST HYDRANT	SHEET 1 OF 1	DATE 5-31-19	NO / DATE / COMMENT	



NOTES:

1. AUTOMATIC FLUSHING DEVICES SHALL BE ATTACHED TO HYDRANT IN THE FOLLOWING LOCATIONS AS SHOWN ON PLANS.
2. A 2-1/2" NST SWIVEL CONNECTION WILL LEAD INTO A 2" AUTOMATIC SOLENOID VALVE.
3. AUTOMATIC SOLENOID VALVE SHALL HAVE INTERNAL,SELF-CLEANING DEBRIS SCREEN, AND HAVE A 220 PSI RATING.
4. EACH UNIT SHALL BE FURNISHED WITH A STAND-ALONE VALVE CONTROLLER.
5. VALVE CONTROLLER WILL NOT REQUIRE A SECOND HAND HELD DEVICE FOR PROGRAMMING, MUST HAVE A MINIMUM CAPABILITY OF 9 POSSIBLE FLUSHING CYCLES PER DAY FOR UP TO FOUR HOURS EACH FLUSH, SHALL BE SUBMERSIBLE TO 12 FEET, OPERATE WITH A 9 VOLT BATTERY, AND HAVE RESIN-SEALED ELECTRICAL COMPONENTS.
6. SOLENOID SHALL HAVE NO LOOSE PARTS WHEN REMOVED FROM VALVE.
7. ALL COMPONENTS SHALL BE HOUSED INSIDE AN ALUMINUM, LOCKABLE ENCLOSURE, WITH PERFORATIONS IN BOX FLOOR TO DIFFUSE FLUSHING WATER.
8. REMOVABLE FLOOR PLATE SHALL ALLOW TO A 2" FIP OUTLET IF NEEDED.
9. EACH BOX SHALL BE POWDER-COATED, AND COLOR SHALL MATCH FIRE HYDRANT COLOR.

WINTERVILLE
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2" AUTOMATIC FLUSHING DEVICE

STD. NO.	SCALE
W-10	N.T.S
SHEET	DATE
1 OF 1	5-31-19

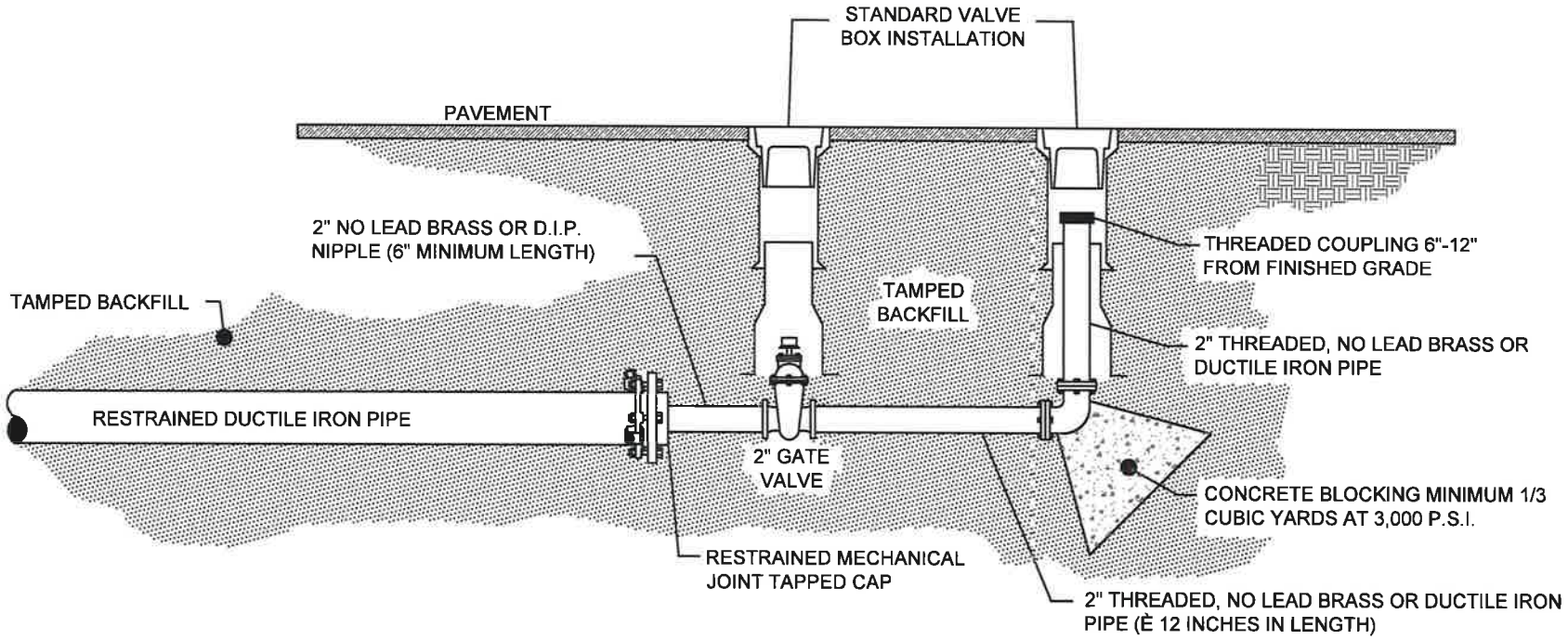
REVISIONS		
NO	DATE	COMMENT

MAIN SIZE	END PIPE SIZE
4" - 12"	2" BLOW-OFF
14" & GREATER	AS APPROVED BY TOWN

NOTES:

1) FOR MAINS THAT ARE TO BE EXTENDED, USE A VALVE EQUAL TO THE MAIN SIZE AS THE BLOW-OFF VALVE AND THEN REDUCE TO THE 2 INCH STANDPIPE.

2) PIPE SHALL BE RESTRAINED AWAY FROM THE TAPPED CAP



WINTERVILLE
NORTH CAROLINA

TOWN OF WINTERVILLE

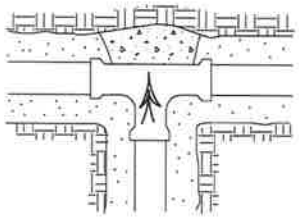
PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

STANDARD 2" BLOW-OFF ASSEMBLY

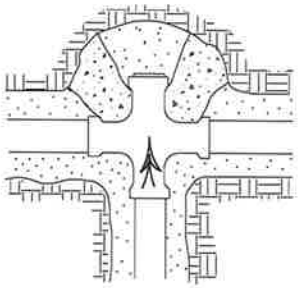
STD. NO.	SCALE
W-11	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

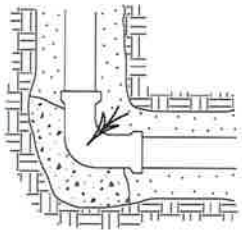
TYPES OF THRUST BLOCKING



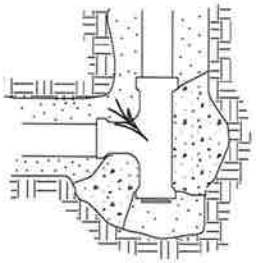
THRU LINE CONNECTION TEE



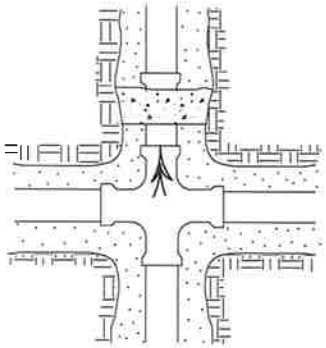
THRU LINE CONNECTION CROSS USED AS TEE



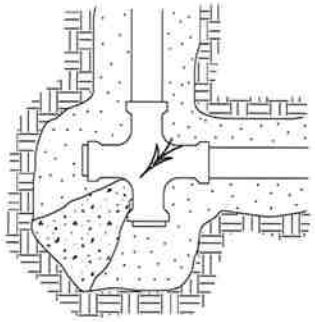
DIRECTION CHANGE ELBOW



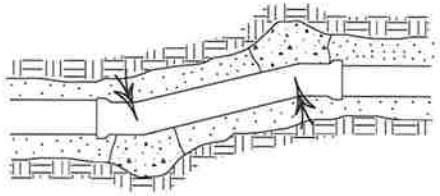
DIRECTION CHANGE TEE USED AS ELBOW



CHANGE LINE SIZE REDUCER



DIRECTION CHANGE CROSS USED AS ELBOW



DIRECTION CHANGE

RESULTANT THRUST AT FITTING AT 150 PSI WATER PRESSURE

	TOTAL POUNDS				
NOMINAL PIPE DIA.	DEAD END	90° BEND	45° BEND	22½ ° BEND	11¼ ° BEND
4"	2,700	3,800	2,100	1,100	530
6"	5,600	8,000	4,300	2,200	1,100
8"	9,700	13,600	7,400	3,800	1,900
10"	14,500	20,500	11,100	5,700	2,900
12"	20,500	29,000	15,700	8,000	4,000
14"	27,600	39,000	21,100	11,000	5,400
16"	35,700	50,400	27,300	14,000	7,000
18"	44,800	63,400	34,400	17,500	8,800
20"	55,000	77,800	42,100	21,500	10,800
24"	78,500	111,000	60,000	31,600	15,400
30"	120,600	170,600	92,300	47,100	23,600
36"	172,800	244,400	132,300	67,500	33,900
42"	233,300	330,000	178,600	91,000	45,700
48"	304,000	430,000	232,700	118,600	59,600
54"	384,100	543,200	294,000	149,000	75,300

SOIL	BEARING LOAD (LB./SQ. FT.)
MUCK	0
SOFT CLAY	1,000
SILT	1,500
SANDY SILT	3,000
SAND	4,000
SANDY CLAY	6,000
HARD CLAY	9,000

NOTES:

1) TO DETERMINE THE SIZE OF A CONCRETE THRUST BLOCK, DIVIDE THE TOTALFORCE BY THE BEARING VALUES OF THE SOIL. THE QUOTIENT WILL BE THE SIZE OF THE BEARING AREA OF THE THRUST BLOCK IN SQUARE FEET. APPROXIMATE VALUES FOR VARIOUS TYPES OF SOIL ARE LISTED IN THE TABLE.

2) CONCRETE SHALL HAVE A 28-DAY COMPRESSIVE STRENGTH OF 3000 psi.

3) LEAVE JOINTS CLEAR OF CONCRETE.

4) POLYETHYLENE SHALL BE WRAPPED AROUND FITTING WHERE CONCRETE BLOCKING MAY BE REMOVED.

WINTERVILLE NORTH CAROLINA

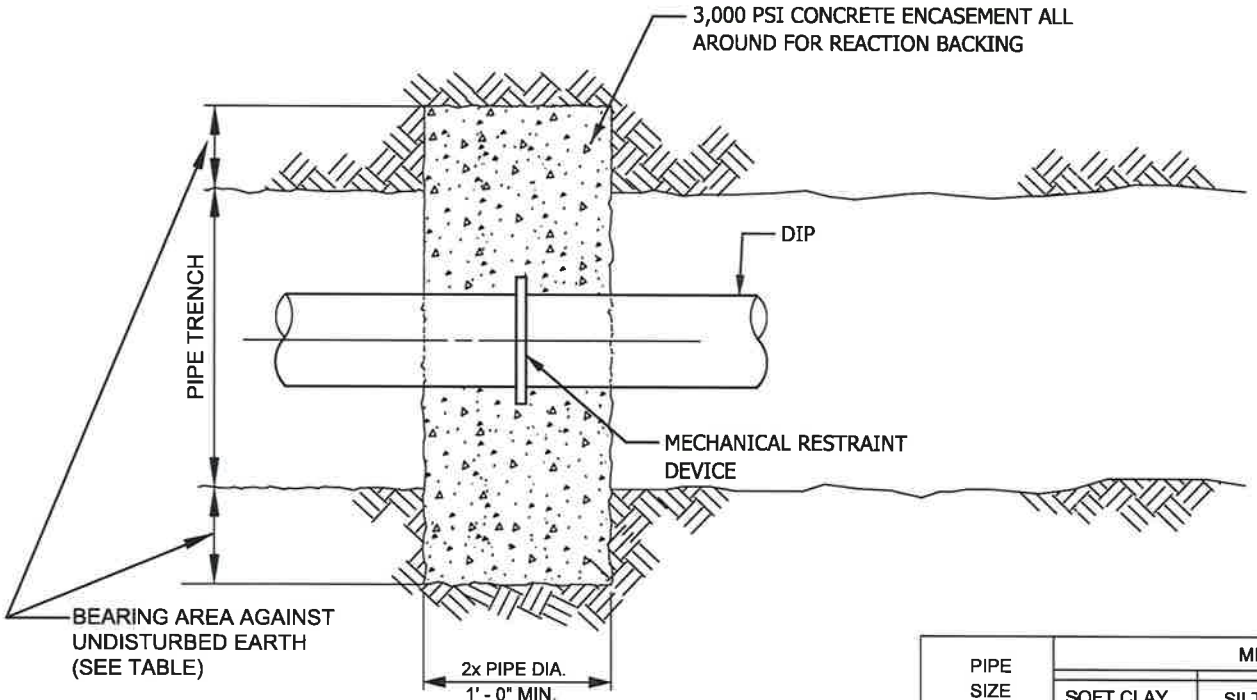
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

CONCRETE THRUST BLOCKING

STD. NO.	SCALE
W-12	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



SOIL	BEARING LOAD (lb/sq.ft.)
MUCKY	0
SOFT CLAY	1,000
SILT	1,500
SANDY SILT	3,000
SAND	4,000
SANDY CLAY	6,000
HARD CLAY	9,000

NOTE:

MIN. BEARING AREAS ARE BASED UPON THE TABLE ABOVE. FOR SOILS HAVING BEARING CAPACITIES DIFFERENT THAN THAT SHOWN ADJUST AREA AS NECESSARY TO PROVIDE EQUIVALENT RESTRAINT.

PIPE SIZE	MIN. BEARING AREA (SQ. FT.)					
	SOFT CLAY	SILT	SANDY SILT	SAND	SAND CLAY	HARD CLAY
4	2.7	1.8	1.0	1.0	1.0	1.0
6	5.6	3.7	1.9	1.4	1.0	1.0
8	9.7	6.4	3.2	2.4	1.6	1.1
10	15	10	4.8	3.6	2.4	1.6
12	21	14	6.8	5.1	3.4	2.3
14	28	18	9.2	6.9	4.6	3.1
16	36	24	12	8.9	5.9	4.0
18	45	30	15	11	7.4	5.0
20	55	37	18	14	9.2	6.1
24	78	52	26	20	13	8.7
30	121	81	40	30	20	13
36	173	115	56	43	29	19

NOTE: ALTERNATE METHOD OF RESTRAINT SHOULD BE CONSIDERED FOR SITUATIONS FALLING WITHIN OUTLINED AREA.

WINTERVILLE NORTH CAROLINA

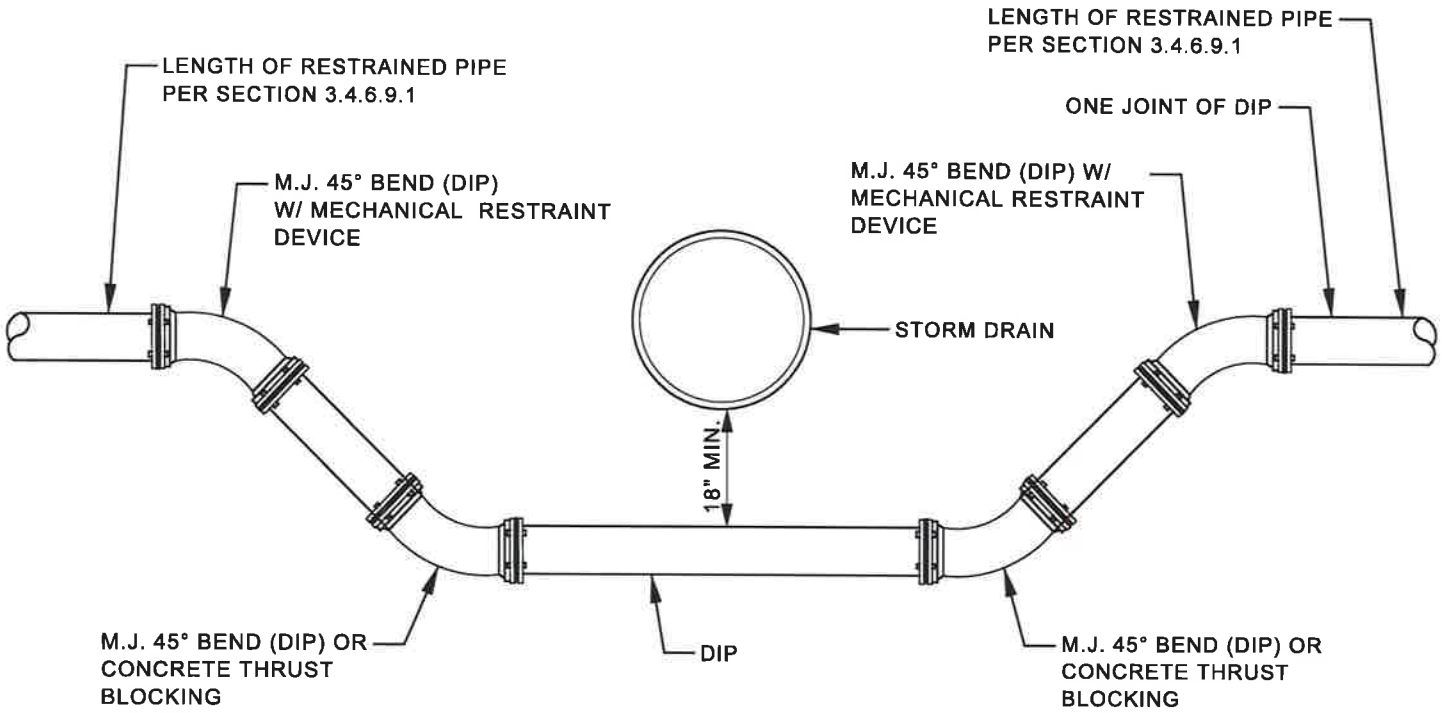
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

THRUST RESTRAINT WITH ANCHOR RING

STD. NO.	SCALE
W-13	N.T.S
SHEET	DATE
1 OF 1	5-31-19

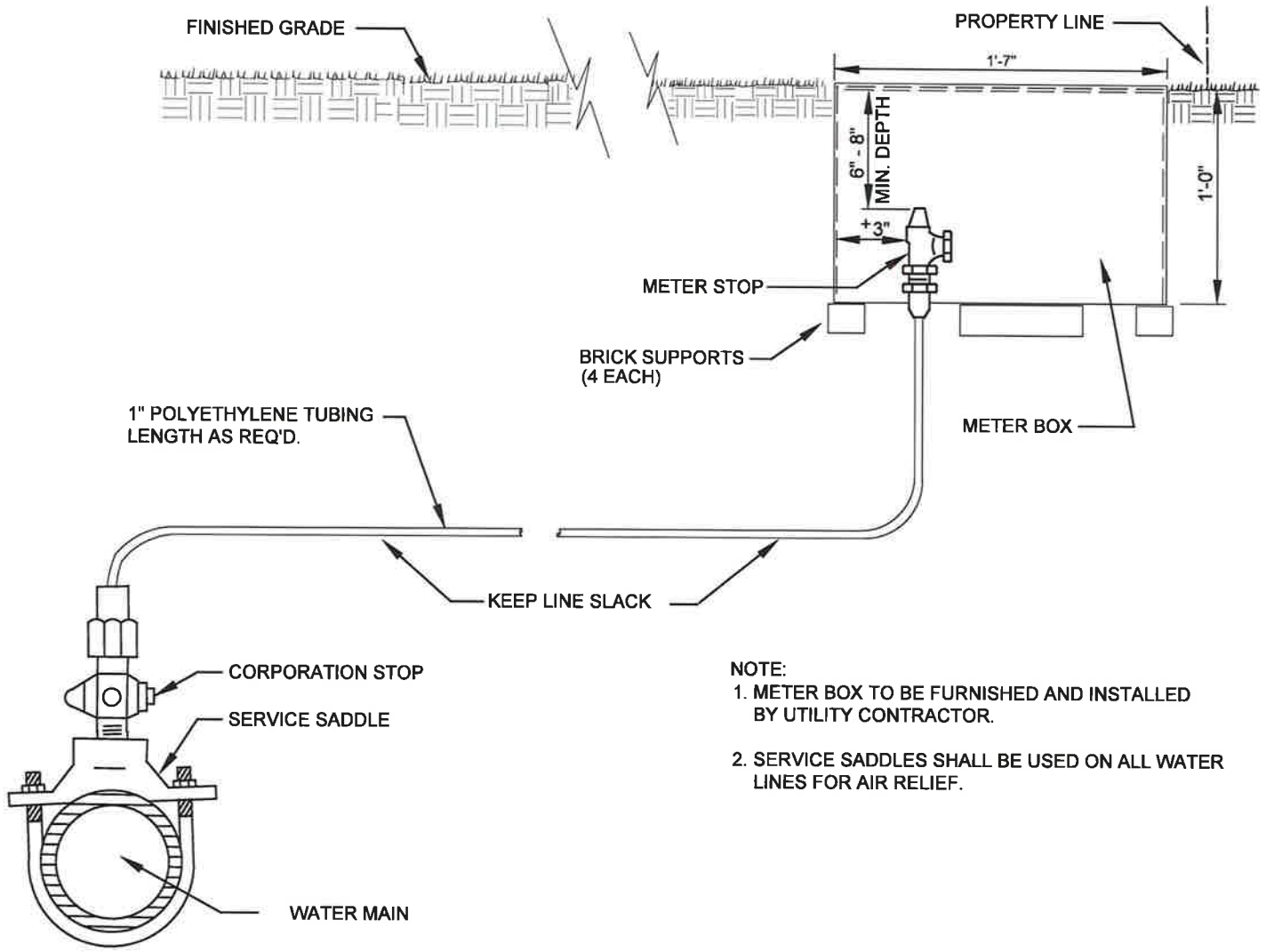
REVISIONS		
NO	DATE	COMMENT



NOTES:

1. PLACE CONCRETE BLOCKING SUCH THAT IT WILL NOT INTERFERE WITH REMOVAL OF BOLTS.
2. PIPE DIAMETER GREATER THAN 12" SEE ENGINEERING DEPT.
3. PIPE LENGTHS SHALL BE AS REQUIRED TO CONSTRUCT CROSSING.
4. ALL JOINTS TO BE RESTRAINED IN ACCORDANCE WITH MANUAL.

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **W-14**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT	
	WATER MAIN AND STORM DRAIN CROSSING	SHEET 1 OF 1	DATE 5-31-19		



NOTE:
1. METER BOX TO BE FURNISHED AND INSTALLED BY UTILITY CONTRACTOR.

2. SERVICE SADDLES SHALL BE USED ON ALL WATER LINES FOR AIR RELIEF.

SERVICE SADDLES SHALL BE USED ON ALL WATER LINES FOR AIR RELIEF.

WINTERVILLE
NORTH CAROLINA

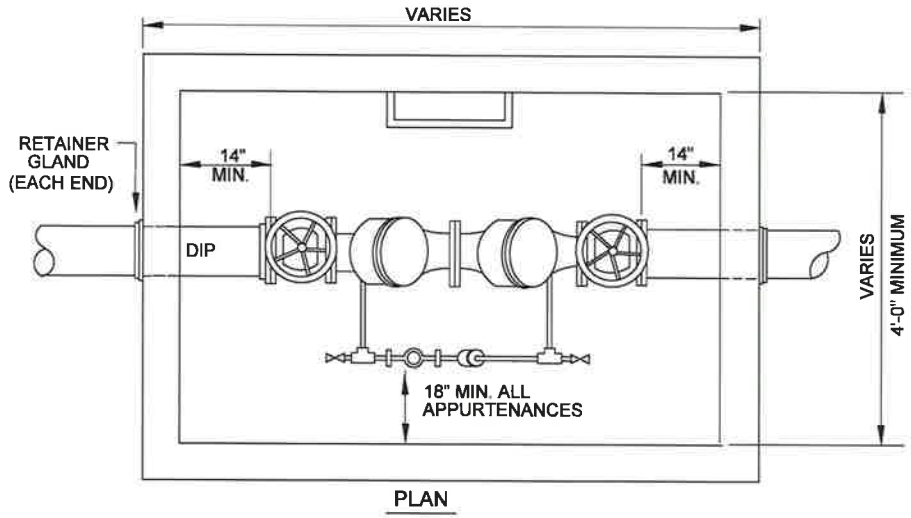
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT
2571 Railroad St. Winterville, NC 28590

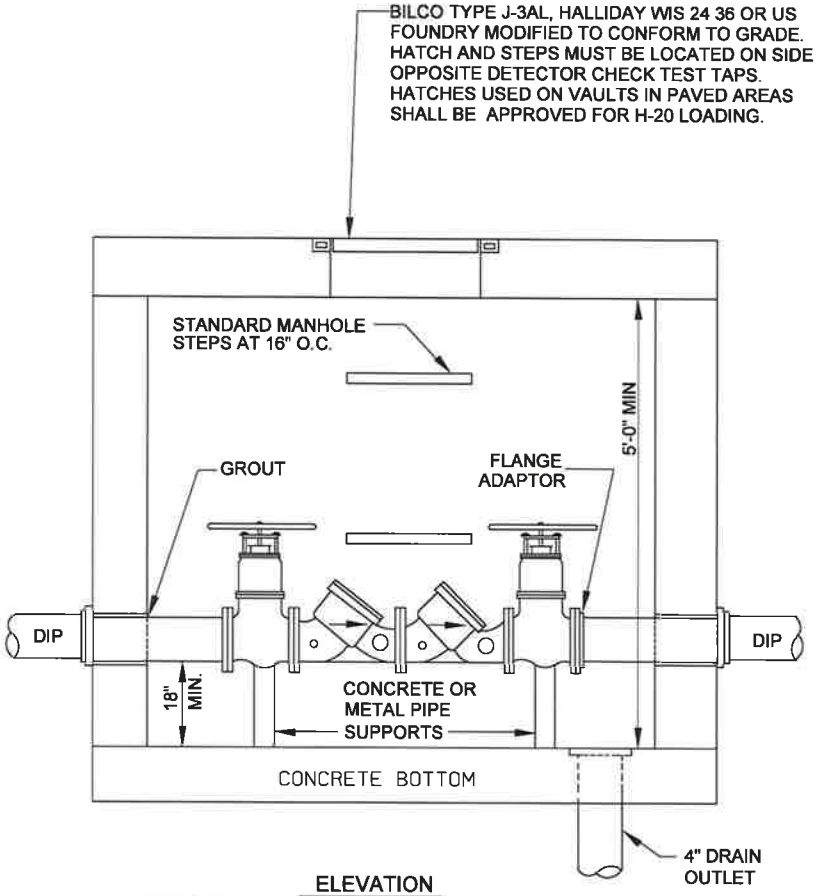
MANUAL AIR RELEASE FOR WATER MAIN

STD. NO.	SCALE
W-15	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



PLAN



ELEVATION

DETECTOR CHECK NOT SHOWN IN THIS VIEW

NOTES

1. ALL FLANGE BOLTS SHALL BE STAINLESS
2. THE VAULT SHOWN IS A GUIDE TO INDICATE MINIMUM REQUIREMENTS ACCEPTABLE TO THE TOWN OF WINTERVILLE, PLANS AND SPECIFICATIONS SHALL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. PLANS SUBMITTED SHALL INDICATE ONLY ONE ITEM, PRODUCT, SIZE, MEANS OF CONSTRUCTION, ETC. THE TERM " OR APPROVED EQUAL" WILL NOT BE ALLOWED.
3. VAULT TO BE CONSTRUCTED OF REINFORCED CONCRETE OR REINFORCED MASONRY BLOCK AND SHALL BE ADEQUATELY SIZED TO FACILITATE ASSEMBLY WITHOUT REQUIRING MODIFICATION TO THE VAULT BY EITHER CUTTING OR CORING. INDICATE TYPE OF CONSTRUCTION AND REINFORCEMENT ON SUBMITTAL.
4. PROVIDE VAULT WITH 4" OUTLET DRAIN, GRATE AND P-TRAP, INDICATE INVERT ELEVATION OF VAULT AND AT DISCHARGE POINT. IF GRAVITY DRAIN IS IMPRACTICAL, FORM 18" SQUARE BY 12" DEEP SUMP IN VAULT FLOOR, PROVIDE SUMP PUMP, ELECTRICAL SERVICE TO BE PROVIDED AND MAINTAINED BY THE OWNER.
5. PROVIDE REQUIRED CLEARANCE FOR RISING STEM GATE VALVES.
6. SUBMITTAL SHALL SHOW ALL PIPING & APPURTENANCES WITHIN THE VAULT WITH MEASUREMENTS & CLEARANCES CLEARLY LABELED.
7. HATCH SHALL BE SIZED TO FACILITATE REMOVAL OF PRIMARY UNIT WITHOUT REQUIREMENT OF DISASSEMBLING.

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

DOUBLE CHECK/DETECTOR CHECK VAULT FOR 6" AND LARGER SERVICES

STD. NO.	SCALE
W-16	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

NOTES:

1) ALL FLANGE BOLTS SHALL BE STAINLESS.

2) SUBMITTAL SHALL SHOW ALL PIPPING & APPURTENANCES WITHIN THE PROTECTIVE ENCLOSURE WITH MEASURES & CLEARANCES CLEARLY LABELED.

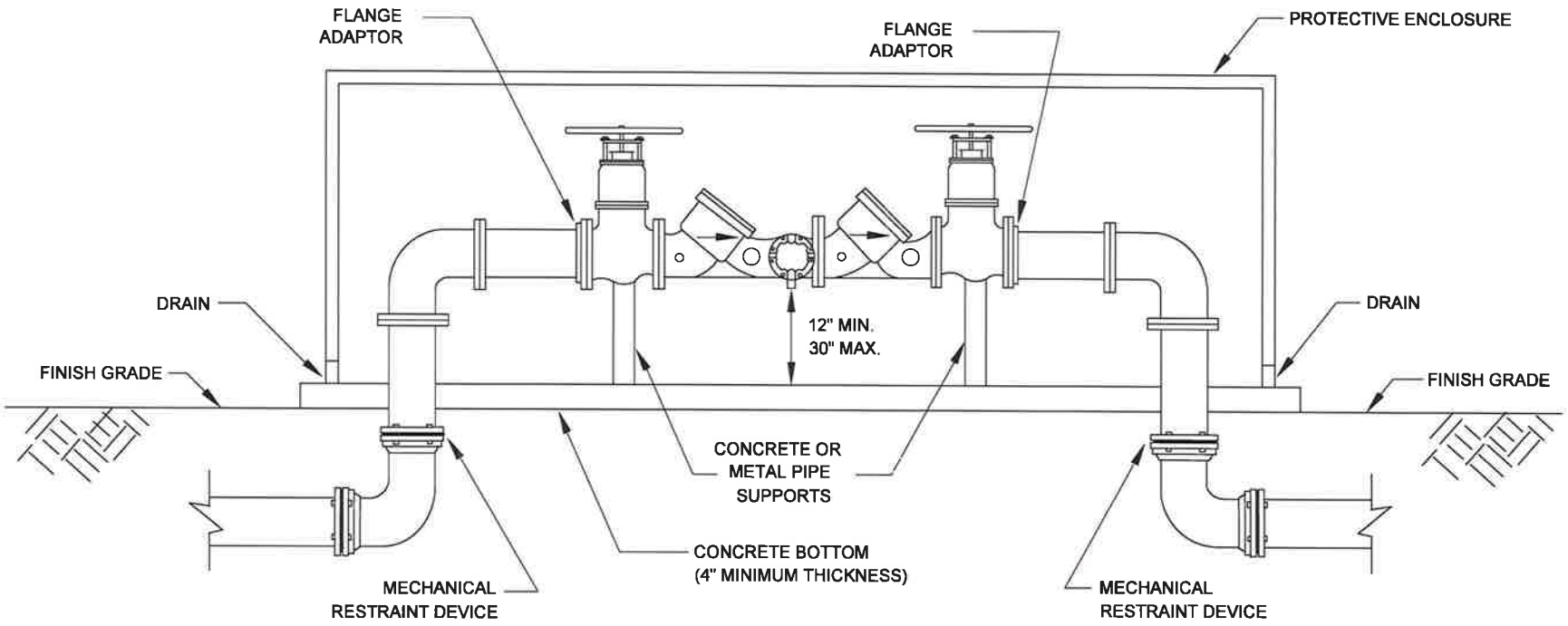
3) ENCLOSURE MUST BE SIZED TO ALLOW ADEQUATE ROOM FOR TESTING, MAINTENANCE AND OPERATION.

4) DRAIN OPENINGS SHALL BE SIZED TO ADEQUATELY RELIEVE MAXIMUM DISCHARGE OF APPROPRIATE DEVICE.

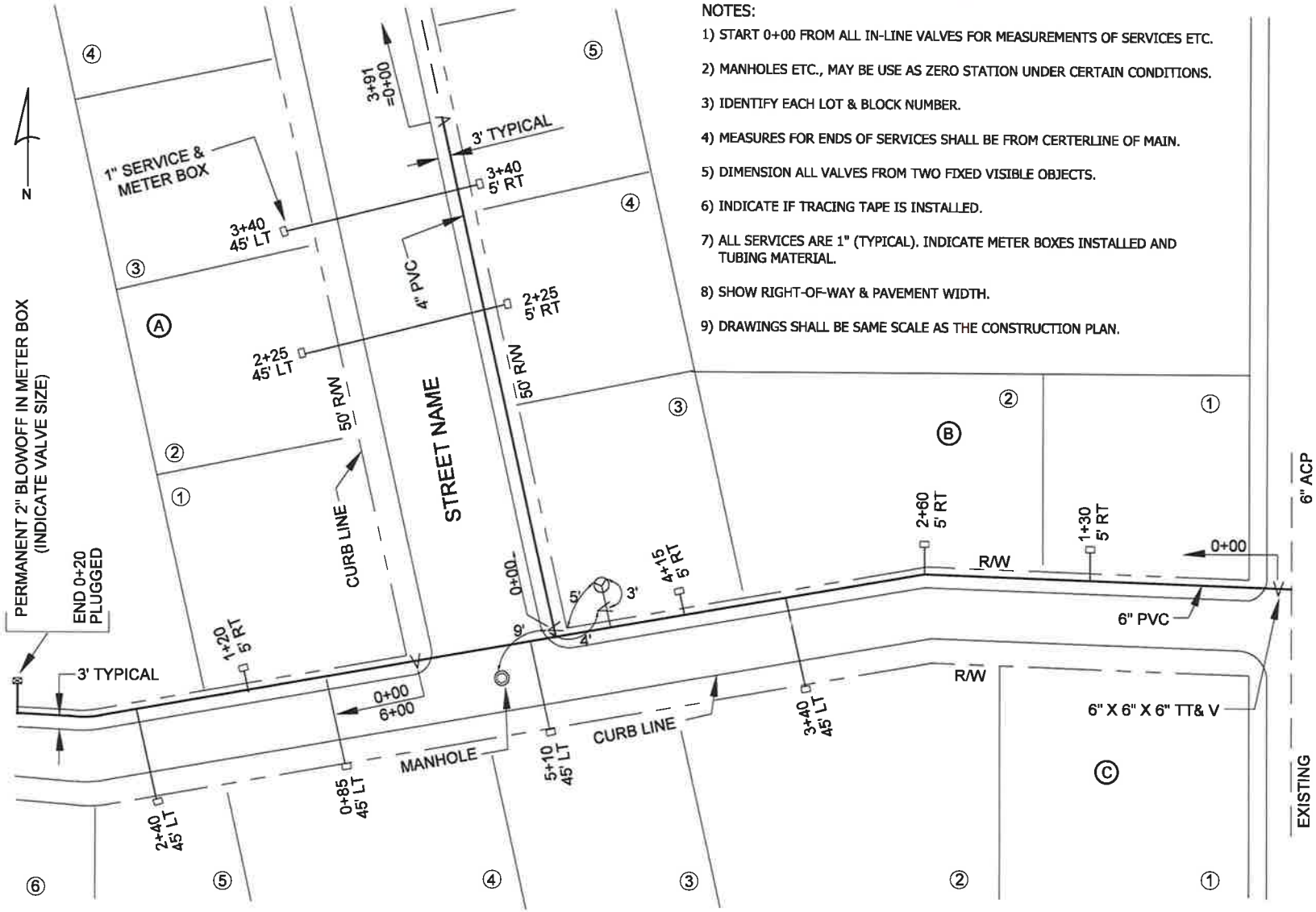
5) REDUCED PRESSURE PRINCIPLE ASSEMBLIES (RPZ) SHALL REQUIRE AN ABOVE GROUND INSTALLATION.

6) IT IS RECOMMENDED THAT THE CUSTOMER PROVIDE ADEQUATE FREEZE PROTECTION.

7) REFER TO DETAIL W-12 FOR REACTION BLOCKING.



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **ABOVE GROUND INSTALLATION FOR RPZ ASSEMBLY (ALTERNATIVE INSTALLATION FOR DCVA)**	STD. NO. **W-17** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS: NO / DATE / COMMENT



NOTES:

1) START 0+00 FROM ALL IN-LINE VALVES FOR MEASUREMENTS OF SERVICES ETC.
2) MANHOLES ETC., MAY BE USE AS ZERO STATION UNDER CERTAIN CONDITIONS.
3) IDENTIFY EACH LOT & BLOCK NUMBER.
4) MEASURES FOR ENDS OF SERVICES SHALL BE FROM CERTERLINE OF MAIN.
5) DIMENSION ALL VALVES FROM TWO FIXED VISIBLE OBJECTS.
6) INDICATE IF TRACING TAPE IS INSTALLED.
7) ALL SERVICES ARE 1" (TYPICAL). INDICATE METER BOXES INSTALLED AND TUBING MATERIAL.
8) SHOW RIGHT-OF-WAY & PAVEMENT WIDTH.
9) DRAWINGS SHALL BE SAME SCALE AS THE CONSTRUCTION PLAN.

WINTERVILLE
NORTH CAROLINA

TOWN OF WINTERVILLE

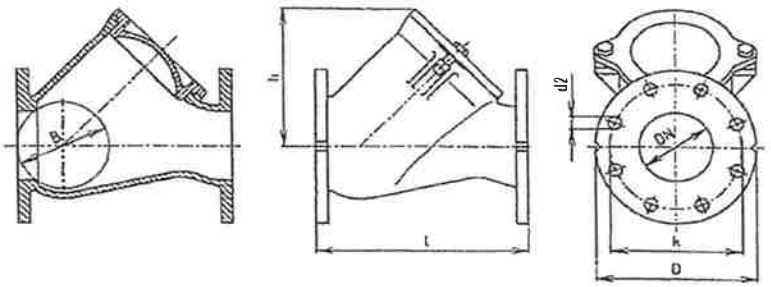
PUBLIC WORKS DEPARTMENT
2571 Railroad St. Winterville, NC 28590

TYPICAL WATER SYSTEM AS-BUILT

STD. NO.	SCALE
W-18	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

HDL "Municipal" Ball Check Valve Type 5087A-6"	6" – ASA125
AVAILABLE IN 4", 6", 8", 10" and 12" sizes	Resilient seated



DN inch	h inch	l inch	B inch	D inch	k inch	d_2 inch	KV Cu ft / sec	Weight Lbs	Space Cu ft	
6	10.2	14.0	7.1	11.0	9.5	8 x 0.9	8.2	87	1.4	

Design features and materials: (Standard *HDL®* Ball Check Valve)
HDL® Ball Check Valves with unrestricted passage, resilient seated, low resistance ball operation; a wide range of applications in municipal waste water systems, industrial waste water systems and potable water lines.

Body and cover	: Ductile iron, grade 60-40-18, ASTM A 536.
Ball core	: Aluminium, Alum 231A.
Ball coating	: Buna, hardness 55° shore.
Bolts and nuts	: 8.8, zincromat coated.
Gasket	: Buna o-ring, hardness 70° shore.
Coating	: Outside Alkyd base coat, black (40 microns).
Alternative Ball coatings	: Available.
Alternative Valve coatings	: Available.

www.GPMpumps.com

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE
PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

BALL CHECK VALVE TYPE 5087A-6"

STD. NO.	SCALE
W-19	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

Section 3

Stormwater Drainage System

Standard Detail Index

SECTION 3 - STORMWATER DRAINAGE SYSTEM

DWG #	DWG Description

BASIN, PIPES, AND MANHOLES STANDARDS

SEDIMENT AND EROSION CONTROL

ENWALLS AND RETAINING WALLS STANDARDS

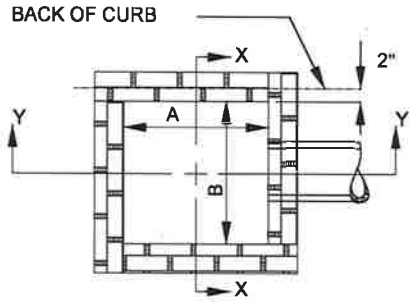
SD-20 .....Concrete "L" Enwall for Single Pipe Culverts
(18" Thru 72" Arch Pipe)

SD-21 .....Concrete "L" Enwall for Single Pipe Culverts
(15" Thru 48" Pipe)

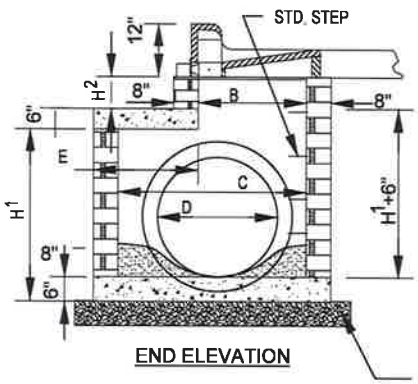
SD-22 .....Concrete Endwall for Single and Double Pipe Culverts
(15" thru 48" Pipe – 90° Skew)

SD-23 .....Precast Endwall for Single Pipe Culverts
(12" thru 72" Pipe – 90° Skew)

SD-24 .....General Notes - Details SD-20 Thru SD-23



PLAN

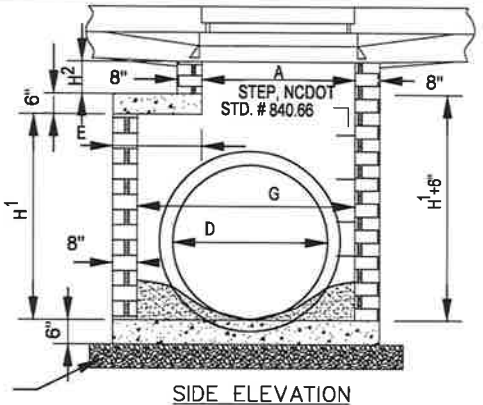


END ELEVATION

WHERE 30" TO 36" PIPE IS USED.

SECTION - JJ

6" MIN. #67 STONE BEDDING



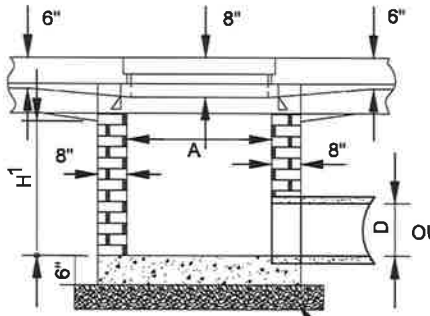
SIDE ELEVATION

WHERE 42" TO 54" PIPE IS USED.

SECTION - MM

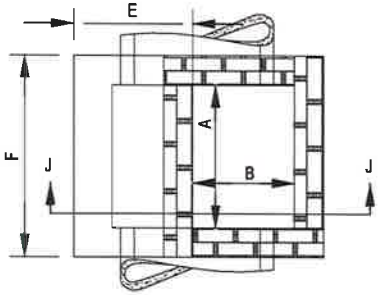
NOTES:

1) MORTAR JOINTS 1/2" 1/8" THICK.
2) 3000 P.S.I. CONCRETE TO BE USED.
3) THE POURING OF FLOOR SLAB TO BE ACCOMPLISHED BY FORMING.
4) ALL CATCH BASINS OVER 3' - 6" IN DEPTH SHALL BE PROVIDED WITH STEPS 16" O.C.
5) CONCRETE BLOCKS ONLY, CLAY BRICKS SHALL NOT BE USED.
6) FOR 8'-0" IN HEIGHT OR LESS, USE 8" WALL. OVER 8'-0" IN HEIGHT USE 12" WALL TO 6'-0" FROM TOP OF WALL, 8" WALL FOR THE REMAINING 6'-0".
7) INVERTS SHALL BE SHAPED TO FORM A SMOOTH, REGULAR SURFACE, SLOPED TO PREVENT SEDIMENTATION.
8) LOCATE STEPS ON NARROW SIDE OF STRUCTURE.
9) USE TYPE "E", "F", & "G" GRATE UNLESS OTHERWISE INDICATED.
10) PRE-CAST BOXES MADE OF 4000 P.S.I. CONCRETE MAY BE USED IN LIEU OF CONCRETE BLOCK MASONRY CONCSTRUCTION. PRE-CAST UNITS SHALL BE AS SHOWN ON DETAIL SD-3.02

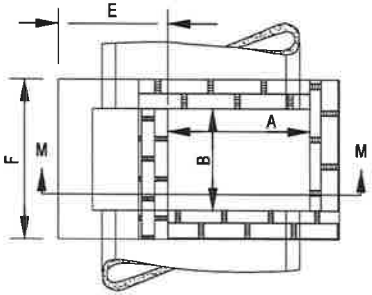


SECTION - YY

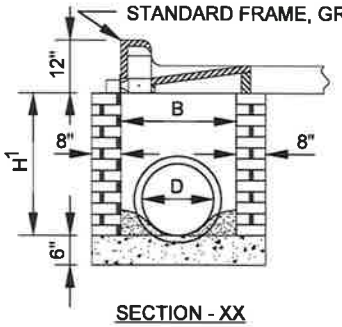
6" MIN. #67 STONE BEDDING



PLAN



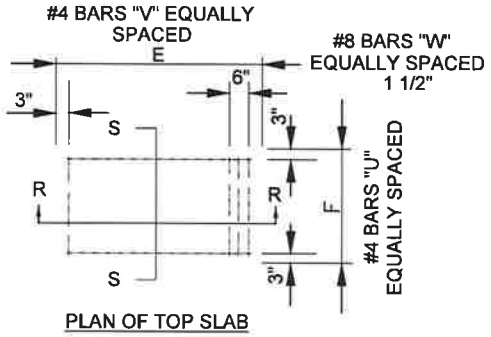
PLAN



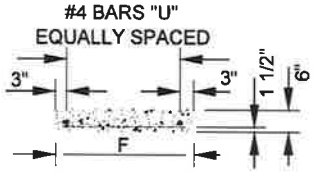
SECTION - XX

ADOPTED FROM NCDOT 840.01 1 OF 2

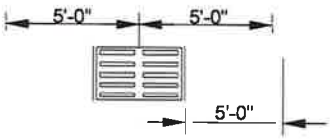
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **SD-1**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	STANDARD CATCH BASIN 15" THRU 54" PIPE	SHEET 1 OF 2	DATE 5-31-19	



PLAN OF TOP SLAB

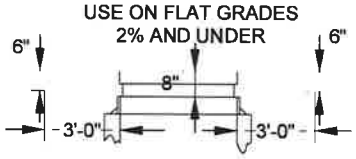


SECTION - SS



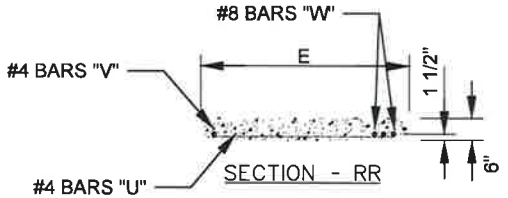
PLAN

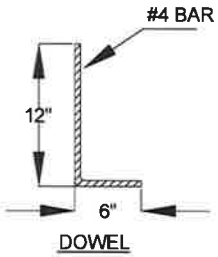
CURB AND GUTTER
WITH CATCH BASIN ON STEEP GRADES



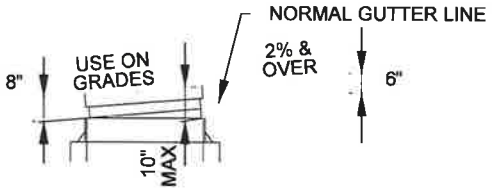
DEPRESSED
GUTTER LINE
ELEVATION

NORMAL CURB AND GUTTER ON LIGHT GRADES





DOWEL



ELEVATION

NORMAL CURB AND GUTTER ON STEEP GRADES

DIMENSIONS AND QUANTITIES FOR CONCRETE BLOCK CATCH BASIN

DIMENSIONS OF BOX AND PIPE							COVER DIMENSION		REINFORCING							* CUBIC YARDS OF CONCRETE IN BOX			CONCRETE BLOCK		DEDUCTIONS FOR ONE PIPE	
									BARS-U		BARS-V		BARS-W		TOTAL				H^1			
PIPE D	SPAN A	WIDTH B	WIDTH C	SPAN G	HEIGHT MIN. H^1	HEIGHT H^2	E	F	NO	LENGTH	NO	LENGTH	NO	LENGTH	LBS.	TOP SLAB	FLOOR	TOTAL	CU. YDS.	PER FT.HT.	C.M.	R.C.
15"	3'-0"	2'-2"	–	–	3'-0"	–	–	–	–	–	–	–	–	–	–	–	0.281	0.281	0.963	0.321	0.0308	0.047
18"			–	–	3'-3"	–	–	–	–	–	–	–	–	–	–	–	0.281	0.281	1.043	ABOVE	0.0442	0.065
24"			–	–	3'-9"	–	–	–	–	–	–	–	–	–	–	–	0.281	0.281	1.204	MIN. H^1	0.0784	0.121
30"			3'-4"	–	4'-3"	VARIABLE	1'-2"	4'-4"	4	1'-6"	3	4'-1"	3	4'-1"	45	0.147	0.374	0.521	1.606		0.1224	0.184
36"			3'-10"	–	4'-9"		1'-8"	4'-4"	4	2'-0"	4	4'-1"	3	4'-1"	49	0.187	0.415	0.602	1.914	0.321	0.1760	0.261
42"			–	4'-5"	5'-3"		1'-5"	3'-6"	4	1'-9"	3	3'-3"	3	3'-3"	38	0.135	0.373	0.508	2.152	H^2	0.2400	0.371
48"			–	5'-0"	5'-9"		2'-0"	3'-6"	4	2'-6"	4	3'-3"	3	3'-3"	41	0.173	0.410	0.583	2.415		0.3131	0.477
54"	3'-0"	2'-2"	–	5'-7"	6'-3"		2'-7"	3'-6"	4	3'-0"	6	3'-3"	3	3'-3"	47	0.211	0.448	0.659	2.806		0.3958	0.595

ADOPTED FROM NCDOT 840.01 2 OF 2

WINTERVILLE
NORTH CAROLINA

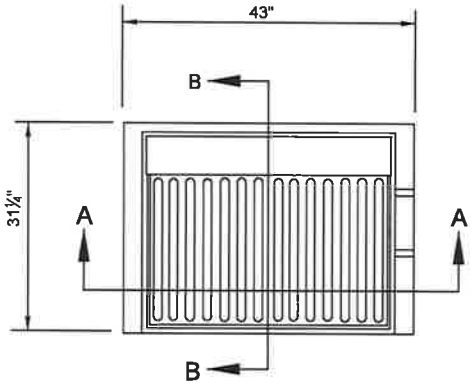
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT
2571 Railroad St. Winterville, NC 28590

STANDARD CATCH BASIN 15" THRU 54" PIPE

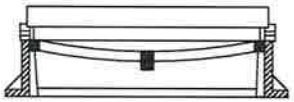
STD. NO.	SCALE
SD-2	N.T.S
SHEET	DATE
2 OF 2	5-31-19

REVISIONS		
NO	DATE	COMMENT

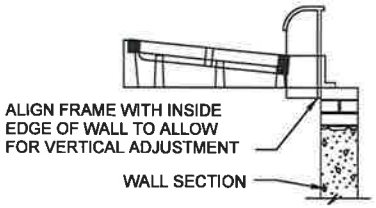


PLAN

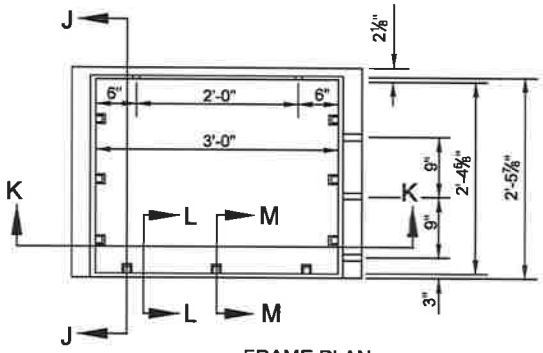
FRAME,GRATE, & HOOD ASSEMBLY



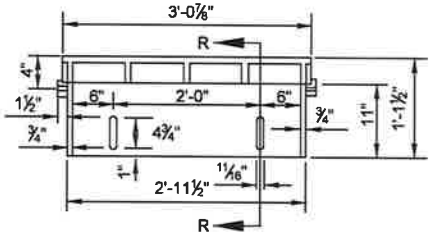
SECTION - AA



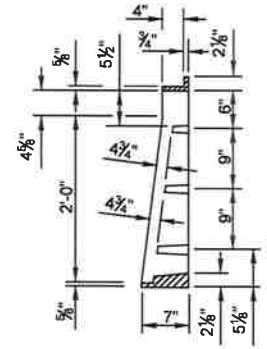
SECTION - BB



FRAME PLAN

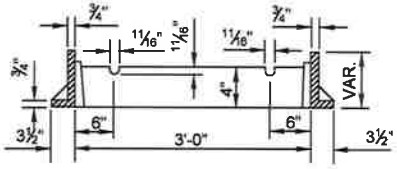


HOOD ELEVATION

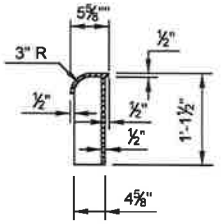


SECTION - JJ

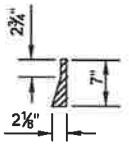
NOTE: USE TYPE "E", "F" AND "G" GRATE
UNLESS OTHERWISE NOTED.



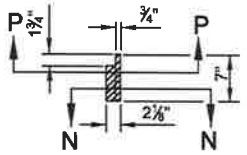
SECTION - KK



SECTION - RR

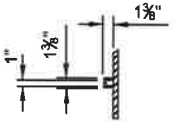


SECTION - LL



SECTION - MM

SECTION - PP

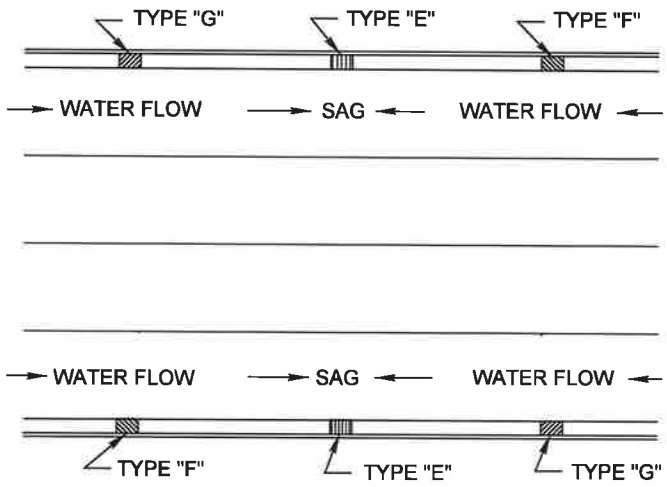


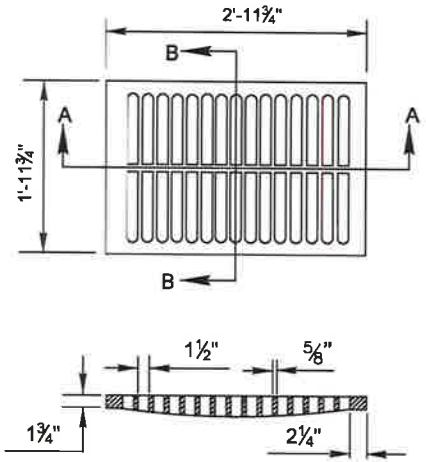
SECTION - NN

ADOPTED FROM NCDOT 840.03 1 OF 2

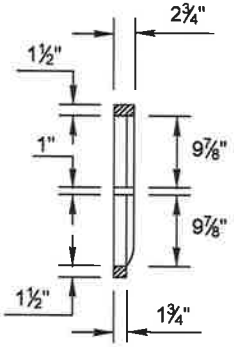
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **STANDARD CATCH BASIN FRAME, GRATES AND HOOD**	STD. NO. **SD-3** SHEET 1 OF 2	SCALE N.T.S DATE 5-31-19	REVISIONS: NO / DATE / COMMENT

DETAIL SHOWING TYPES OF GRATES
USE ACCORDING TO WATER FLOW.



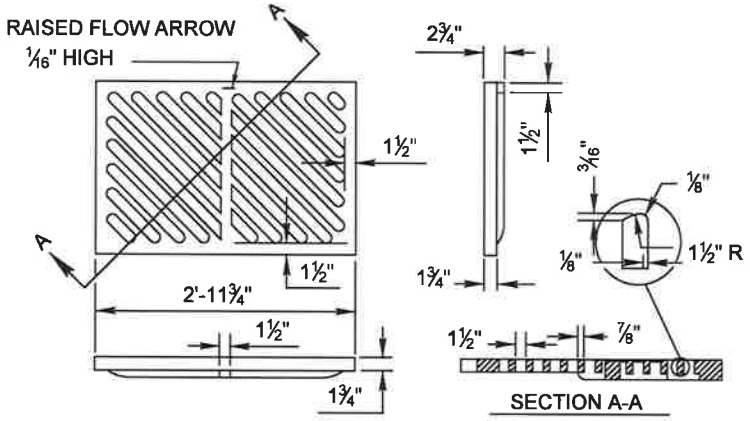


SECTION A-A



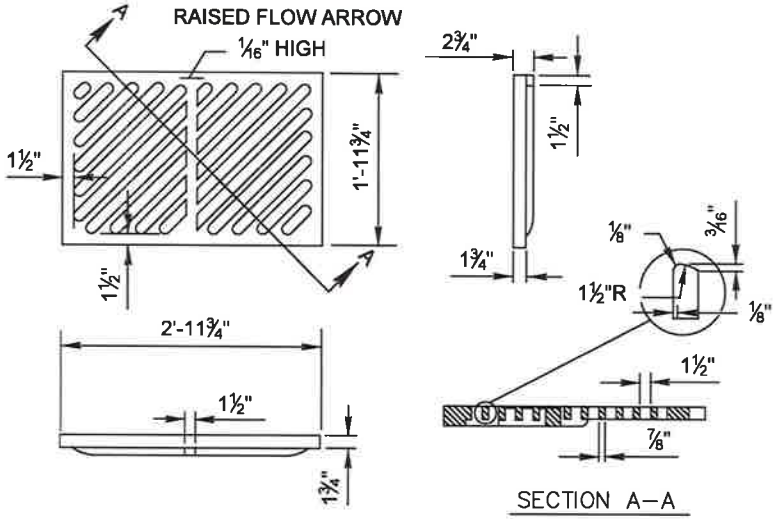
SECTION B-B

TYPE - E



SECTION A-A

TYPE - F

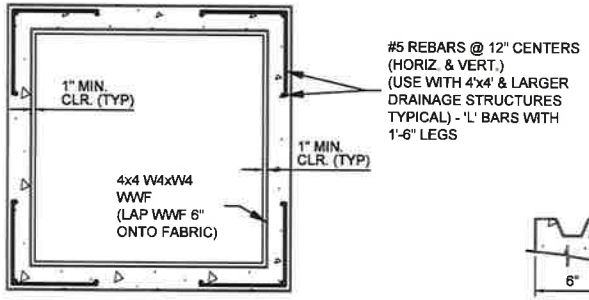


SECTION A–A

TYPE - G

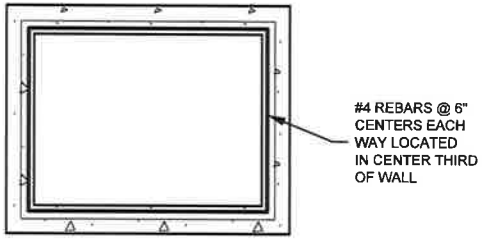
ADOPTED FROM NCDOT 840.03 2 OF 2

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	STD. NO.	SCALE	REVISIONS
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**SD-4**	N.T.S	NO / DATE / COMMENT
	STANDARD CATCH BASIN FRAME, GRATES AND HOOD	SHEET 2 OF 2	DATE 5-31-19	

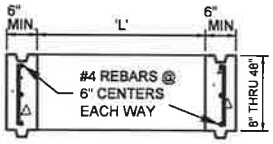


PLAN VIEW OF BASE UNIT

SECTION VIEWS
OPTIONAL JOINT DETAILS



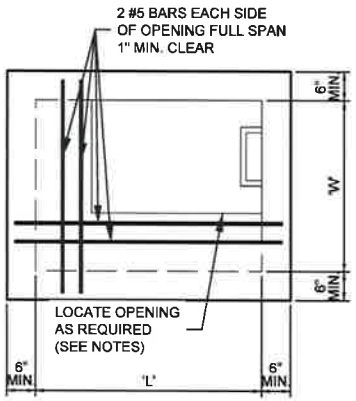
PRECAST RISER PLAN



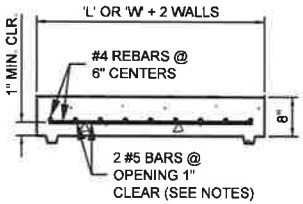
TYPICAL PRECAST
RISER SECTION

NOTES:

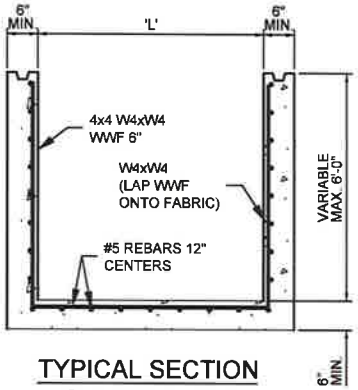
1. INSTALL PRE-CAST DRAINAGE STRUCTURES IN ACCORDANCE WITH NCDOT STANDARD SPECIFICATION SECTION 840 AND THE TOWN SPECIFICATIONS.
2. USE 4000 P.S.I. MINIMUM COMPRESSIVE STRENGTH CONCRETE.
3. USE ASTM A615 GRADE 60 REINFORCING STEEL. USE ASTM A185 WELDED WIRE FABRIC (WWF).
4. LIMIT MAXIMUM DEPTH TO TOP OF BOTTOM SLAB TO 15'-0".
5. PLACE LIFT HOLES OR PINS IN ACCORDANCE WITH OSHA STANDARD 1926.704.
6. ORIENT STRUCTURES SO THAT CORNERS WILL NOT BE CUT OR MODIFIED UNLESS ALLOWED BY DETAIL IN PLANS.
7. PRE-CAST ALL ELEMENTS TO MEET ASTM C913.
8. FRAME AND GRATE HEIGHT MAY BE ADJUSTED WITH CONCRETE OR BRICK.
9. PROVIDE PRE-CAST STRUCTURES OVER 4'-0" IN DEPTH WITH STEPS 16" ON CENTERS.
10. WELDED WIRE FABRIC MAY BE SUBSTITUTED FOR REBAR IF THE SAME MIN. AREA OF STEEL IS PROVIDED.
11. SEAL JOINTS WITH AN APPROVED SEALANT.
12. LIMIT MAXIMUM STRUCTURE SIZE INSIDE CLEAR DIMENSIONS TO 6'-0" X 6'-0".
13. THE OUTSIDE PIPE DIAMETER PLUS 2" IS THE MINIMUM STRUCTURE SIZE OR THE OPENING REQUIRED FOR GRATE AND FRAME WHICHEVER IS GREATER.
14. ROUND MANHOLE MAY BE USED IN LIEU OF SQUARE PROVIDED 2 EXTRA #5'S ARE PLACED ON EVERY SIDE NOT ADJACENT TO A WALL.



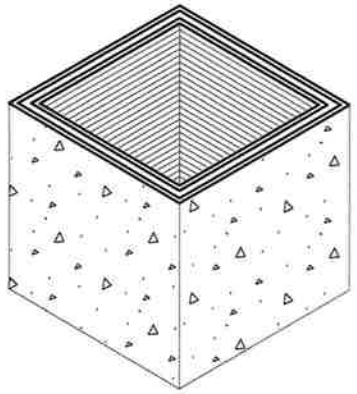
PLAN TOP SLAB



TYPICAL SECTION
TOP SLAB

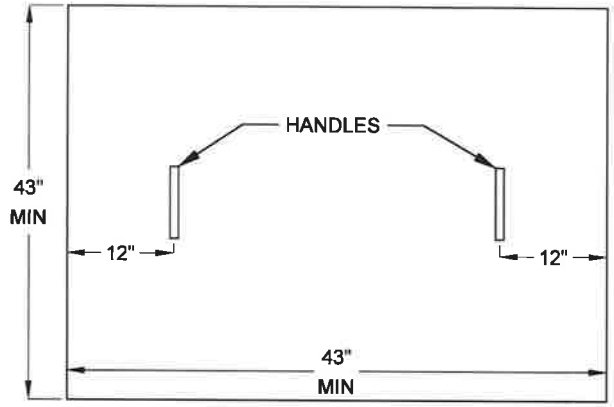


TYPICAL SECTION
OF BASE UNIT

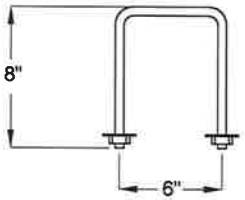


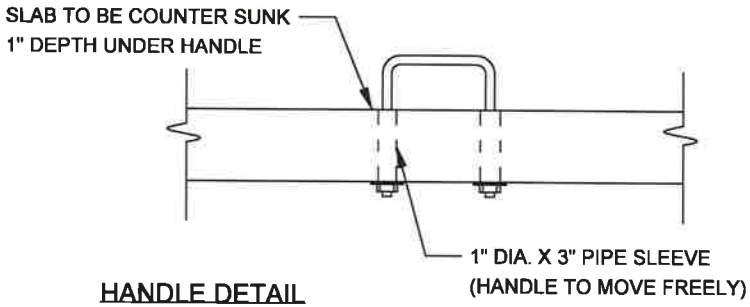
ISOMETRIC VIEW

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **SD-5**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	PRECAST DRAINAGE STRUCTURE	SHEET 1 OF 1	DATE 5-31-19	



PRECAST CONC. SLAB

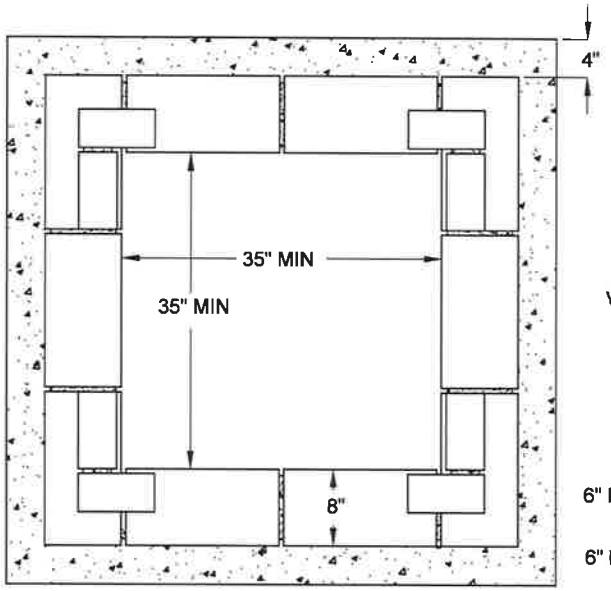




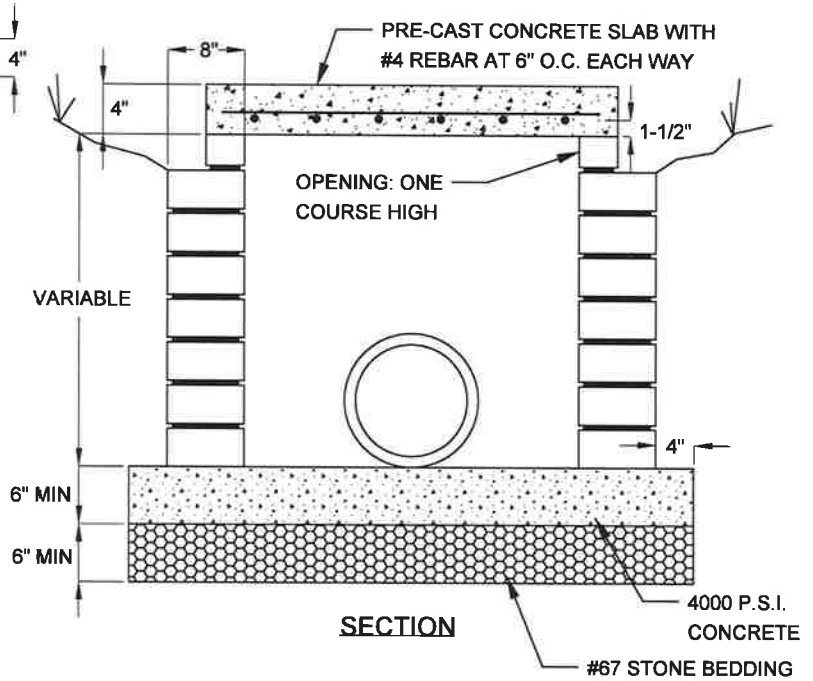
HANDLE DETAIL

NOTES:

1) USE CONCRETE BLOCK ONLY. NO CLAY BRICKS.
2) PRE-CAST UNITS MAY BE USED. SEE STANDARD DETAIL SD-5
3) STEPS REQUIRED AT 16" O.C. WHERE DEPTH EXCEEDS 4'.
4) USE ONLY 4000 P.S.I. CONCRETE.
5) INSIDE DIMENSIONS FOR 24" PIPE AND LARGER, USE OUTSIDE PIPE DIAMETER PLUS 12".



PLAN

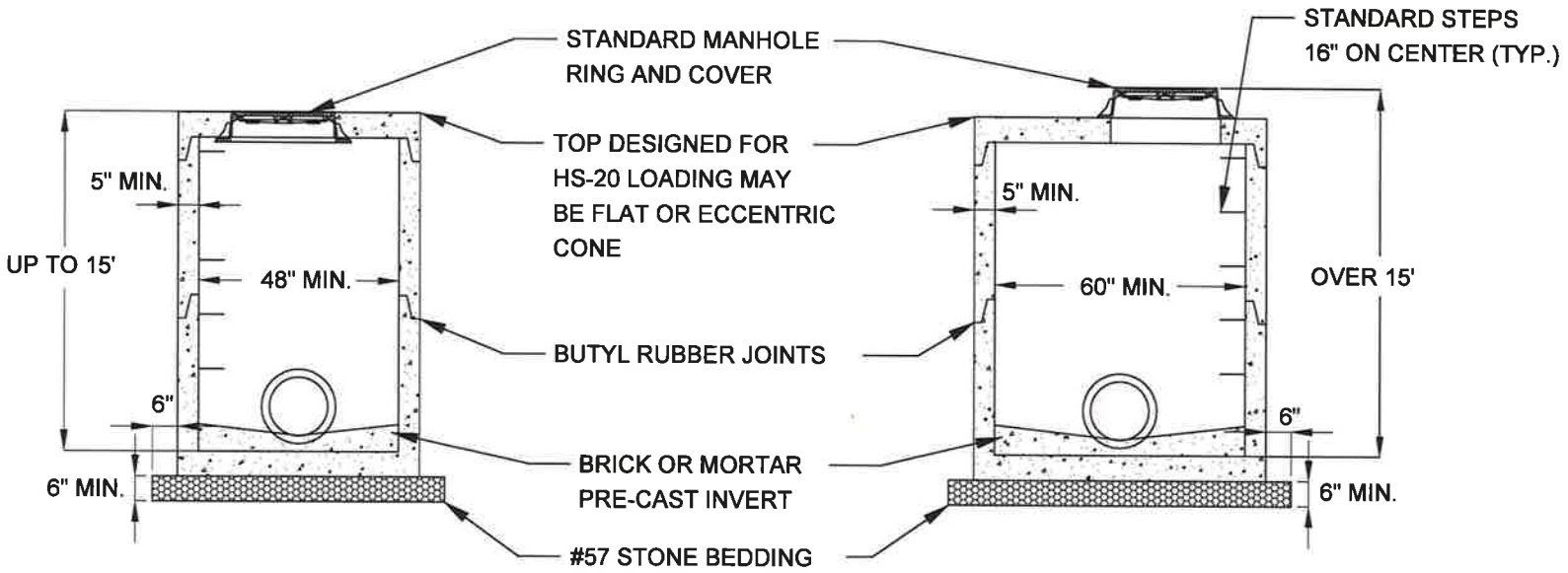


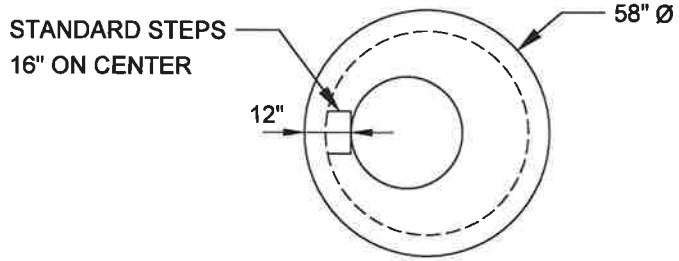
SECTION

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **SD-6**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	STANDARD DROP INLET	SHEET 1 OF 1	DATE 5-31-19	

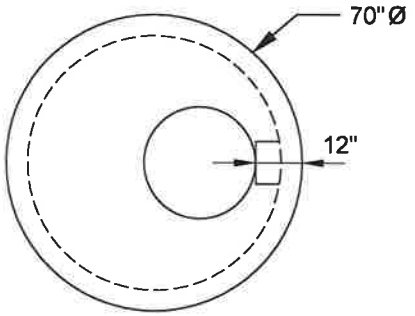
STANDARD
(UP TO 15 FEET IN DEPTH)

DEEP
(OVER 15 FEET IN DEPTH)





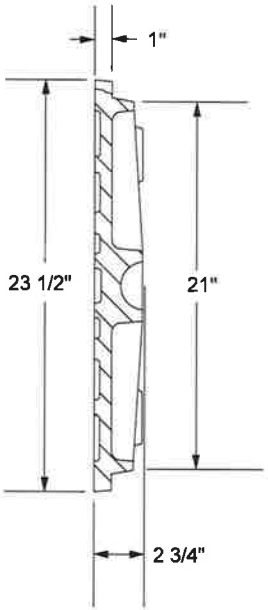
FLAT TOP DETAIL

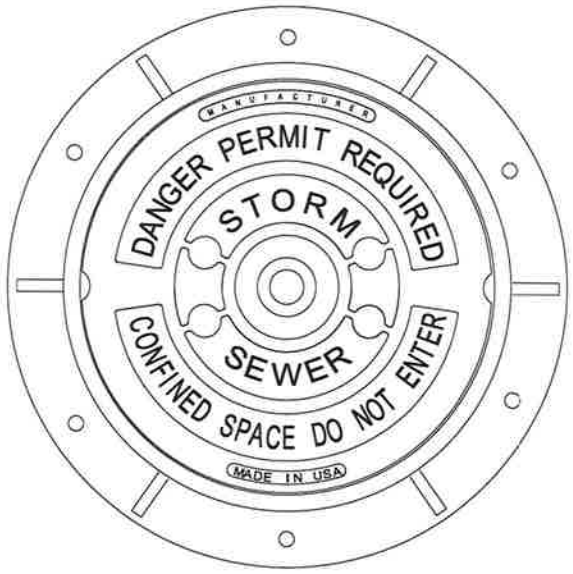


FLAT TOP DETAIL

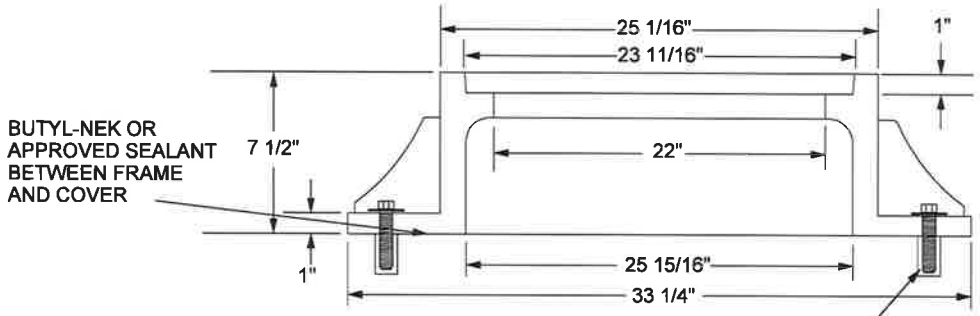
NOTE:
SEE STANDARD SPECIFICATIONS
FOR MH REQUIREMENTS

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **SD-7**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	PRECAST MANHOLE JUNCTION BOX	SHEET 1 OF 1	DATE 5-31-19	





COVER 120 LBS. MINIMUM



NOTES:

1. ALL MANHOLE FRAMES SHALL BE BE DOMESTICALLY CAST.
2. FRAME SHALL BE A MINIMUM WEIGHT OF 182 LBS. WITHIN PUBLIC ROW AND 160 LBS. WITHIN EASEMENTS.
3. COVER SHALL WEIGH A MINIMUM OF 120 LBS.
4. ALL MANHOLE FRAMES OUTSIDE OF PAVED SURFACES SHALL BE BOLTED TO THE CONE SECTION OR RING WITH A MINIMUM OF 4 BOLTS PER FRAME.

WINTERVILLE
NORTH CAROLINA

TOWN OF WINTERVILLE

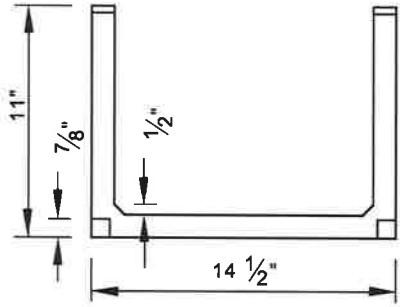
PUBLIC WORKS DEPARTMENT

2571 Railroad St. Winterville, NC 28590

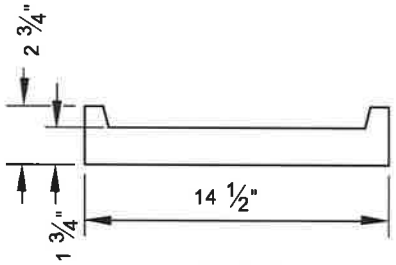
MANHOLE FRAME AND COVER

STD. NO.	SCALE
SD-8	N.T.S
SHEET	DATE
1 OF 1	5-31-19

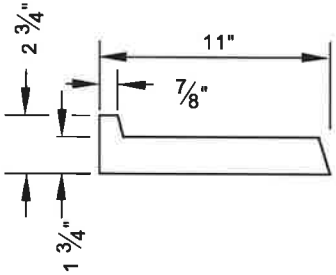
REVISIONS		
NO	DATE	COMMENT



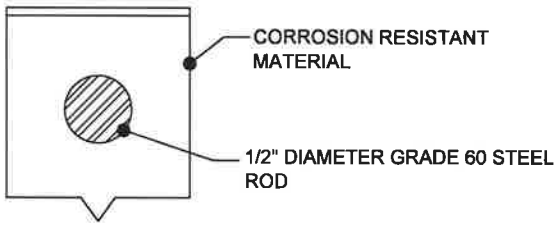
PLAN



ELEVATION



SIDE ELEVATION



SECTION VIEW

NOTES:

1. VERTICAL SPACING = 16" O.C., ON VERTICAL WALL ONLY.

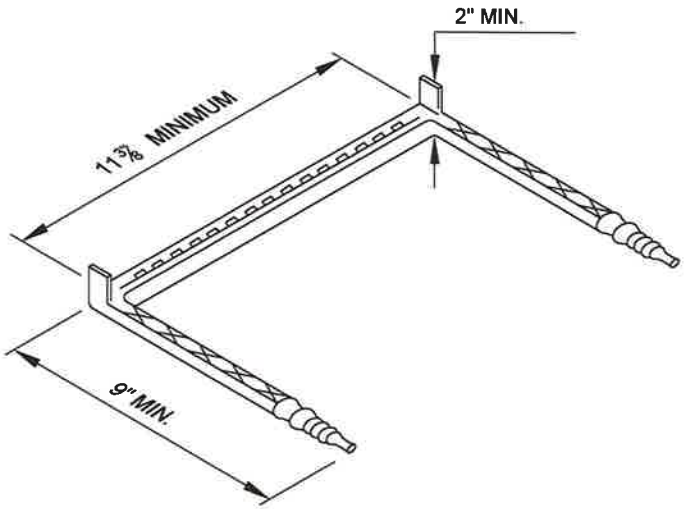
2. STEPS TO PROTRUDE MINIMUM 5" FROM FACE OF STRUCTURE WALL.

3. STEPS SHALL MEET THE REQUIREMENTS OF ASTM C478 IN ADDITION TO A HORIZONTAL PULL-OUT LOAD OF 1000 LBS. WHEN INSTALLED.

4. ALL STEPS SHALL BE VERTICALLY ALIGNED IN A STRAIGHT LINE.

5. NO STEPS LOCATED INSIDE MANHOLE CHIMNEY.

6. STEPS DIFFERING IN DIMENSIONS, CONFIGURATIONS, OR MATERIALS FROM THOSE SHOWN MAY ALSO BE USED PROVIDED THE CONTRACTOR HAS FURNISHED THE TOWN WITH DETAILS OF THE PROPOSED STEPS AND HAS RECEIVED WRITTEN APPROVAL FROM THE TOWN FOR THE USE OF SUCH STEPS.



ENCAPSULATED STEEL STEP

WINTERVILLE
NORTH CAROLINA

TOWN OF WINTERVILLE

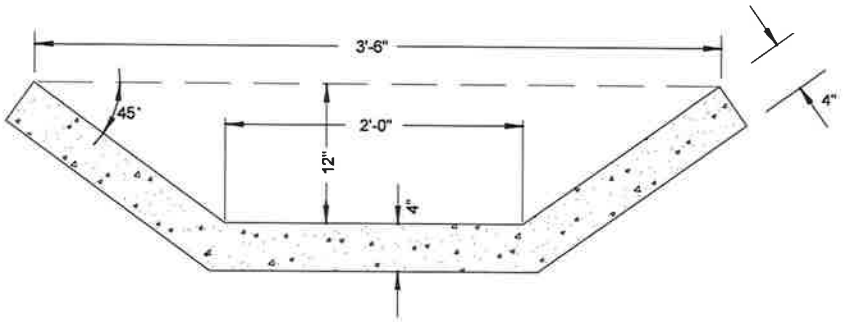
PUBLIC WORKS DEPARTMENT

2571 Railroad St. Winterville, NC 28590

MANHOLE STEPS

STD. NO.	SCALE
SD-9	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



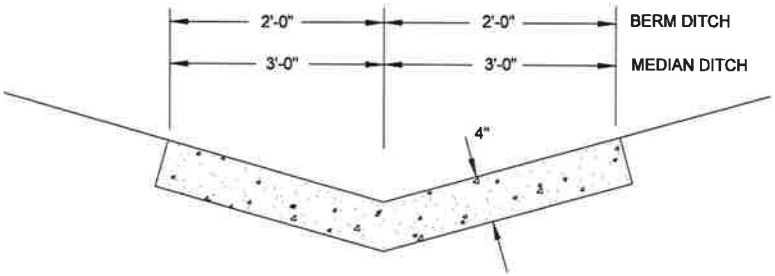
SLOPE DRAIN, BASE DITCH OR BERM DRAINAGE OUTLET DITCH

GENERAL NOTES:

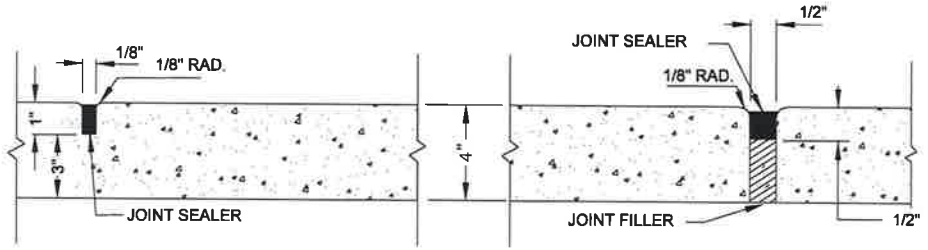
IN THE 4" CONCRETE PAVED DITCHES PLACE 1/2" EXPANSION JOINT AT 30 FT INTERVALS AND AT ALL OTHER POINTS WHERE PROPOSED DITCHES ABUT RIGID OBJECTS. PLACE GROOVED JOINTS 1" DEEP AT 10' INTERVALS BETWEEN EXPANSION JOINTS.

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

ALL CONCRETE TO BE 3,000 P.S.I. COMPRESSIVE STRENGTH.

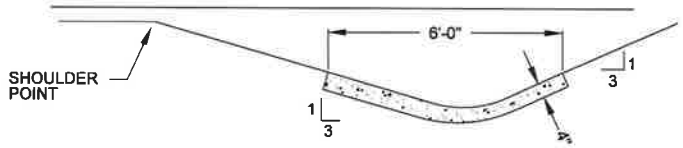


MEDIAN OR BERM DITCH

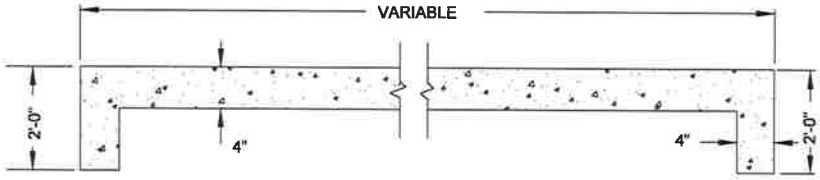


SHOWING GROOVED JOINT

SHOWING EXPANSION JOINT



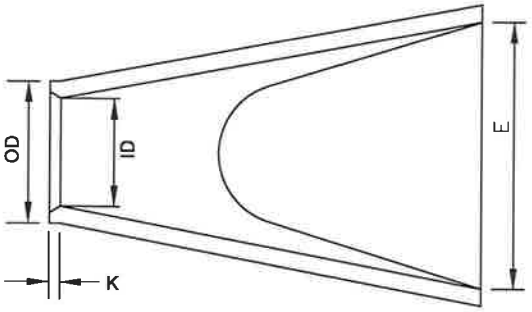
SIDE DITCH



LONGITUDINAL SECTION OF PAVED DITCH

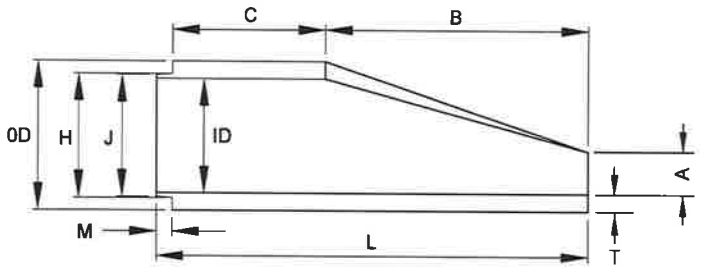
SHOWING 2'-0" CURTAIN WALL REQUIRED AT EACH END

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	STD. NO.	SCALE	REVISIONS
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**SD-10**	N.T.S	NO / DATE / COMMENT
	STANDARD CONCRETE PAVED DITCHES	SHEET 1 OF 1	DATE 5-31-19	

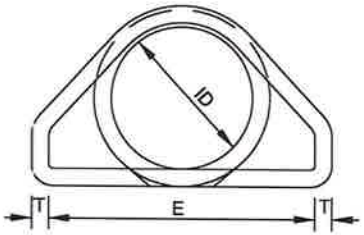


PLAN

TABLE OF DIMENSIONS												
ID	T	0D	A	B	C	E	H	J	K	M	L	WT.
15"	2-1/4"	19-1/2"	7"	27-1/4'	47-1/2"	30"	17"	16-1/2"	2"	2"	74-3/4"	1038
18"	2-1/2"	23"	9"	27"	47-3/4"	36"	20-1/4"	19-1/2"	2"	2"	74-3/4"	1426
24"	3"	30"	9"	43"	37"	47-3/4"	26-3/4"	26-1/4"	2-13/16"	2-3/4"	80"	2137
30"	3-1/2"	37"	12"	54-1/2"	22-1/2"	60"	33-1/2"	32-1/2"	3"	2-15/16"	77"	2990
36"	4"	44"	16"	60"	37-1/2"	71"	39-3/4"	39"	3-3/4"	3-3/4"	97-1/2"	3960
42"	4-1/2"	51"	22-1/4"	61-3/8'	37"	77-1/4"	46-1/8"	45-1/8"	4-1/4"	4-1/4"	98-3/8"	5160
48"	5"	58"	25-1/4"	70-1/4'	29"	83-1/2"	52-1/2"	51-3/4"	4-1/4"	4-1/4"	99-1/4"	6480
54"	5-1/2"	65-1/4"	26"	65"	39-1/2"	89-3/4"	58-1/4"	57-1/2"	4-1/4"	4-1/4"	104-1/2"	9370
60"	6"	72-1/4"	28-1/2"	57-1/2"	46"	96"	64-3/4"	64"	4-3/4"	4-3/4"	103-1/2"	11650



SECTION



END VIEW

NOTES:

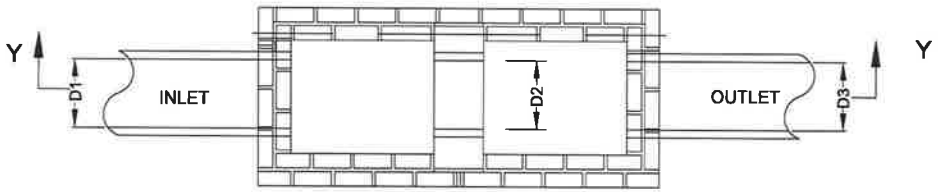
1) REFER TO STANDARD SPECIFICATIONS FOR MATERIALS AND INSTALLATION.

2) CONCRETE SHALL BE MINIMUM 3500 P.S.I.

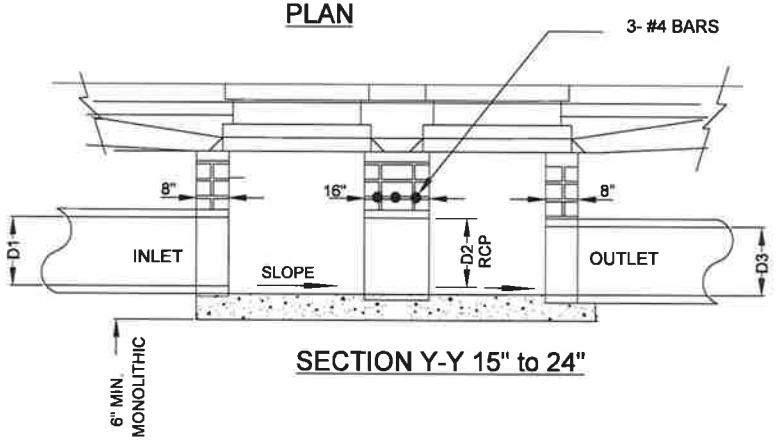
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	STD. NO.	SCALE	REVISIONS
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**SD-11**	N.T.S	NO / DATE / COMMENT
	PRECAST FLARED END SECTION	SHEET 1 OF 1	DATE 5-31-19	

GENERAL NOTES:

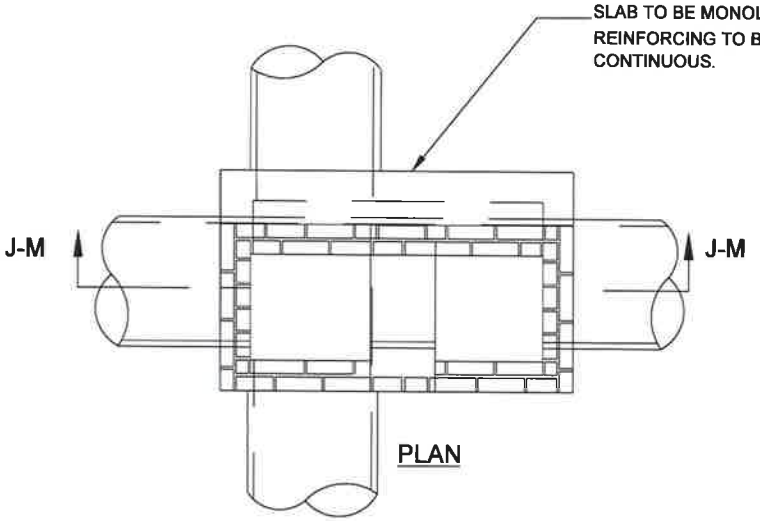
1. DOUBLE CATCH BASIN ONLY FOR USE WITHIN TOWN MAINTAINED STREETS. INSTALLATION ON STREETS WITHIN EXISTING/FUTURE NCDOT MAINTAINED RIGHT OF WAY REQUIRES A MINIMUM OF ONE 4 FOOT LONG SECTION OF REINFORCED CONCRETE PIPE BETWEEN CATCH BASINS.
2. SEE NCDOT STANDARD 840.01 FOR DETAILS BASED ON PIPE SIZE PER CROSS-SECTION.
3. CONSTRUCT TWO SINGLE BASINS PER NCDOT STANDARD WITH DOUBLE INTERIOR WALL.
4. ALL CONCRETE TO BE 3600 P.S.I COMPRESSIVE STRENGTH.
5. BASE SLAB SHALL BE MONOLITHIC.
6. RCP PIPE SECTION D2 CONNECTING CATCH BASINS SHALL HAVE A MINIMUM DIAMETER SAME AS OF OUTLET PIPE D3.
7. 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)



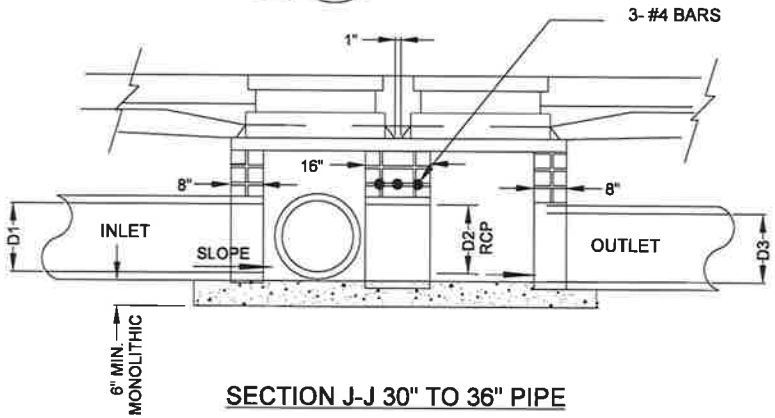
PLAN



SECTION Y-Y 15" to 24"



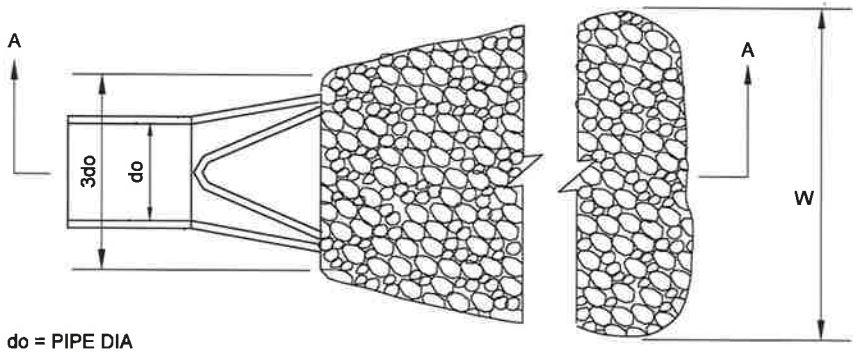
PLAN



SECTION J-J 30" TO 36" PIPE

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **DOUBLE CATCH BASIN 15" THRU 36" PIPE**	STD. NO. **SD-12** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS NO / DATE / COMMENT

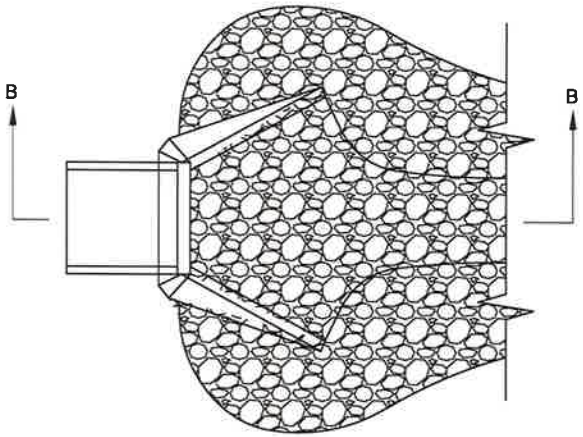
DISCHARGE TO A NOT
WELL DEFINED CHANNEL



do = PIPE DIA
La = APRON LENGTH
W = APRON WIDTH
3 x PIPE Ø MIN
d = APRON DEPTH

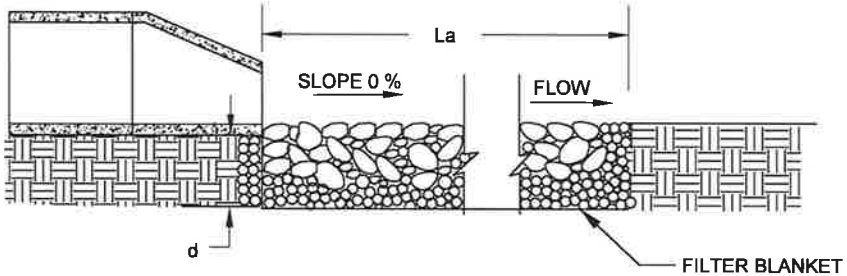
PLAN

DISCHARGE TO A
WELL DEFINED CHANNEL

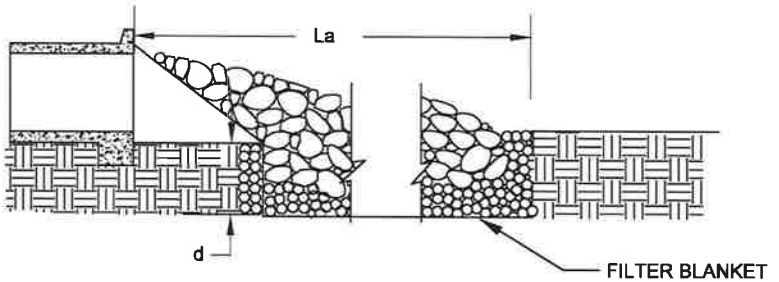


PLAN

1. La IS THE LENGTH OF THE RIPRAP APRON.
2. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER BUT NOT LESS THAN 6"
3. A FILTER BLANKET OR FILTER FABRIC SHOULD BE INSTALLED BETWEEN THE RIPRAP AND SOIL FOUNDATION.
4. IN A WELL-DEFINED CHANNEL, EXTEND THE APRON UP THE CHANNEL BANKS TO AN ELEVATION OF 6" ABOVE THE MAXIMUN TAILWATER DEPTH OR TO THE TOP OF THE BANK, WHICHEVER IS LESS.



SECTION A-A



SECTION B-B

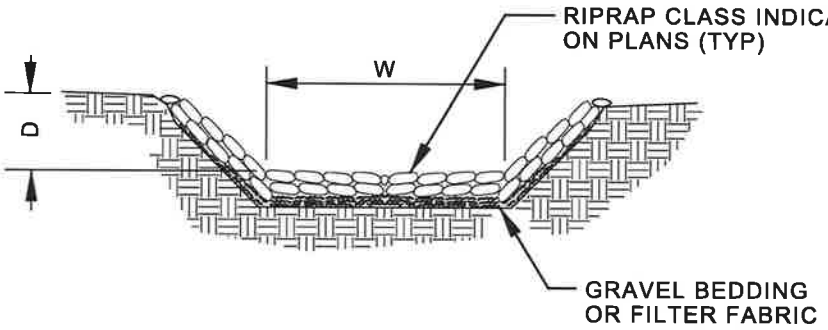
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT
2571 Railroad St. Winterville, NC 28590

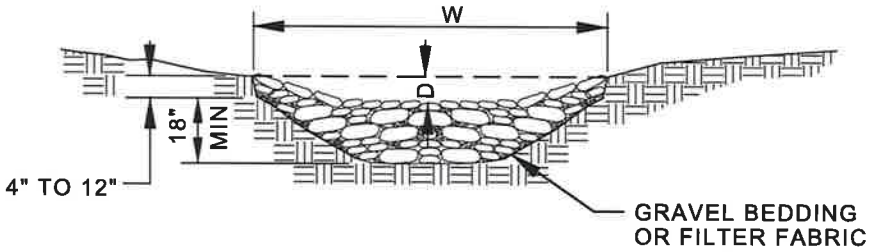
FLARED END SECTION OUTLET TREATMENT

STD. NO.	SCALE
SD-13	N.T.S
SHEET	DATE
1 OF 1	5-31-19

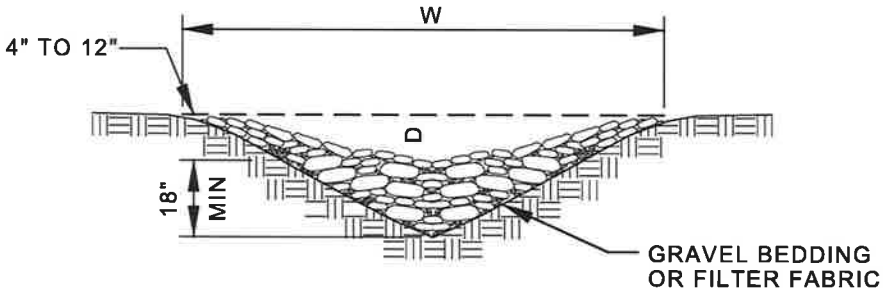
REVISIONS		
NO	DATE	COMMENT



TRAPEZOIDAL



PARABOLIC



V-SHAPED

RIPRAP CLASS	MIN DEPTH
A	9"
B	1' - 6"
1	2' - 2"
2	3' - 0"

NOTES:

1. TO BE USED WHERE EXCESSIVE STORMWATER VELOCITIES PROHIBIT VEGETATIVE LININGS.
2. DIMENSIONS FOR D & W VARIES ACCORDING TO DESIGN.
3. SIDE SLOPES SHALL BE NO STEEPER THAN 2:1.

WINTERVILLE
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PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

RIP-RAP LINED CHANNELS

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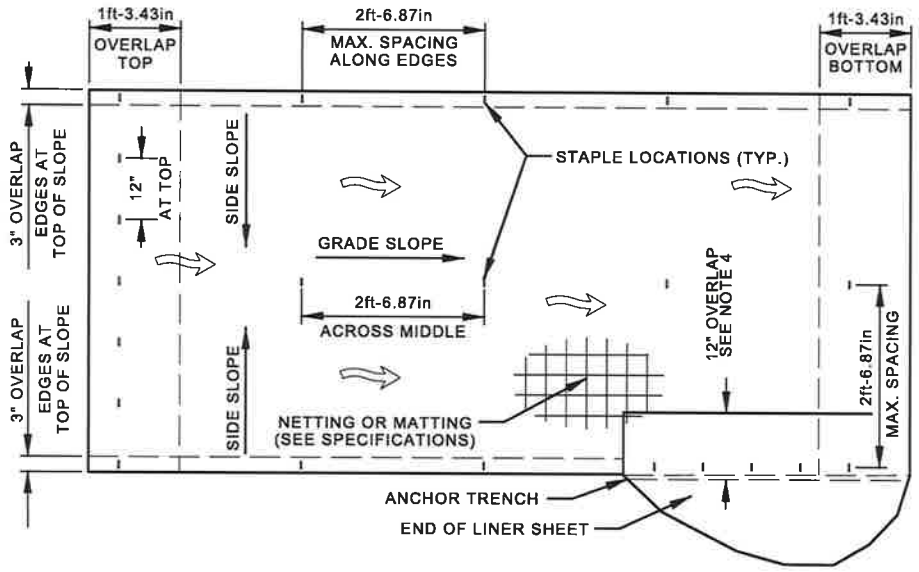
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



INSTALLATION OF LINER:

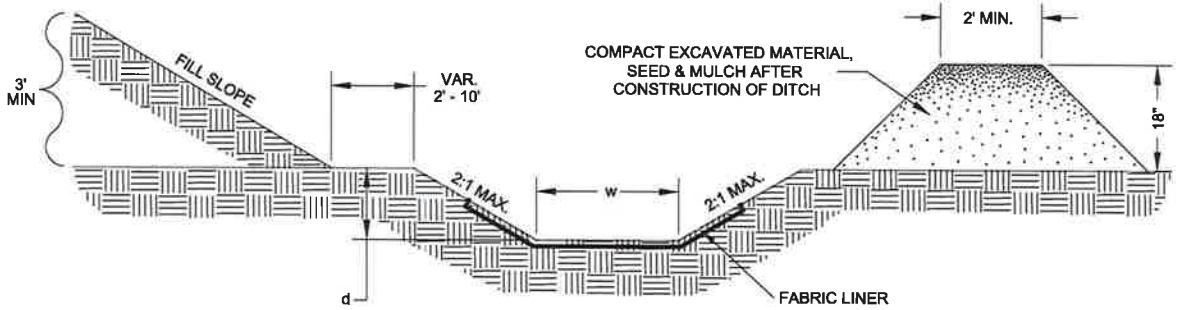
1. APPLY LIME, FERTILIZER, AND SEED BEFORE LAYING LINER.
2. LAY LINER FROM TOP OF SLOPE OR CHANNEL AND UNROLL IT DOWN THE GRADE. ALLOW NETTING TO LAY LOOSELY WITH WRINKLES. DO NOT STRECH LINER.
3. BURY THE UPSLOPE END IN AN ANCHOR TRENCH 6" DEEP, COVER WITH SOIL AND TAMP FIRMLY. PROVIDE STAPLES (1" WIDE x 6" LONG MIN.) AND OVERLAP AS SHOW ABOVE.
4. TO JOIN TWO STRIPS, CUT A TRENCH AND ANCHOR THE END OF THE NEW LINER. OVERLAP THE END OF PREVIOUS ROLL 12" MINIMUM AND STAPLE AT 12" O.C.

NOTES:

DIMENSIONS d & w AND LINER TO BE DETERMINED BY ENGINEER.

MAINTENANCE:

1. INSPECT PERIODICALLY OR AFTER RAINSTORMS FOR EROSION OR FAILURE. REPAIR ALL WASHED OUT AREAS BY RE-GRADING, RE-SEEDING, AND RE-INSTALLING LINER AND MULCH AS REQUIRED.
2. REMOVE SILT WHEN DITCH IS 1/2 FULL.
3. STABILIZE IMMEDIATELY UPON CONSTRUCTION AND PRIOR TO SITE INSPECTION APPROVAL.



CROSS SECTIONAL VIEW

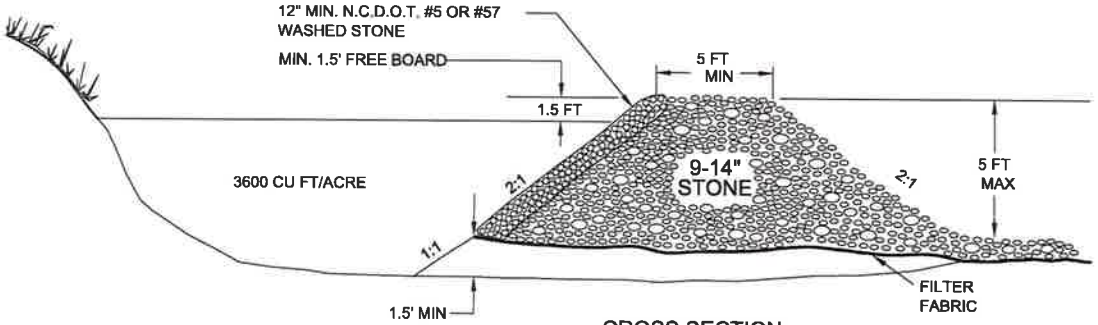
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **SD-15**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	STANDARD TEMPORARY SILT DITCH	SHEET 1 OF 1	DATE 5-31-19	

DESIGN CRITERIA

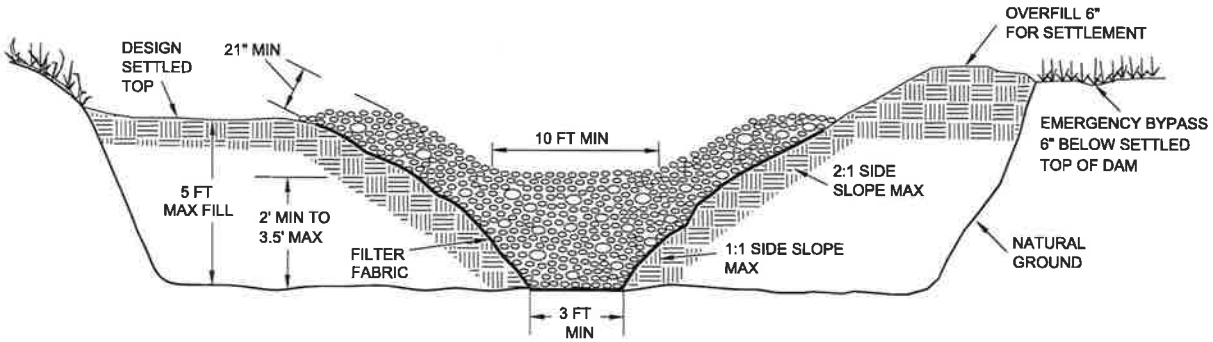
SUMMARY:

PRIMARY SPILLWAY:	STONE SPILLWAY
MAXIMUM DRAINAGE AREA:	<1 ACRES
MINIMUM VOLUME:	3600 CU FT PER ACRE OF DISTURBED AREA
MINIMUM SURFACE AREA:	435 SQ FT PER CFS OF Q25 PEAK FLOW
MINIMUM L/W RATIO:	2:1
MINIMUM DEPTH:	3.5 FEET, 1.5FEET EXCAVATED BELOW GRADE
MAXIMUM HEIGHT:	WEIR ELEVATION 3.5 FEET ABOVE GRADE
DEWATERING MECHANISM:	STONE SPILLWAY
MINIMUM DEWATERING TIME:	N/A
BAFFLES REQUIRED:	3 MINIMUM (COIR OR JUTE) MESH
MIN WEIR (COR)	10'

NOTE: TRAPS LESS THAN 20' IN LENGTH MAY USE BAFFLES.



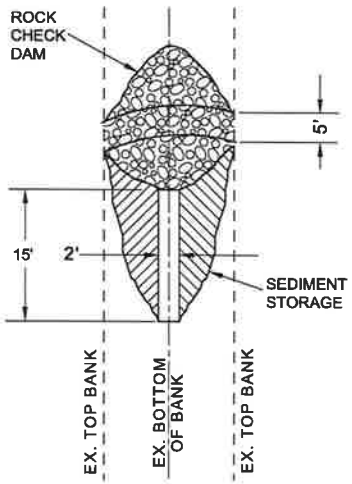
CROSS SECTION



PLAN VIEW

NOTES:
SEE N.C. DEQ EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL FOR CONDITIONS WHERE PRACTICE APPLIES; PLANNING CONSIDERATION & DESIGN CRITERIA. BASINS LESS THAN 20' IN LENGTH MAY USE BAFFLES.

TYPICAL FOR ROADSIDE DITCHES



MAINTENANCE:

1. CHECK BASIN AFTER EVERY RAINFALL WHICH CAUSES FLOW IN ROADSIDE DITCH.
2. REMOVE SEDIMENT AND RESTORE TRAP TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-HALF THE DESIGN DEPTH OF THE TRAP. PLACE THE SEDIMENT THAT IS REMOVED IN A DESIGNATED DISPOSAL AREA AND REPLACE THE CONTAMINATED PART OF THE GRAVEL FACING.
3. CHECK THE STRUCTURE FOR DAMAGE FROM EROSION OR PIPING. PERIODICALLY CHECK THE DEPTH OF THE SPILLWAY TO ENSURE IT IS A MINIMUM OF 1.5 FT BELOW THE LOW POINT OF THE EMBANKMENT. IMMEDIATELY FILL ANY SETTLEMENT OF THE EMBANKMENT TO SLIGHTLY ABOVE DESIGN GRADE.
4. ALL TEMPORARY SEDIMENT TRAPS SHOWN ON PLANS SHALL BE SIZED ACCORDING TO THIS DETAIL.

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

TEMPORARY SEDIMENT TRAP

STD. NO.	SCALE
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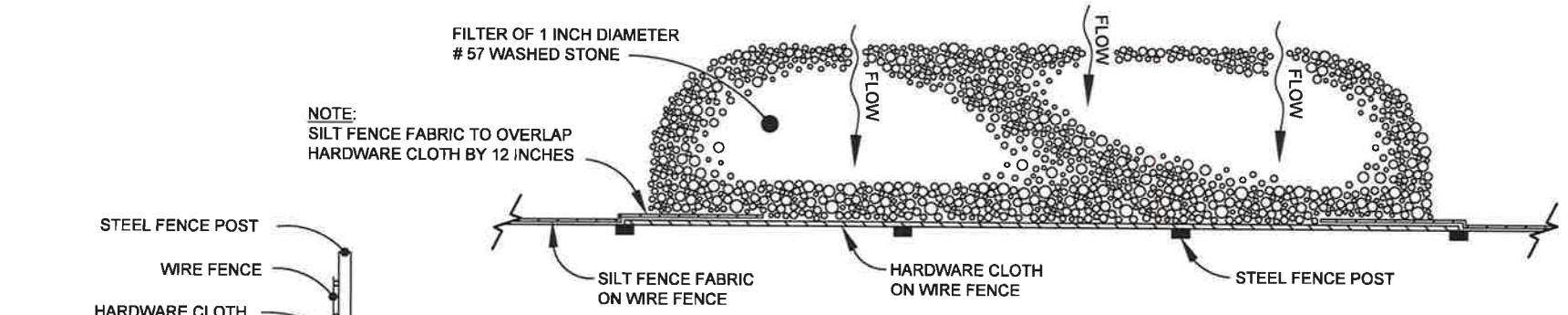
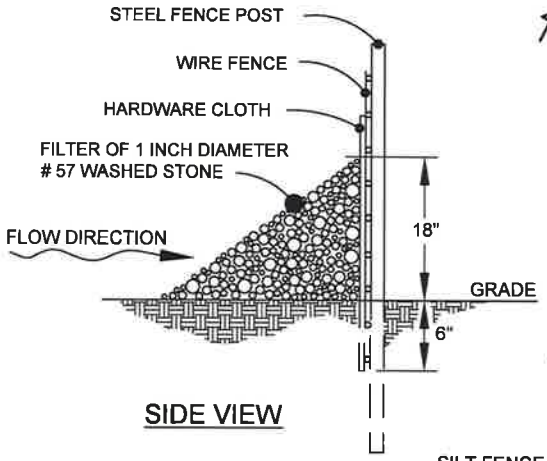
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



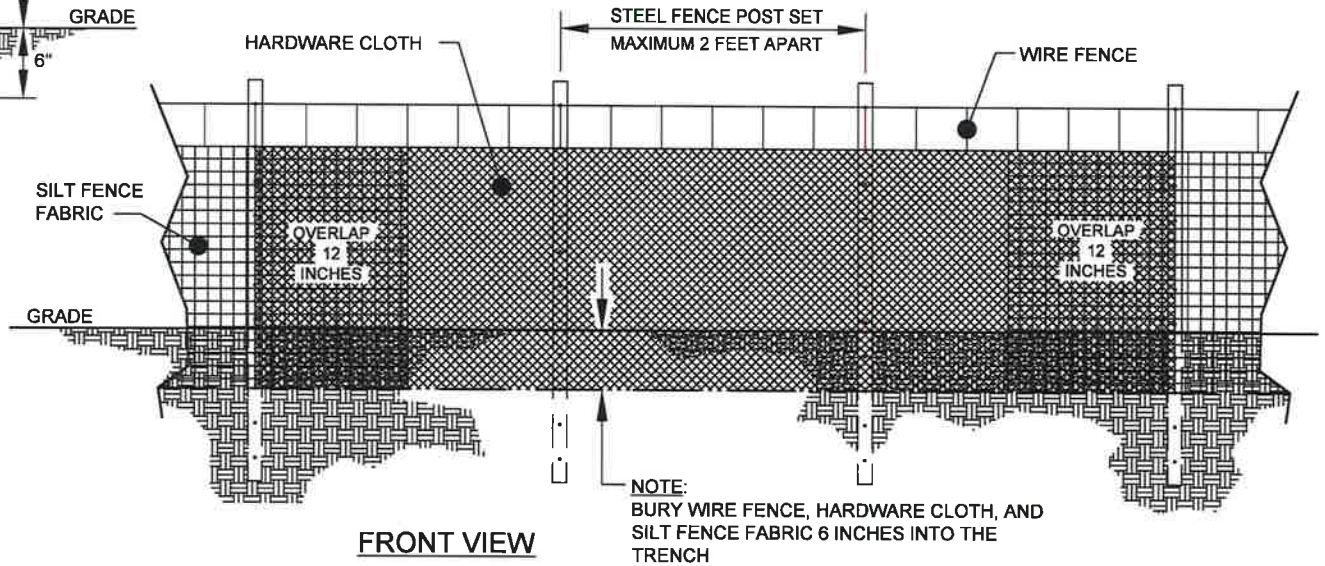
PLAN VIEW

NOTE:
USE SILT FENCE OUTLETS ONLY WHEN DRAINAGE AREA DOES NOT EXCEED 1/4 ACRE AND THERE IS A LOW AREA. USE AS A REPAIR OF SILT FENCE FAILURES.



SIDE VIEW

NOTE:
1. WATTLES MAY BE USED IN LIEU OF STONE OR FILTER FABRIC WITH APPROVAL BY THE TOWN.

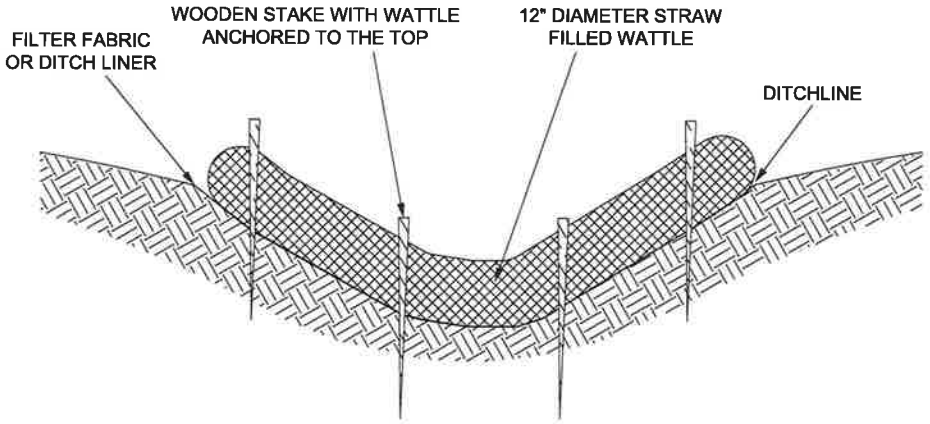


FRONT VIEW

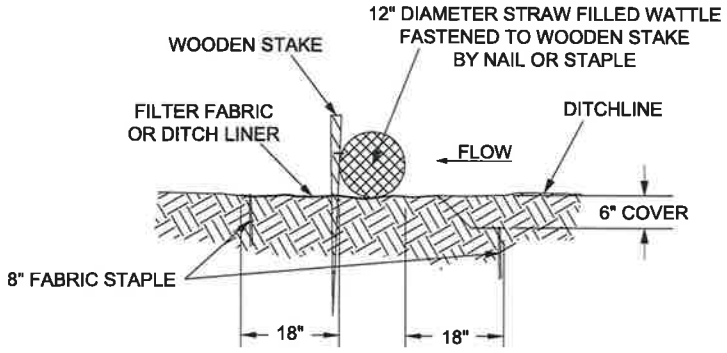
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **SD-17**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	STANDARD SILT FENCE OUTLET	SHEET 1 OF 1	DATE 5-31-19	

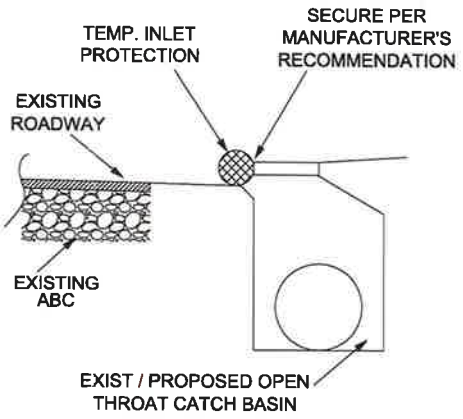
NOTES:

1. WATTLES SHALL BE FILLED WITH STRAW OR OTHER APPROVED MATERIAL.
2. SPACING FOR WATTLES SHALL BE DETERMINED BY THE SITE ENGINEER.
3. WATTLES MAY BE USED FOR PROTECTION OF CATCH BASINS AND DROP INLETS WITH APPROVAL BY THE STORMWATER PROGRAM MANAGER OR DESIGNEE.

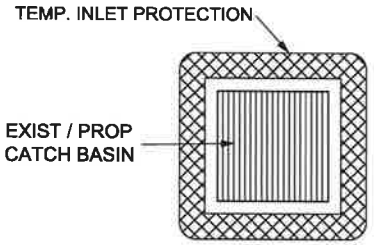


PROFILE VIEW

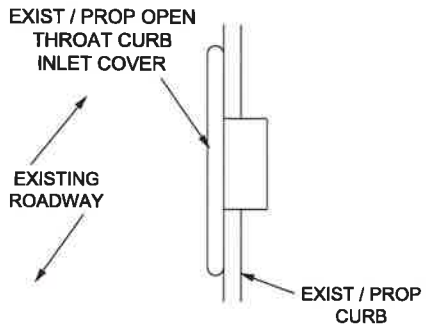




CROSS SECTION

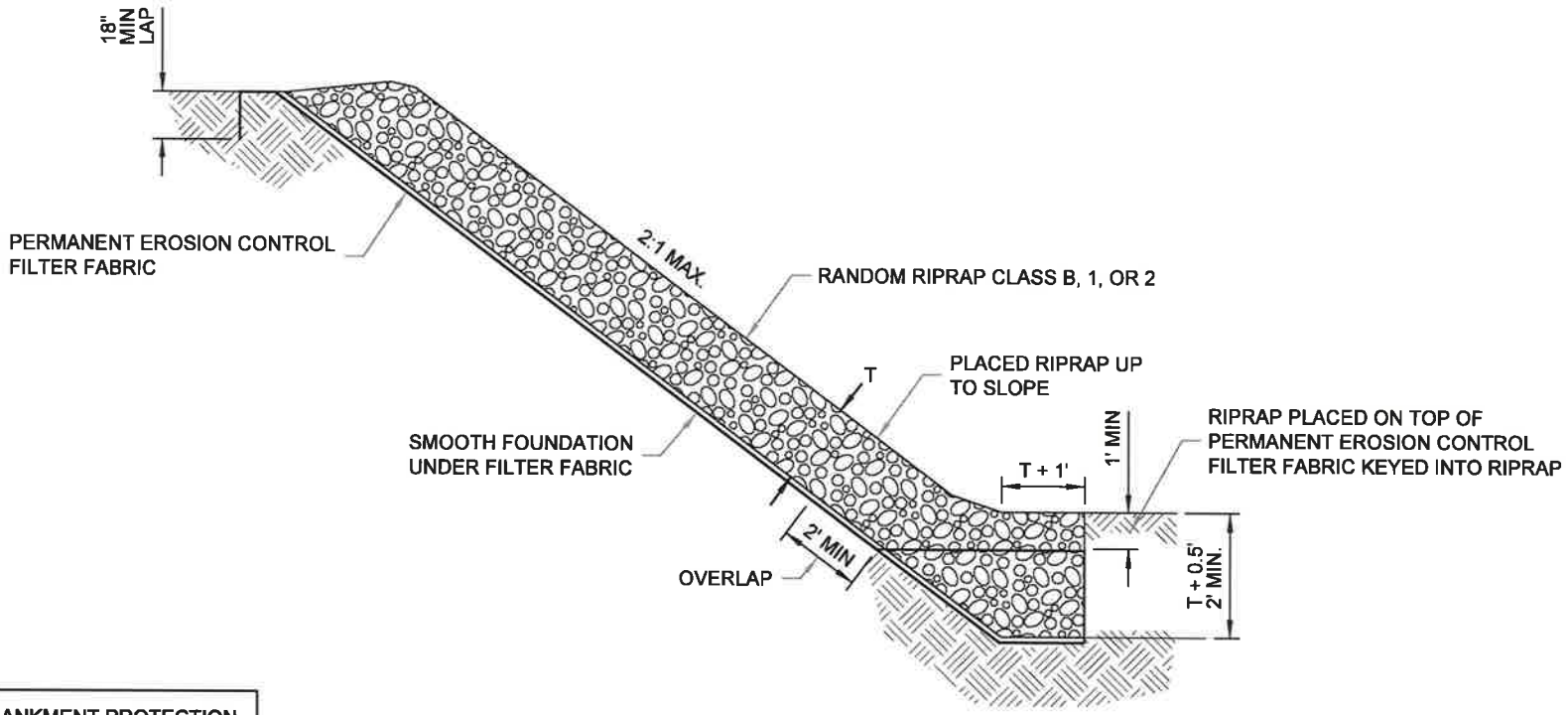


PLAN W / DROP INLET



PLAN W / INLET
INLET PROTECTION - COR BOX

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **WATTLE / INLET PROTECTION**	STD. NO. **SD-18** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS: NO / DATE / COMMENT



EMBANKMENT PROTECTION	
RIPRAP CLASS	MINIMUM T
B	1' - 6"
1	2' - 2"
2	3' - 0"

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT

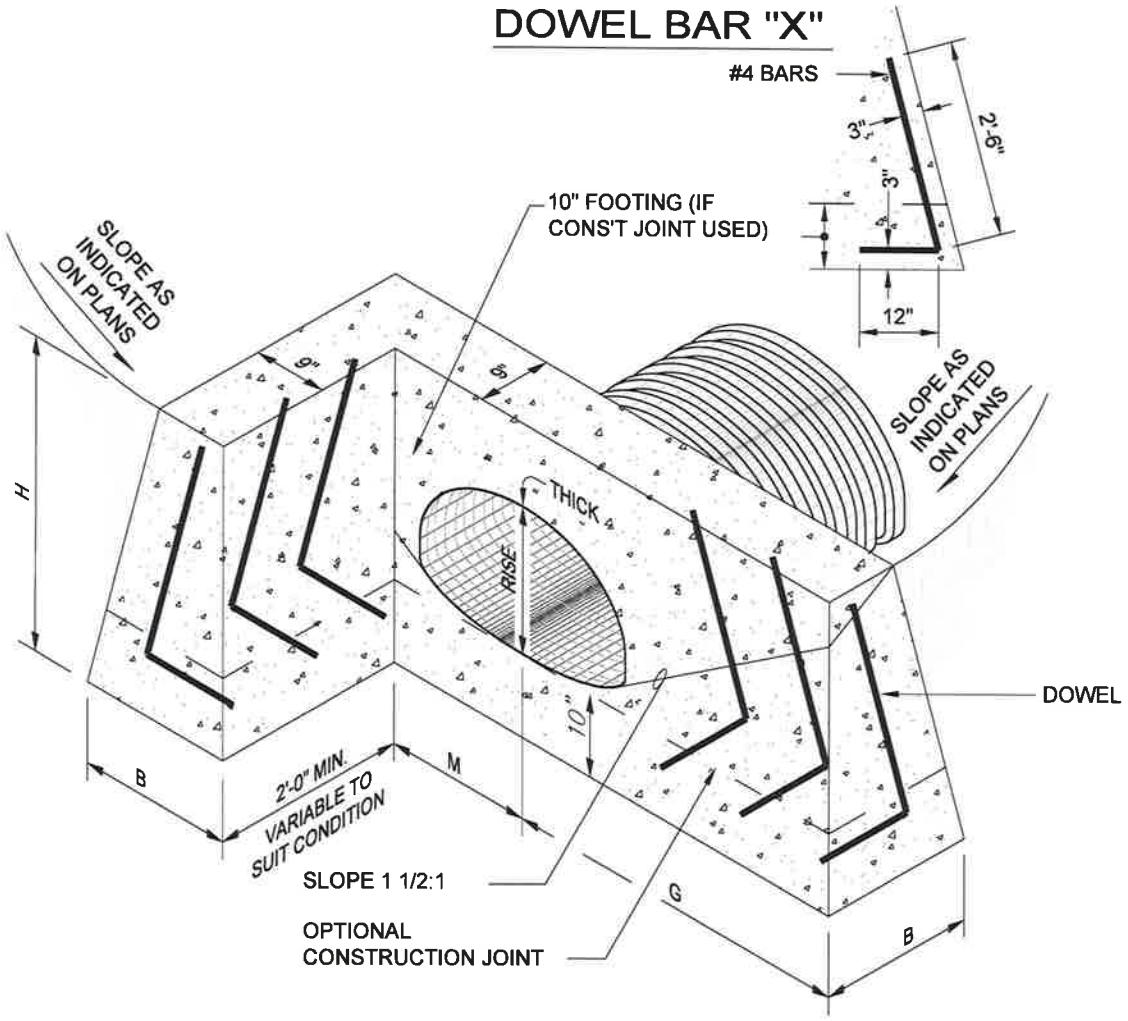
2571 Railroad St. Winterville, NC 28590

EMBANKMENT STABILIZATION

STD. NO.	SCALE
SD-19	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

DOWEL BAR "X"



REINFORCING QUANTITIES										
SPAN	18"	22"	25"	29"	36"	43"	50"	58"	65"	72"
BARS	X	←							→	X
QTY.	5	5	5	6	6	7	7	7	8	8
LBS.	12	12	12	14	14	16	16	16	19	19

DIMENSIONS AND CONCRETE QUANTITIES							
COMMON DIMENSIONS USING C.M. ARCH PIPE							TOTAL CONC.
SPAN	RISE	THICK	H	B	G	M	CU. YD.
18"	11"	.064	2'-7"	1'-4"	2'-5"	1'-0"	0.604
22"	13"	.064	2'-9"	1'-5"	2'-9"	1'-2"	0.712
25"	16"	.064	3'-0"	1'-6"	3'-3"	1'-4"	0.877
29"	18"	.079	3'-2"	1'-7"	3'-7"	1'-6"	1.015
36"	22"	.079	3'-6"	1'-9"	4'-3"	1'-9"	1.306
43"	27"	.079	3'-11"	2'-0"	5'-1"	2'-1"	1.796
50"	31"	.109	4'-3"	2'-2"	5'-9"	2'-4"	2.206
58"	36"	.109	4'-8"	2'-4"	6'-7"	2'-8"	2.794
65"	40"	.138	5'-0"	2'-6"	7'-4"	3'-0"	3.387
72"	44"	.138	5'-4"	2'-8"	8'-0"	3'-3"	3.995

QUANTITIES BASED ON 2'-0"

NOTES:

1. SEE STD. DETAIL SD-24 FOR GENERAL NOTES.

WINTERVILLE NORTH CAROLINA

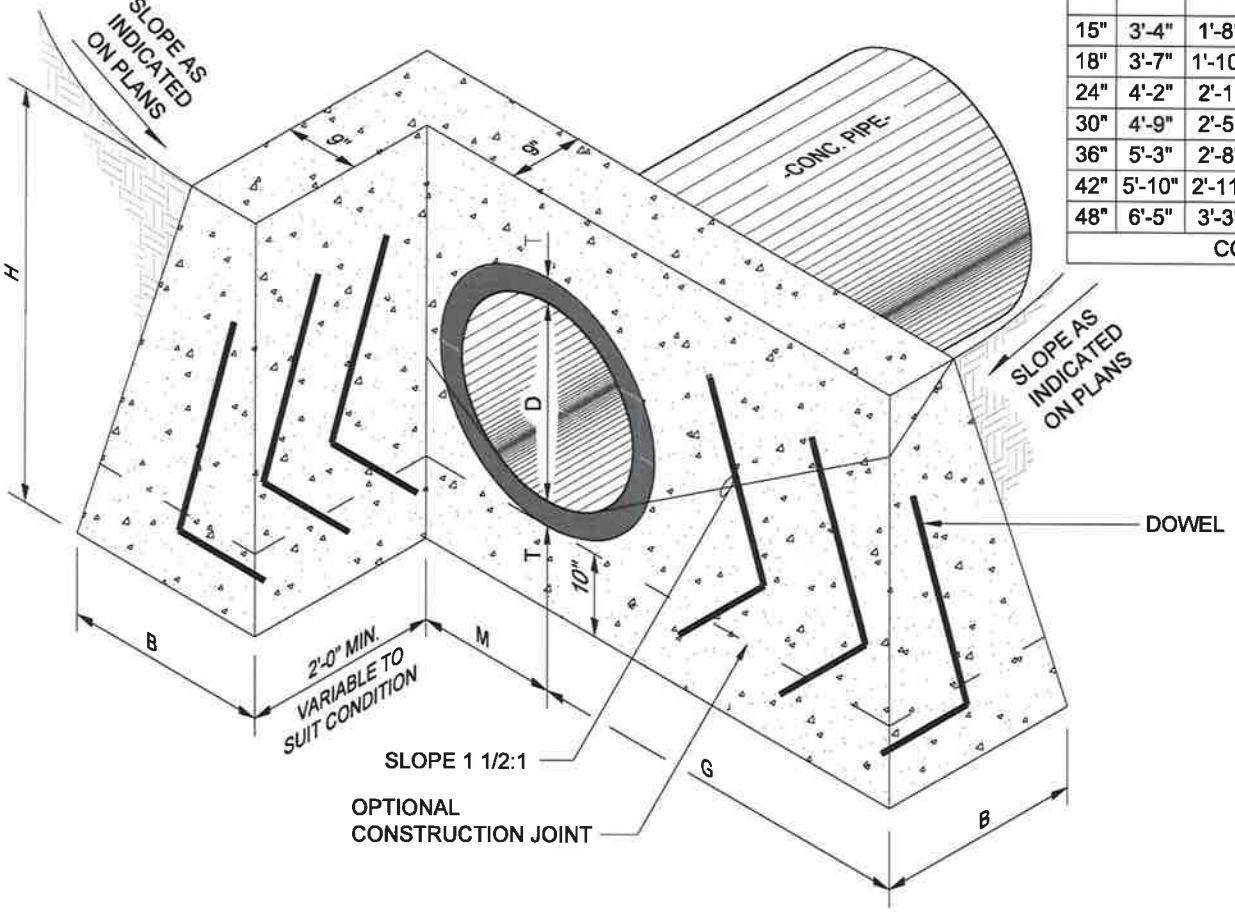
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

CONCRETE "L" ENDWALL FOR SINGLE PIPE CULVERTS (18" THRU 72" ARCH PIPE)

STD. NO.	SCALE
SD-20	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



DIMENSIONS AND CONCRETE QUANTITIES

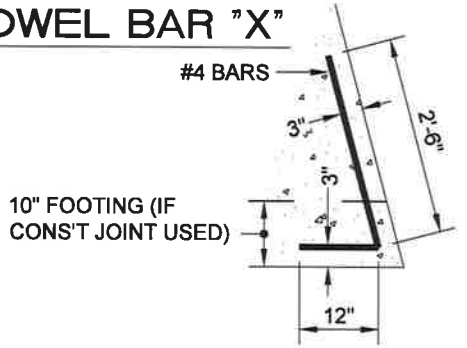
COMMON DIMENSIONS						
D	H	B	G	M	T	CU. YD.
15"	3'-4"	1'-8"	2'-9"	1'-10"	1 7/8"	0.960
18"	3'-7"	1'-10"	3'-2"	1'-2"	2"	1.193
24"	4'-2"	2'-1"	4'-0"	1'-5"	2 1/2"	1.711
30"	4'-9"	2'-5"	4'-7"	1'-9"	2 1/4"	2.394
36"	5'-3"	2'-8"	5'-6"	2'-0"	3"	3.169
42"	5'-10"	2'-11"	6'-4"	2'-4"	3 1/2"	4.139
48"	6'-5"	3'-3"	7'-2"	2'-11"	4"	5.422
CONCRETE PIPE						

COMMON DIMENSIONS				
H	B	G	M	CU. YD.
3'-0"	1'-5"	2'-6"	0'-11"	0.770
3'-3"	1'-8"	2'-11"	1'-0"	0.964
3'-9"	1'-11"	3'-8"	1'-3"	1.385
4'-3"	2'-2"	4'-5"	1'-6"	1.908
4'-9"	2'-5"	5'-2"	1'-9"	2.544
5'-3"	2'-8"	5'-11"	2'-0"	3.301
5'-9"	2'-11"	6'-8"	2'-3"	4.193
METAL PIPE				

REINFORCING QUANTITIES

SPAN	15"	18"	24"	30"	36"	42"CM		42"RC		48"CM		48"RC	
BARS	X	X	X	X	X	X	Y	X	Y	X	Y	X	Y
QTY.	5	5	6	6	7	7	2	7	2	8	2	8	2
LBS.	12	12	14	14	16	47		49		52		55	

DOWEL BAR "X"

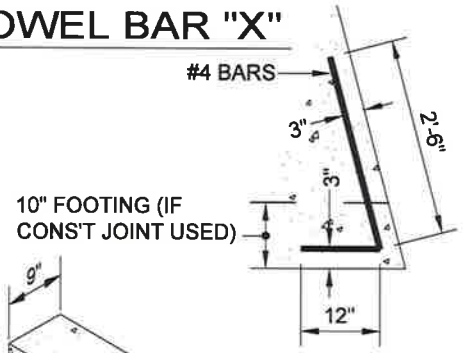


NOTES:

1. SEE STD. DETAIL SD-24 FOR GENERAL NOTES.

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT — 2571 Railroad St. Winterville, NC 28590 **CONCRETE "L" ENDWALL FOR SINGLE PIPE CULVERTS (15" THRU 48" PIPE)**	STD. NO. **SD-21** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS: NO / DATE / COMMENT

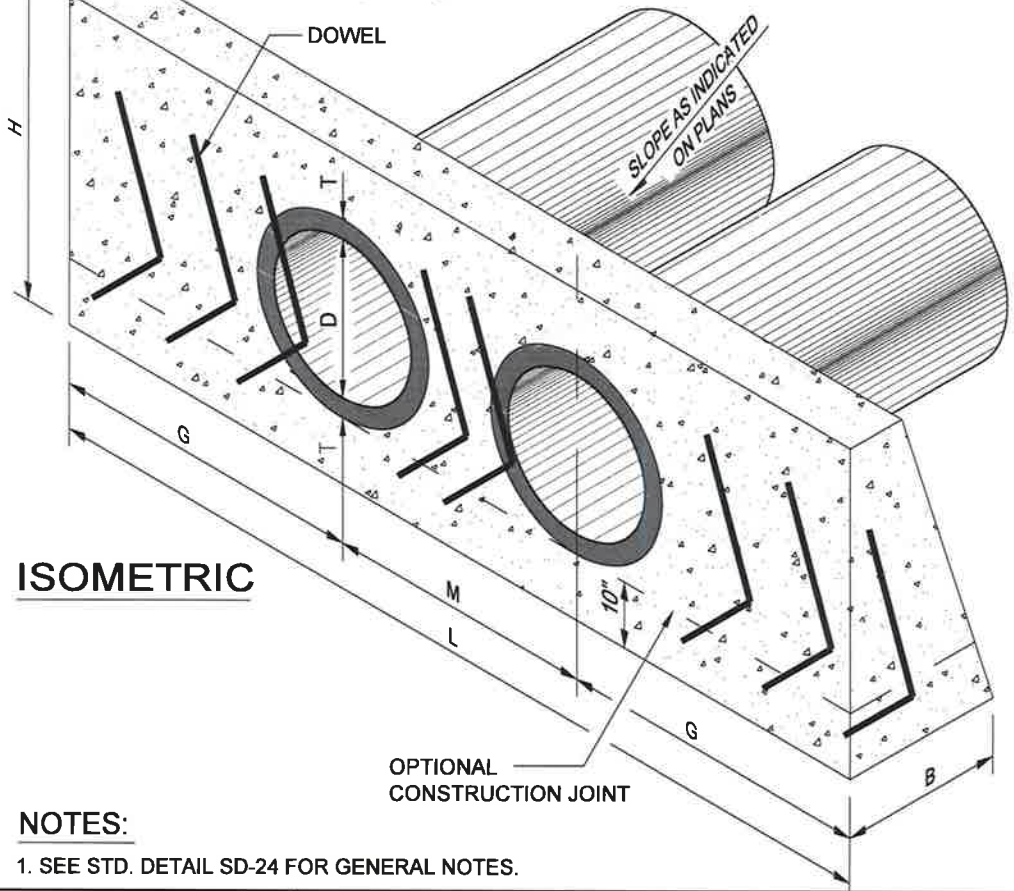
DOWEL BAR "X"



DIMENSIONS AND CONCRETE QUANTITIES

CONCRETE PIPE									
	COMMON DIMENSIONS				SINGLE PIPE		DOUBLE PIPE		
D	H	B	G	T	L	CU. YD.	M	L	CU. YD.
15"	3'-4"	1'-8"	2'-9"	1 7/8"	5'-6"	0.734	2'-2"	7'-8"	0.970
18"	3'-7"	1'-10"	3'-2"	2"	6'-4"	0.958	2'-7"	8'-11"	1.274
24"	4'-2"	2'-1"	4'-0"	2 1/2"	8'-0"	1.506	3'-5"	11'-5"	2.010
30"	4'-9"	2'-5"	4'-7"	2 3/4"	9'-2"	2.145	4'-3"	13'-5"	2.920
36"	5'-3"	2'-8"	5'-6"	3"	11'-0"	3.040	5'-0"	16'-0"	4.086
42"	5'-10"	2'-11"	6'-4"	3 1/2"	12'-8"	4.120	5'-10"	18'-6"	5.534
48"	6'-5"	3'-3"	7'-2"	4"	14'-4"	5.535	6'-8"	21'-0"	7.427

CORRUGATED METAL PIPE							
COMMON DIMS.			SINGLE PIPE		DOUBLE PIPE		
H	B	G	L	CU. YD.	M	L	CU. YD.
3'-0"	1'-6"	2'-6"	5'-0"	0.573	1'-11"	6'-11"	0.780
3'-3"	1'-8"	2'-11"	5'-10"	0.767	2'-3"	8'-1"	1.014
3'-9"	1'-11"	3'-8"	7'-4"	1.200	3'-0"	10'-4"	1.597
4'-3"	2'-2"	4'-5"	8'-10"	1.757	3'-9"	12'-7"	2.340
4'-9"	2'-5"	5'-2"	10'-4"	2.455	4'-6"	14'-10"	3.288
5'-3"	2'-8"	5'-11"	11'-10"	3.310	5'-3"	17'-1"	4.434
5'-9"	2'-11"	6'-8"	13'-4"	4.337	6'-0"	19'-4"	5.812



ISOMETRIC

DOWELS IN ENDWALL WITH REINFORCED CONC. PIPE

LOC.	PIPE DIA.	SINGLE PIPE									DOUBLE PIPE								
		15"	18"	24"	30"	36"	42"		48"		15"	18"	24"	30"	36"	42"		48"	
	BARS	X	X	X	X	X	X	Y	X	Y	X	X	X	X	X	X	Y	X	Y
G	QTY.	2	2	3	3	4	4		5		2	2	3	3	4	4		5	
M	QTY.	-	-	-	-	-	-	2	-	2	1	1	2	2	2	2	2	3	2
G	QTY.	2	2	3	3	4	4		5		2	2	3	3	4	4		5	
TOT. LBS.		9	9	14	14	19	55		65		12	12	19	19	23	77		92	

SEE NOTE

DOWELS IN ENDWALL WITH CORRUGATED METAL PIPE

LOC.	PIPE DIA.	SINGLE PIPE									DOUBLE PIPE								
		15"	18"	24"	30"	36"	42"		48"		15"	18"	24"	30"	36"	42"		48"	
	BARS	X	X	X	X	X	X	Y	X	Y	X	X	X	X	X	X	Y	X	Y
G	QTY.	2	2	3	3	4	4		5		2	2	3	3	4	4		5	
M	QTY.	-	-	-	-	-	-	2	-	2	1	1	1	2	2	2	2	2	2
G	QTY.	2	2	3	3	4	4		5		2	2	3	3	4	4		5	
TOT. LBS.		9	9	14	14	19	53		62		12	12	16	19	23	73		85	

SEE NOTES

NOTES:

1. SEE STD. DETAIL SD-24 FOR GENERAL NOTES.

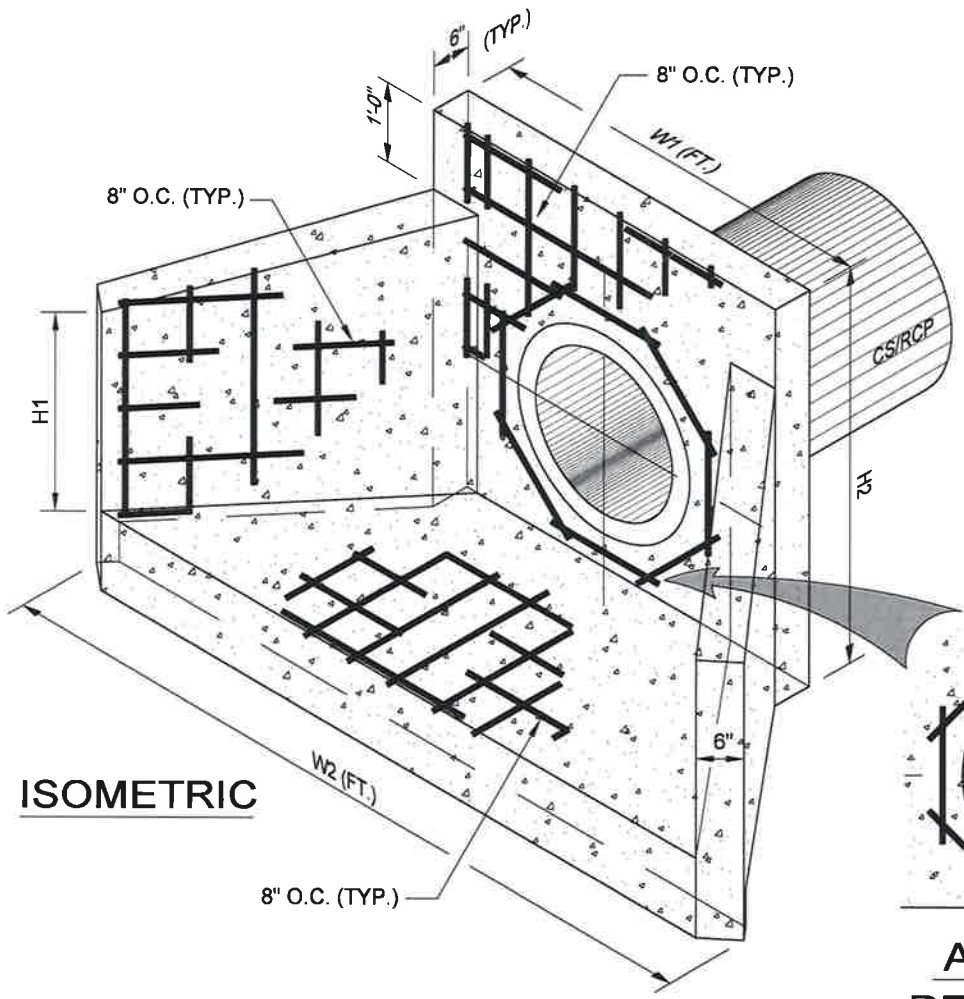
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT — 2571 Railroad St. Winterville, NC 28590

CONCRETE ENDWALL FOR SINGLE AND DOUBLE PIPE CULVERTS (15" THRU 48" PIPE - 90° SKEW)

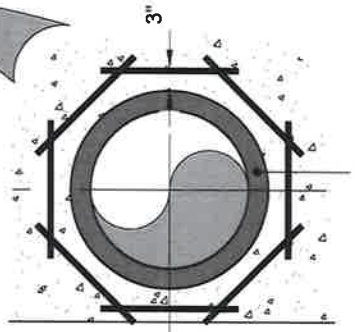
STD. NO.	SCALE
SD-22	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

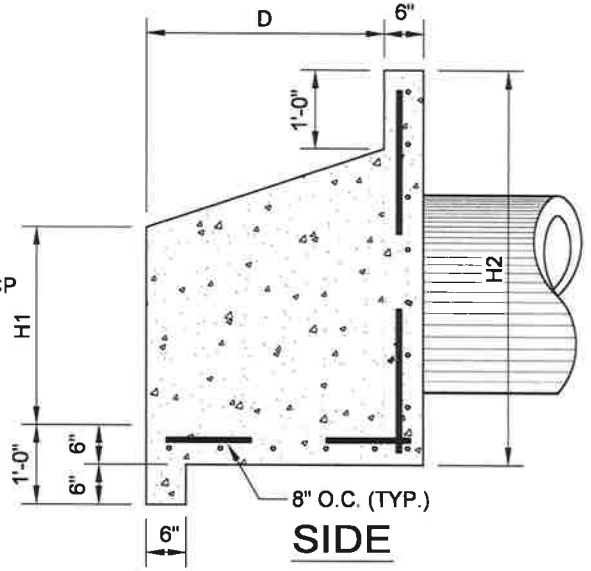


ISOMETRIC

ENDWALL DIMENSIONS						
FT.	MINIMUM	MIN./MAX.	MIN./MAX.	MIN./MAX.	MIN./MAX.	MIN./MAX.
PIPE DIA.	BAR SIZE	H1 (FT.)	H2 (FT.)	D (FT.)	W1	W2
1.0	#5 @ 8"	1.25 / 2.00	2.00 / 3.75	1.25 / 1.75	3.00 / 3.75	5.50 / 6.00
1.25	#5 @ 8"	1.25 / 2.00	3.00 / 3.75	1.25 / 2.00	3.50 / 3.75	6.50 / 6.75
1.50	#5 @ 8"	1.25 / 2.00	3.00 / 4.25	1.50 / 2.50	3.50 / 3.75	6.50 / 6.75
2.0	#5 @ 8"	1.50 / 2.50	4.00 / 4.75	1.75 / 2.50	4.00 / 4.25	7.50 / 8.25
2.5	#5 @ 8"	2.50 / 3.50	4.00 / 6.00	2.00 / 3.00	4.50 / 5.50	10.00 / 11.50
3.0	#5 @ 8"	3.00 / 3.50	5.00 / 6.00	2.75 / 3.50	5.25 / 5.75	11.50 / 11.75
3.5	#5 @ 8"	3.25 / 4.50	6.00 / 6.75	3.25 / 3.50	6.00 / 6.75	12.00 / 13.25
4.0	#5 @ 8"	3.50 / 4.50	6.50 / 7.00	3.25 / 3.50	6.50 / 6.75	13.00 / 13.25
4.5	#5 @ 8"	4.00 / 5.00	6.50 / 8.50	3.25 / 4.00	7.00 / 9.25	13.50 / 15.75
5.0	#5 @ 8"	4.50 / 5.00	7.00 / 8.50	3.25 / 4.00	7.25 / 9.25	13.75 / 15.75
5.5	#5 @ 8"	4.50 / 5.00	7.50 / 8.50	3.25 / 4.00	7.25 / 9.25	14.00 / 15.75
6.0	#5 @ 8"	4.50 / 5.00	7.50 / 8.50	3.25 / 4.00	7.75 / 9.25	14.75 / 16.75



ADD'L PIPE REINFORCING



SIDE

NOTE: THE MINIMUM BAR SIZE SHALL BE #5 BARS AT 8" CTS. THE CONTRACTOR WILL HAVE THE OPTION TO INCREASE THIS BAS SIZE AS NEEDED

NOTES:

1. SEE STD. DETAIL SD-24 FOR GENERAL NOTES.

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

PRECAST ENDWALL FOR SINGLE PIPE CULVERTS (12" THRU 72" PIPE - 90° SKEW)

STD. NO.	SCALE
SD-23	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

GENERAL NOTES:

1. ALL CORNERS ARE TO BE CHAMFERED 1".

2. THE CONTRACTOR WILL BE REQUIRED TO PLACE (2) #6 BARS "Y" IN THE TOP OF ALL ENDWALLS FOR PIPE CULVERTS 42" AND OVER WITH A MINIMUM OF 3" COVER AND A LENGTH OF 6" LESS THAN ENDWALL.

3. IF CONTRACTOR ELECTS TO USE CONSTRUCTION JOINT AT BOTTOM OF PIPE, BAR "X" (DOWELS) SHALL BE PLACED IN THE BASE AS SHOWN ON PLANS, SPACING OF BARS TO BE APPROXIMATELY 12" CENTERS UNLESS ENGINEERS DIRECT OTHERWISE.

4. IF CONTRACTOR ELECTS TO USE CONSTRUCTION JOINT AT BOTTOM OF PIPE AND POURS SLAB SEPARATELY, THE TOP OF THE BASE SHALL BE LEFT ROUGH.

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

6. WALL THICKNESS (T) SHOWN IS NOT TO BE INTERPRETED TO MEAN THE THICKNESS ACCEPTABLE, BUT IS USED ONLY IN COMPUTING ENDWALL QUANTITIES.

7. WHEN SKEW ANGLE OF PIPE IS OVER 45°, USE G-1 DIMENSIONS FOR 45° PLUS 6" FOR EACH 5° OVER 45°, G2 DIMENSION WILL BE THE NEW DIMENSION DIVIDED BY THE COSINE OF THE ANGLE OF PIPE SKEW.

8. CLASS "AA" CONCRETE SHALL BE USED.

9. ALL PIPES WILL MEET THE NCDOT-DIVISION OF HIGHWAYS SPECIFICATIONS FOR LOAD BEARING CAPACITIES.

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **GENERAL NOTES - DETAILS SD-20 THRU SD-23**	STD. NO. **SD-24** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS	
				NO / DATE / COMMENT	

Section 4

Streets and Sidewalks

Standard Detail Index

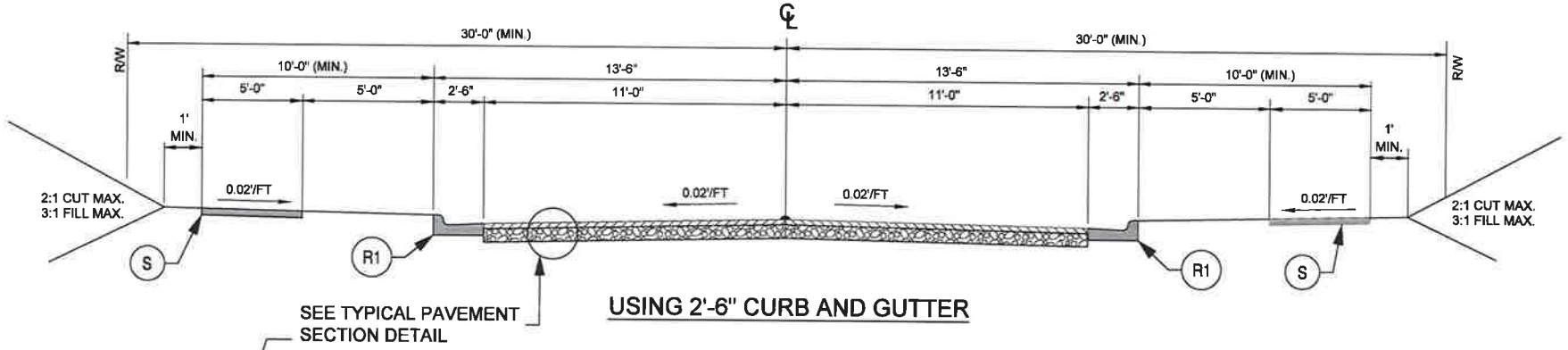
SECTION 4 - STREETS AND SIDEWALKS

DWG #	DWG Description
STREET STANDARDS	
ST-1	Street Section - 60' Right-of-Way
ST-2	Standard Residential Street (Curb & Gutter)
ST-3	Standard Residential Street (Non-Curb & Gutter)
ST-4	Standard Curb and Gutter
ST-5	Standard Roll-Type Curb and Gutter
ST-6	Standard Valley Gutter
ST-7	Typical Curb Drain
ST-8	Standard Catch Basin Frame in Curb and Gutter
ST-9	Standard Concrete Sidewalk
ST-10	Standard Brick/Concrete Pavers Sidewalk
ST-11	Standard Handicap Ramp
ST-12	Handicap Ramps – Median or Turn Lane Islands
ST-13	Standard Cul-de-Sac
ST-14	Tangent Distances at Reverse Curves
ST-15	Curve Radius at Deflecting Street Lines
ST-16	Concrete Right-of-Way Marker
ST-17	Standard Container Pad
ST-18	Street Name Signs

DRIVEWAYS STANDARDS

PARKING

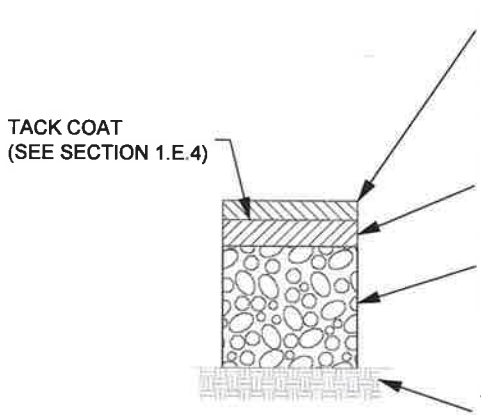
60' R/W (MINIMUM)



SEE TYPICAL PAVEMENT SECTION DETAIL

USING 2'-6" CURB AND GUTTER

TYPICAL PAVEMENT SECTION (MINIMUM)



SURFACE COURSE
1" SF9.5A
FINAL LIFT TO BE APPLIED AFTER 75% DEVELOP OCCUPANCY OR 1 YEAR FROM INTERMEDIATE COURSE PLACEMENT (WHICHEVER OCCURS FIRST).

INTERMEDIATE COURSE
2" S9.5B, SF9.5A

BASE COURSE
8" COMPACTED AGGREGATE BASE COURSE, OR 4" BCBC TYPE B25.0B SHOULD ENTIRE DEVELOPMENT HAVE A CBR OF 6 OR GREATER, THEN AN ALTERNATIVE BASE COURSE PAVEMENT DESIGN MAY BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

SUBGRADE
COMPACT SUBGRADE TO AASHTO STANDARDS AND SPECIFICATIONS.

NOTES:

1. AN ALTERNATIVE PAVEMENT DESIGN MAY BE REQUIRED BASED ON SPECIFIC TRAFFIC PARAMETERS.

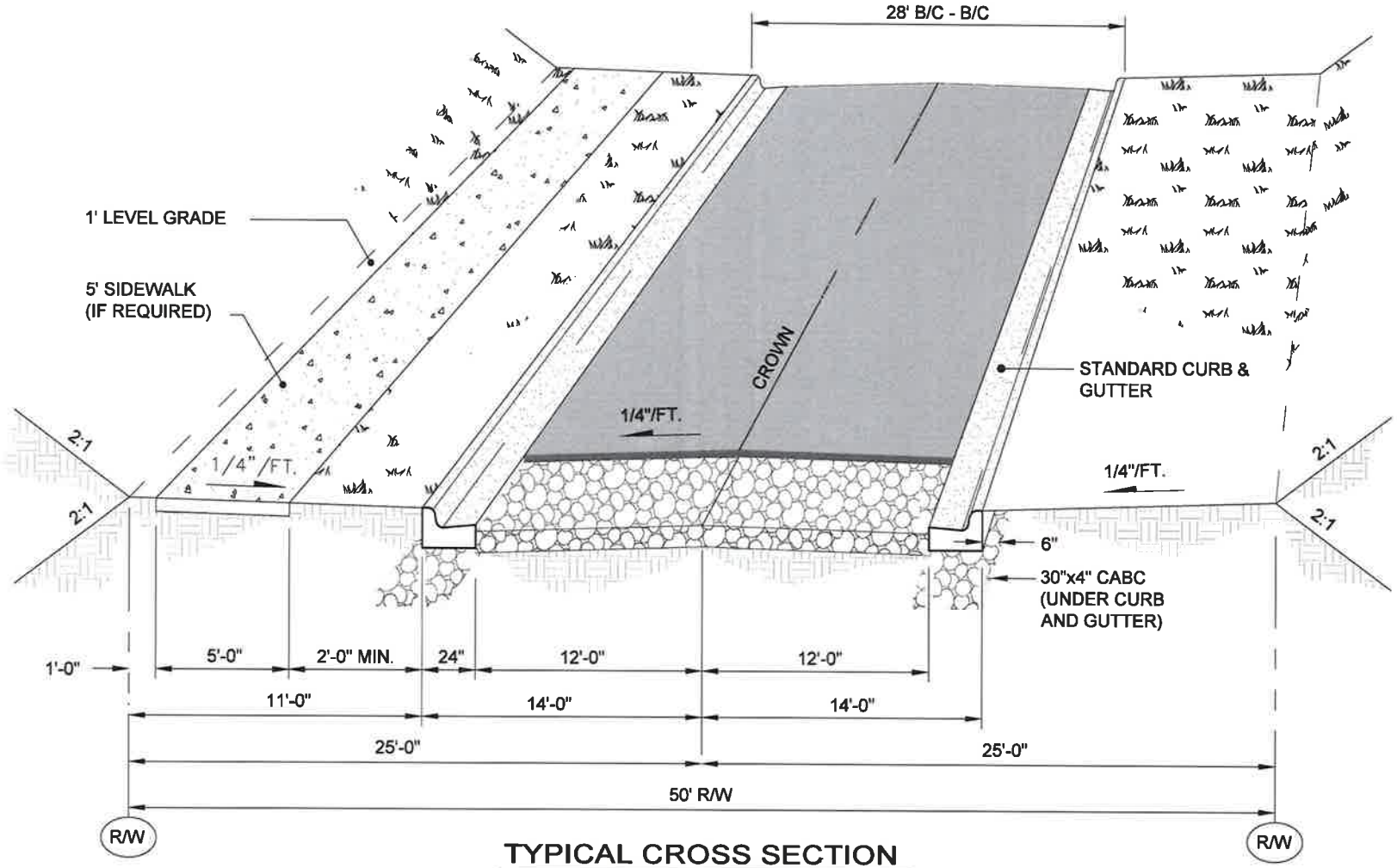
2. ALL DIMENSIONS NOTED AS MINIMUMS ARE SUBJECT TO STANDARDS REQUIRED BY OF THE WINTERVILLE DEVELOPMENT ORDINANCE.

KEY

(R1) 2'-6" CURB AND GUTTER

(S) 4" CONCRETE SIDEWALK

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	STD. NO.	SCALE	REVISIONS
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**ST-1**	N.T.S	NO / DATE / COMMENT
	STREET SECTION - 60' RIGHT-OF-WAY	SHEET 1 OF 1	DATE 5-31-19	



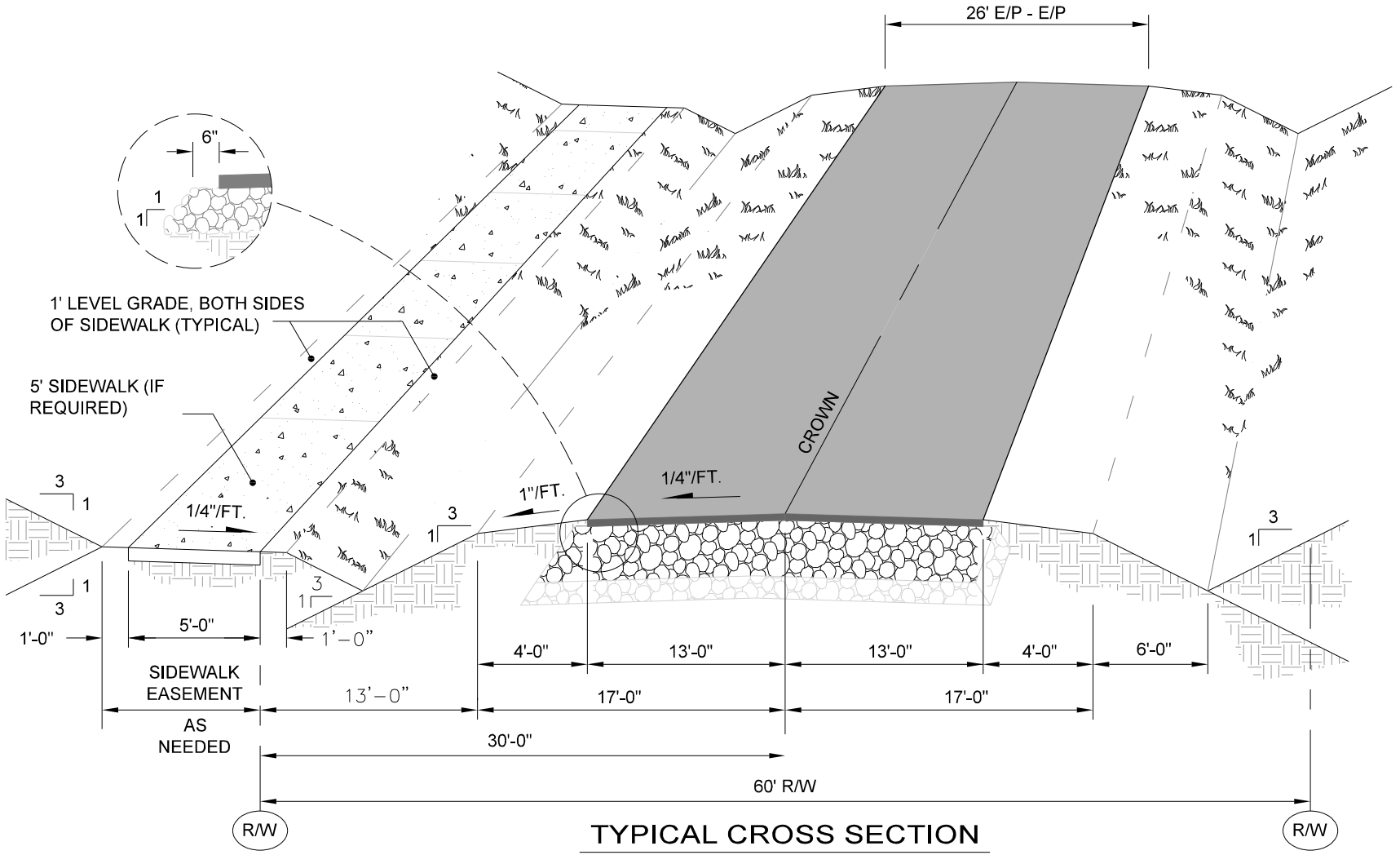
TYPICAL CROSS SECTION

"STANDARD RESIDENTIAL STREET"
(CURB & GUTTER)

NOTES:

1. PAVEMENT DESIGN TO BE ACCORDING TO PROCEDURE DESCRIBED IN THE MANUAL.
2. MAY ONLY BE USED IN CASES WHERE PROJECTED TRAFFIC VOLUMES WILL NOT EXCEED 1500 ADT .

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	STD. NO.	SCALE	REVISIONS
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville NC 28590	**ST-2**	N.T.S	NO / DATE / COMMENT
	STANDARD RESIDENTIAL STREET (CURB & GUTTER)	SHEET 1 OF 2	DATE 5-31-19	



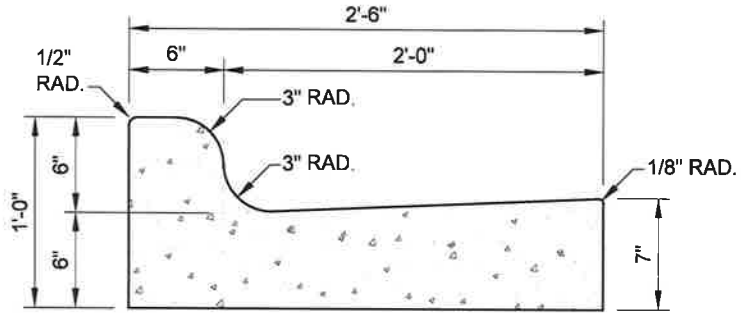
TYPICAL CROSS SECTION

"STANDARD RESIDENTIAL STREET"
(NON-CURB & GUTTER)

NOTES:

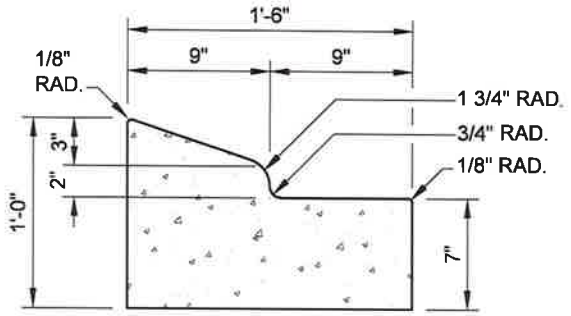
1. PAVEMENT DESIGN TO BE ACCORDING TO PROCEDURE DESCRIBED IN THE MANUAL
2. MAY ONLY BE USED IN CASES WHERE PROJECTED TRAFFIC VOLUMES WILL NOT EXCEED1500 ADT .
3. TIE-IN SLOPES MAY BE SHALLOWER, HOWEVER ALL DRAINAGE MUST BE MAINTAINED WITHIN R/W.

WINTERVILLE NORTH CAROLINA *A slice of the good life*	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT — 2571 Railroad St. Winterville, NC 28590	STD. NO. **ST-3**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	STANDARD RESIDENTIAL STREET (NON-CURB & GUTTER)	SHEET 2 OF 2	DATE 5-31-19	



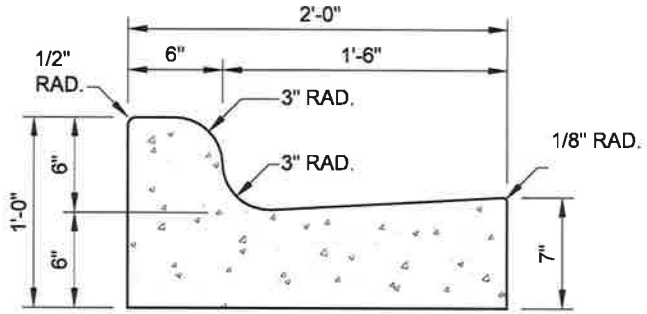
2' - 6" CURB AND GUTTER

30" CURB AND GUTTER SHALL BE PLACED IN NCDOT R/W.



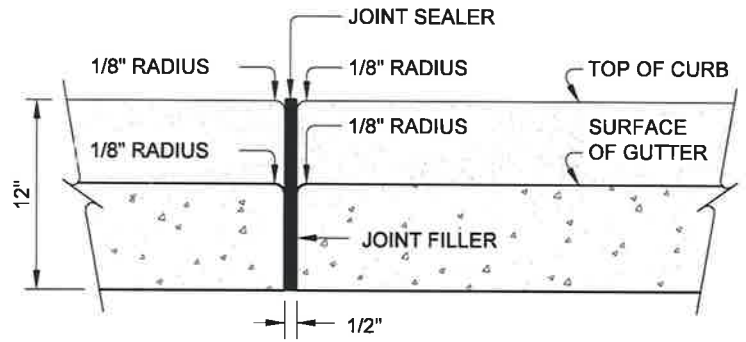
1' - 6" CURB AND GUTTER

(TO BE USED IN MEDIANS ONLY)



2' - 0" CURB AND GUTTER

24" CURB AND GUTTER SHALL BE PLACED IN
RESIDENTIAL DEVELOPMENTS



TRANSVERSE EXPANSION JOINT IN CURB AND GUTTER

NOTES:

1. CONTRACTION JOINTS SHALL BE PLACED AT 10' INTERVALS, EXCEPT THAT 15' SPACING MAY BE USED WHEN A MACHINE IS USED OR WHEN SATISFACTORY SUPPORT FOR THE FACE FORM CAN BE OBTAINED WITHOUT THE USE OF TEMPLATES AT 10' INTERVALS. JOINT SPACING MAY BE ALTERED BY THE ENGINEER TO PREVENT UNCONTROLLED CRACKING.
2. CONTRACTION JOINTS MAY BE INSTALLED BY THE USE OF TEMPLATES OR FORMED BY OTHER APPROVED METHODS. WHERE SUCH JOINTS ARE NOT FORMED BY TEMPLATES, A MINIMUM DEPTH OF 1 1/2" SHALL BE OBTAINED.
3. ALL CONTRACTION JOINTS SHALL BE FILLED WITH JOINT FILLER.
4. EXPANSION JOINTS SHALL BE SPACED AT 90' INTERVALS, AND ADJACENT TO ALL RIGID OBJECTS.
5. ALL CURB AND GUTTERS ARE TO BE POURED WITH CLASS "A" CONCRETE (3,000 PSI).
6. FLEXIBLE FORMS ARE TO BE USED WHEN RADIUS IS LESS THAN 200'.

WINTERVILLE
NORTH CAROLINA

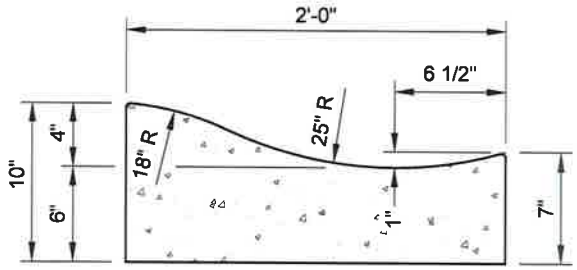
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

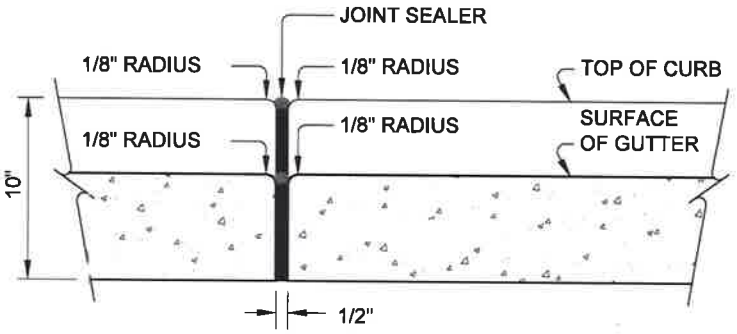
STANDARD CURB AND GUTTER

STD. NO.	SCALE
ST-4	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



ROLL TYPE CURB AND GUTTER

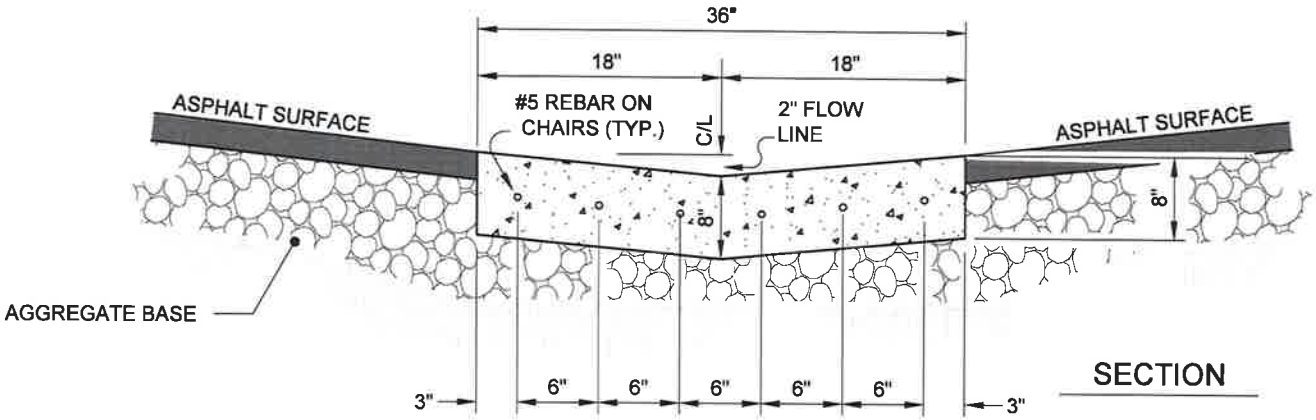


TRANSVERSE EXPANSION JOINT IN CURB AND GUTTER

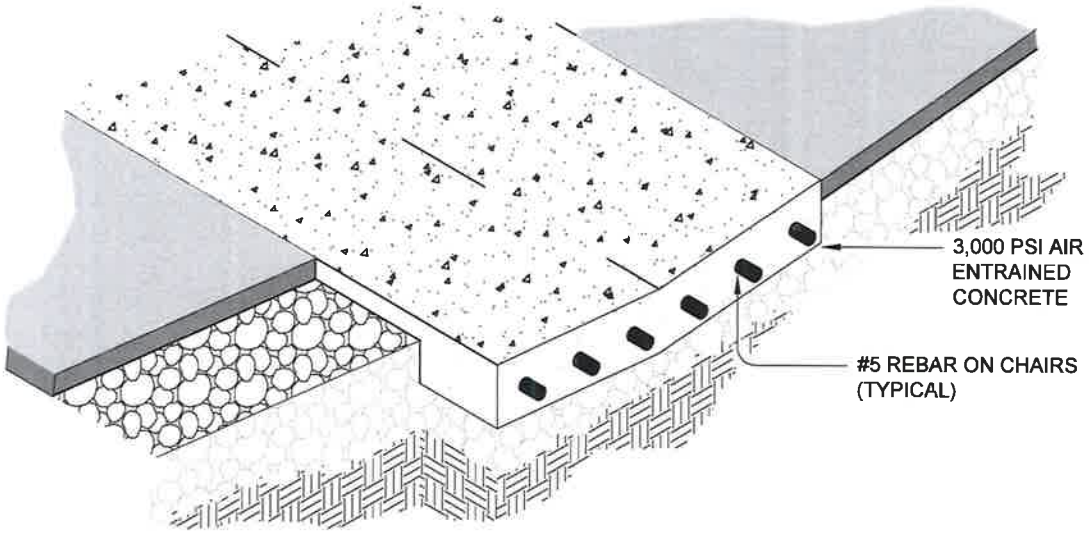
NOTES:

1. CONTRACTION JOINTS SHALL BE PLACED AT 10' INTERVALS, EXCEPT THAT 15' SPACING MAY BE USED WHEN A MACHINE IS USED OR WHEN SATISFACTORY SUPPORT FOR THE FACE FORM CAN BE OBTAINED WITHOUT THE USE OF TEMPLATES AT 10' INTERVALS. JOINT SPACING MAY BE ALTERED BY THE ENGINEER TO PREVENT UNCONTROLLED CRACKING.
2. CONTRACTION JOINTS MAY BE INSTALLED BY THE USE OF TEMPLATES OR FORMED BY OTHER APPROVED METHODS. WHERE SUCH JOINTS ARE NOT FORMED BY TEMPLATES, A MINIMUM DEPTH OF 1 1/2" SHALL BE OBTAINED.
3. ALL CONTRACTION JOINTS SHALL BE FILLED WITH JOINT FILLER.
4. EXPANSION JOINTS SHALL BE SPACED AT 90' INTERVALS, AND ADJACENT TO ALL RIGID OBJECTS.
5. ALL CURB AND GUTTERS ARE TO BE POURED WITH CLASS "A" CONCRETE (3,000 PSI).
6. FLEXIBLE FORMS ARE TO BE USED WHEN RADIUS IS LESS THAN 200'.

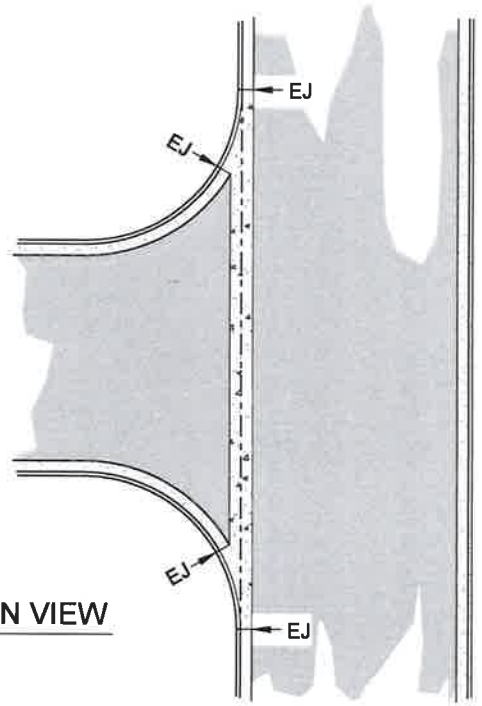
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **ST-5**	SCALE N.T.S	REVISIONS	
	STANDARD ROOL-TYPE CURB AND GUTTER	SHEET 1 OF 1	DATE 5-31-19	NO / DATE / COMMENT	



SECTION

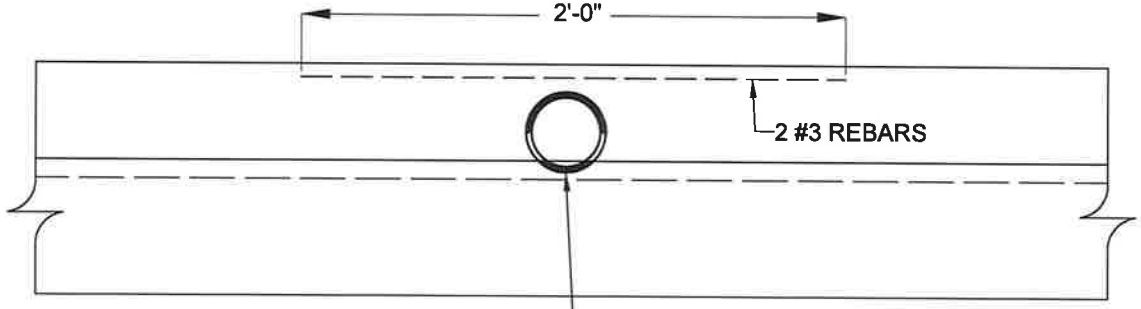


ISOMETRIC



PLAN VIEW

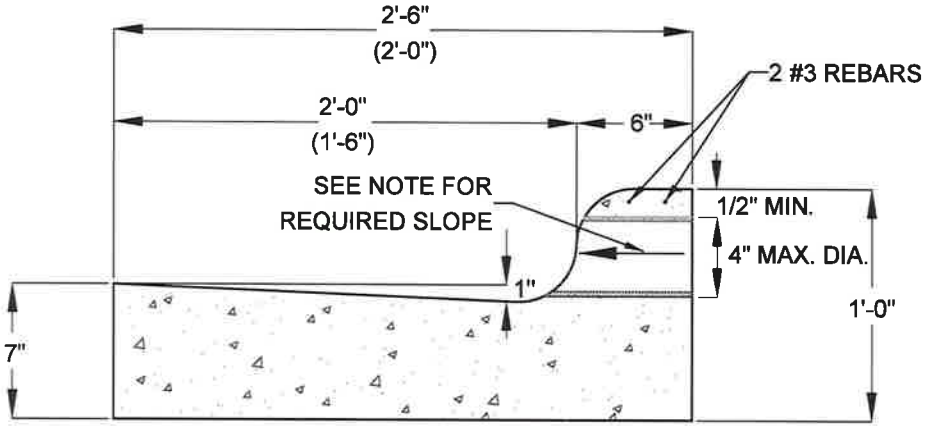
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	STD. NO. **ST-6**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590			
	STANDARD VALLEY GUTTER	SHEET 1 OF 1	DATE 5-31-19	



ELEVATION

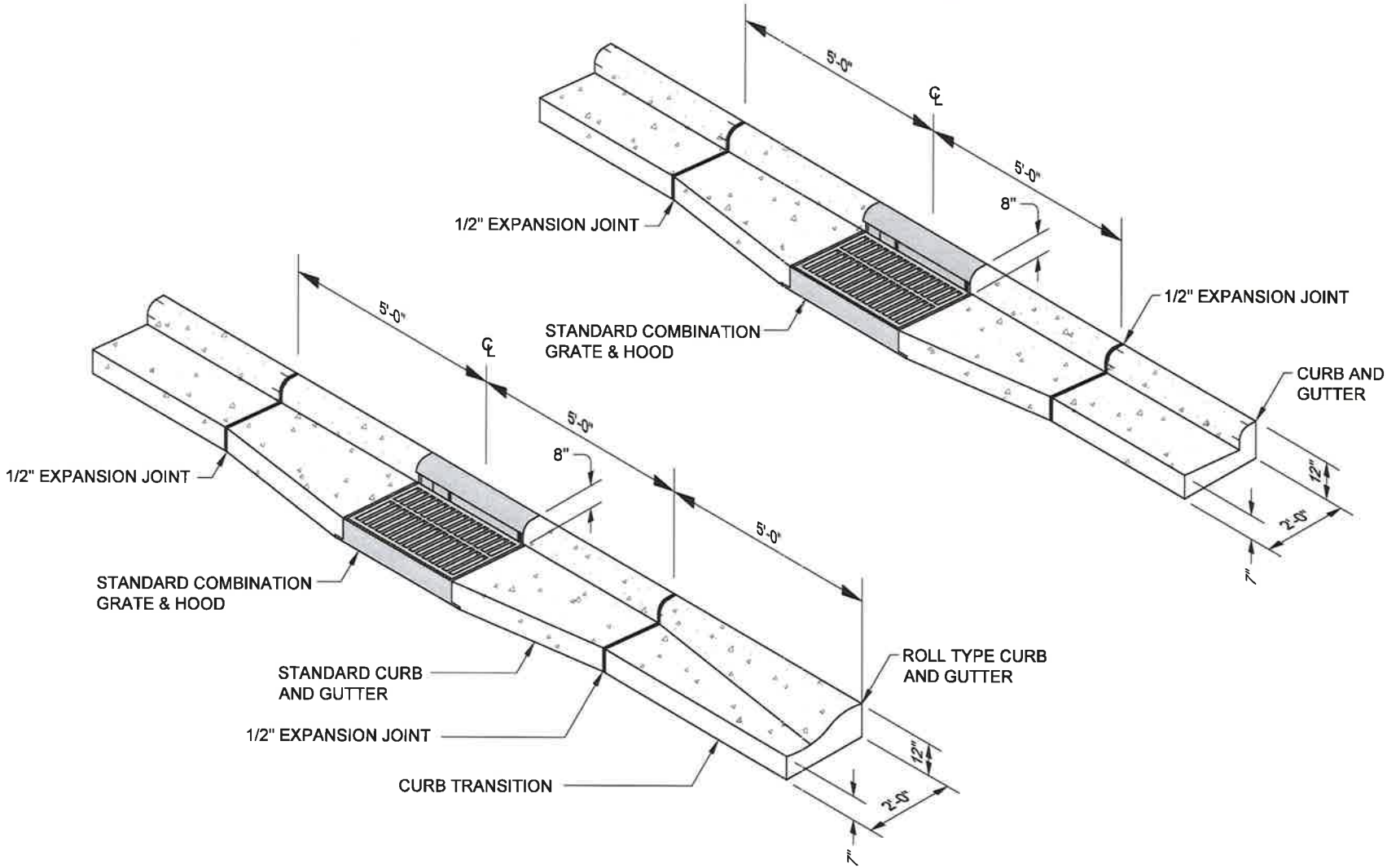
NOTES:

1) CURB DRAINS SHALL NOT BE CONSTRUCTED WITHIN 18" OF CONTRACTION OR EXPANSION JOINTS.
2) OPENING GRADE MAY VARY BETWEEN A MAXIMUM SLOPE OF 1/2" PER FOOT AND A MINIMUM OF 1/4" PER FOOT.
3) MORE THAN ONE HOLE MAY BE INSTALLED PROVIDED THE HOLES ARE LOCATED WITH 18" MINIMUM SPACING.
4) REINFORCING STEEL IS NOT REQUIRED IF OUTLET IS INSTALLED AFTER CURB & GUTTER IS POURED.

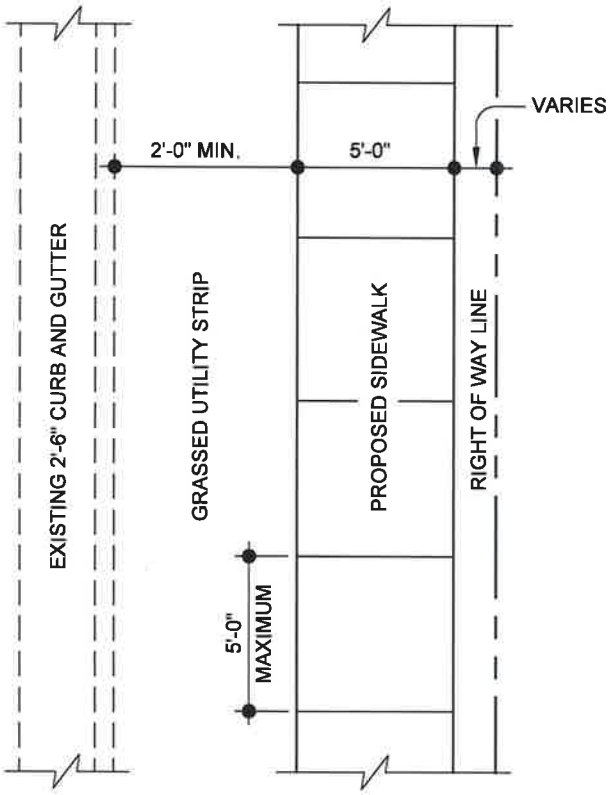


SECTION

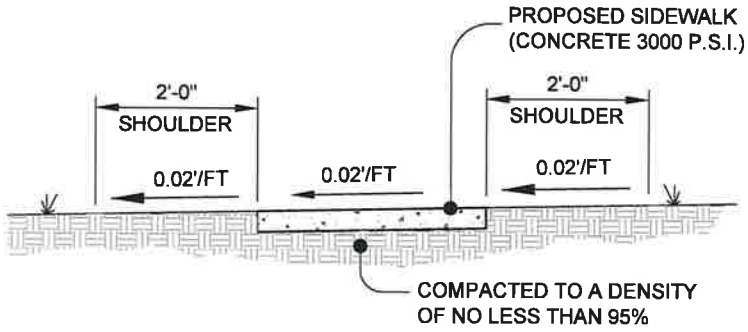
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **ST-7**	SCALE N.T.S	REVISIONS	
	TYPICAL CURB DRAIN	SHEET 1 OF 1	DATE 5-31-19	NO / DATE / COMMENT	



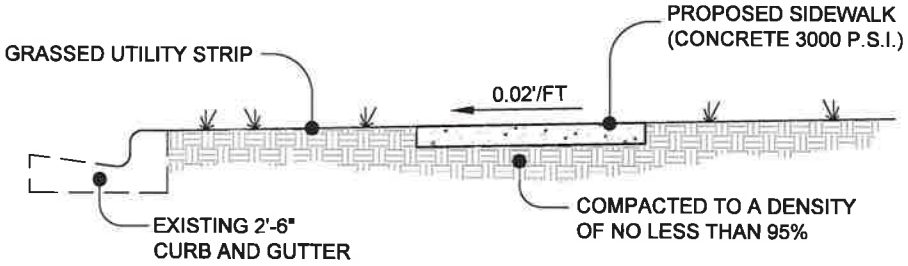
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **ST-8**	SCALE N.T.S	REVISIONS	
	STANDARD CATCH BASIN FRAME IN CURB AND GUTTER	SHEET 1 OF 1	DATE 5-31-19	NO / DATE / COMMENT	



PLAN VIEW

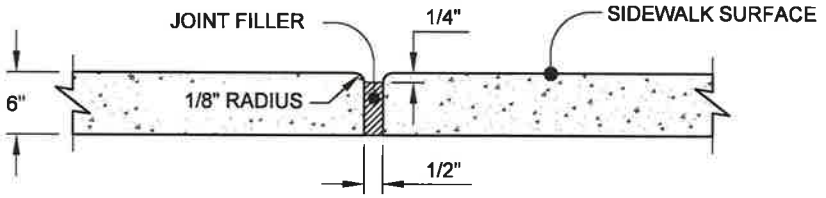


TYPICAL SECTION



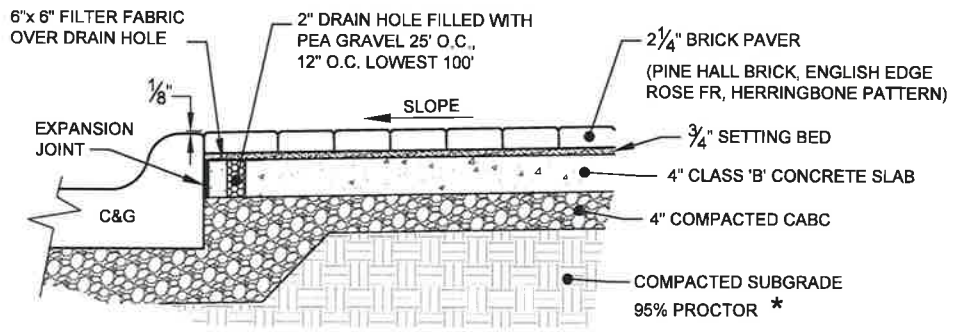
TYPICAL SECTION

NOTES:
1. TRANSVERSE EXPANSION JOINTS TO BE A MAXIMUM OF 50 FEET.
2. ALL CONCRETE TO BE FINISHED WITH CURING COMPOUND.
3. A 6 INCH DEPTH IS REQUIRED AT LOCATIONS OF DRIVEWAY CROSSINGS, AT STREET INTERSECTIONS (ALONG THE LENGTH OF RADIUS CURB RETURNS), AND IN THE HANDICAP RAMPS.
4. SAW CUT JOINTS EVERY 10 FEET OR WIDTH.
5. EXPANSION JOINTS REQUIRED WHEN SIDEWALK ABUTS RIGID STRUCTURES AND OTHERS SIDEWALKS.
6. ALL SIDEWALKS SHALL BE LOCATED MINIMUM 2 FEET FROM THE BACK OF CURB.



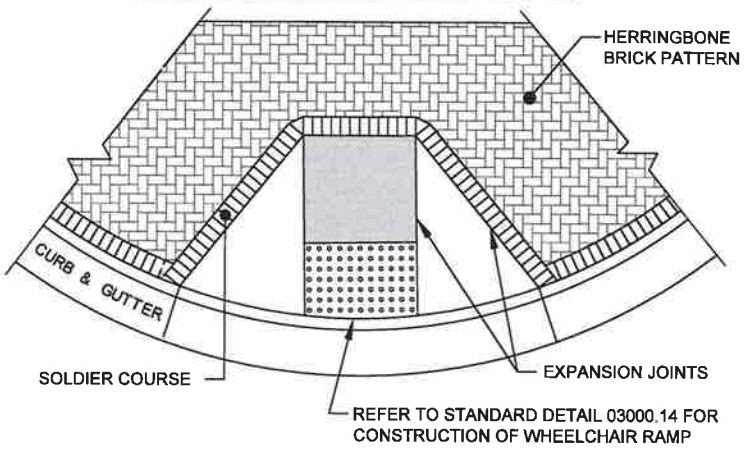
TRANSVERSE EXPANSION JOINT

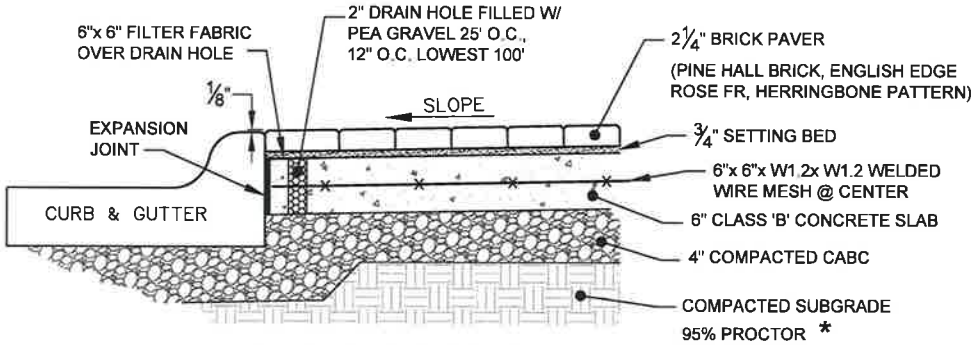
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville NC 28590 **STANDARD CONCRETE SIDEWALK**	STD. NO. **ST-9** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS: NO / DATE / COMMENT



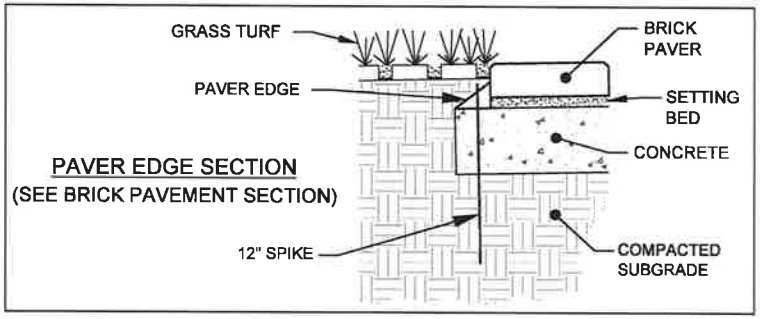
BRICK SIDEWALK SECTION
LIGHT DUTY

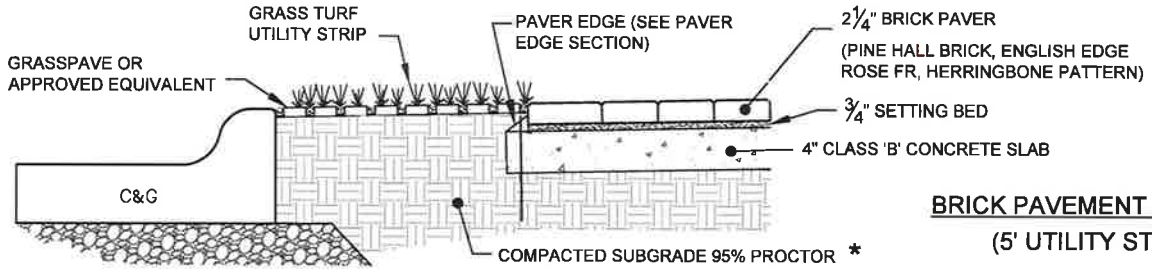
WHEELCHAIR RAMP - PLAN VIEW





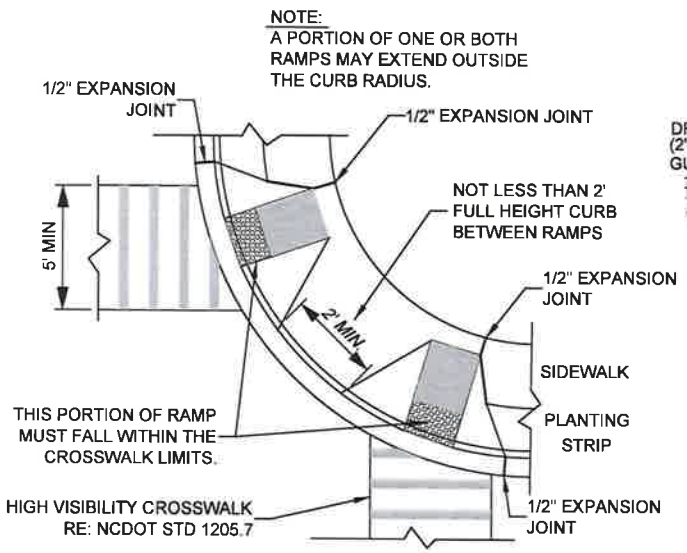
BRICK SIDEWALK SECTION
HEAVY DUTY





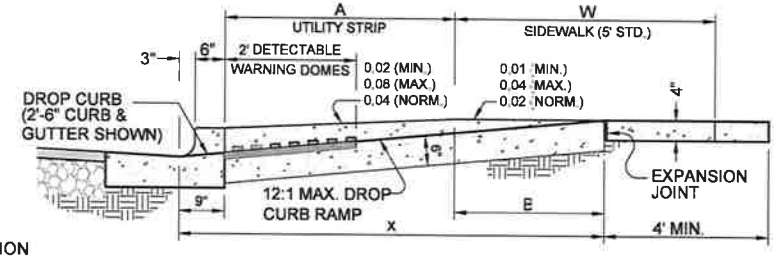
BRICK PAVEMENT SECTION
(5' UTILITY STRIP)

TOWN OF WINTERVILLE PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. ST-10	SCALE N.T.S	REVISIONS	
STANDARD BRICK/CONCRETE PAVERS SIDEWALK	SHEET 1 OF 1	DATE 5-31-19	NO / DATE / COMMENT	

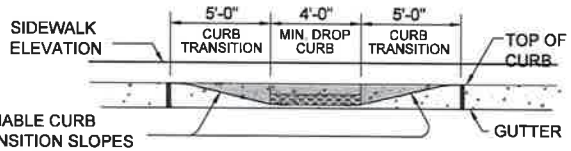


PLAN VIEW

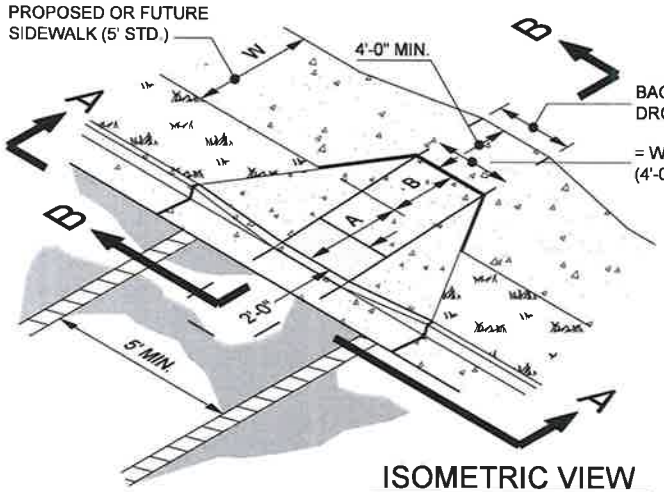
DUAL RAMPS ANY RADII
(40" MIN. FLOOR WIDTH)



SECTION B-B



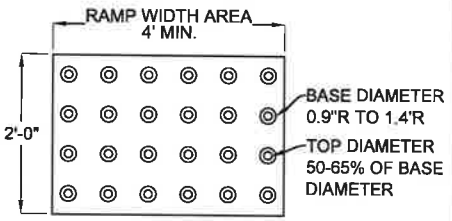
SECTION A-A

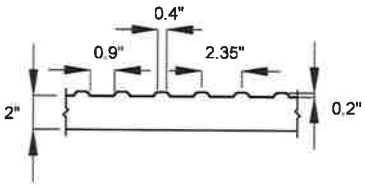


ISOMETRIC VIEW

NOTE:
1. DETECTABLE WARNING DOMES SHALL COVER 2 FEET IN LENGTH & FULL WIDTH OF THE RAMP FLOOR AS SHOWN.
THE WALKING SURFACE SHALL BE DARK GRAY (70% CONTRAST RATIO) IN COLOR.

2. CROSSWALK WIDTHS AND CONFIGURATIONS VARY, ALL MUST CONFORM TO TRAFFIC DESIGN STANDARDS.





DETECTABLE WARNING DOMES

ALTERNATE MATERIAL MAY BE SUBSTITUTED, PROVIDED THE PRODUCT IS ON THE CUTY'S APPROVED MANUFACTURER LIST AND THE MANUFACTURER'S PRODUCT AND INSTALLATION SPECIFICATIONS ARE ALLOWED.

W	A	W + A + 9"	X	B
5'	0.0'	5.8'	5.8'	5.0' *
6'	0.0'	6.8'	6.8'	6.0' **
7'	0.0'	7.8'	7.3'	6.5' **
8'	0.0'	8.8'	7.3'	6.5' **
5'	1.5'	7.3'	7.5'	5.2'
5'	2.0'	7.8'	7.8'	5.0'
5'	2.5'	8.3'	8.1'	4.8'
5'	3.0'	8.8'	8.3'	4.4'
5'	3.5'	9.3'	8.3'	4.1'
5'	4.0'	9.8'	8.6'	3.8'
5'	4.5'	10.3'	8.7'	3.4'
5'	5.0'	10.8'	8.9'	3.1'

DIMENSION SCHEDULE

B = X-(A+9")

B = DISTANCE FROM FRONT EDGE OF SIDEWALK TO BACK POINT OF 12:1 (8.33%) SLOPE.

* BACK OF SIDEWALK DROP REQUIRED FOR ALL SIDEWALK SLOPES.

** BACK OF SIDEWALK DROP REQUIRED FOR SIDEWALK SLOPES 0.04.

WINTERVILLE NORTH CAROLINA

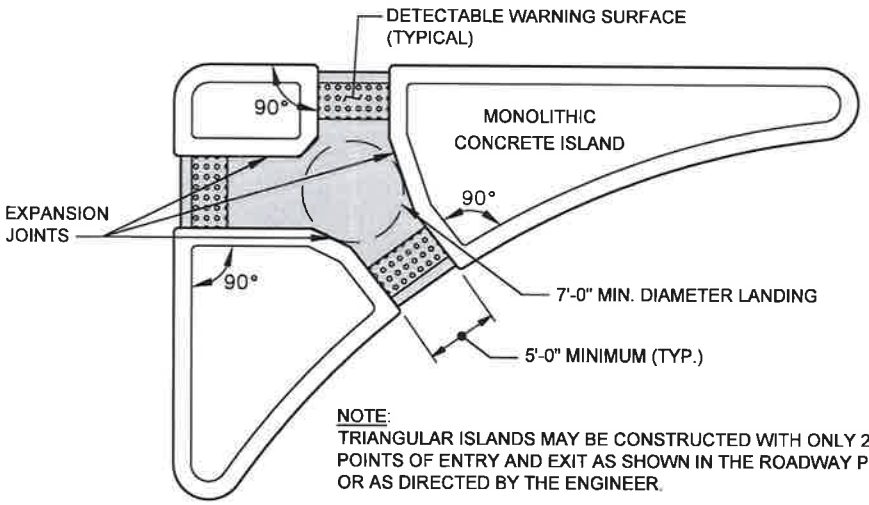
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

STANDARD HANDICAP RAMP

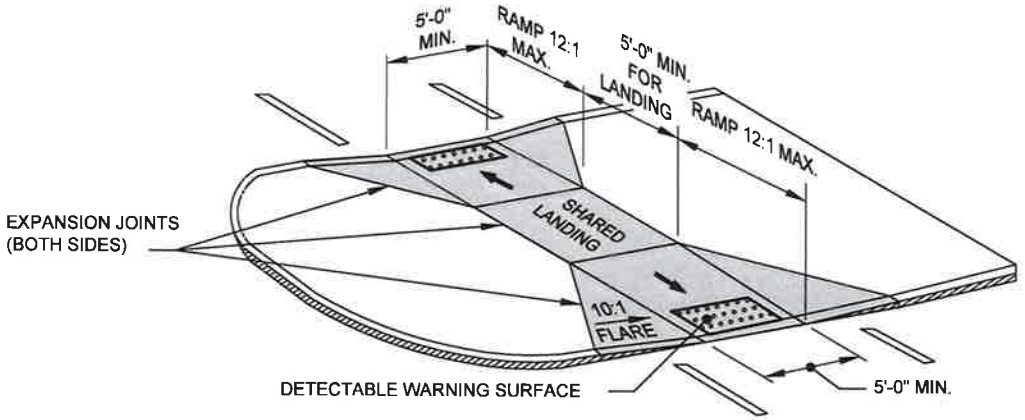
STD. NO.	SCALE
ST-11	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

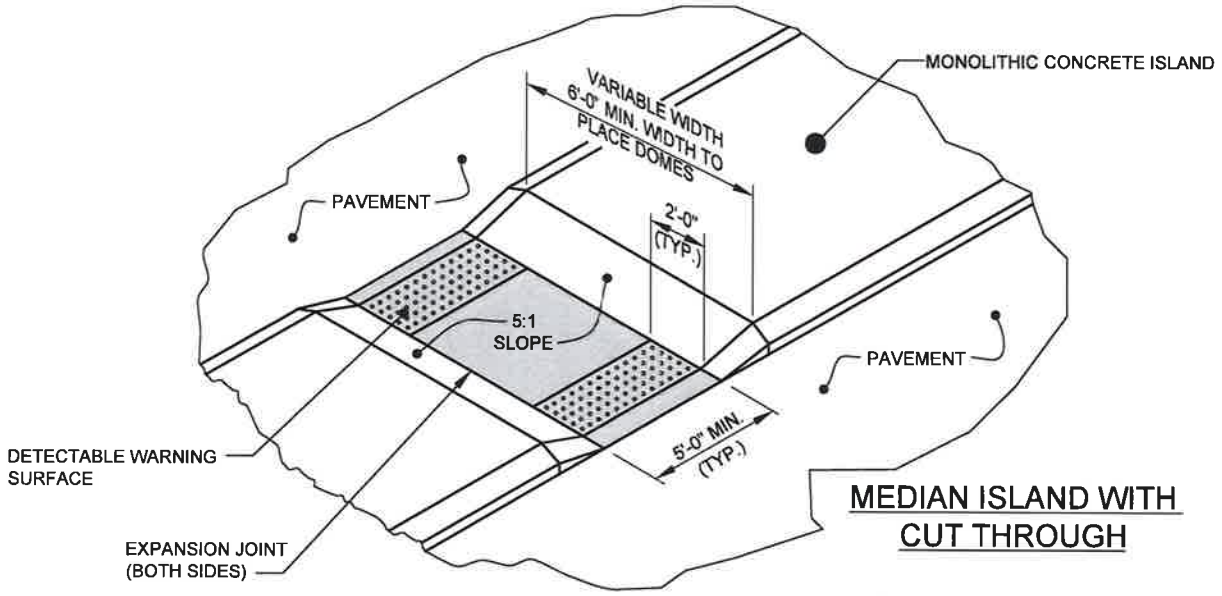


NOTE:
TRIANGULAR ISLANDS MAY BE CONSTRUCTED WITH ONLY 2 POINTS OF ENTRY AND EXIT AS SHOWN IN THE ROADWAY PLANS OR AS DIRECTED BY THE ENGINEER.

TRIANGULAR ISLAND WITH CUT THROUGH

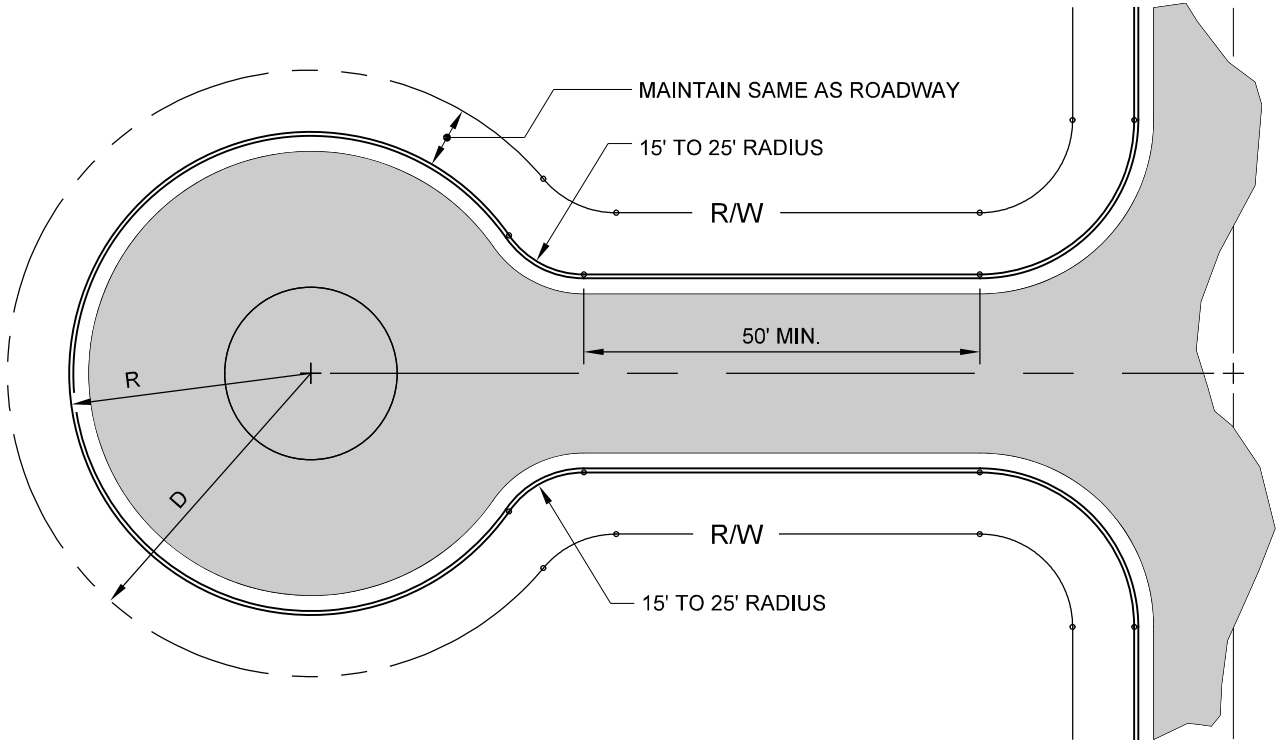


MEDIAN ISLAND CURB RAMPS



MEDIAN ISLAND WITH CUT THROUGH

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	STD. NO.	SCALE	REVISIONS	
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**ST-12**	N.T.S	NO / DATE / COMMENT	
	HANDICAP RAMPS - MEDIAN OR TURN LANE ISLANDS	SHEET 1 OF 1	DATE 5-31-19		



NOTES:

1. NO PARKING IN CUL-DE-SAC.
2. VEGETATION WITHIN ISLAND TO BE REVIEWED & APPROVED BY CITY ENGINEER.
3. ALL DEAD END ACCESS ROADS IN EXCESS OF 150 FEET SHALL BE PROVIDEDWITH A PROPER FIRE APPARATUS TURNAROUND AS APPROVED IN APPENDIX D OF THE LATEST EDITION OF THE NORTH CAROLINA FIRE CODE.

R	48' TO BACK OF CURB
D	60'
CUL-DE-SAC MAY BE OFFSET FROM CENTERLINE OF STREET.	

WINTERVILLE NORTH CAROLINA *A slice of the good life*

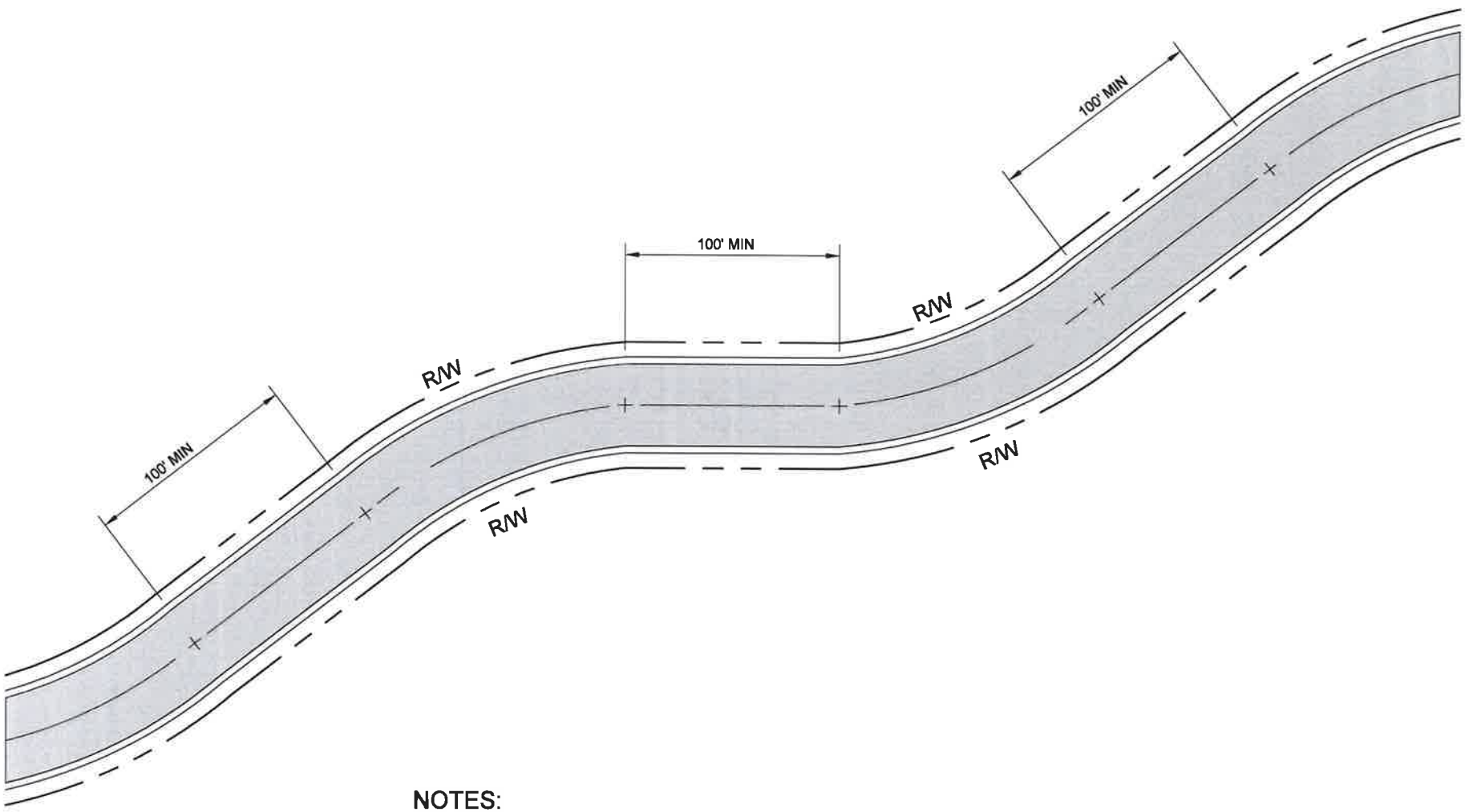
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

STANDARD CUL-DE-SAC

STD. NO.	SCALE
ST-13	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



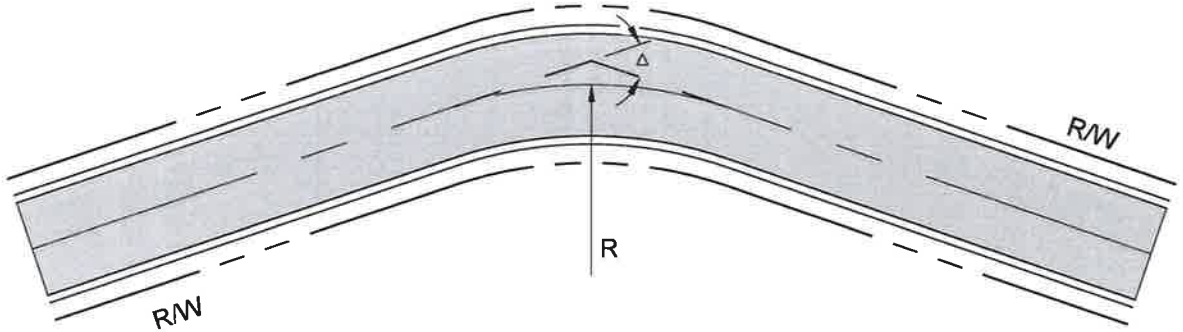
NOTES:

1.A MINIMUM OF 100 FT. TANGENT DISTANCE IS REQUIRED BETWEEN REVERSE CURVES ON RESIDENTIAL, COLLECTOR STREETS AND ON ALL THOROUGHFARES.

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **ST-14**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	TANGENT DISTANCES AT REVERSE CURVES	SHEET 1 OF 1	DATE 5-31-19	

VERTICAL CURVE TABLE

DESIGN SPEED (mph)	MIN. STOPPING SIGHT DISTANCE (ft)	MIN. C/L RADIUS (ft)	K (crest) (deg)	K (sag) (deg)	K (stop) (deg)
25	155	150	26	26	12
30	200	230	37	37	19
35	250	340	49	49	29
40	305	475	64	64	44
45	360	640	79	79	61
50	425	825	96	96	84
55	495	1050	115	115	114



NOTES:

1.WHEN CONNECTING STREET CENTERLINES DEFLECT FROM EACH OTHER AT ANY ONE POINT BY MORE THAN FIVE DEGREES, ($\Delta > 5^{\circ}$), THEY SHALL BE CONNECTED BY A CURVE WITH A RADIUS OF NOT LESS THAN 100 FEET ($R \geq 100'$) FOR RESIDENTIAL STREETS. FOR COLLECTOR STREETS AND THOROUGHFARES, THE RADIUS SHOULD BE SUFFICIENT TO ENSURE A SIGHT DISTANCE ADEQUATE FOR VISIBILITY AND SAFETY, CONSIDERING THE CHARACTER OF THE STREET AND THE TYPES AND SPEED OF TRAFFIC ANTICIPATED, BUT IN NO CASE SHALL SUCH RADIUS BE LESS THAN 200 FEET ($R \geq 200'$).

WINTERVILLE NORTH CAROLINA

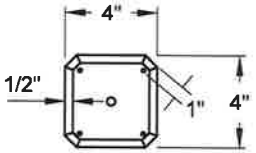
TOWN OF WINTERVILLE

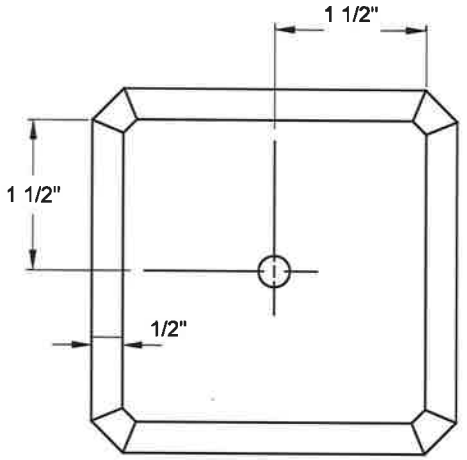
PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

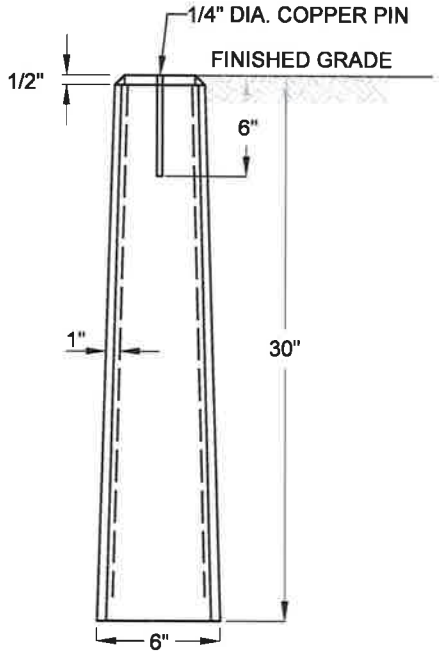
CURVE RADIUS AT DEFLECTING STREET LINES

STD. NO.	SCALE
ST-15	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



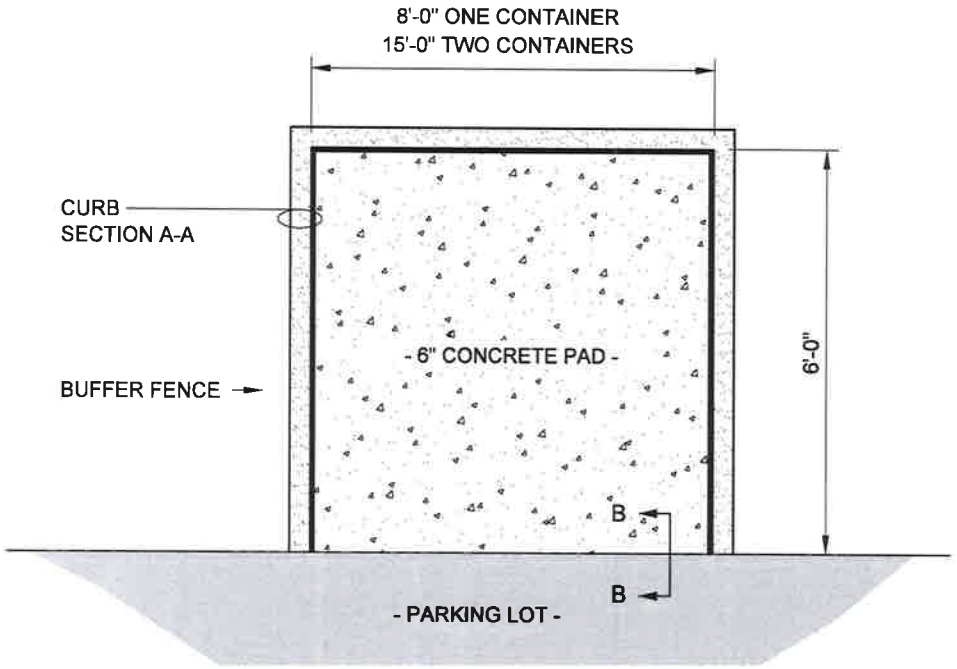




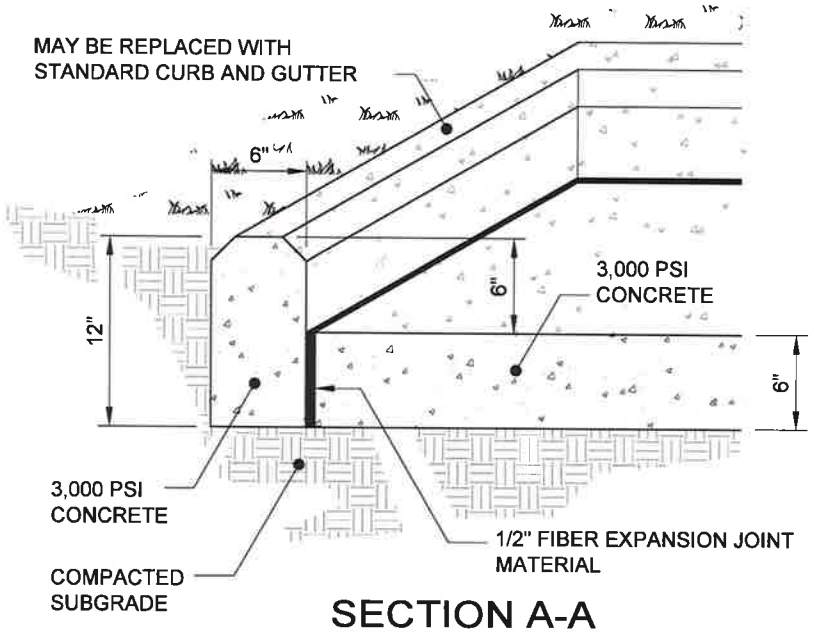
3/8" DIA. STEEL REINFORCED BAR 2'-3" LONG TO BE PLACED IN EACH CORNER

THE RIGHT-OF-WAY MARKER SHALL BE SET THAT THE RIGHT-OF-WAY LINE PASSES THROUGH THE CENTER OF THE COPPER PIN.

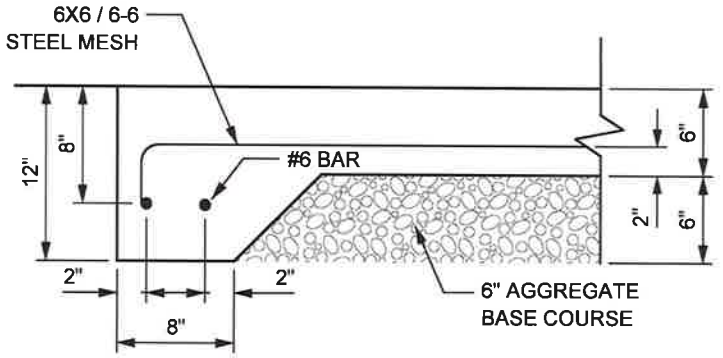
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville NC 28590	STD. NO. **ST-16**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	STANDARD CONCRETE RIGHT-OF-WAY MARKER	SHEET 1 OF 1	DATE 5-31-19	



PLAN VIEW



SECTION A-A



SECTION B-B

NOTES:

1. CONTAINER PAD MUST BE FLUSH WITH PARKING LOT PAVEMENT.
2. FOR SAFETY REASONS, THE TRUCK CANNOT BACK MORE THAN 50'.
3. THE TRUCK LOADS FROM THE DRIVER'S SIDE.
4. REFUSE TRUCK MUST HAVE 25' MIN. FORWARD TRAVEL CLEARANCE.
5. CONTAINER PADS ARE NOT TO BE INSTALLED ON TOWN RIGHT OF WAY.

WINTERVILLE
NORTH CAROLINA

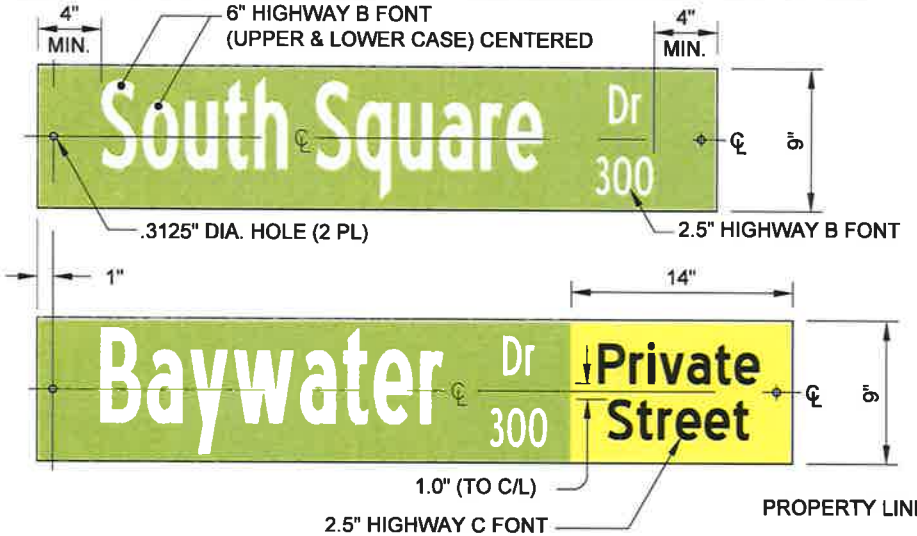
TOWN OF WINTERVILLE

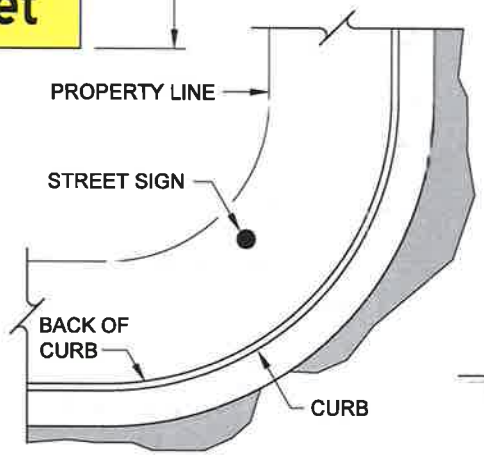
PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

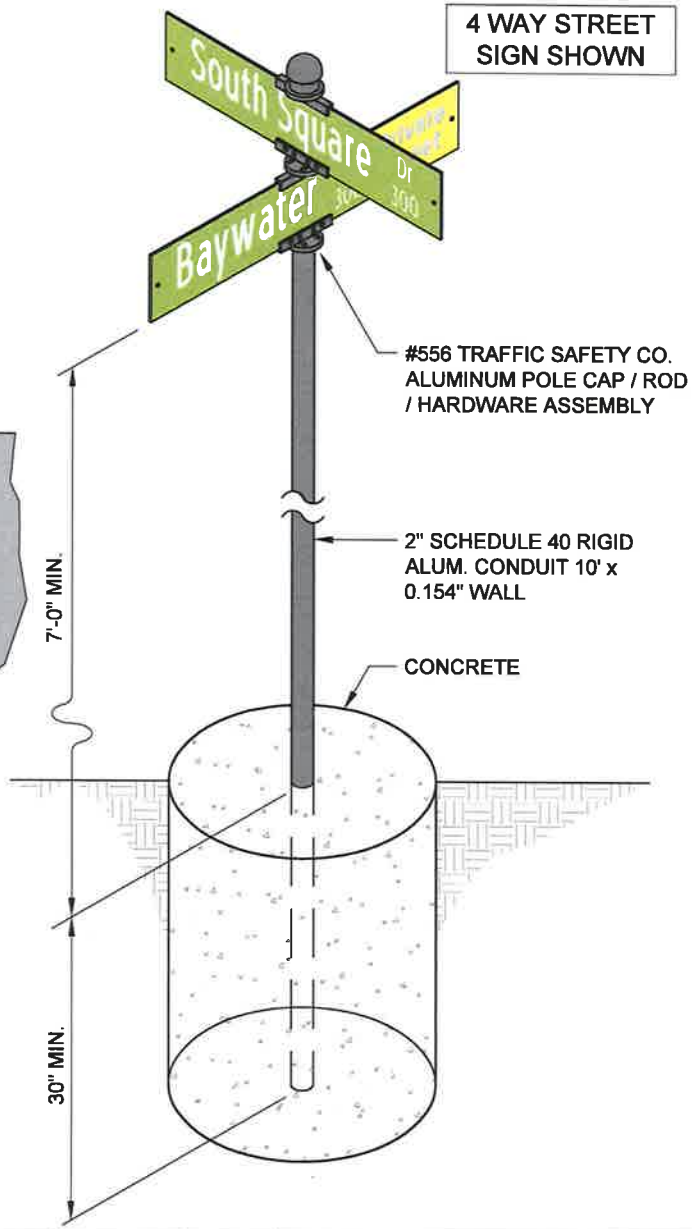
STANDARD CONTAINER PAD

STD. NO.	SCALE
ST-17	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT







NOTES:

1. 6" LETTERS TO BE SERIES "B" (FHWA)
2. 2 1/2" LETTERS TO BE SERIES "B" (FHWA) ALL LETTERS AND BACKGROUND MATERIALS TO BE "SCOTCHLITE" OR AN APPROVED EQUAL AND MEET I.T.E. SPECIFICATIONS ON REFLECTIVITY.
3. SIGN APPEARANCE SHALL BE GREEN BACKGROUND WITH WHITE LETTERS AND WHITE BORDER.
4. FABRICATE SIGN AS FOLLOWS: BASE SHEETING SHALL BE HI-INTENSITY PRISMATIC (OR EQUAL). OVERLAY LETTER MASK USING TRANSLUCENT EC GREEN FILM. ALLOW A 0.50" BORDER TO SHOW.
5. ALUMINUM SIGN BLANK MATERIALS TO BE 0.080" THICK WITH 1.5" RADIUS CORNERS, 2-BLANKS PER SIGN FACE.

RECOMMENDED INSTALLATION

1. STREET NAME SIGN TO BE ONE-FOOT FROM PROPERTY LINE IF SAID LINES WERE EXTENDED.
2. SIGN BLADES NOT TO EXTEND PAST BACK OF CURB INTO ROAD.
3. SIGN LOCATION TO BE PLACED ON LOW SIDE OF BLOCK NUMBERING.
4. ANY EXCEPTIONS SHALL BE APPROVED BY THE TOWN ENGINEER.
5. DEVELOPER RESPONSIBLE FOR INSTALLATION OF ALL STREET SIGNS.

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE

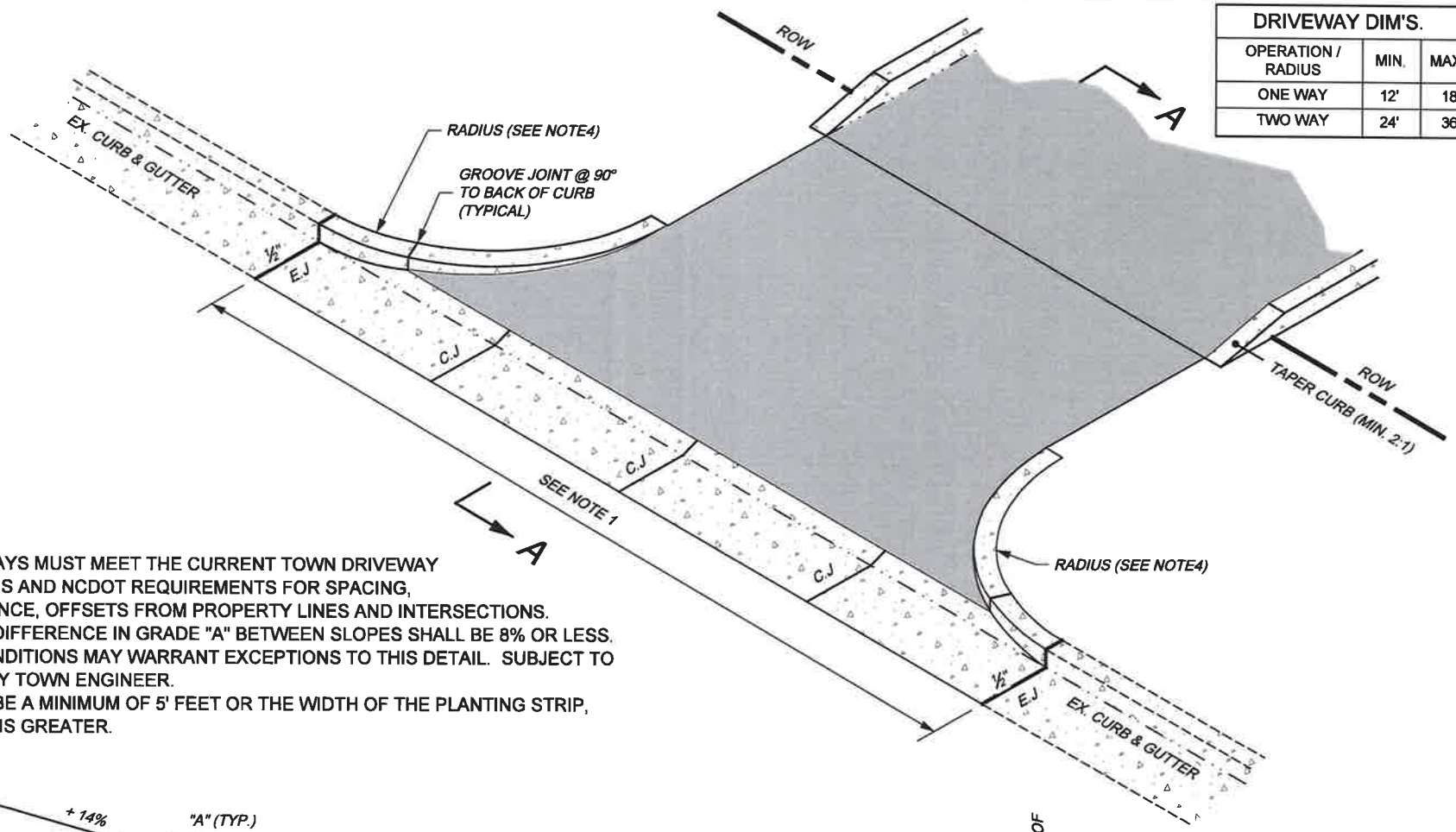
PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville NC 28590

STREET NAME SIGNS

STD. NO.	SCALE
ST-18	N.T.S
SHEET	DATE
1 OF 1	5-31-19

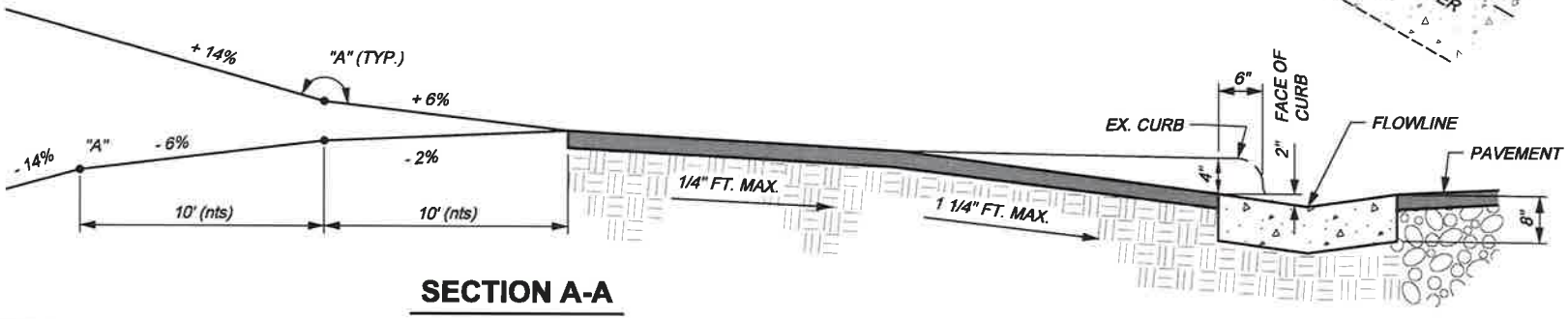
REVISIONS		
NO	DATE	COMMENT

DRIVEWAY DIM'S.		
OPERATION / RADIUS	MIN.	MAX.
ONE WAY	12'	18'
TWO WAY	24'	36'



NOTES

1. ALL DRIVEWAYS MUST MEET THE CURRENT TOWN DRIVEWAY REGULATIONS AND NCDOT REQUIREMENTS FOR SPACING, SIGHT DISTANCE, OFFSETS FROM PROPERTY LINES AND INTERSECTIONS.
2. ALGEBRAIC DIFFERENCE IN GRADE "A" BETWEEN SLOPES SHALL BE 8% OR LESS.
3. SPECIAL CONDITIONS MAY WARRANT EXCEPTIONS TO THIS DETAIL. SUBJECT TO APPROVAL BY TOWN ENGINEER.
4. RADII MUST BE A MINIMUM OF 5' FEET OR THE WIDTH OF THE PLANTING STRIP, WHICHEVER IS GREATER.

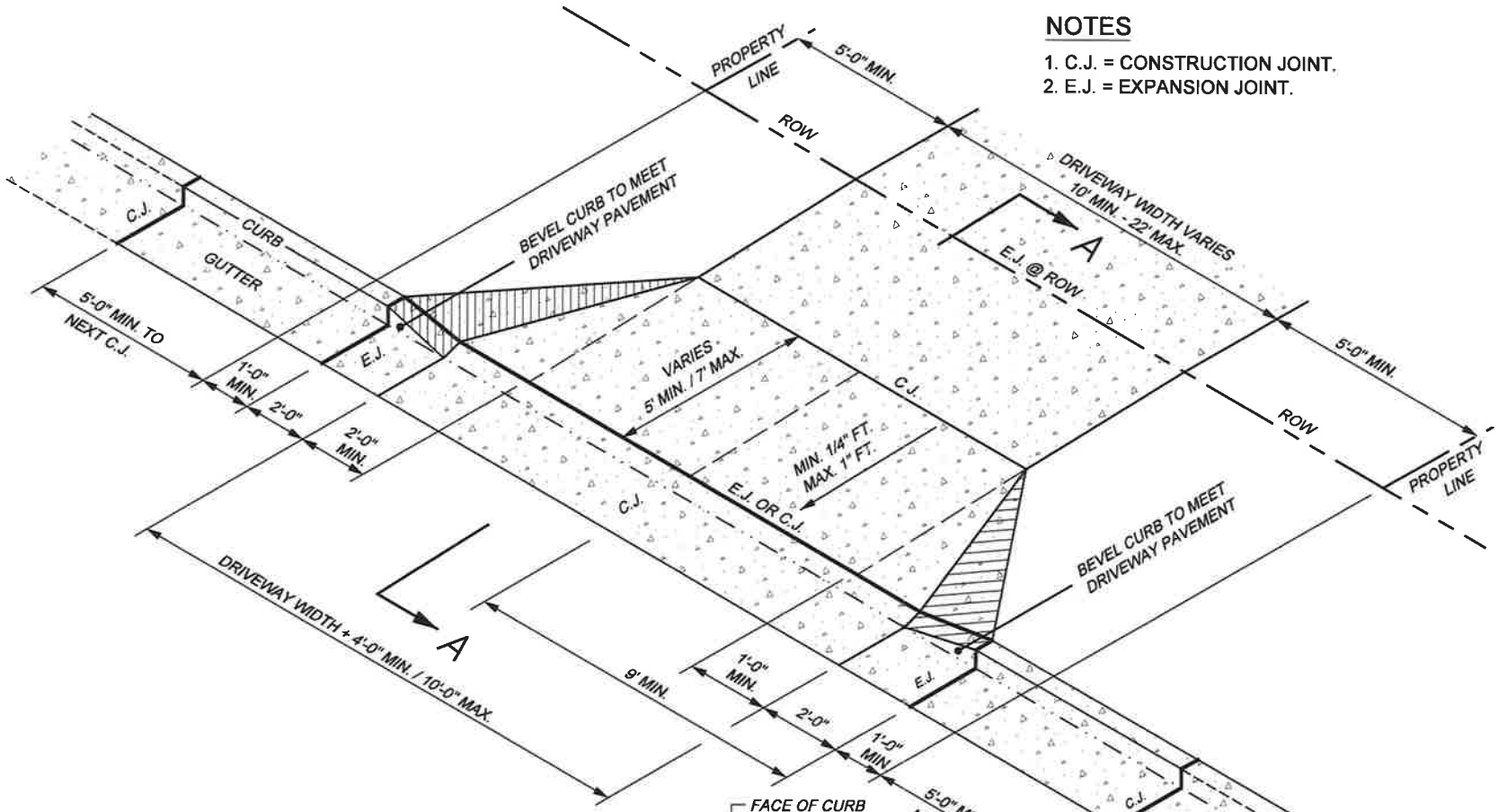


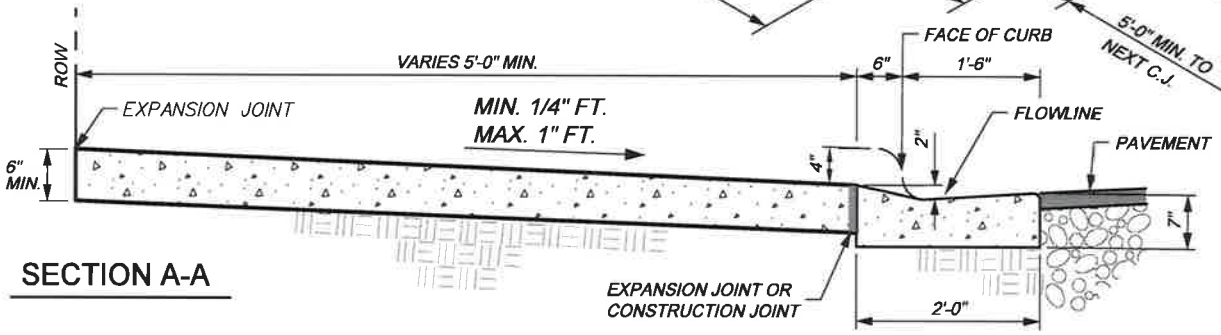
SECTION A-A

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	STD. NO.	SCALE	REVISIONS	
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**ST-19**	N.T.S	NO / DATE / COMMENT	
	TYPICAL ASPHALT DRIVEWAY (COMMERCIAL, INDUSTRIAL, INSTITUTIONAL, MULTIFAMILY)	SHEET 1 OF 1	DATE 5-31-19		

NOTES

1. C.J. = CONSTRUCTION JOINT.
2. E.J. = EXPANSION JOINT.



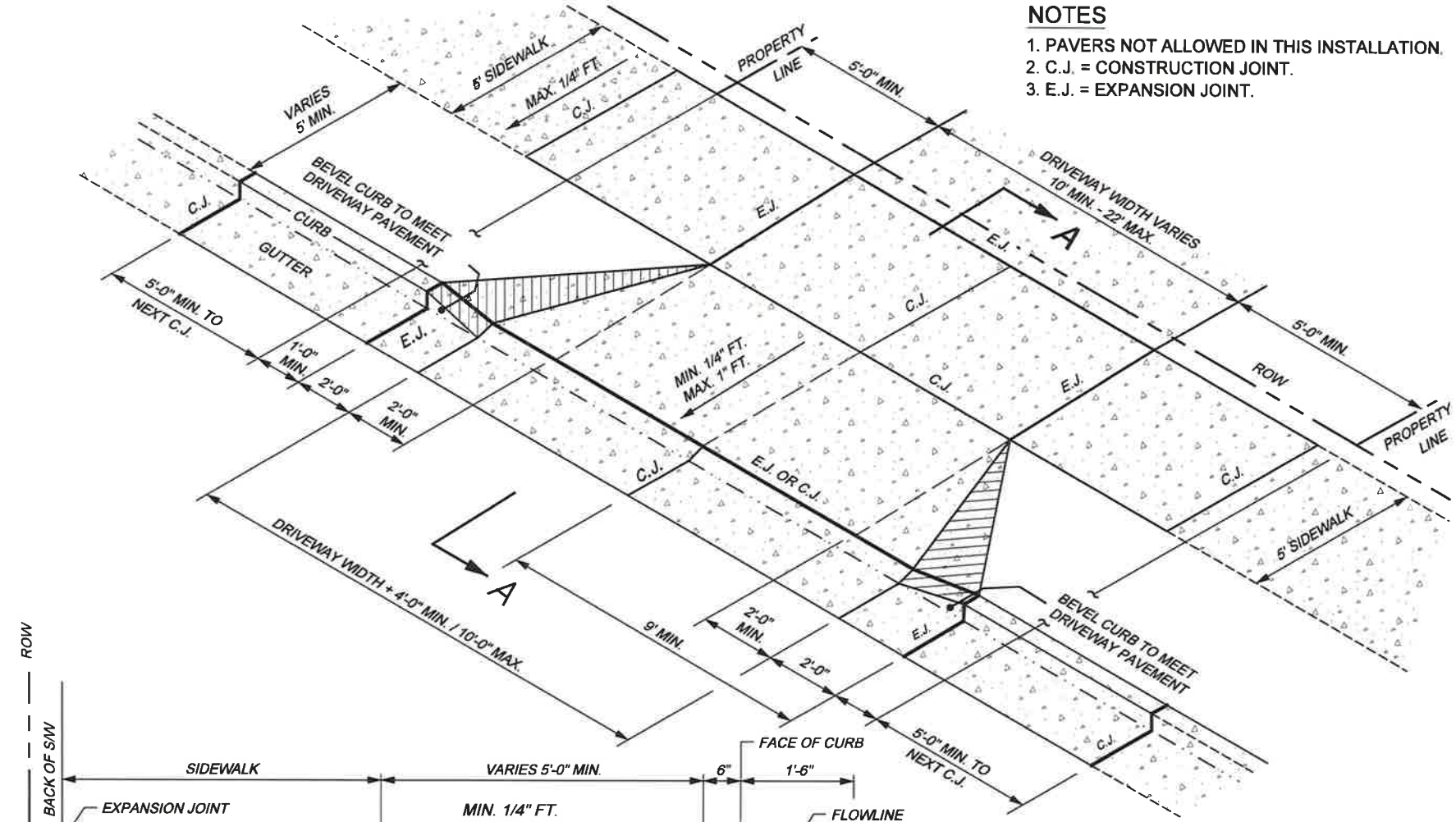


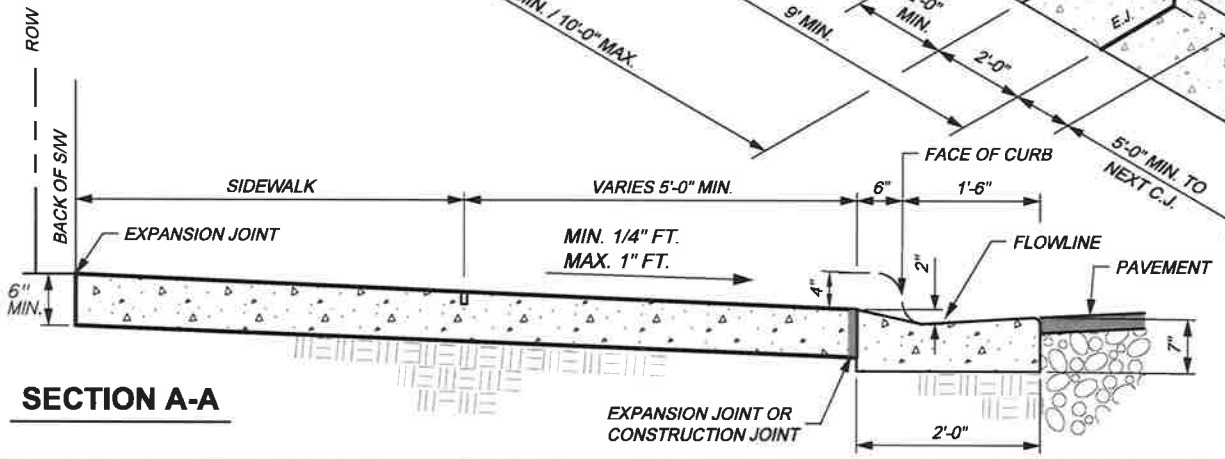
SECTION A-A

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	STD. NO.	SCALE	REVISIONS
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**ST-20**	N.T.S	NO / DATE / COMMENT
	RESIDENTIAL DRIVEWAY - NO SIDEWALK	SHEET 1 OF 1	DATE 5-31-19	

NOTES

1. PAVERS NOT ALLOWED IN THIS INSTALLATION.
2. C.J. = CONSTRUCTION JOINT.
3. E.J. = EXPANSION JOINT.



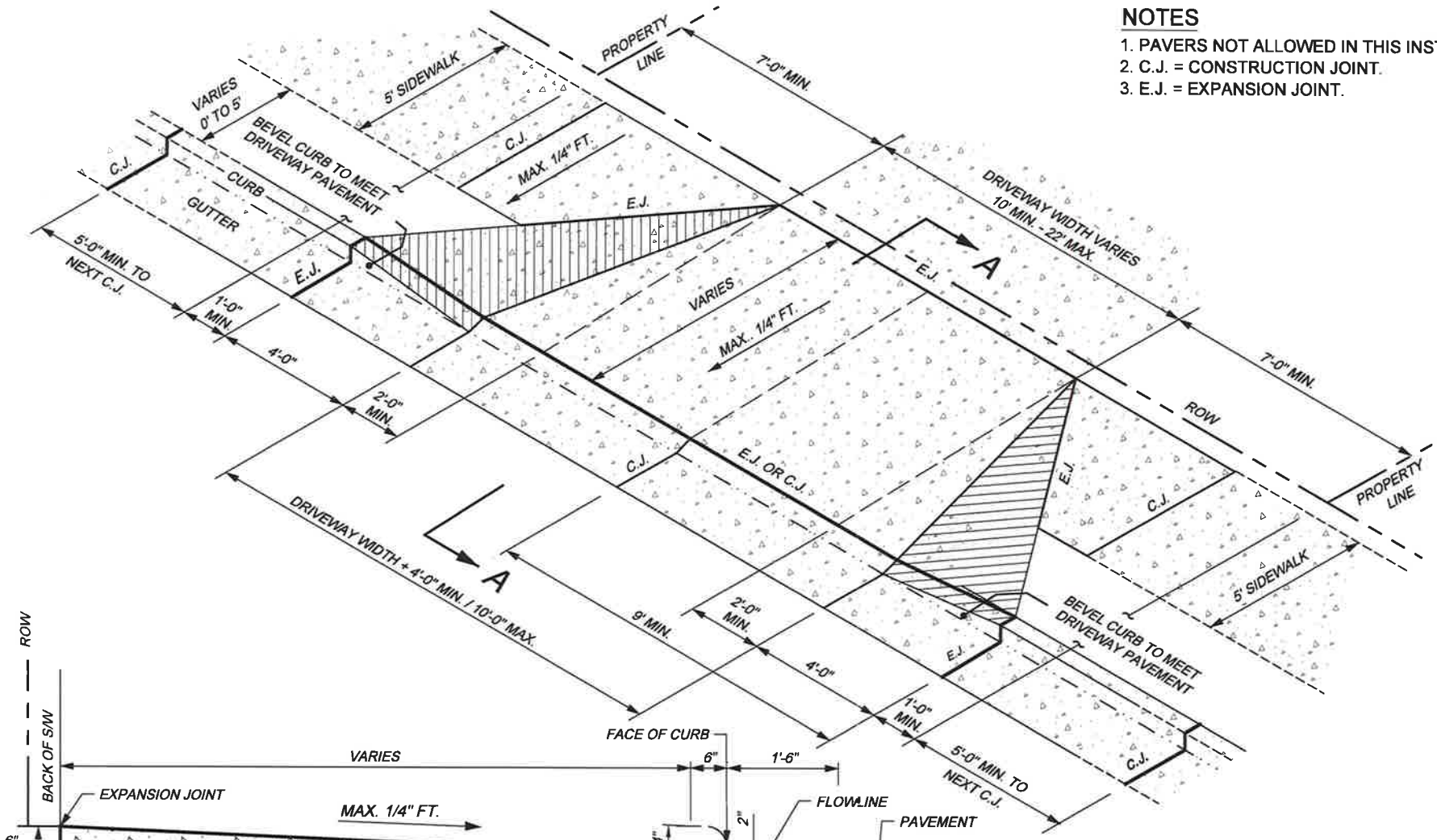


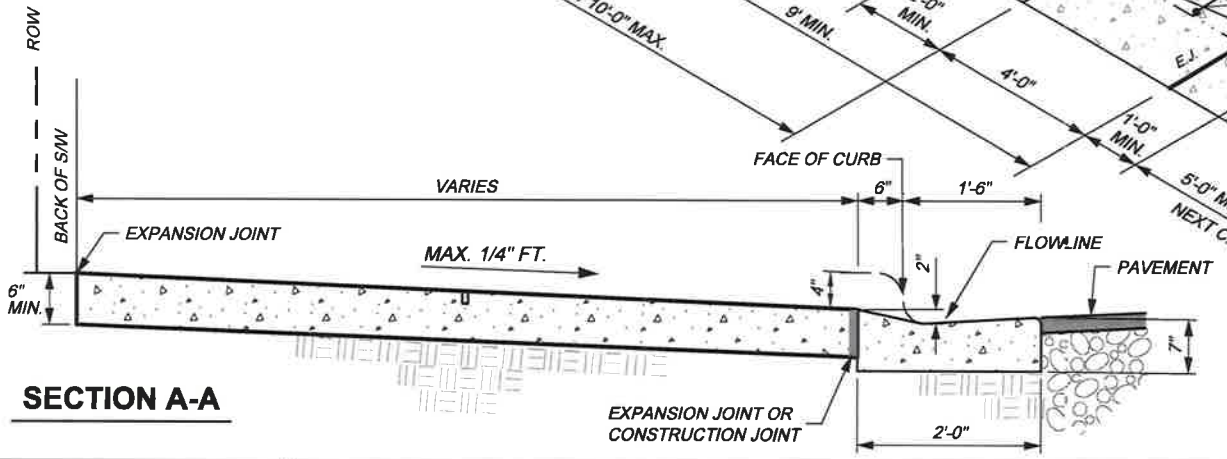
SECTION A-A

TOWN OF WINTERVILLE		STD. NO.	SCALE	REVISIONS	
PUBLIC WORKS DEPARTMENT — 2571 Railroad St. Winterville, NC 28590		ST-21	N.T.S	NO / DATE / COMMENT	
RESIDENTIAL DRIVEWAY - SIDEWALK GREATER THAN 5' FROM CURB		SHEET 1 OF 1	DATE 5-31-19		

NOTES

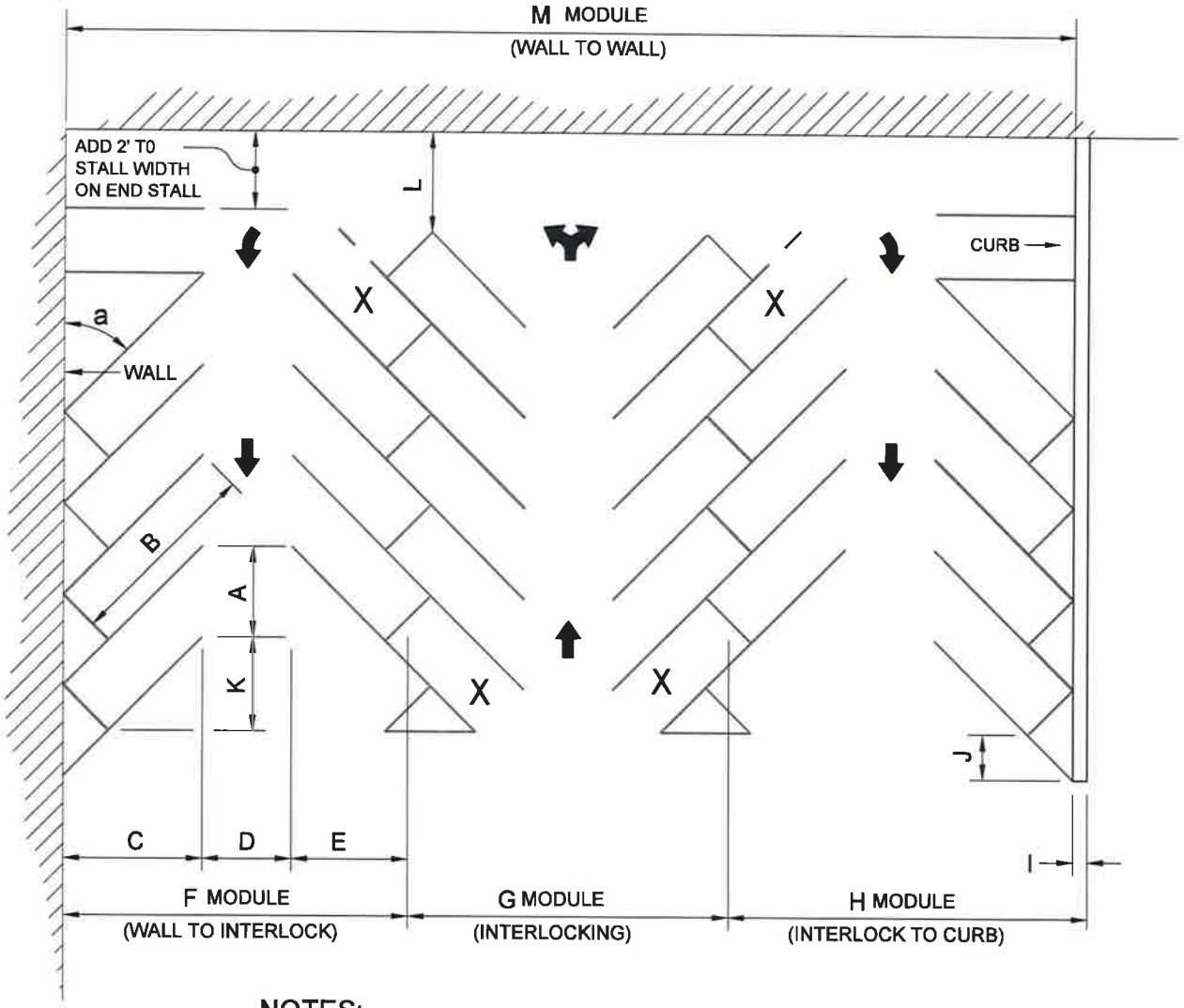
1. PAVERS NOT ALLOWED IN THIS INSTALLATION.
2. C.J. = CONSTRUCTION JOINT.
3. E.J. = EXPANSION JOINT.





SECTION A-A

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	STD. NO.	SCALE	REVISIONS	
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	ST-22	N.T.S	NO / DATE / COMMENT	
	RESIDENTIAL DRIVEWAY-SIDEWALK WITHIN 5' OF CURB	SHEET 1 OF 1	DATE 5-31-19		



NOTES:

X = STALL WILL NOT BE ACCESSIBLE IN CERTAIN LAYOUTS

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **ST-23**	SCALE N.T.S	REVISIONS	
	PARKING STANDARDS	SHEET 1 OF 2	DATE 5-31-19	NO / DATE / COMMENT	

		ANGLE																		
		45°					60°					75°					90°			
STALL WIDTH, PARALLEL TO AISLE	A	10.6	12.0	12.7	13.4		8.7	9.8	10.4	10.9		7.8	8.8	9.3	9.8		7.5	8.5	9.0	9.5
STALL LENGTH OF LINE	B	24.0	25.0	25.0	25.0		20.4	22.0	22.0	22.0		17.9	20.0	20.0	20.0		16.0	18.5	18.5	18.5
STALL DEPTH OF LINE	C	17.0	17.7	17.7	17.7		17.7	19.0	19.0	19.0		17.2	19.3	19.3	19.3		16.0	18.5	18.5	18.5
AISLE WIDTH BETWEEN STALL LINES	D	11.0	13.0	12.0	11.0		14.0	18.0	16.0	15.0		17.4	25.0	23.0	22.0		20.0	28.0	26.0	25.0
STALL DEPTH, INTERLOCK	E	14.3	14.7	14.5	14.3		15.8	16.9	16.8	16.6		16.2	18.2	18.1	18.1		16.0	18.5	18.5	18.5
MODULE, WALL TO INTERLOCK	F	42.3	45.4	44.2	43.0		47.5	53.9	51.8	50.6		50.8	60.9	60.4	59.4		52.0	65.0	63.0	62.0
MODULE, INTERLOCKING	G	39.6	42.4	41.0	39.6		45.6	51.8	49.6	48.2		49.2	61.4	59.2	58.2		52.0	65.0	63.0	62.0
MODULE, INTERLOCK TO CURB FACE	H	40.3	43.4	42.2	41.0		45.2	51.6	49.5	48.3		48.3	58.4	57.9	56.9		49.5	62.5	60.5	59.5
BUMPER OVERHANG (TYPICAL)	I	2.0	2.0	2.0	2.0		2.3	2.3	2.3	2.3		2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5
OFFSET	J	5.3	6.0	6.4	6.7		1.9	2.1	2.3	2.4		0.5	0.6	0.6	0.6		0.0	0.0	0.0	0.0
SETBACK	K	11.7	11.7	11.3	11.0		8.2	9.0	8.8	8.7		4.5	4.6	4.6	4.6		0.0	0.0	0.0	0.0
CROSS AISLE, ONE-WAY	L_1	13	14	14	14		13	14	14	14		13	14	14	14		13	14	14	14
CROSS AISLE, TWO-WAY	L_2	22	24	24	24		22	24	24	2.4		22	24	24	24		22	24	24	24
MODULE, WALL TO WALL	M	45.0	48.4	47.4	46.4		49.4	56.0	54.0	53..0		51.8	63.6	61.6	60.6		52.0	65.0	63.0	62.0
	STALL WIDTH	7.5' Compacts Only	8.5'	9.0'	9.5'		7.5' Compacts Only	8.5'	9.0'	9.5'		7.5' Compacts Only	8.5'	9.0'	9.5'		7.5' Compacts Only	8.5'	9.0'	9.5'

WINTERVILLE
NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT

2571 Railroad St. Winterville, NC 28590

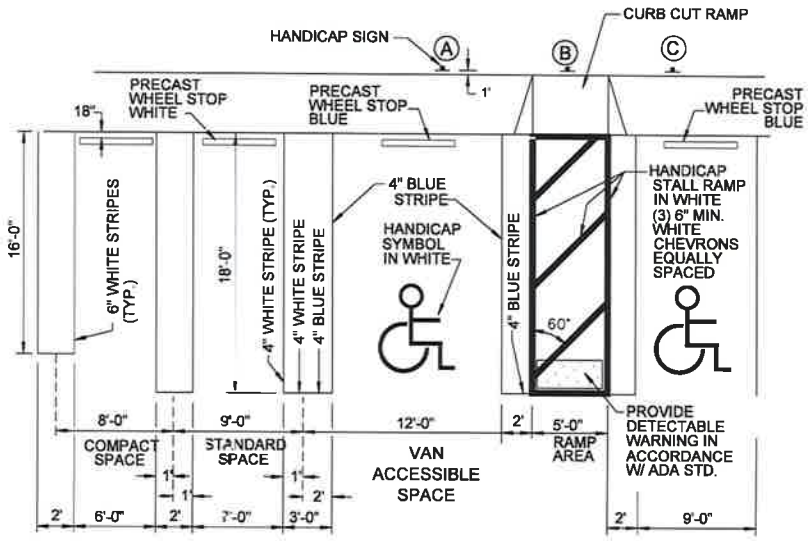
MAXIMUM PARKING STANDARDS

STD. NO.	SCALE
ST-24	N.T.S
SHEET	DATE
2 OF 2	5-31-19

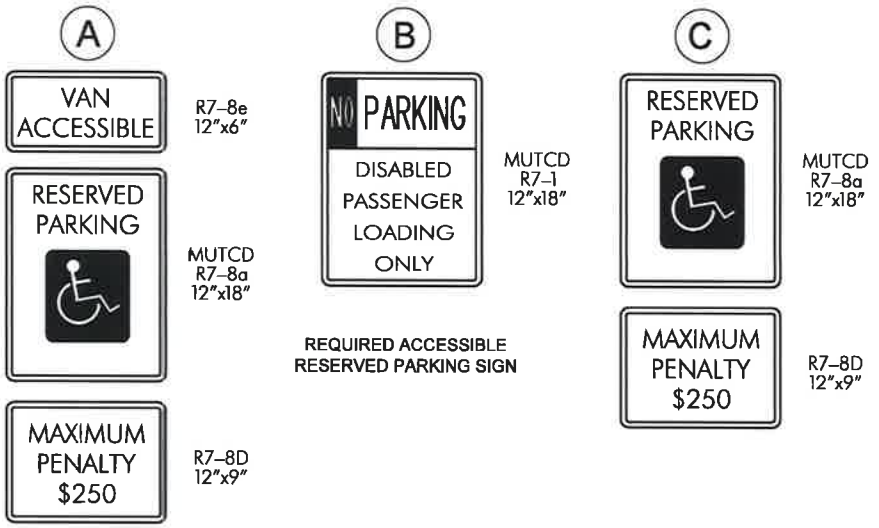
REVISIONS		
NO	DATE	COMMENT

ACCESSIBLE PARKING REQUIREMENTS

TOTAL PARKING SPACES PROVIDE	MINIMUM NUMBER OF ACCESSIBLE SPACES REQUIRED	MINIMUM NUMBER OF ACCESSIBLE SPACES REQUIRED TO BE VAN ACCESSIBLE
1 TO 25	1	1
26TO 50	2	1
51 TO 75	3	1
76 TO 100	4	1
101 TO 150	5	1
151 TO 200	6	1
201 TO 300	7	1
301 TO 400	8	1
401 TO 500	9	2
501 TO 1000	25% OF TOTAL	1 IN EVERY 8 ACCESSIBLE SPACES
1001 AND OVER	20 PLUS 1 FOR EACH 100 OVER 1000	1 IN EVERY 8 ACCESSIBLE SPACES
SECTION 4.1.2 (5) OF THE AMERICANS WITH DISABILITIES ACT (ADA). SEE 4.1.2 (5) (d) FOR MEDICAL CARE FACILITIES.		



PARKING SPACES PAVEMENT MARKINGS



NOTES:

1. ALL 12"x18" ACCESSIBLE SIGNS (R7-8a & R7-1) SHALL BE MOUNTED AT 7 FEET FROM GRADE TO BOTTOM EDGE OF SIGN FACE (MUTCD). MOUNTING HEIGHT CAN BE REDUCED TO 5 FEET IF PLACED IN AN AREA BETWEEN SIDEWALK AND BUILDING FACE IN WHICH PEDESTRIANS ARE NOT EXPECTED TO USE.

2. REFER TO MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, (MUTCD) U.S. DEPARTMENT OF TRANSPORTATION AND NORTH CAROLINA DEPARTMENT OF TRANSPORTATION SUPPLEMENT.

3. IF ACCESSIBLE ROUTE IS A RAISED SIDEWALK AREA, THEN RAMPS ARE REQUIRED AT LOADING ZONE AREA.

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

ACCESSIBLE PARKING AND SIGNAGE

STD. NO.	SCALE
ST-25	N.T.S
SHEET	DATE
1 OF 1	5-31-19

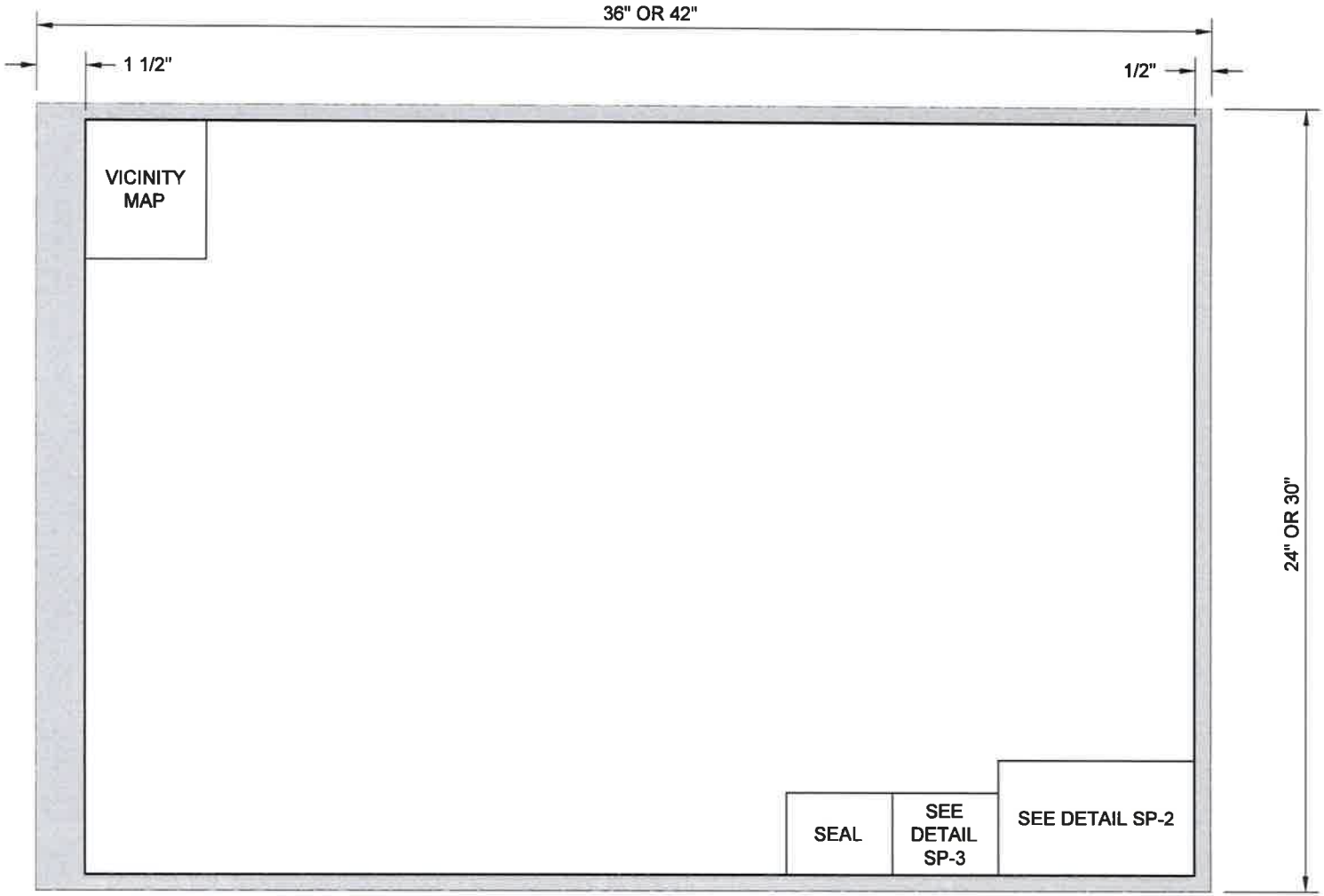
REVISIONS		
NO	DATE	COMMENT

Section 5

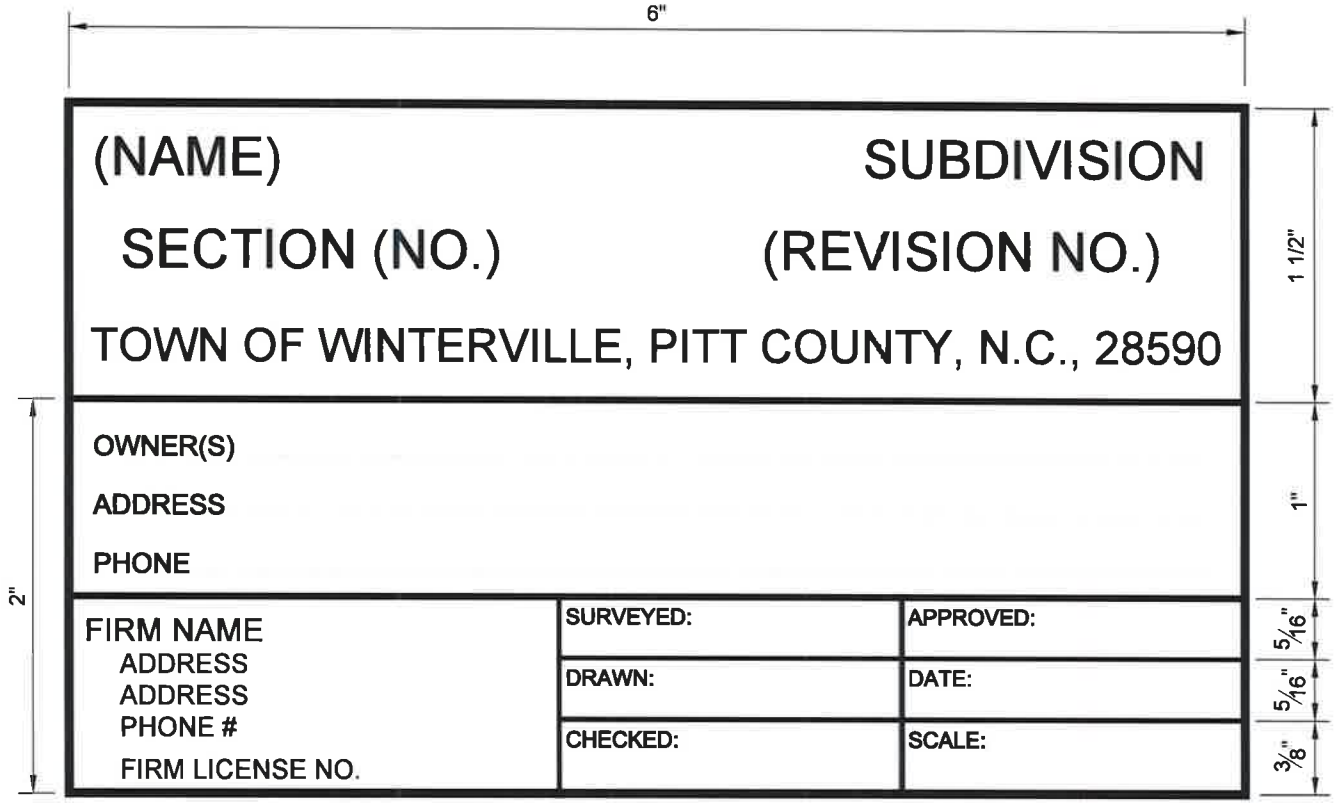
Plat and Drawing Requirements

Standard Detail Index

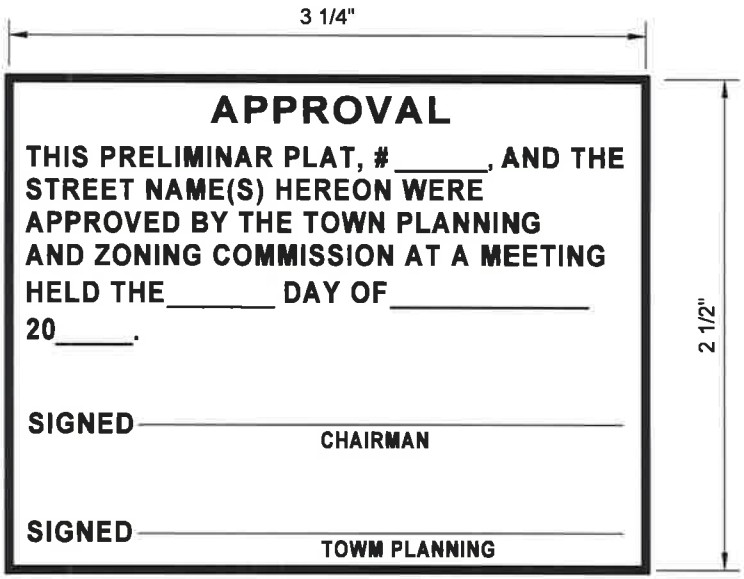
SECTION 5 – PRELIMINARY AND FINAL PLAT PREPARATION



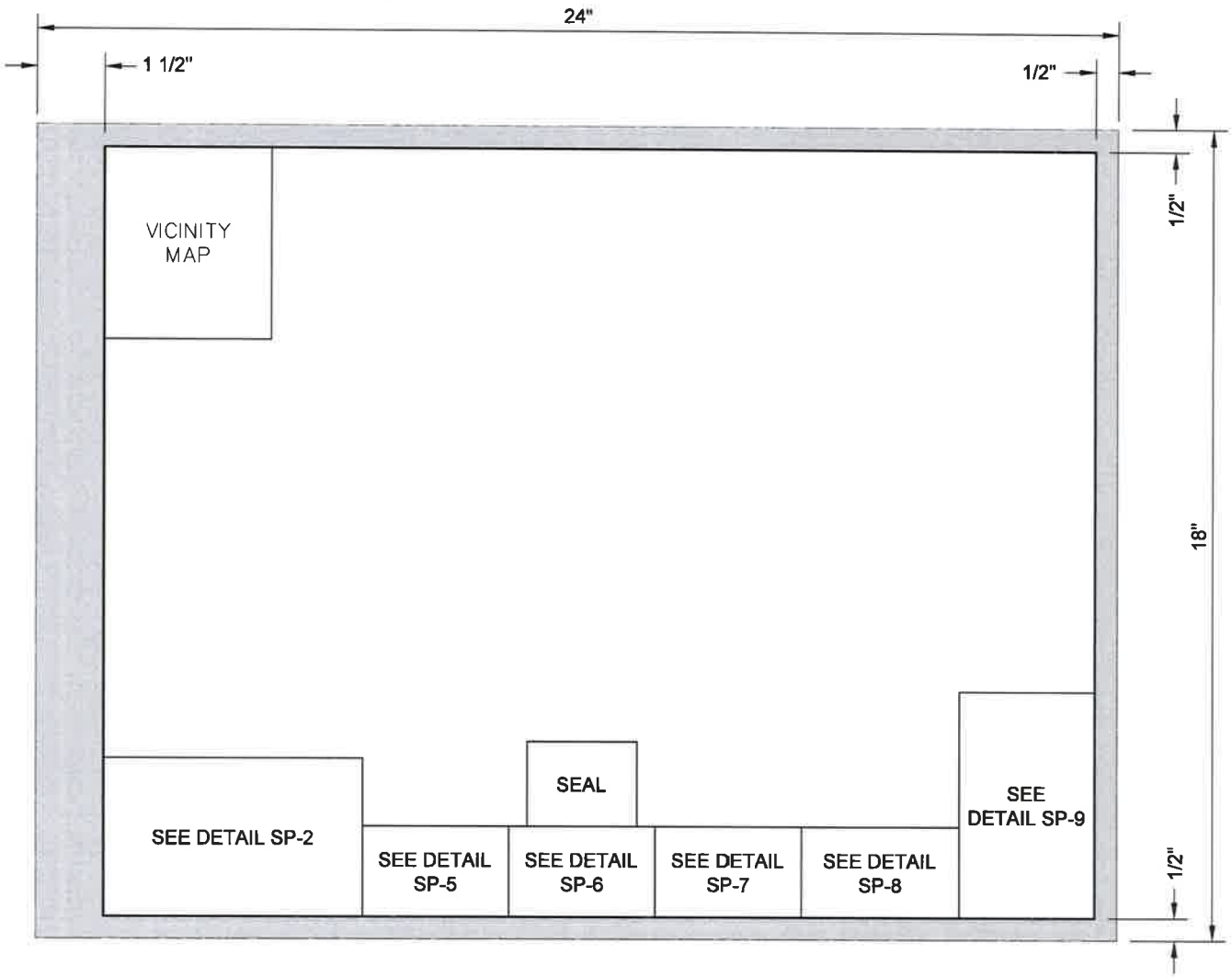
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **SP-1**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	PRELIMINARY PLAT LAYOUT	SHEET 1 OF 1	DATE 5-31-19	



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	STD. NO.	SCALE	REVISIONS	
PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590		SP-2	N.T.S	NO / DATE / COMMENT	
TITLE BLOCK		SHEET 1 OF 1	DATE 5-31-19		



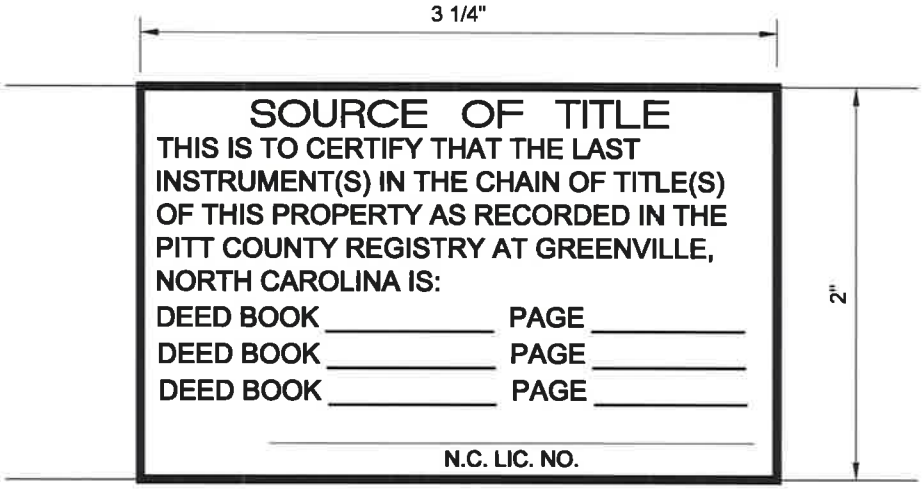
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **SP-3**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT	
	"APPROVALS" INFORMATION BLOCK FOR PRELIMINARY PLAT	SHEET 1 OF 1	DATE 5-31-19		



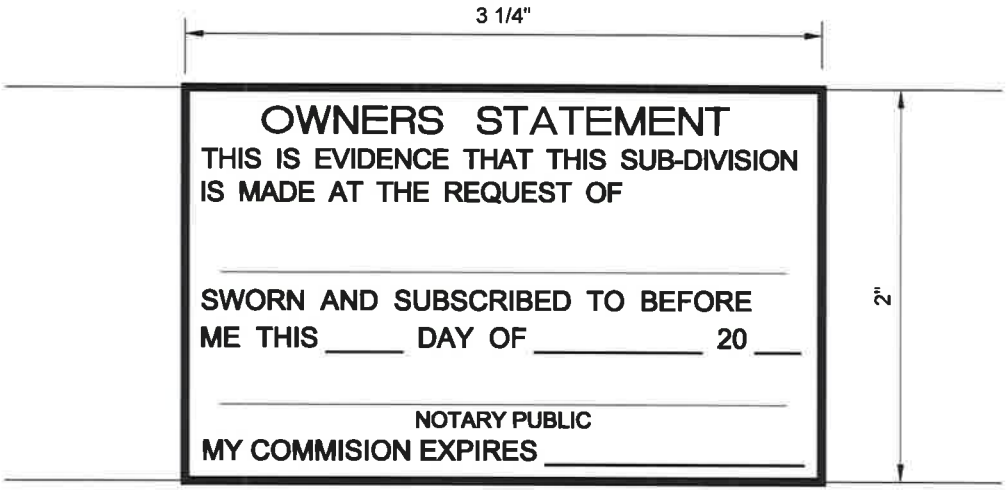
NOTES:

1. ORIGINAL TO BE ON MYLAR, 0.003-0.004 INCH THICKNESS.
2. RESERVE AREA FOR REGISTER OF DEEDS STICKER.

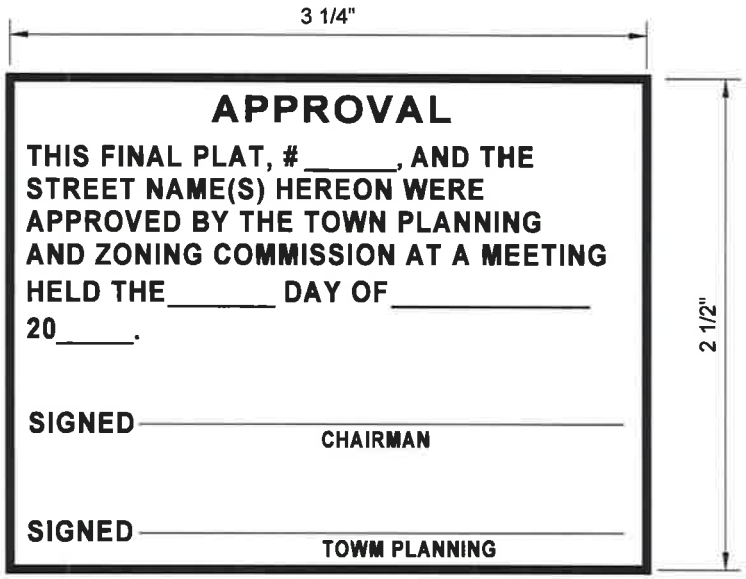
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **SP-4**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	FINAL PLAT LAYOUT	SHEET 1 OF 1	DATE 5-31-19	



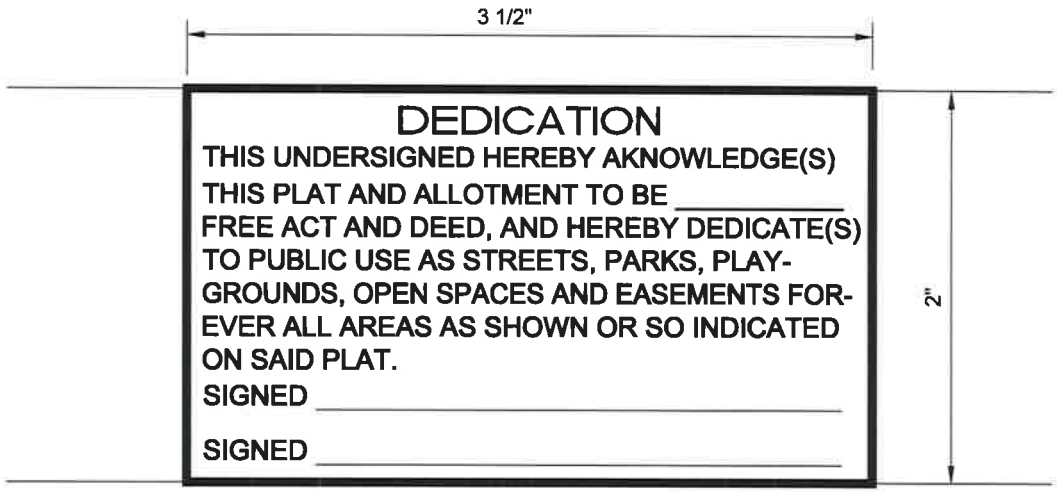
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St Winterville, NC 28590	STD. NO. **SP-5**	SCALE N.T.S	REVISIONS	
	"SOURCE OF TITLE" INFORMATION BLOCK	SHEET 1 OF 1	DATE 5-31-19	NO / DATE / COMMENT	



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **SP-6**	SCALE N.T.S	REVISIONS	
	OWNERS STATEMENT BLOCK	SHEET 1 OF 1	DATE 5-31-19	NO / DATE / COMMENT	



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, Nc 28590	STD. NO. **SP-7**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT	
	"APPROVALS" INFORMATION BLOCK FOR FINAL PLAT	SHEET 1 OF 1	DATE 5-31-19		



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	STD. NO. **SP-8**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	DEDICATION INFORMATION BLOCK	SHEET 1 OF 1	DATE 5-31-19	

COMMENTS:

THE SURVEYOR'S CERTIFICATION SHALL BE SUBSTANTIALLY IN THE FORM SHOWN FOR SURVEYS MADE BY TRADITIONAL AND GPS SURVEY METHODS. FOR TRADITIONAL ONLY SURVEYS USE MSDD STANDARD C11.07. THE SURVEYOR SHOULD REFER TO AND COMPLY WITH THE CURRENT NCBELS RULES 21 NCAC 56.1600, "STANDARDS OF PRACTICE OF LAND SURVEYING IN NORTH CAROLINA", AND G.S. 47-30 FOR ANY RULE AMENDMENTS. www.ncbels.org

REQUIRED MINIMUM ACCURACY STANDARDS: (21 NCAC 56.1603 & .1605)

HORIZONTAL: "URBAN LAND SURVEYS", CLASS "A" (1:10,000+)

VERTICAL: "URBAN AND SUBURBAN VERTICAL CONTROL SURVEYS", CLASS "A" (Error not to exceed 0.10 times the square root of the numbers of miles run from reference station).

REFERENCE INFORMATION REQUIRED FOR GPS SURVEYS IN THE CERTIFICATION. (REF, NCBELS BOARD RULE 21 NCAC 56.1607).

(1) POSITIONAL ACCURACY:_____ (0.07 feet +/- 50PPM or less).
(2) TYPE OF GPS FIELD PROCEDURE:_____
(STATIC, REAL-TIME KINEMATIC, REAL-TIME KINEMATIC NETWORK, ONLINE POSITION USER SERVICE).
(3) DATE(S) OF SURVEY:_____
(4) DATUM / EPOCH: _____
(HORIZONTAL (NAD83/86, NAD83(NSRS2007), etc.; VERTICAL (NAVD88)).
(5) PUBLISHED / FIXED-CONTROL STATIONS USED: _____
(INCLUDE: STATION NAMES, HORIZONTAL POSITION (NORTHING AND EASTING), ELEVATION, DATUM AND EPOCH).
(6) GEOID MODEL USED:_____
(GEOID03, GEOID06, GEOID09, etc.).
(7) COMBINED GRID FACTOR(S):_____
(8) UNITS: US SURVEY FOOT .

SURVEYOR'S CERTIFICATION

I, _____, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL FIELD SURVEY PERFORMED UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN BOOK _____, PAGE _____, OR FROM BOOKS REFERENCED HEREON); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK _____, PAGE _____, OR AS REFERENCED HEREON; THAT THE RATIO OF PRECISION FOR TRADITIONAL SURVEY METHOD IS 1:_____; THAT THE GLOBAL POSITIONING SYSTEM (GPS) OBSERVATIONS WERE PERFORMED TO THE GEOSPATIAL POSITIONING ACCURACY STANDARDS, PART 2: STANDARDS FOR GEODETIC NETWORKS AT THE CLASS "A" ACCURACY CLASSIFICATION (95% CONFIDENCE) AND THE FOLLOWING INFORMATION WAS USED TO PERFORM THE GPS SURVEY:

POSITION ACCURACY: _____
TYPE OF GPS FIELD PROCEDURE: _____
DATE(S) OF SURVEY: _____
DATUM / EPOCH: _____
PUBLISHED / FIELD CONTROL MONUMENTS USED:
_____
_____
GEOID MODEL: _____
COMBINED GRID FACTOR: _____
UNITS: _____

THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.
I, FURTHER CERTIFY PURSUANT TO G.S.47-30(f)(11)(a), THIS SURVEY CREATES A SUBDIVISION OF LAND WITHIN A COUNTY OR MUNICIPALITY THAT HAS AN ORDINANCE THAT REGULATES PARCELS OF LAND.
WITNESS MY ORIGINAL SIGNATURE AND SEAL THIS THE _____ DAY OF _____, 20 _____.

SIGNED _____
PROFESSIONAL LAND SURVEYOR NO. L- ####

5 1/2"

3"

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

FINAL PLAT SURVEYOR'S CERTIFICATION TRADITIONAL & GPS SURVEY METHODS

STD. NO.	SCALE
SP-9	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

Section 6

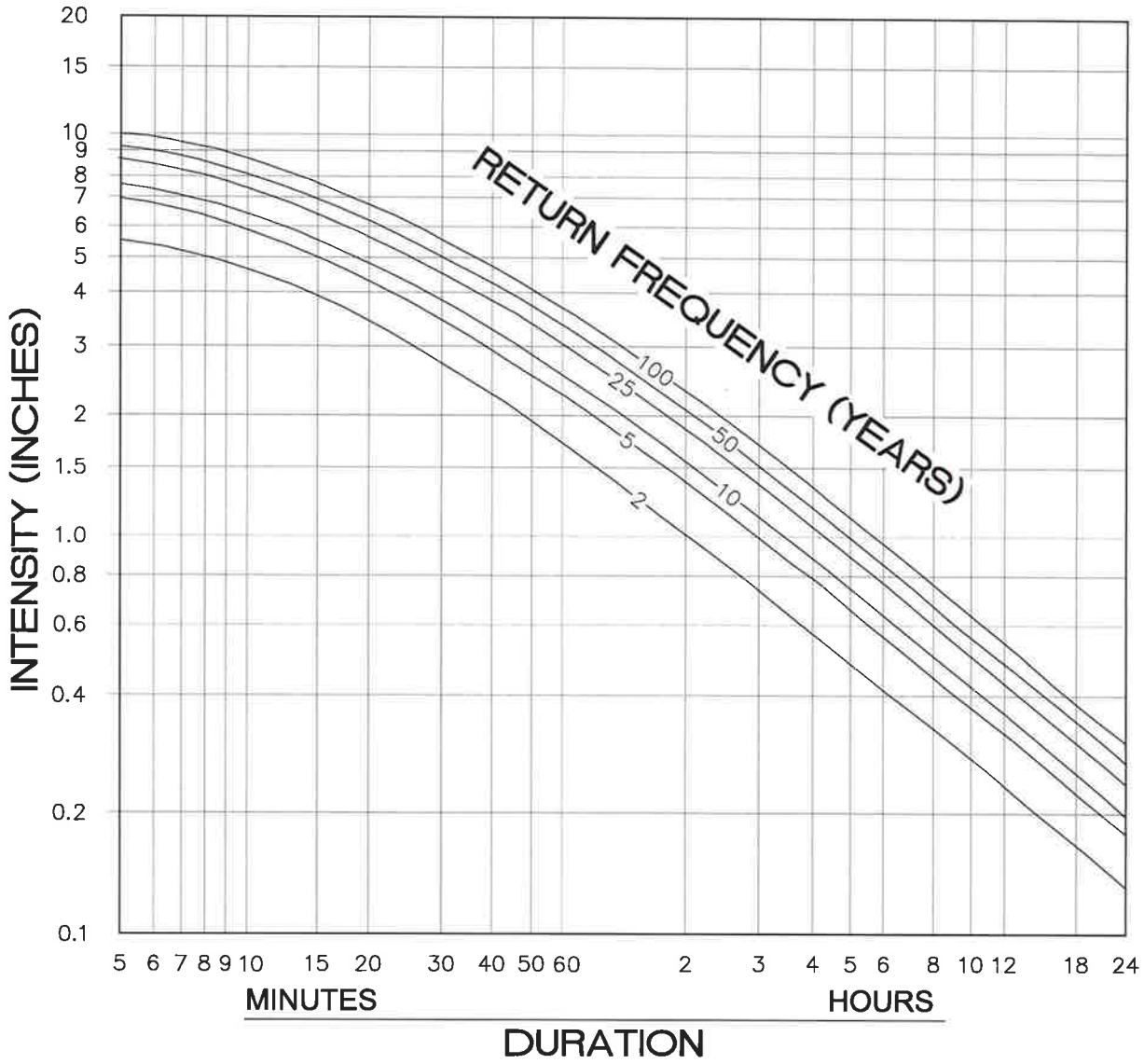
Attachments

Standard Detail Index

SECTION 6 – APPENDICES

STORMDRAINAGE CHARTS

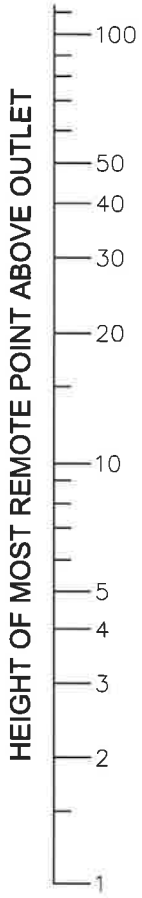
ROADWAY FIGURES



NOTES:

1. ASSUME TIME OF CONCENTRATION EQUALS DURATION

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **RAINFALL INTENSITY VS. DURATION**	CHART NO. **CHT-1** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS	
				NO / DATE / COMMENT	



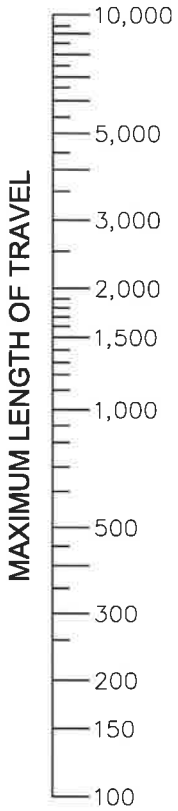
Use nomograph T_C for natural basins with well defined channels for overland flow on bare earth, and for mowed grass roadside channels.

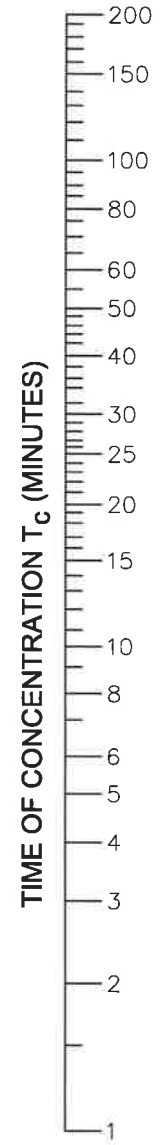
For overland flow, grassed surfaces, multiply T_C by 2.

For overland flow, concrete or asphalt surfaces, multiply T_C by 0.4

For concrete channels, multiply T_C by 0.2

$$T_C = \frac{\left(\frac{L^3}{H}\right)^{0.385}}{128}$$





WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	CHART NO. **CHT-2**	SCALE N.T.S	REVISIONS	
				NO / DATE / COMMENT	
	TIME OF CONCENTRATION	SHEET 1 OF 1	DATE 5-31-19		

RUNOFF COEFFICIENTS

LAWNS:	(1) SANDY SOILS	FLAT	<2%	0.10
		AVERAGE	2% - 7%	0.15
		STEEP	>7%	0.20
	(2) HEAVY SOILS	FLAT	<2%	0.15
		AVERAGE	2% - 7%	0.20
		STEEP	>7%	0.30
WOODS, CEMETERIES, PARKS:				0.20
UNIMPROVED AREAS (PASTURE, CROP, ETC.):				0.25
PLAYGROUNDS:				0.30
RESIDENTIAL:	(1) APARTMENTS AND TOWNHOUSES			0.70
	(2) LOT SIZE <1/4 ACRE (R-6, R-9)			0.60
	(3) LOT SIZE <1/3 ACRE (R-15)			0.60
	(4) LOT SIZE <1/2 ACRE (R-20)			0.60
	(5) LOT SIZE <1.0 ACRE			0.60
	(6) LOT SIZE >1.0 ACRE			0.55
INDUSTRIAL:	(1) LIGHT			0.70
	(2) HEAVY			0.80
COMMERCIAL:	(1) DOWNTOWN, STRIP, MALL, PAVEMENT AREAS			0.95
	(2) CENTER			0.90
	(3) NEIGHBORHOOD			0.85
ROOF:				0.95
PAVEMENT:	(1) ASPHALT OR CONCRETE			0.90
	(2) BRICK			0.80
GRAVEL:				0.30

WINTERVILLE
NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

RUNOFF COEFFICIENTS

CHART NO.	SCALE
CHT-3	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

CAPACITY OF BASIN =

$$Q = K D^{5/3}$$

WHERE:

Q= C.F.S.

D= DEPTH OF GUTTER FLOW IN FEET

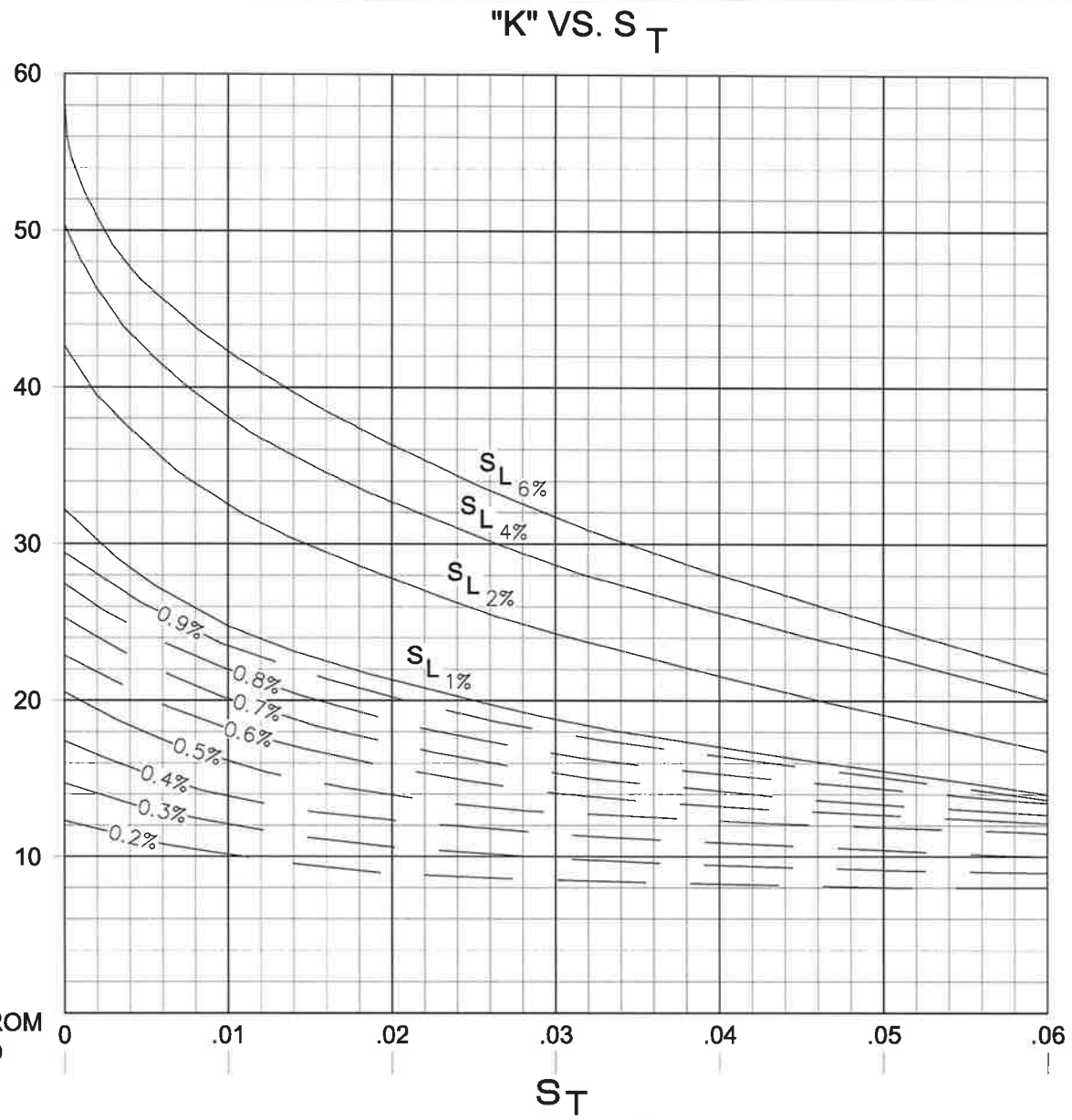
S_L = LONGITUDINAL GUTTER SLOPE

S_T = TRANSVERSE GUTTER SLOPE

K = GRATE INLET COEFFICIENT

——— INDICATES INTERPOLATED VALUES

S_T = VERTICAL DISTANCE FROM CROWN TO GUTTER LINE DIVIDED BY DISTANCE FROM CREST OF ROADWAY (USUALLY C/L) TO GUTTER LINE.



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **STANDARD CATCH BASIN INLET CAPACITY**	CHART NO. **CHT-4** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS: NO / DATE / COMMENT

CATCH BASIN DESIGN DATA SHEET

PROJECT _____ COMPUTED BY _____ DATE _____,20____

LOCATION _____ CHECKED BY _____ DATE _____,20____

STORM FREQUENCY _____ YEARS

CATCH BASIN NO.	1 LONGITUDINAL STREET GRADE (S_L)%	2 TRANSVERSE STREET GRADE (S_T)	3 MAX. DEPTH OF OF FLOW IN GUTTER (FT.)	4 CAPACITY OF BASIN (C.F.S.) $Q=KD^{8/3}$	5 TRIAL COEF. OF RUNOFF	6 TRIAL INTENSITY (in.)	7 DERIVED AREA $=\frac{4}{5 \times 6}$	8 LENGTH OF DRAINAGE AREA	9 HEIGHT ABOVE MOST REMOTE POINT	10 COEF. OF RUNOFF	11 TIME OF CONCENTRATION (T_C)	12 ACTUAL INTENSITY (in.)	13 MAX. ALLOWABLE DRAINAGE AREA $=\frac{4}{10 \times 12}$	REMARKS (COLUMN 13 MUST BE W/N 10% OF COLUMN 7)

STORM DRAINAGE DESIGN DATA SHEET

PROJECT _____ DESIGNED BY _____ DATE _____,20____

LOCATION _____ CHECKED BY _____ SHEET _____ OF _____

STORM FREQUENCY _____ YEARS

LOCATION		AREA (ACRE)		C	INTENSITY			Q=CIA (C.F.S. REQ'D)	PIPE DATA							HGL	REMARKS
FROM	TO	SUB TOTAL	TOTAL		H	L	I		TYPE	N	S%	LENGTH	SIZE	VEL. (OF Q REQ'D)	Q AVAIL.		

C = RUNOFF COEFFICIENT
H = HEIGHT ABOVE INLET OF MOST REMOTE POINT
L = LENGTH OF DRAINAGE AREA
I = INTENSITY OF STORM (INCHES)
N = COEFFICIENT OF FRICTION
S = SLOPE (%)
Q = FLOW (C.F.S.)

NOTE: DESIGN BASED ON THE SUM OF AREAS AND NOT THE SUM OF THE DISCHARGES.

WINTERVILLE NORTH CAROLINA

TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

STORM DRAINAGE DESIGN DATA SHEET

CHART NO.	SCALE
SD-6	N.T.S
SHEET 1 OF 1	DATE 5-31-19

REVISIONS		
NO	DATE	COMMENT

COEFFICIENT OF ENTRANCE LOSS, "ke"

TYPE OF STRUCTURE AND DESIGN OF ENTRANCE	COEFFICIENT Ke:
PIPE, CONCRETE	
Projecting from fill	0.5
Headwall or headwall and wingwalls	0.5
Mitered to conform to fillslope	0.7
PIPE OR PIPE-ARCH, CORRUGATED METAL	
Projecting (no headwall)	0.9
Headwall or headwall and wingwalls	0.5
Mitered to conform to fillslope	0.7
BOX REINFORCED CONCRETE	
Headwall	0.5
Wingwall at 30 degrees to 75 degrees to barrel	0.4
Wingwalls at 10 degrees to 25 degrees to barrel	0.5

WINTERVILLE NORTH CAROLINA

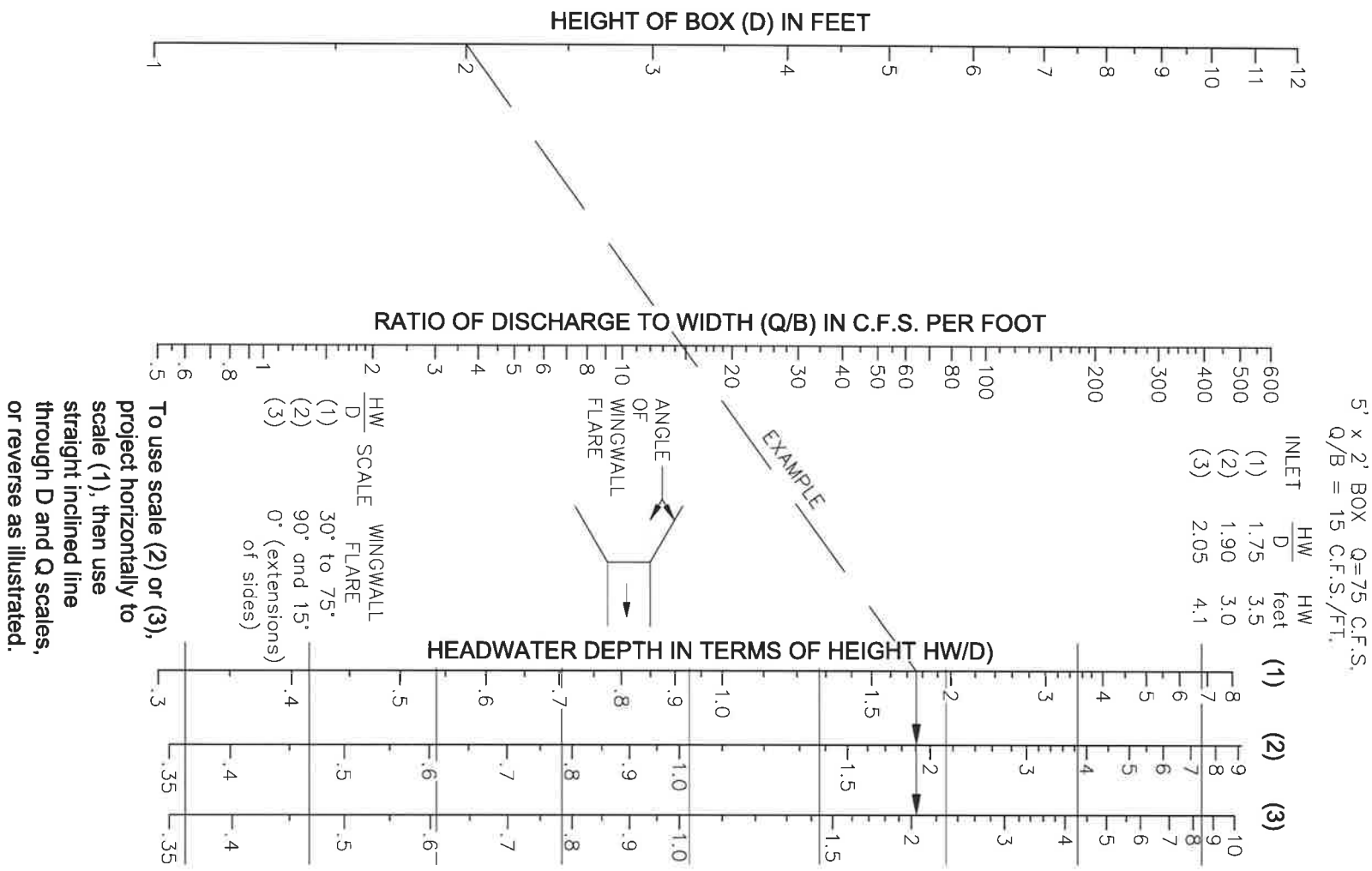
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

COEFFICIENT OF ENTRANCE LOSS, "Ke"

CHART NO.	SCALE
CHT-7	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



EXAMPLE

5' x 2' BOX Q=75 C.F.S.
Q/B = 15 C.F.S./FT.

INLET	HW/D	HW
(1)	1.75	3.5 feet
(2)	1.90	3.0
(3)	2.05	4.1

To use scale (2) or (3), project horizontally to scale (1), then use straight inclined line through D and Q scales, or reverse as illustrated.

HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS - JAN. 1963

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	CHART NO. **CHT-8**	SCALE N.T.S	REVISIONS	
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590			NO / DATE / COMMENT	
	CULVERT DESIGN - INLET CONTROL	SHEET 1 OF 1	DATE 5-31-19		

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

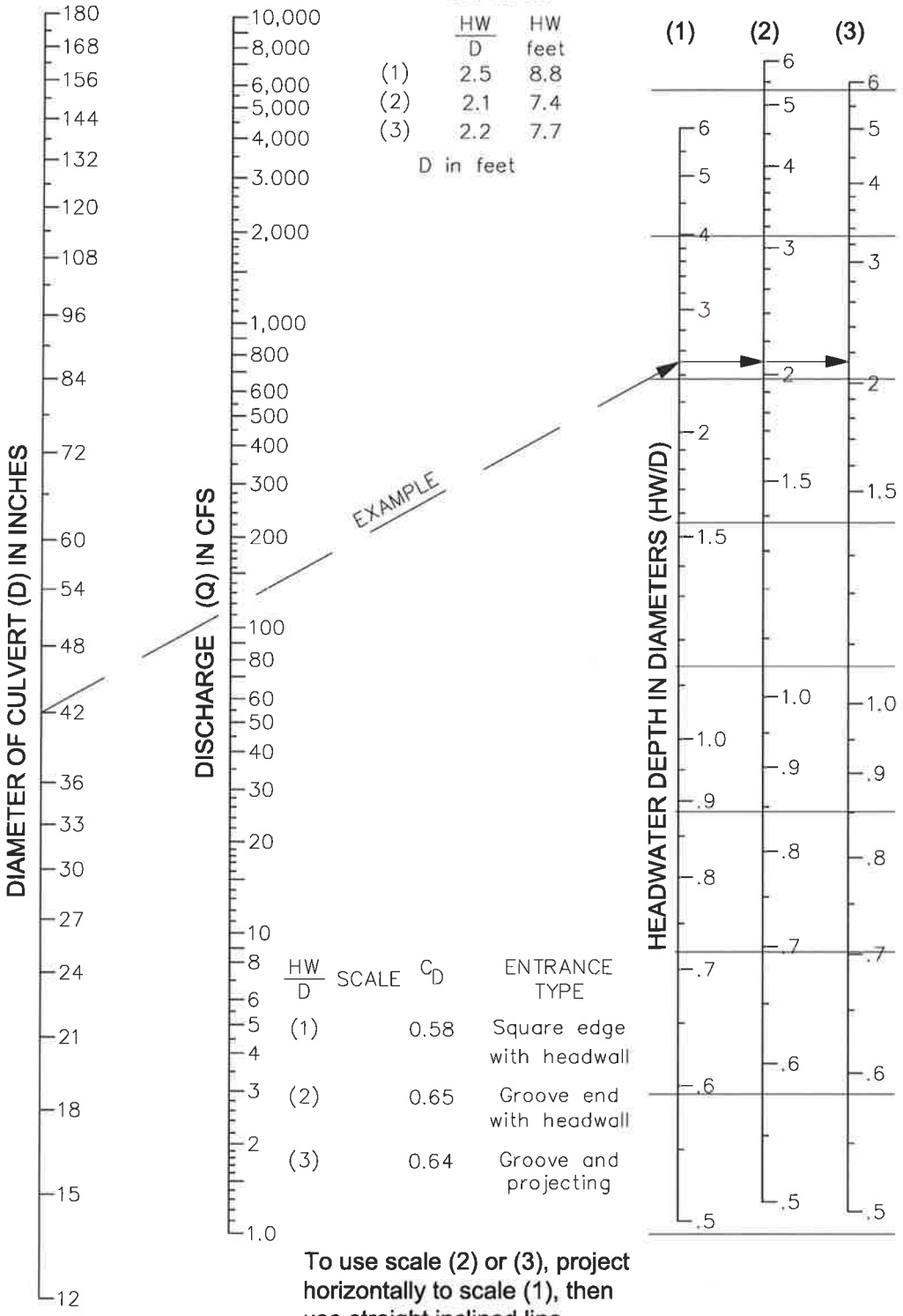
BUREAU OF PUBLIC ROADS - JAN. 1963

EXAMPLE

D = 42 INCHES (3.5 FEET)
Q = 120 C.F.S.

	HW/D	HW feet
(1)	2.5	8.8
(2)	2.1	7.4
(3)	2.2	7.7

D in feet



HW/D SCALE	C_D	ENTRANCE TYPE
(1)	0.58	Square edge with headwall
(2)	0.65	Groove end with headwall
(3)	0.64	Groove and projecting

To use scale (2) or (3), project horizontally to scale (1), then use straight inclined line through D and Q scales, or reverse as illustrated.

HEADWATER SCALES 2 & 3
REVISED MAY 1964

REVISIONS

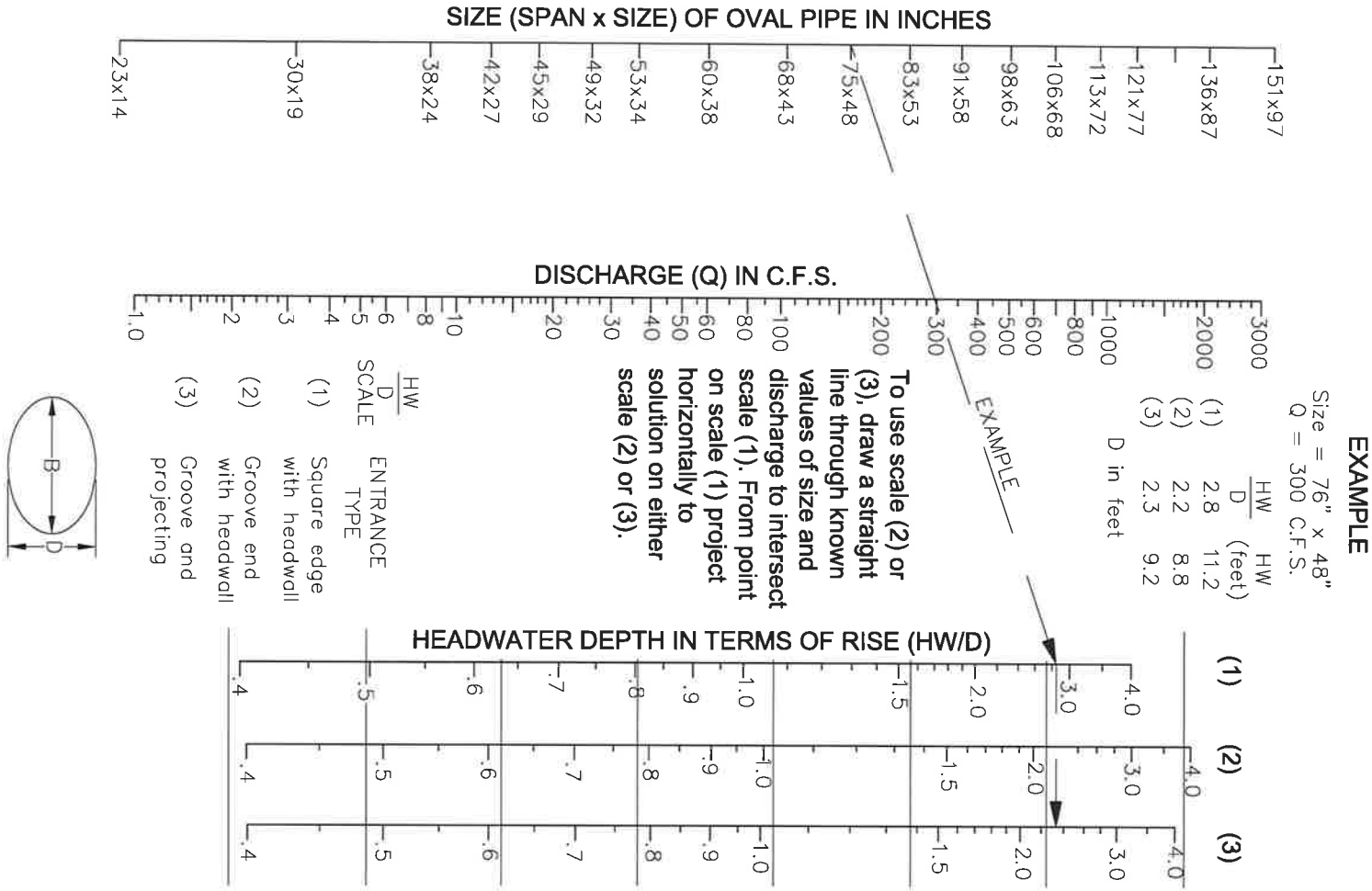
NO	DATE	COMMENT

SCALE N.T.S
DATE 5-31-19

CHART NO. CHT-9
SHEET 1 OF 1

TOWN OF WINTERVILLE
2571 Railroad St. Winterville, NC 28590
PUBLIC WORKS DEPARTMENT

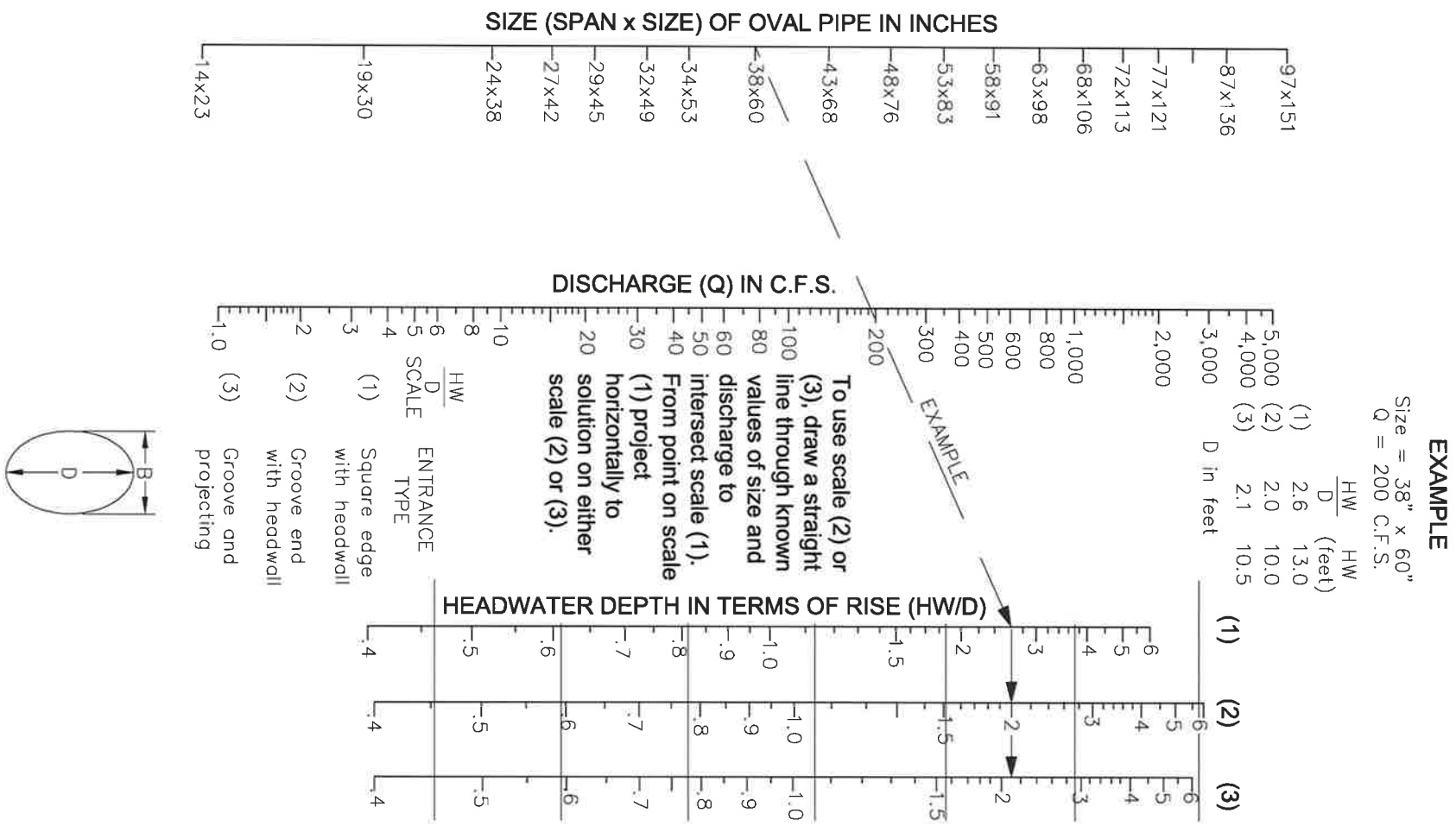
CONCRETE PIPE CULVERTS - INLET CONTROL



HEADWATER DEPTH FOR OVAL CONCRETE PIPE CULVERTS LONG AXIS HORIZONTAL WITH INLET CONTROL

BUREAU OF PUBLIC ROADS - JAN. 1963

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	CHART NO. **CHT-10**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	ELIPTICAL CONCRETE PIPE CULVERTS - INLET CONTROL	SHEET 1 OF 1	DATE 5-31-19	



EXAMPLE

Size = 38" x 60"
Q = 200 C.F.S.

	HW/D	HW (feet)
(1)	2.6	13.0
(2)	2.0	10.0
(3)	2.1	10.5

D in feet

HEADWATER DEPTH FOR OVAL CONCRETE PIPE CULVERTS LONG AXIS VERTICAL WITH INLET CONTROL

BUREAU OF PUBLIC ROADS - JAN. 1963

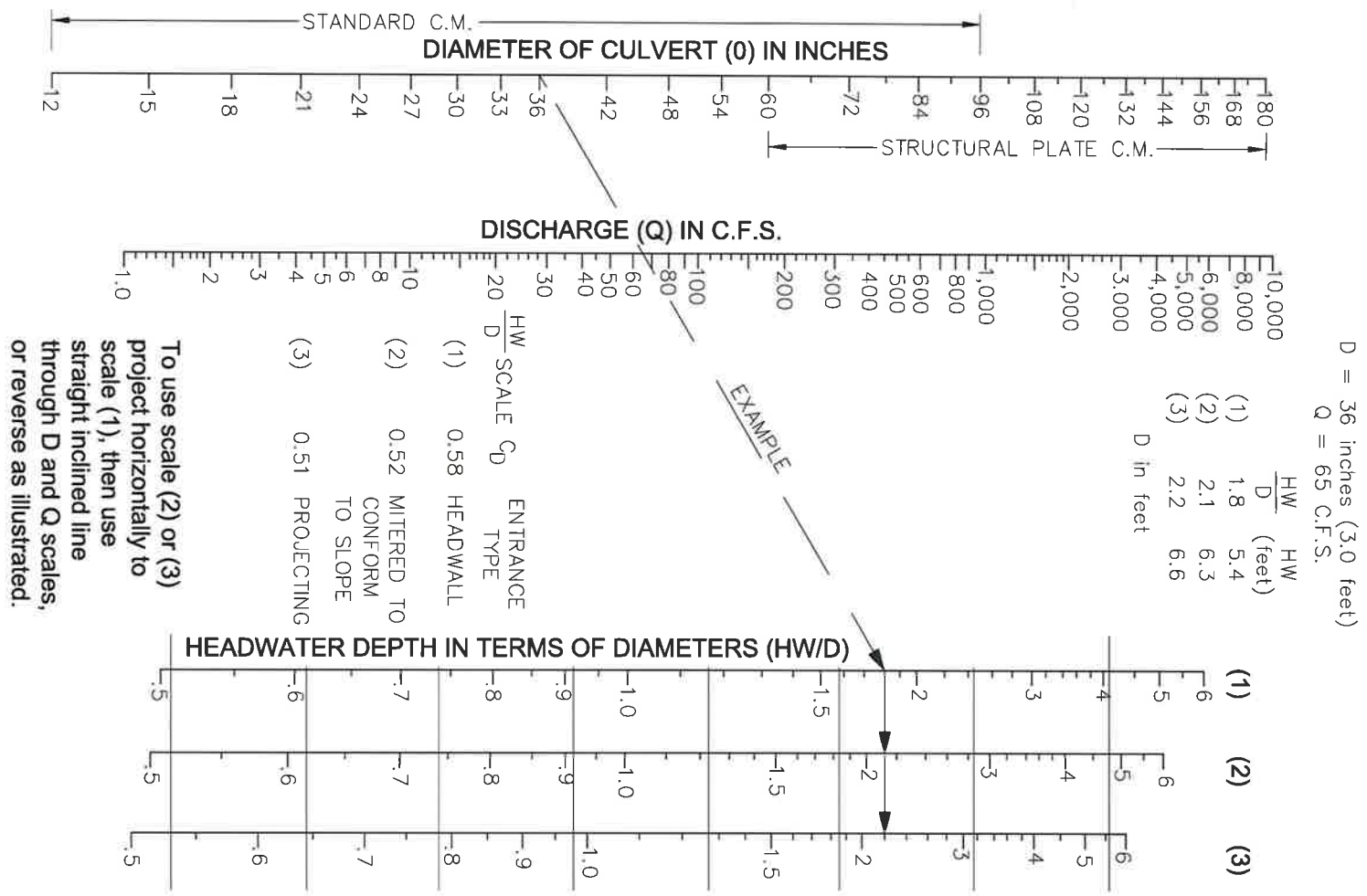
TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590

ELIPTICAL CONCRETE PIPE CULVERTS - INLET CONTROL

CHART NO.	SCALE
CHT-11	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT



EXAMPLE

D = 36 inches (3.0 feet)
Q = 65 C.F.S.

D in feet		$\frac{HW}{D}$	HW (feet)
	(1)	1.8	5.4
	(2)	2.1	6.3
	(3)	2.2	6.6

$\frac{HW}{D}$ SCALE		C_D	ENTRANCE TYPE
	(1)	0.58	HEADWALL
	(2)	0.52	MITERED TO CONFORM TO SLOPE
	(3)	0.51	PROJECTING

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through D and Q scales, or reverse as illustrated.

HEADWATER DEPTH FOR C.M. PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS - JAN. 1963

TOWN OF WINTERVILLE	CHART NO. **CHT-12**	SCALE N.T.S	REVISIONS	
PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590			NO / DATE / COMMENT	
C.M. PIPE CULVERTS - INLET CONTROL	SHEET 1 OF 1	DATE 5-31-19		

HEADWATER DEPTH FOR C.M. PIPE-ARCH CULVERTS WITH INLET CONTROL

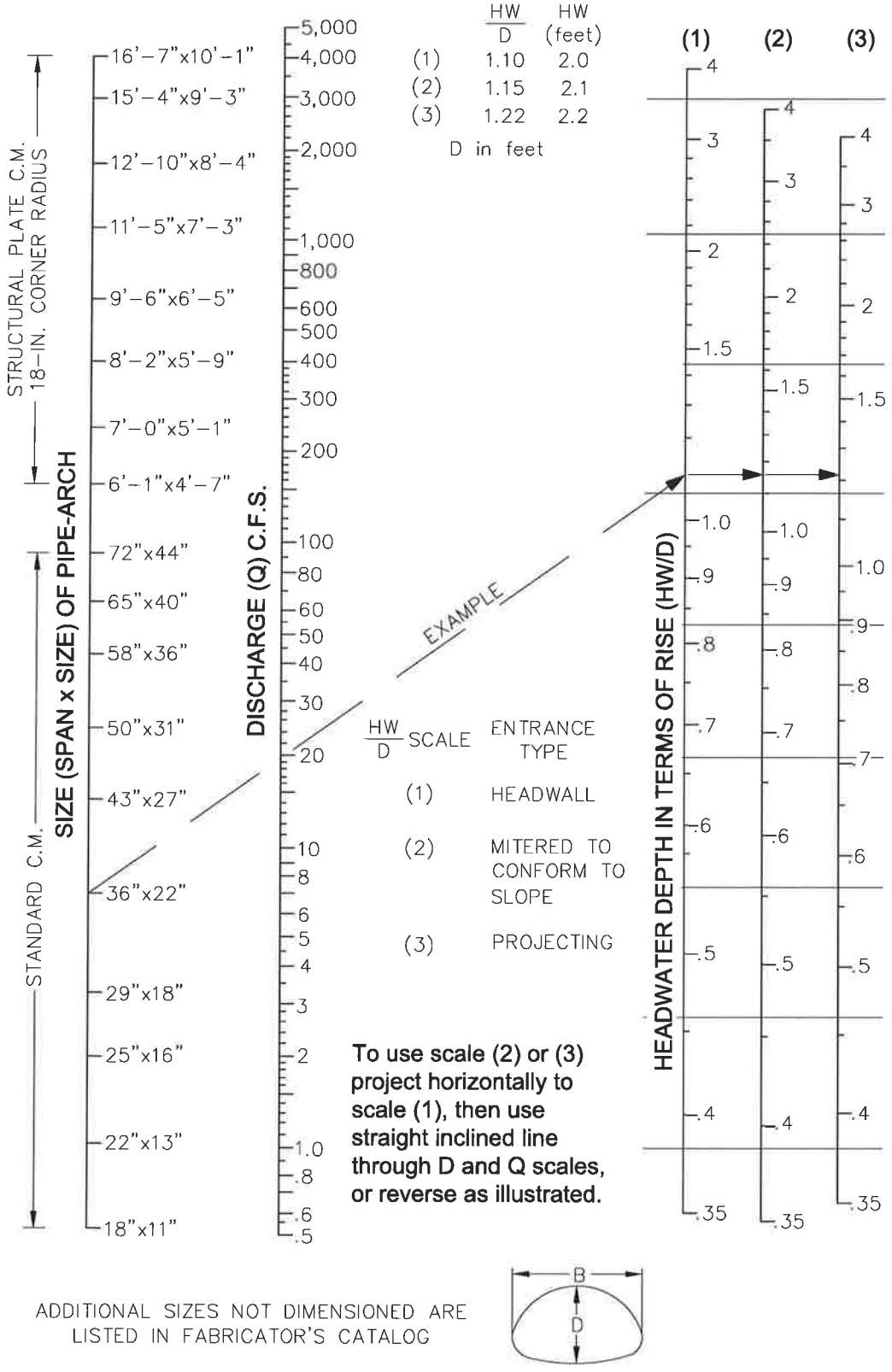
BUREAU OF PUBLIC ROADS - JAN. 1963

EXAMPLE

Size = 36"x22"
Q = 20 C.F.S.

	HW/D	HW (feet)
(1)	1.10	2.0
(2)	1.15	2.1
(3)	1.22	2.2

D in feet



To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through D and Q scales, or reverse as illustrated.

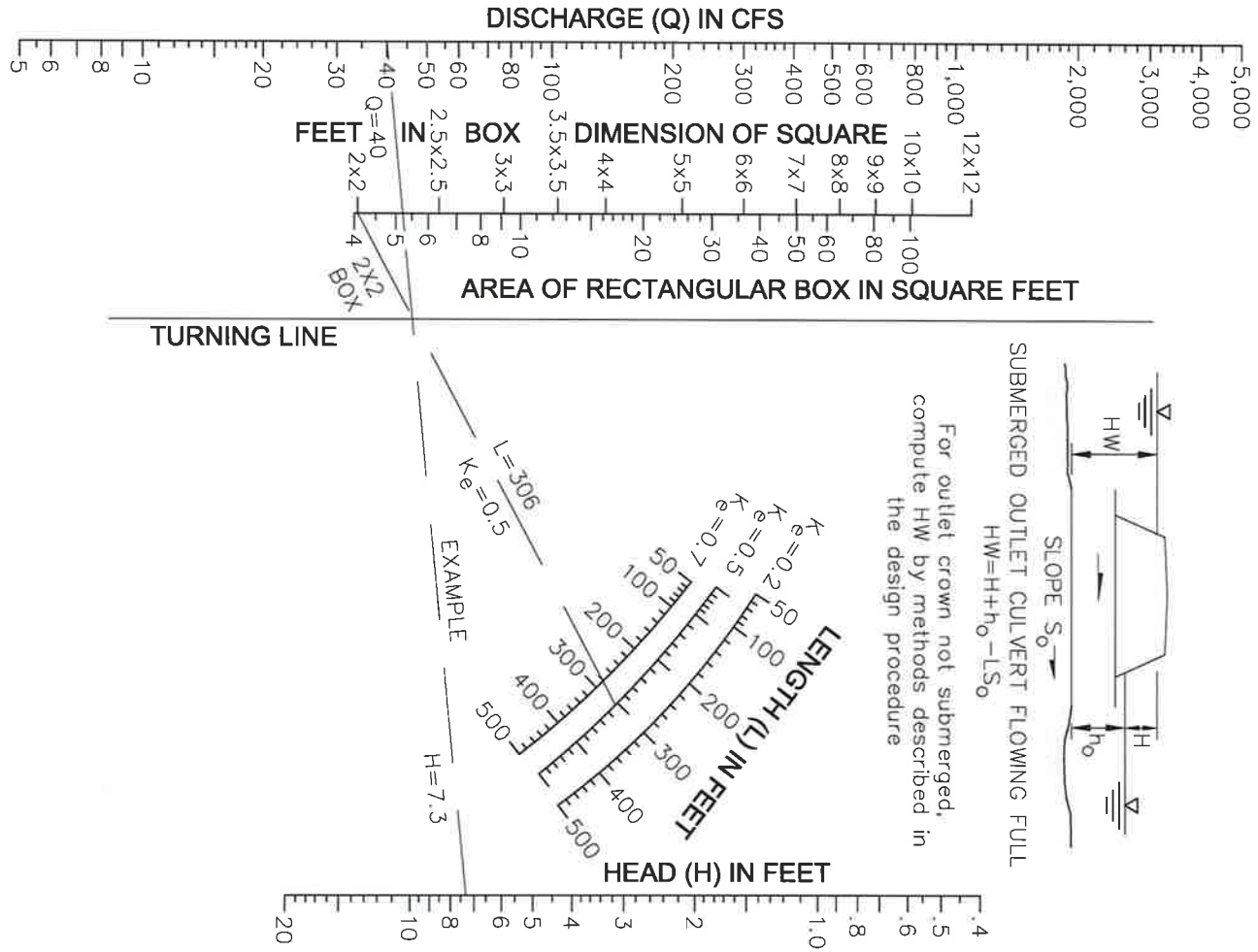
ADDITIONAL SIZES NOT DIMENSIONED ARE LISTED IN FABRICATOR'S CATALOG

REVISIONS		
NO	DATE	COMMENT

SCALE	CHART NO.	SHEET	DATE
N.T.S	CHT-13	1 OF 1	5-31-19

TOWN OF WINTERVILLE
2571 Railroad St. Winterville, NC 28590
PUBLIC WORKS DEPARTMENT

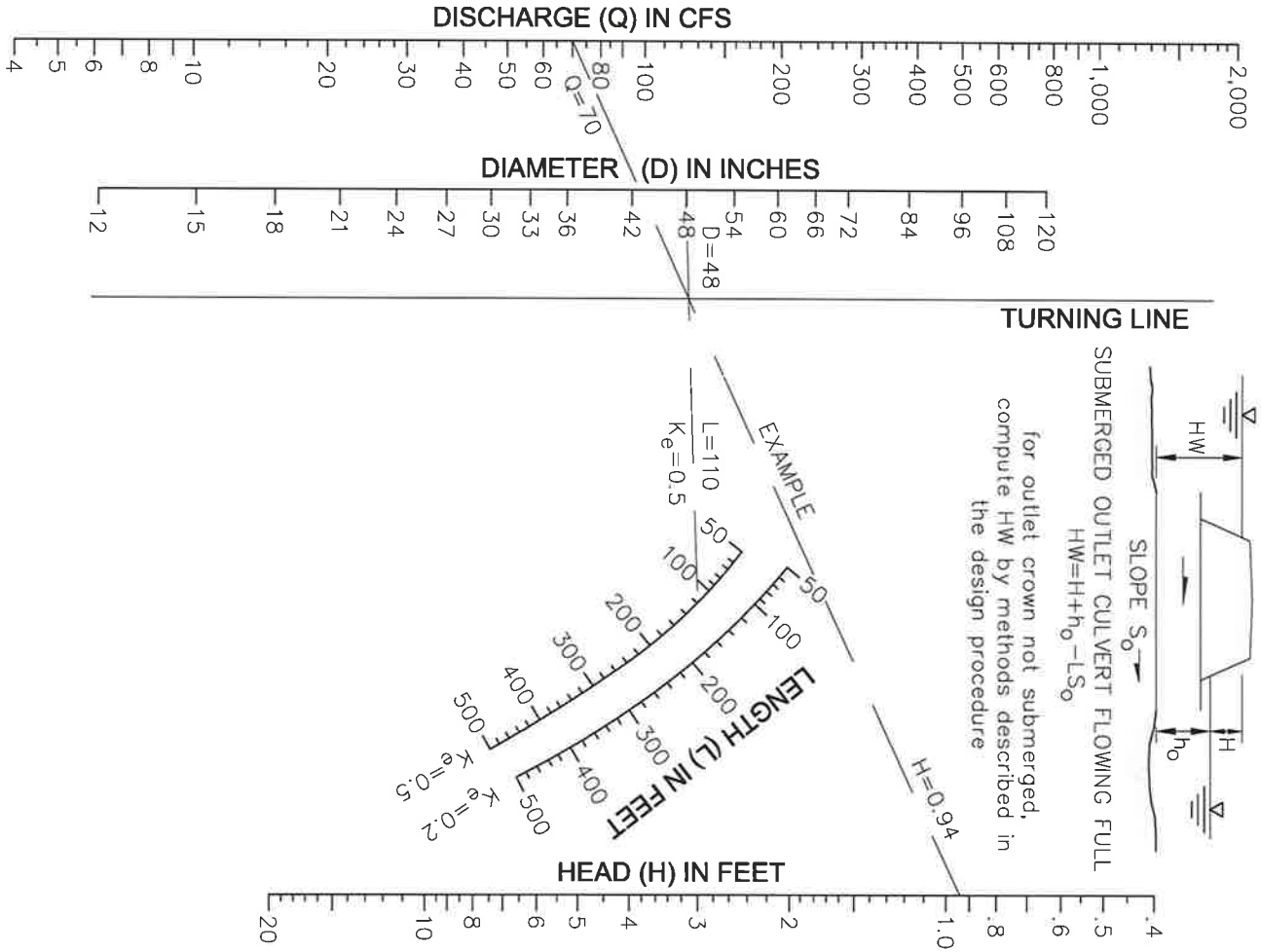
C.M. PIPE ARCH CULVERTS - INLET CONTROL



HEAD FOR CONCRETE BOX CULVERTS FLOWING FULL n=0.013

BUREAU OF PUBLIC ROADS - JAN. 1963

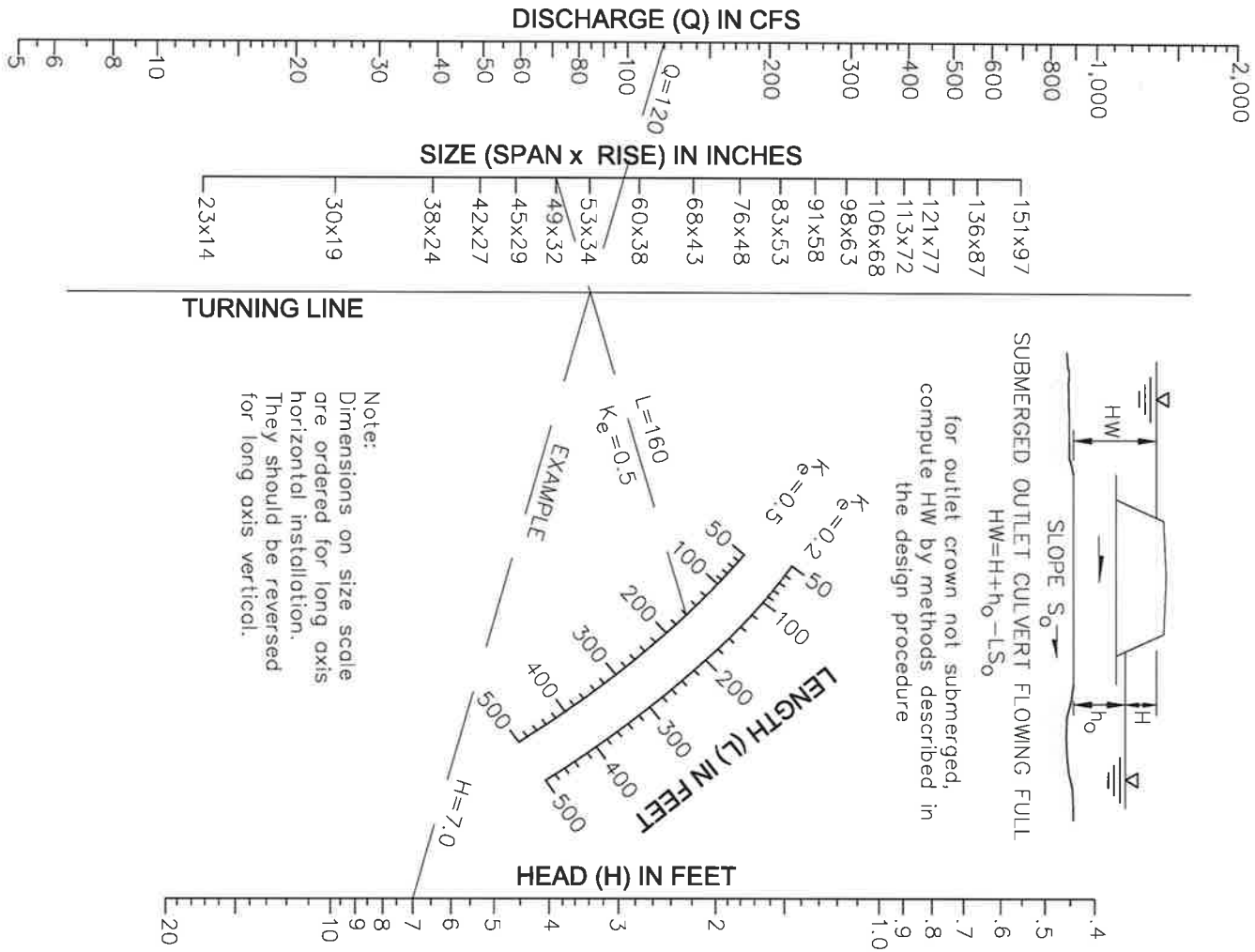
TOWN OF WINTERVILLE PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	CHART NO. CHT-14	SCALE N.T.S	REVISIONS	
CONCRETE BOX CULVERTS FLOWING FULL n=0.013	SHEET 1 OF 1	DATE 5-31-19	NO / DATE / COMMENT	



HEAD FOR CONCRETE PIPE CULVERTS FLOWING FULL n=0.013

BUREAU OF PUBLIC ROADS - JAN. 1963

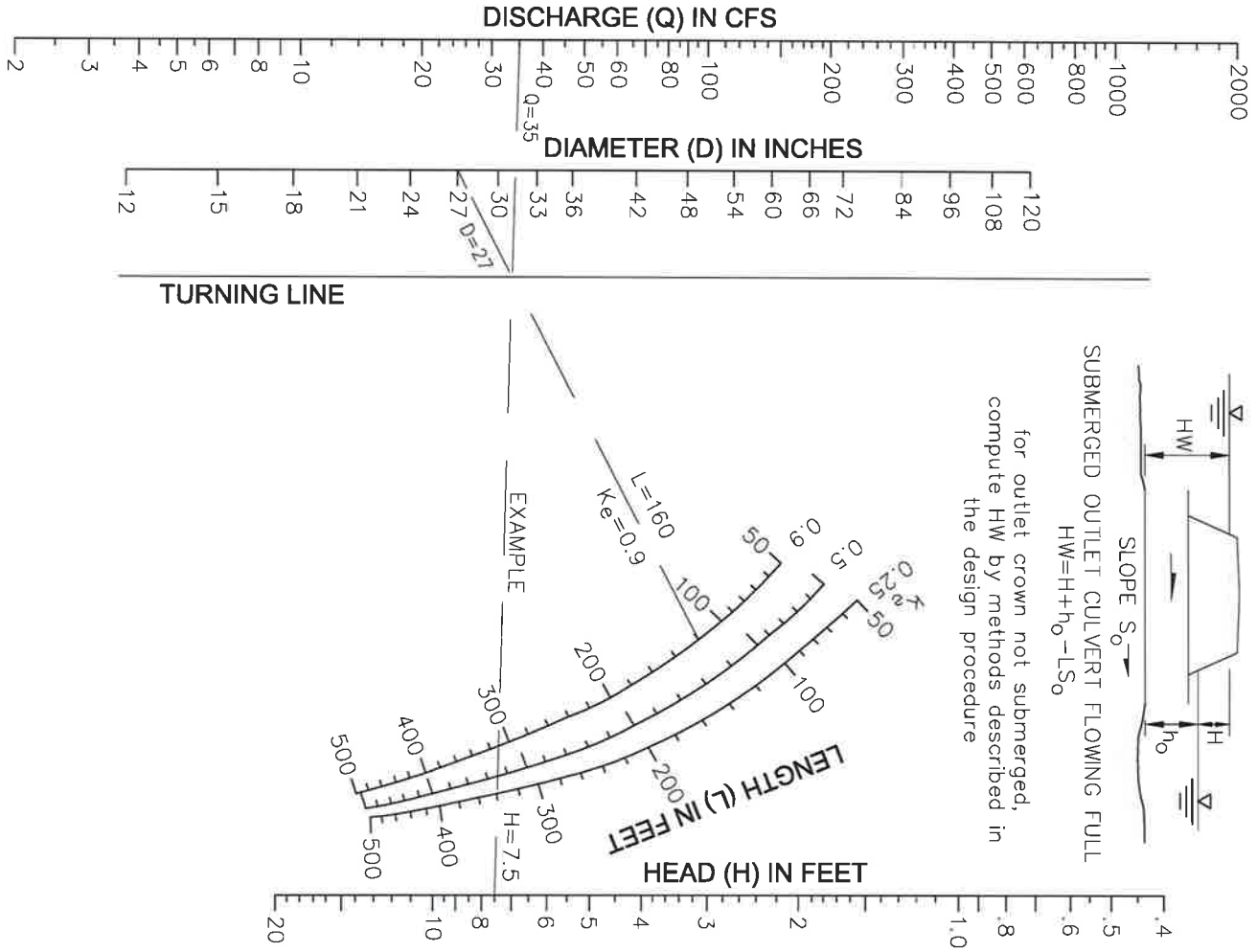
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	CHART NO.	SCALE	REVISIONS	
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	CHT-15	N.T.S	NO / DATE / COMMENT	
	CONCRETE PIPE CULVERTS FLOWING FULL n=0.013	SHEET 1 OF 1	DATE 5-31-19		



HEAD FOR OVAL CONCRETE PIPE CULVERTS LONG AXIS HORIZONTAL OR VERTICAL FLOWING FULL n=0.013

BUREAU OF PUBLIC ROADS - JAN. 1963

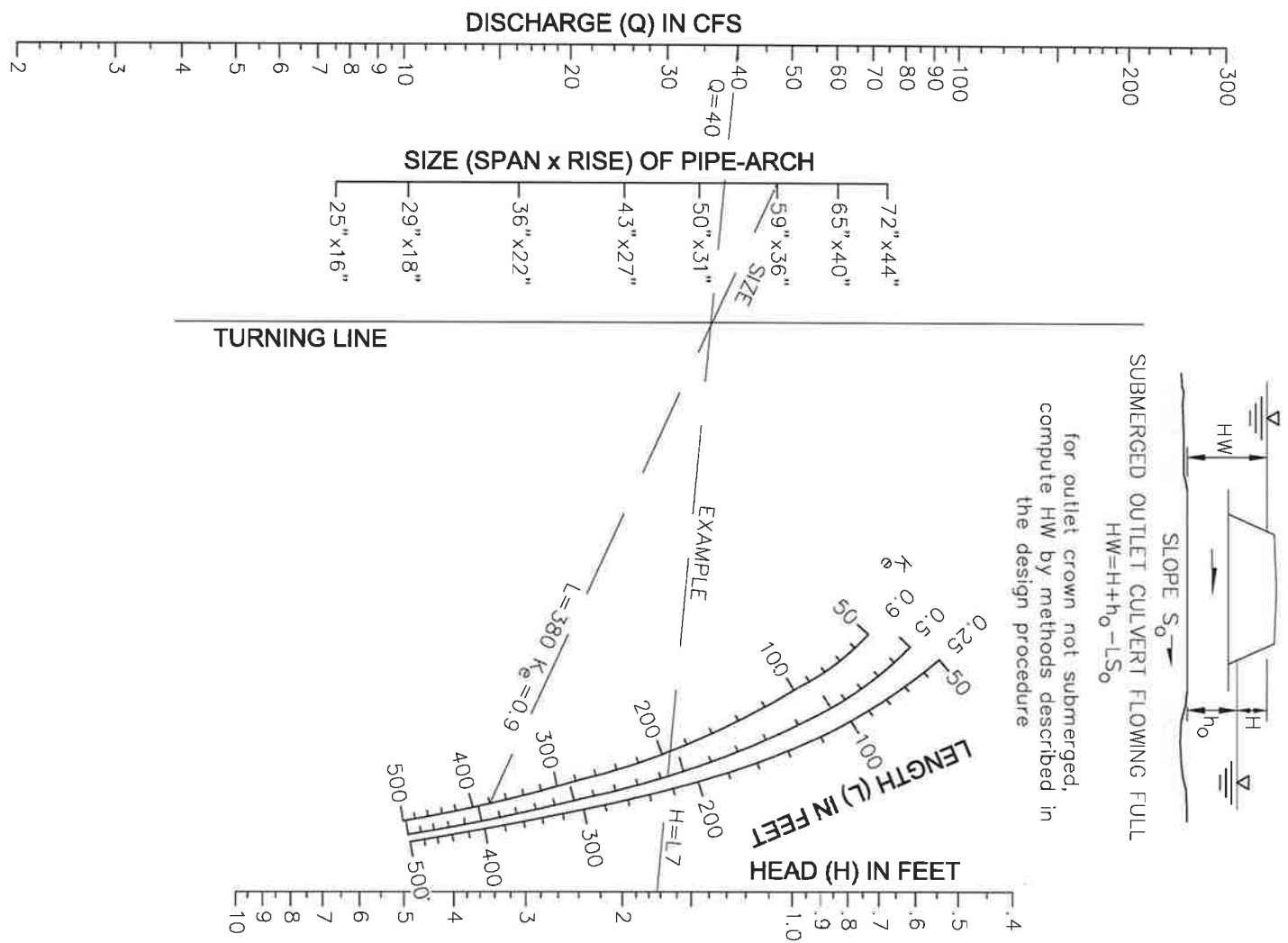
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	CHART NO. **CHT-16**	SCALE N.T.S	REVISIONS: NO / DATE / COMMENT
	ELIPTICAL CONCRETE PIPE CULVERTS FLOWING FULL n=0.013	SHEET 1 OF 1	DATE 5-31-19	



HEAD FOR STANDARD C.M. PIPE CULVERTS FLOWING FULL n=0.024

BUREAU OF PUBLIC ROADS - JAN. 1963

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	CHART NO.	SCALE	REVISIONS	
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	CHT-17	N.T.S	NO / DATE / COMMENT	
	C.M. PIPE CULVERTS FLOWING FULL n=0.024	SHEET 1 OF 1	DATE 5-31-19		



HEAD FOR STANDARD C.M. PIPE-ARCH CULVERTS FLOWING FULL n=0.024

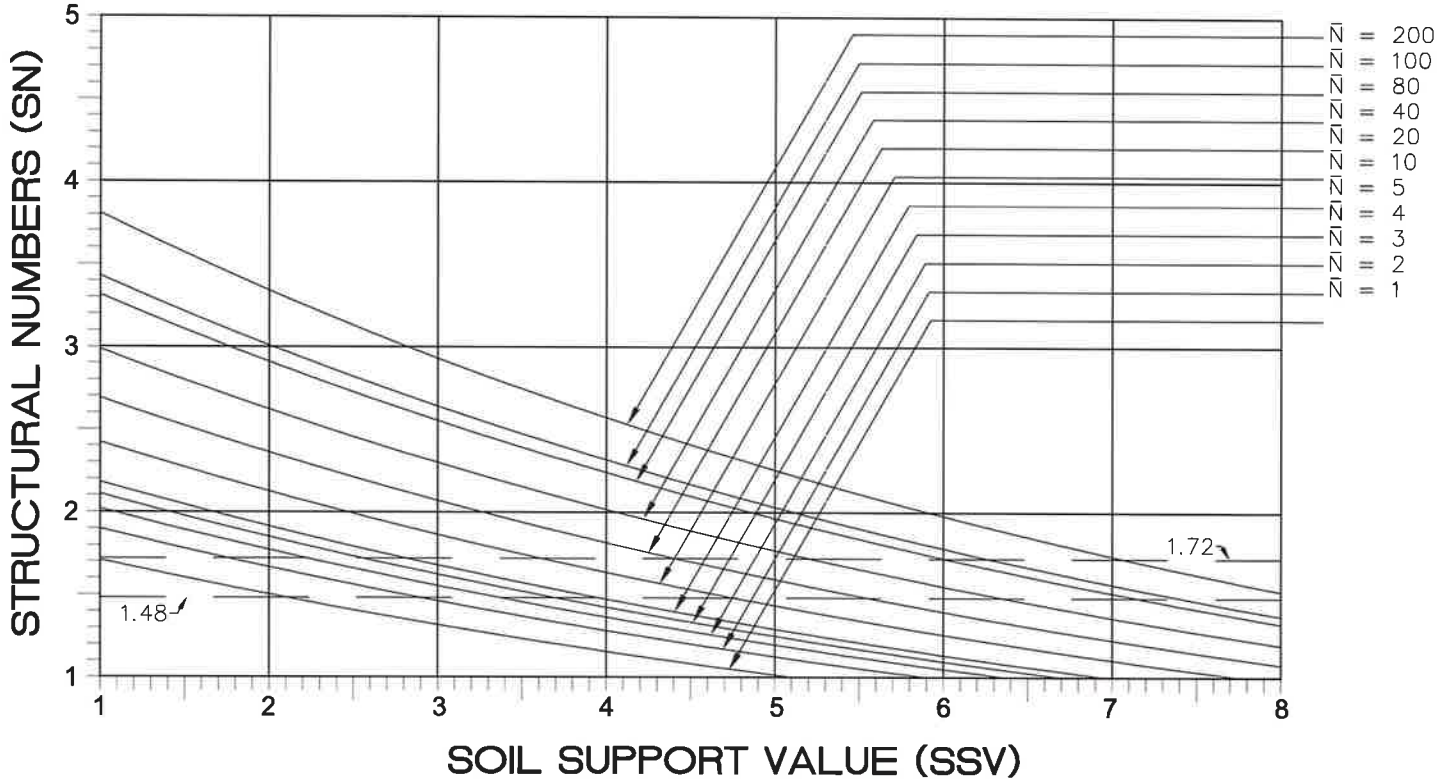
BUREAU OF PUBLIC ROADS - JAN. 1963

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE**	CHART NO.	SCALE	REVISIONS
	PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	CHT-18	N.T.S	NO / DATE / COMMENT
	C.M. PIPE ARCH CULVERTS FLOWING FULL n=0.024	SHEET 1 OF 1	DATE 5-31-19	

NO SN BELOW 1.72 FOR POOR TO FAIR SUBGRADE SOILS NOR 1.48 FOR GOOD TO EXCELLENT SUBGRADE SOILS SHOULD BE USED.

$$SN = \frac{1.95\,(\bar{N})^{\,0.151}}{(1.14)^{\,SSV}}$$

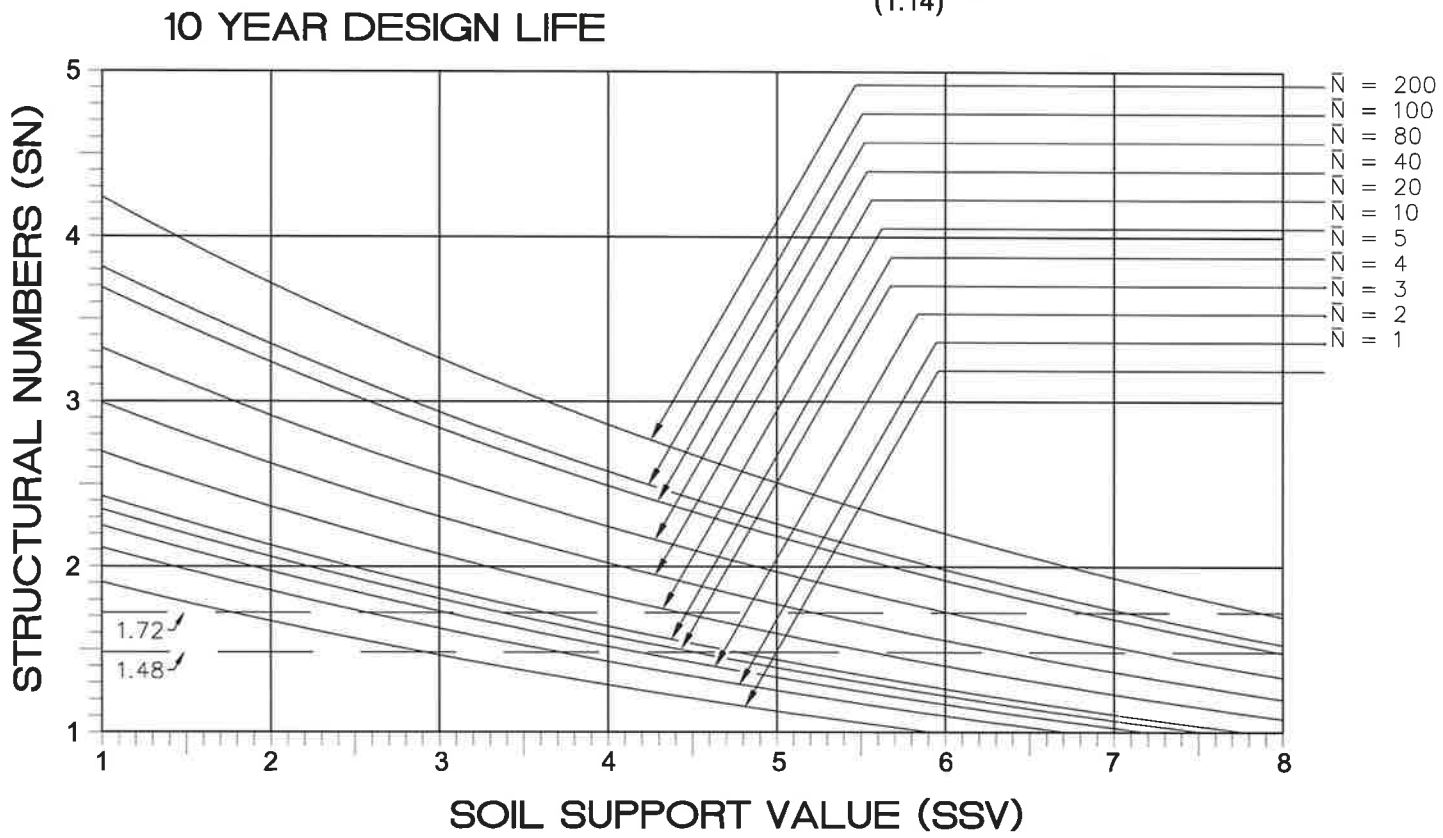
5 YEAR DESIGN LIFE



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **RESIDENTIAL STREET SECTION DESIGN**	FIGURE NO. **Fig-1** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS	
				NO / DATE / COMMENT	

NO SN BELOW 1.72 FOR POOR TO FAIR SUBGRADE SOILS NOR 1.48 FOR GOOD TO EXCELLENT SUBGRADE SOILS SHOULD BE USED.

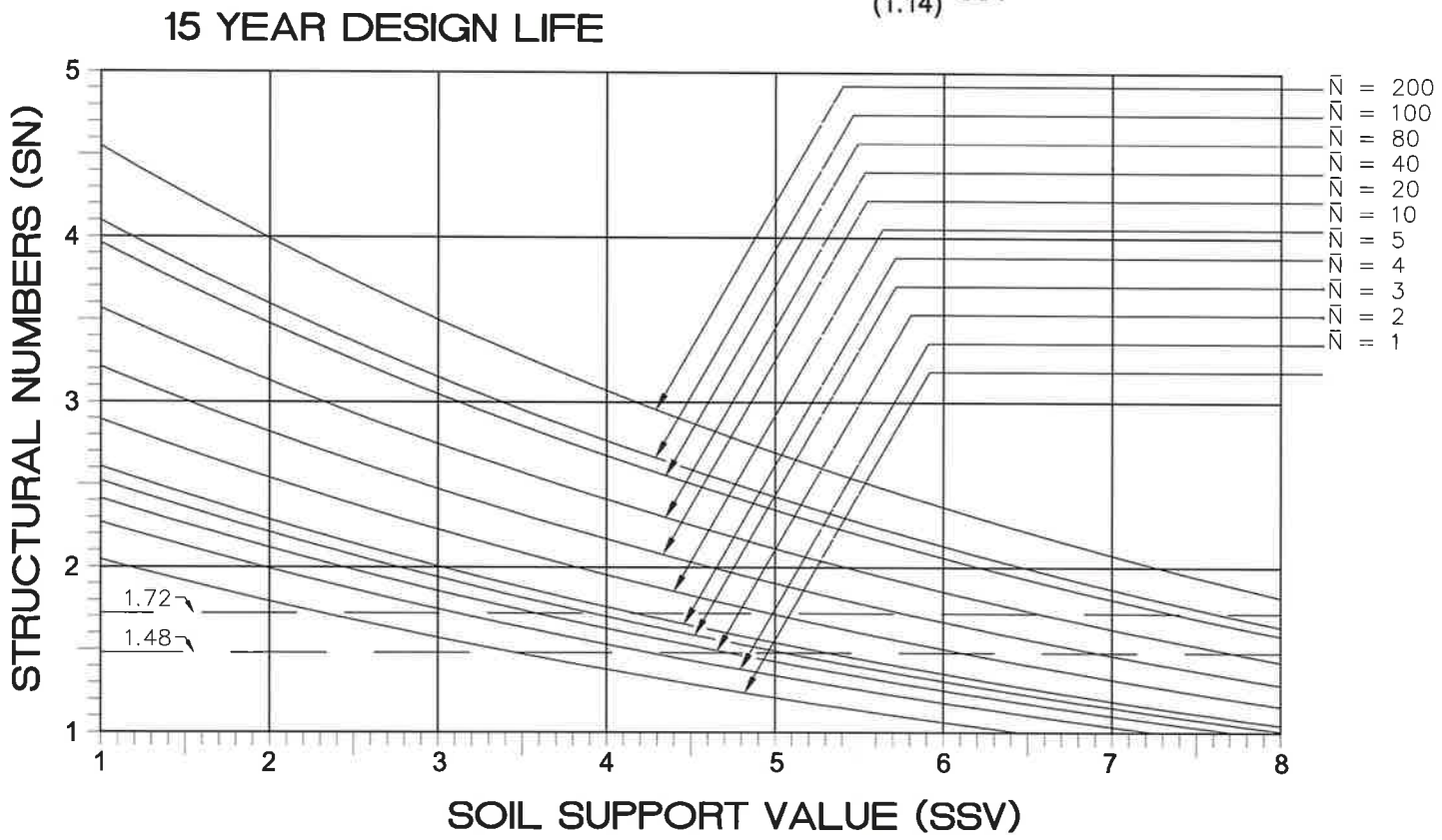
$$SN = \frac{2.17\,(\bar{N})^{0.151}}{(1.14)^{SSV}}$$



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **RESIDENTIAL STREET SECTION DESIGN**	FIGURE NO. **Fig-2** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS: NO / DATE / COMMENT

NO SN BELOW 1.72 FOR POOR TO FAIR SUBGRADE SOILS NOR 1.48 FOR GOOD TO EXCELLENT SUBGRADE SOILS SHOULD BE USED.

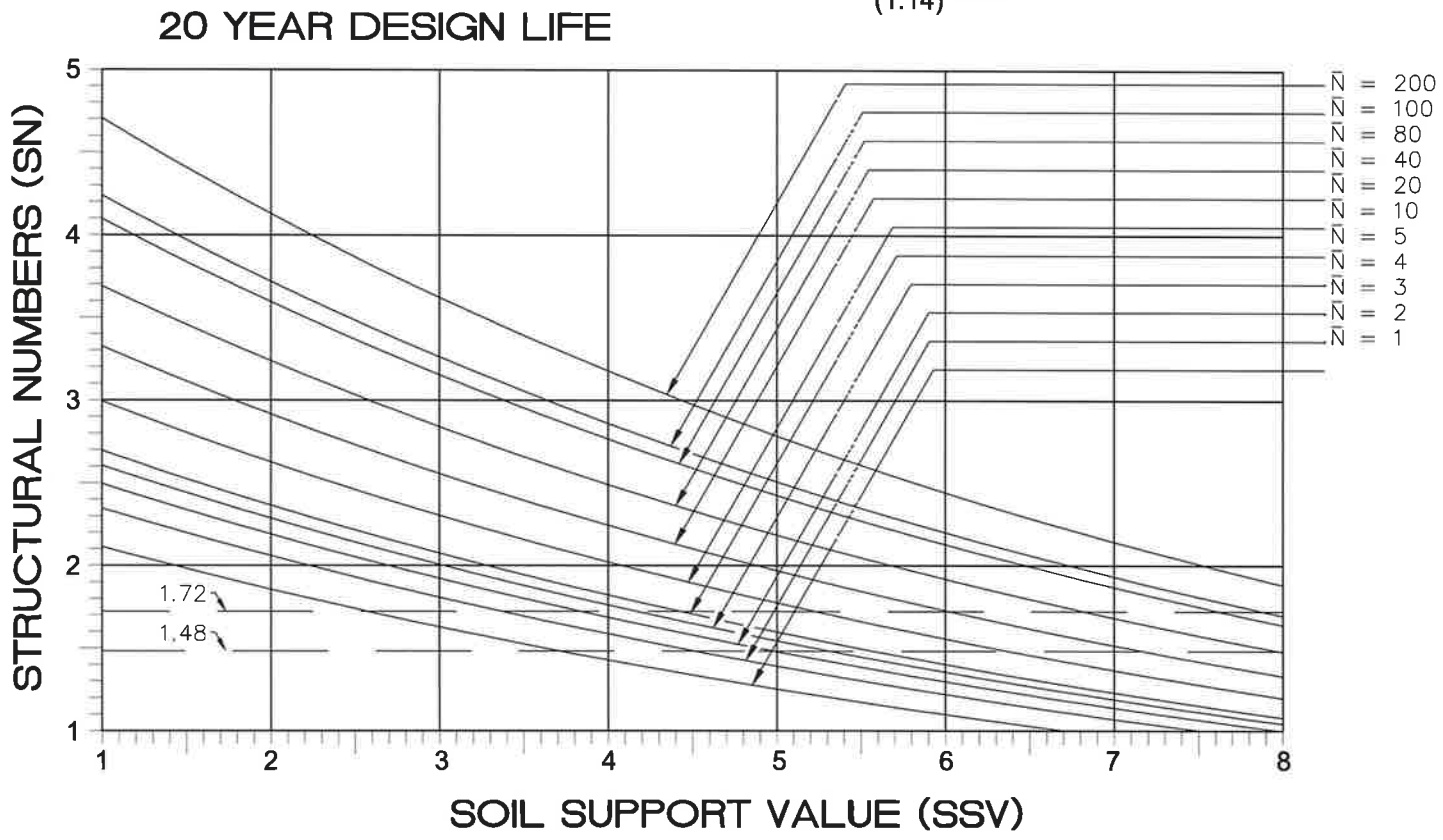
$$SN = \frac{2.33\,(\bar{N})^{0.151}}{(1.14)^{SSV}}$$



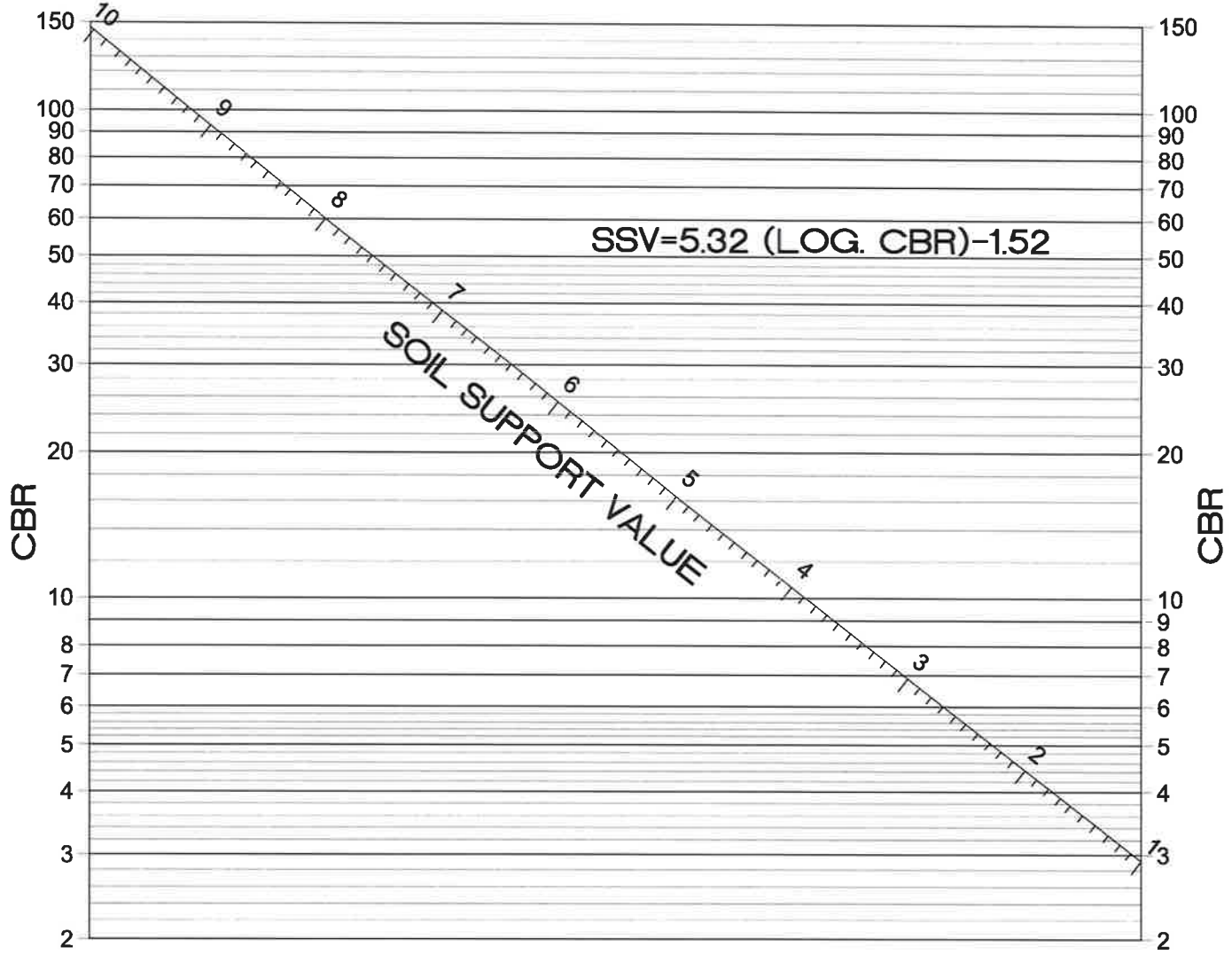
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **RESIDENTIAL STREET SECTION DESIGN**	FIGURE NO. **Fig-3** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS: NO / DATE / COMMENT

NO SN BELOW 1.72 FOR POOR TO FAIR SUBGRADE SOILS NOR 1.48 FOR GOOD TO EXCELLENT SUBGRADE SOILS SHOULD BE USED.

$$SN = \frac{2.41\,(\bar{N})^{0.151}}{(1.14)^{SSV}}$$



WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590 **RESIDENTIAL STREET SECTION DESIGN**	FIGURE NO. **Fig-4** SHEET 1 OF 1	SCALE N.T.S DATE 5-31-19	REVISIONS: NO / DATE / COMMENT



TOWN OF WINTERVILLE

PUBLIC WORKS DEPARTMENT

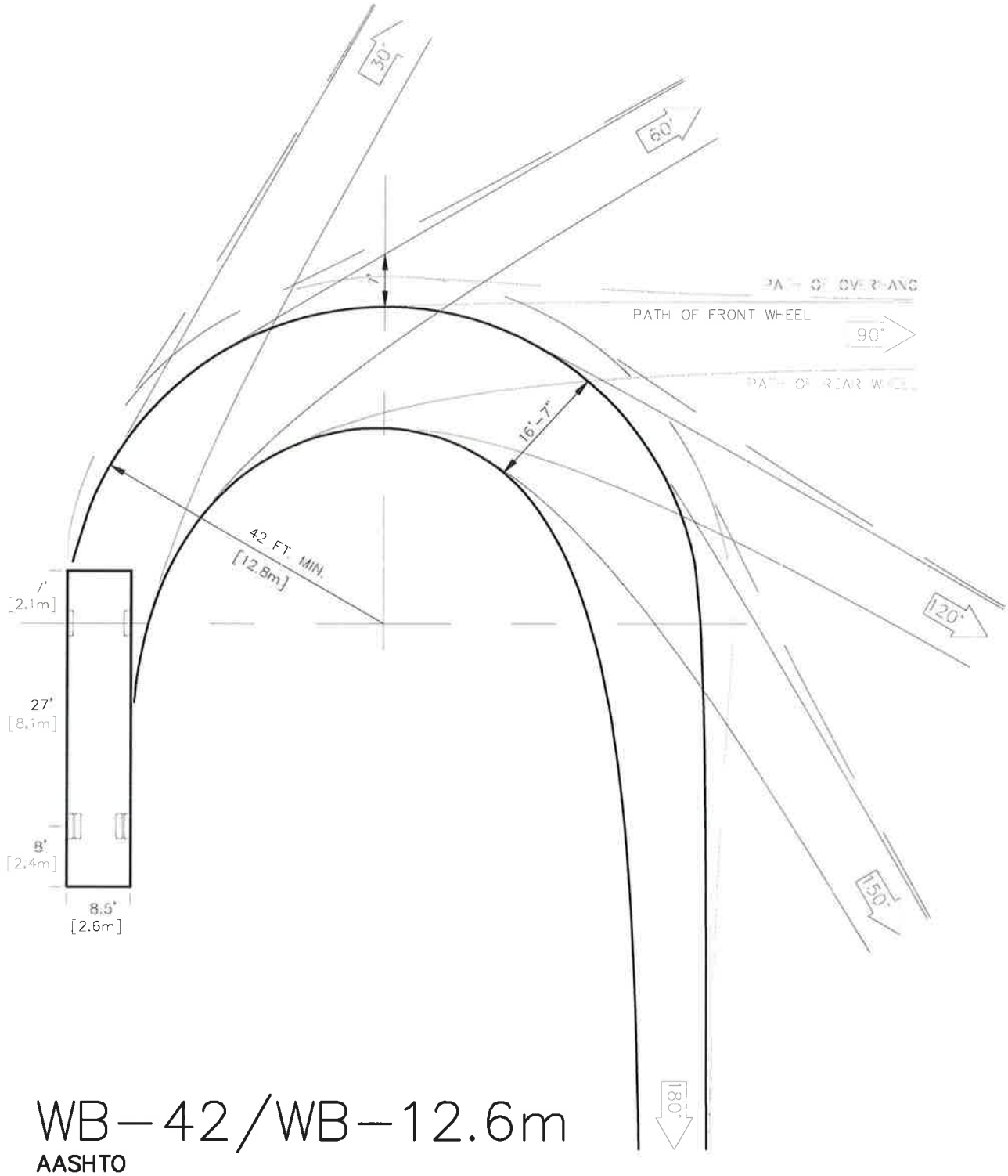
2571 Railroad St. Winterville, NC 28590

RESIDENTIAL STREET SECTION DESIGN

FIGURE NO.	SCALE
Fig-5	N.T.S
SHEET	DATE
1 OF 1	5-31-19

REVISIONS		
NO	DATE	COMMENT

Fire Turning Radius



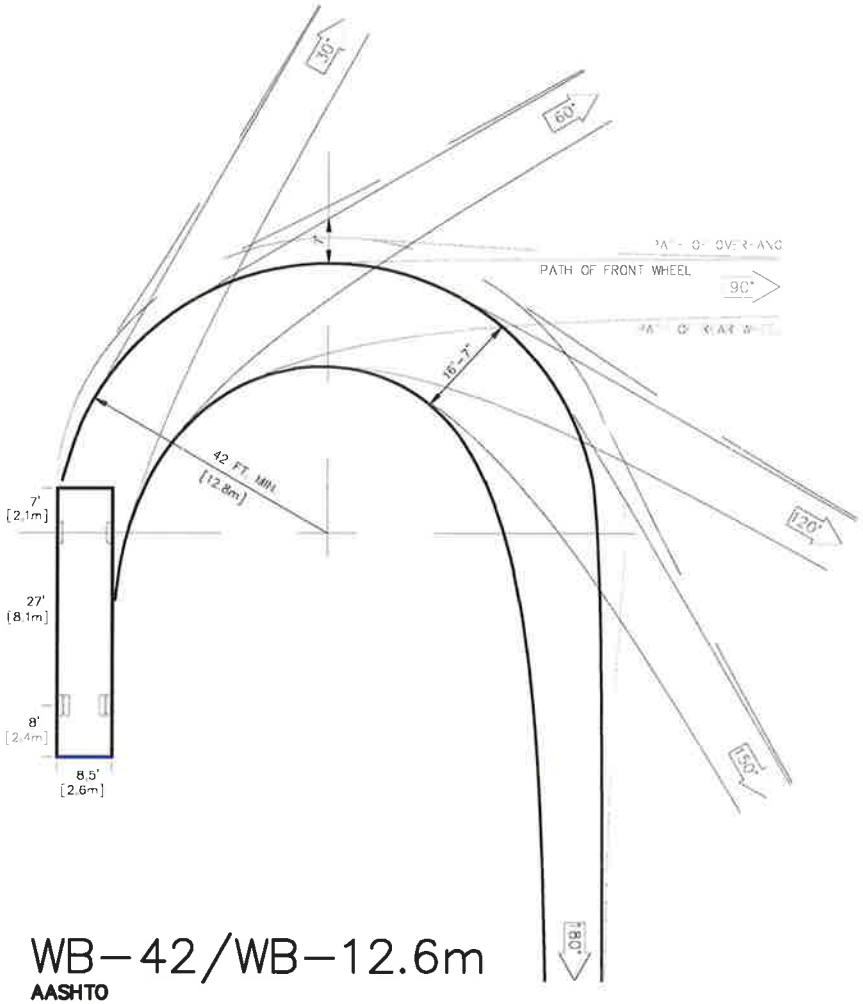
WB-42/WB-12.6m

AASHTO

0 10' 20' 40'

SCALE: 1"=20'

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**R=42'**	SCALE **1"=20'**
	TURNING RADIUS	SHEET 1 OF 7	DATE 3-7-23



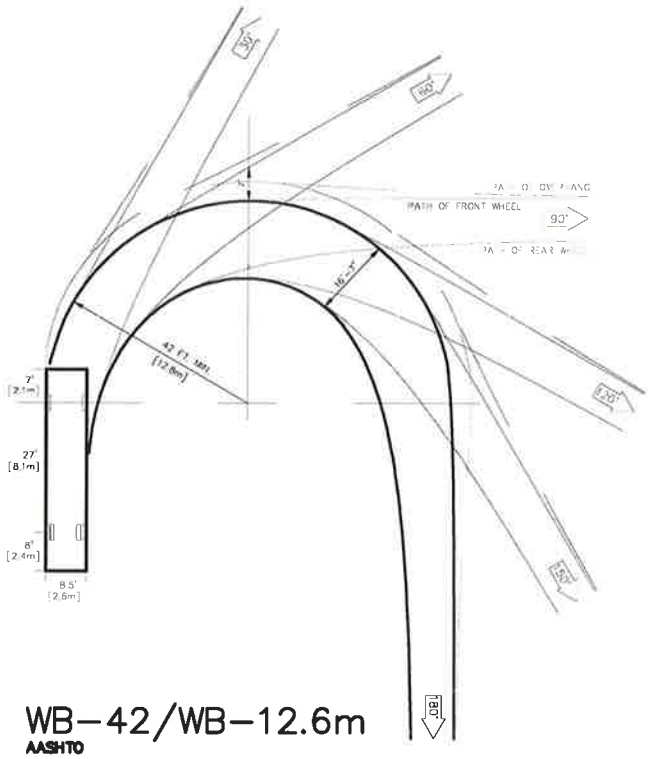
WB–42/WB–12.6m

AASHTO

0 15' 30' 60'

SCALE: 1"=30'

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**R=42'**	SCALE **1"=30'**
	TURNING RADIUS	SHEET 2 OF 7	DATE 3-7-23

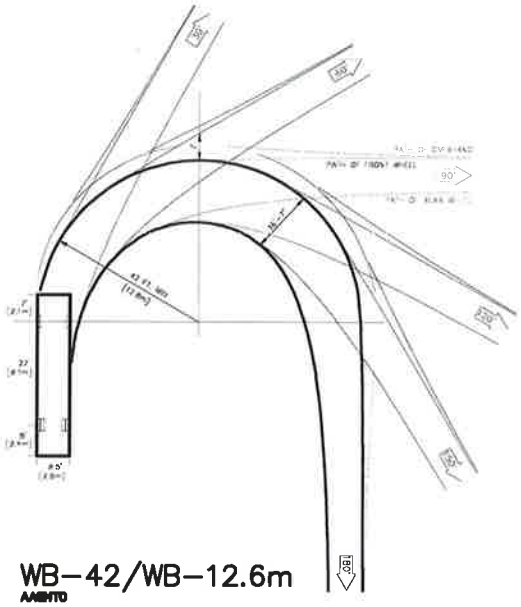


WB–42/WB–12.6m
AASHTO

0 20' 40' 80'

SCALE: 1"=40'

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	R=42'	SCALE 1"=40'
	TURNING RADIUS	SHEET 3 OF 7	DATE 3-7-23

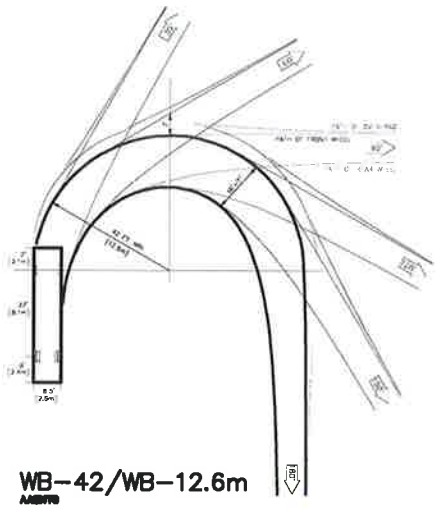


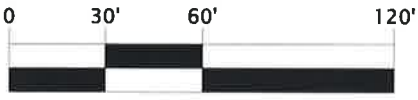
WB–42/WB–12.6m
AASHTO

0 25' 50' 100'

SCALE: 1"=50'

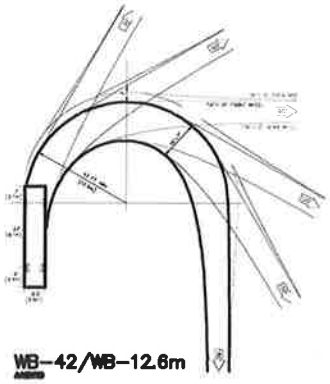
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**R=42'**	SCALE 1"=50'
	TURNING RADIUS	SHEET 4 OF 7	DATE 3-7-23

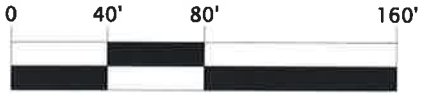




SCALE: 1"=60'

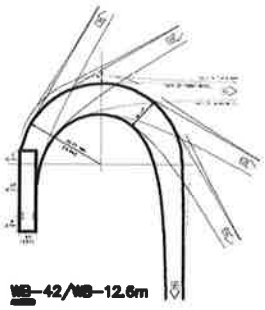
WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	R=42'	SCALE 1"=60'
	TURNING RADIUS	SHEET 5 OF 7	DATE 3-7-23





SCALE: 1"=80'

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**R=42'**	SCALE **1"=80'**
	TURNING RADIUS	SHEET 6 OF 7	DATE 3-7-23



0 50' 100' 200'

SCALE: 1"=100'

WINTERVILLE NORTH CAROLINA	**TOWN OF WINTERVILLE** PUBLIC WORKS DEPARTMENT 2571 Railroad St. Winterville, NC 28590	**R=42'**	SCALE 1"=100
	TURNING RADIUS	SHEET 7 OF 7	DATE 3-7-23