

**The Village of Pinehurst**  
**Engineering Standards and Specifications Manual**



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**Standard Construction Details**

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**SECTION 1 - PRELIMINARY CONSIDERATIONS & INSTRUCTIONS**

**1.01 General**

The Standard Specifications as contained herein are to be utilized as the minimum standards for all new development and new utility line/facility construction projects within the jurisdiction of the Village of Pinehurst or connecting to the Village's utility system. All development projects shall also comply with the Village of Pinehurst "***Pinehurst Development Ordinance***" and the Village's Municipal Code of Ordinances, as well as all other applicable State and Federal laws.

The purpose of these Specifications is to present minimum standards for typical conditions encountered. For infrastructure and engineering design matters not specifically covered in this manual, the project designer will need to schedule a pre-design meeting with the Village Engineering Department staff to determine specific standards for those items. Failure on the part of the project designer to contact the Village Engineering Department an adequate amount of time prior to plan submittals for special standards and details may result in review and approval delays. All projects that include construction of public facilities, such as water & wastewater facilities, storm drainage facilities or streets, require that the design services be performed by, or under the direct supervision of, a Professional Engineer licensed to practice in the State of North Carolina. The existence of these Standard Specifications and Construction Details in no way relieves the Professional Engineer of the responsibility to correctly adapt these standards to the actual site conditions encountered on specific project. The Project Engineer shall review the applicable portions of these specifications and determine that these minimum standards will function correctly for the project.

There may be circumstances whereby the design engineer may wish to employ additional strength pipe, bedding requirements, reinforcing, etc. Likewise, the Village Engineer also reserves the right to require and/or utilize additional strength materials, alternate design standards, and/or modified construction methods to ensure the proper longevity of the proposed infrastructure. In such situations where the designer wishes to propose changes or modifications to these standards, the Village Engineer should be consulted prior to completion of final design and plan submittal. This will serve to help ensure that the plan review time is minimized. Such approval shall be clearly indicated at one location on the construction drawings and labeled "Exceptions to the Standard Specifications of the Village of Pinehurst."

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Each set of plans for development and/or utility extension project, which is submitted to the Village of Pinehurst for review, shall have affixed to the cover sheet or first sheet, the following note and certification:

These improvements shall be constructed in accordance with the following drawings and with the Standard Specifications of the Village of Pinehurst.	
I, _____, PE, certify that the Standard Specifications of the Village of Pinehurst have been thoroughly checked and found to be applicable to this project. All exceptions to the applicable Village standards have been previously approved by the Village of Pinehurst and said exceptions are shown on Sheet(s) _____ of these drawings.	
SEAL	By: _____, PE  Date: _____

The Village of Pinehurst will periodically update these Specifications. Any purchaser of the Specifications will be eligible to receive the updates as they become available. It shall be the responsibility of the designer to ensure that his/her copy of the manual is kept up-to-date. The Village will also periodically consolidate the changes and republish the document in its entirety. To be eligible to receive updates, a new set of the current specifications must be purchased.

*Projects shall be constructed according to the Standard Specifications in effect at the time the project receives final construction approval by the Village of Pinehurst Engineering Department. The project contractor shall have at least one (1) complete set of approved plans and these Standard Specifications at the job site at all times that work is being performed. Failure to keep a copy of the approved plans and these Standard Specifications onsite at all times during which work is being performed shall be grounds of issuance of an immediate "Stop Work" order by the Village Engineer.*

**1.02 Submittal Requirements**

Persons desiring to construct subdivisions, roadway, sidewalk, stormdrainage, or utility extensions within the jurisdiction of the Village of Pinehurst must submit final construction drawings sealed by a Professional Engineer licensed to practice in the State of North Carolina. The submittal of the construction drawings shall be made only after the project has received preliminary plan approval from the Planning Board and the Village Council.

The submittal process shall be as described below:

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**a. Initial Submittal:**

For the initial review, the following items shall be submitted:

- (1) Final Construction Plans - Five (5) sets. The plan size and content shall conform to the requirements outlined in Subsection 1.03 hereof.
- (2) "Application for Approval of Plans & Specifications for Water Supply Systems" - NC Department of Environment & Natural Resources, Division of Environmental Health - Form DENR-2136 (if applicable) - Two (2) penciled (draft) copies.
- (3) "Non-Discharge Permit Application" - form from NC Department of Environment & Natural Resources, Division of Water Quality (if applicable), including all appropriate attachment forms - Two (2) penciled (draft) copies.
- (4) Storm Drainage Computations - Two (2) complete copies including spread, preliminary pipe sizing, structure data – type, invert & rim elevations, and HGL computations.
- (5) Wastewater Pump Station & Force Main Computations - (if applicable) - Two (2) copies.
- (6) Soils Evaluation & Pavement Design Calculations - as specified hereinafter under Sub-Section 3.02, Item b. of these Specifications - Two (2) copies.
- (7) Additional Design Data - as may be requested by the Village Engineer.

**b. Second Submittal:**

The Village of Pinehurst staff will review the initial review items and will return one (1) set of plans with notations marked in red. One (1) copy of the various applications and calculations will also be returned to the submitter with notations and corrections indicated. The submitter shall then make the corrections, additions, or changes to the construction drawings, pursuant to the initial review comments. The second submittal shall then be made to include the following items:

- (1) Final Construction Plans - Five (5) sets.
- (2) "Application for Approval of Plans & Specifications for Water Supply Systems" - Form DHS-2136 (if applicable) - Four (4) completed, typewritten duplicate originals for signature by the Village Manager.
- (3) "Non-Discharge Permit Application" - form from NC Department of Environment & Natural Resources." (if applicable). One (1) completed, typewritten original for signature by the Village Manager.

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- (3) NC Department of Transportation (DOT) - Encroachment Forms, Driveway Permits, etc. - Sufficient copies as required and prepared to conform to the DOT requirements.
- (4) Village of Pinehurst – Encroachment Form, Driveway Permit, Grading & Clearing permit, Burning and/or Blasting permit, Preliminary Plan Approval number – assigned by Planning Department.
- (5) Storm Drainage Computations - Two (2) copies of computations, if revised after initial review.
- (6) Wastewater Pump Station & Force Main Computations - Two (2) copies of computations, if revised after initial review.

The Village of Pinehurst Engineering Department will review the revised plans and, if they are satisfactory, the submitter will be requested to bring the originals (tracings) to the Village staff for approval signatures. If the plans are found to be deficient, the Village will supply comments, either written or redlined on the plans or both. All resubmittals shall be accompanied by the most recent redlined drawings. Failure to include the redlined drawings with the resubmittal will constitute an incomplete submittal and will result in project review delays as the Village will not review any submittals deemed to be incomplete. At that time, the executed forms will also be returned to the applicant or the design engineer so that the applications and proper number of plans may be submitted to the various state and county regulatory agencies.

Erosion and sedimentation control plans for Commercial Sites, new subdivisions, and Multi-Family Residential projects should be submitted directly by the owner to either the Village Engineering Department or NCDENR – Land Quality (NCDENR-LQ), Fayetteville Regional Office, dependant on the amount of disturbed area proposed. Copies of all submittals to and approvals from NCDENR – LQ shall be provided to the Village at the same time they are submitted to or received from NCDENR-LQ by the developer or project engineer.

### **1.03 Plan Requirements**

#### **a. Subdivisions:**

All plan submittals for subdivision construction should, at a minimum, include the following elements. More detailed information is contained in the pertinent sections for each type of infrastructure.

- (1) Plans sealed and signed by a professional engineer registered to practice in North Carolina. Plan size shall be 24" x 36".
- (2) Plan/profile drawings shall be provided for all street/sidewalk improvements, off-street sanitary sewers, storm sewers and culverts, water mains, sanitary sewer force mains, and for all utility extensions. All plan/profile drawings shall be

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prepared at a scale of not less than: 1" = 50' Horizontal and 1" = 5' Vertical (existing grades shall be based on field survey).

- (3) Boundary of the tract with all courses and distances indicated. At least one (1) corner of the tract shall be tied to the NC Plane Coordinate System with x, y, & z for that corner specified on the drawings. A tieline giving bearing and distance from the control corner specified to the NCGS monument used shall also be shown on the plans with the monument name and data called out.
- (4) Vicinity Map, scale of drawings, and NC Grid North directional arrow.
- (5) Master Plan(s) showing all improvements and including: existing contour elevations (2-foot intervals) and USGS datum with benchmarks indicated. The Village may require 1 foot interval contours where deemed necessary to allow for adequate review of the proposed improvements.
- (6) 100-year flood plain limits and notation as to the FEMA/NFIP Map # and effective date.
- (7) Owner, PIN #, and zoning of all properties adjoining the site shall be noted on each adjoining parcel shown in the drawings.
- (8) Tract area and specific data required by subdivision ordinance - number of lots, average and minimum lot size, etc.
- (9) Public & Private Streets
  - Street width - back-to-back of curbs,  
NOTE: Street width shall conform to applicable Village Thoroughfare and Transportation Plans as well as the sections presented in the Standard Details
  - Right-of-way width.
  - Horizontal curve data (centerline only) for each curve including L, delta, R, and other data as requested by the Village Engineer.
  - Vertical curve alignment and data including length, g1, g2, K-value and other pertinent data. Ground shot profile for both the left and right side of the right of way limits superimposed onto the street profile.
  - Distances to existing driveways, streets and intersections.
  - Typical section for each street showing proposed pavement design and other cross-sectional elements.

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**(10) Wastewater Facilities**

- Pipe material, size, length, slope, invert elevations at all manholes, separation from other utilities, existing and proposed ground/cover profile above the pipe segment.
- 100-year flood elevations and manhole top elevations
- Special construction details - piers, boring, encasement, etc.
- Easement widths
- Location, size, and material of all proposed & existing service laterals
- Location of lots where sewer service backflow valves may be required
- Pump station plans - including:
  - 100-year flood elevation and source of this information
  - site layout plan, proposed lift station easement limits, and access road
  - detailed plan and elevation view of pump station facility
  - electrical equipment and wiring
- Pump station and force main calculations - including:
  - volume and cycle time calculations
  - total discharge head calculations and pump selection curve
  - hydrostatic uplift calculations
  - stream classification

**(11) Water Distribution Facilities**

- Pipe material, size, location, and separation from other utilities
- Hydraulic modeling data including estimated daily demand (average & max.), C-factors, ISO computations, ISO modeling, etc.
- Valves, fittings, blow offs including size
- Fire hydrant locations - conforming to the minimum spacing and location standards as specified in this manual and by the Village Engineer and Fire Marshal.
- Service lateral locations

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- Location of lots where pressure reducing valves may be required
- Special details - boring, etc.
- Easement locations and widths (if applicable – NOTE: any proposal to locate a watermain outside of a Public Street Right-of-Way shall have the prior written approval of the Village Engineer.)
- Proposed locations for bacteriological sampling
- Permanent sampling stations

**(12) Storm Drainage**

- Drainage areas and run-off for each section of storm drain pipe
- Off site drainage areas and design volumes
- Invert elevation and top elevations at each structure - catch basin, curb inlet, etc.
- Pipe material, length, slope, etc.
- Exit velocity and details of velocity reduction facilities at each open outlet
- Complete hydraulic calculations
- Special details - open channels, etc.
- Easement widths
- Minimum elevations for building construction

**(13) Miscellaneous Data**

- Owner/developer: name, address, and telephone and fax numbers
- Engineer: name, address, and telephone and fax numbers
- Limits of clearing and land disturbance
- Landscaping including species. Special care should be taken when specifying landscaping that will be installed in any public or private right-of-way to ensure that as the plantings mature, they will not adversely affect sight distances.

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- General Notes as required, including a note - "All construction materials and methods shall conform to the ***Standard Specifications & Construction Details*** of the Village of Pinehurst."
- Summary of quantities of infrastructure improvements in Data Table Format, by project phase if applicable, i.e. linear feet of water mains (by size), sewer mains (by size and material), storm drainage pipe (by size & material), sidewalk (by material), and street (by owner and back of curb to back of curb width)

(14) Engineering Plan Review Fees – see Schedule of Fees

- no plans shall be reviewed until such time as all plan review fees are paid in full. If a plan is submitted without the appropriate review fees, the designer shall be contacted to retrieve the plans.

(15) Engineering Inspections Fees Worksheet – see Schedule of Fees and Worksheet Form

- The Engineering Inspection Fees worksheet shall accompany all sets of Final Drawings presented to the Village for Construction Plan Approval. The Worksheet shall be sealed, signed and dated by the project designer and all required fees shall accompany the submittal. No plans will be granted Final Construction Approval until such time as all required fees are paid in full. In the event the Village levies re-inspection fees due to dilatory progress or continued poor workmanship by any of the Contractors at the site thus necessitating repeated inspections, all re-inspection fees shall be promptly paid or the Village Engineer may issue a "Stop-Work" order for all activities at the site until such time as the re-inspection fees are paid in full.

(16) Certificate of Plan Approval

The design engineer shall affix the "Certificate of Plan Approval" Block to each sheet of the construction drawings. This block is included in the Appendicies.

**b. Site Plans**

All site plans submittals shall, at a minimum, include the following elements:

- (1) Plans sealed and signed by an appropriately registered design professional, licensed to practice in North Carolina. Where public utilities, streets, drainage, and/or pavement designs are involved, or where otherwise required by North Carolina General Statutes all sheets shall bear the seal, signature, and date of signing of an N.C. P.E. in current good standing with the State of North Carolina licensing board. Plan size shall be 24" x 36".

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- (2) Boundary of the tract with all courses and distances indicated. One corner of the tract shall be tied both horizontally and vertically to the NC Plane Coordinate System with tie line and grid monument data provided to the corner. Total gross area of tract shall be indicated.
- (3) Vicinity map, scale of drawing, and NC Grid North directional arrow.
- (4) Existing and proposed contour elevations at minimum interval of 2 feet. Elevations based on USGS/NCGS Datum with benchmark indicated. The Village may require 1 foot interval contours where deemed necessary for adequate review of the proposed improvements.
- (5) 100 year flood plain and/or alluvial soils line. A note shall be placed on the plans indicating the FEMA-NFIP map/panel #, effective date, and soils mapping source information.
- (6) Owner, PIN #, and zoning of all properties adjoining the site shall be noted on each adjoining parcel shown in the drawings.
- (7) Data on Adjoining Streets
  - Street name.
  - Street width, right-of-way dimensions, and pavement design.
  - Existing utilities and storm drainage.
  - Proposed and existing streets, and driveway entrances onto site and adjoining properties.
- (8) Building Site Data
  - Number of buildings and dwelling units in each (for residential site plans).
  - Building "footprint" dimensions and finished ground floor elevation.
  - Front, side and rear yard setbacks.
- (9) Parking Data
  - Number of parking spaces provided.
  - Number of parking spaces required.
  - Location and dimensions of parking areas - angle of parking, typical width, length, aisle width, etc.

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**(10) Storm Drainage**

- Pipe material, size, length, slope, etc.
- Drainage areas and run-off for each storm drain pipe.
- Numbering Plan, Invert elevation, and top elevation for each structure - catch basin, curb inlet. Invert elevations for each flared end section, headwall, etc.
- Exit velocity and details of velocity reduction facilities at each outlet.
- Complete hydraulic calculations, including HGL. All computations to be in neat, legible tabular form.
- Special details as required.
- Easement widths clearly specified on the easement.

**(11) Utilities**

- Waterline location and size.
- ISO Fireflow computations for the proposed development and hydraulic modeling to support the proposed sizing of mains.
- Water meter location and size; size of service branch.
- Backflow Preventer
- Sewer line location and size
- Sewer service lateral - size and location
- Water and sewer easements
- Fire hydrant locations (on and off site)
- Backflow preventer for fire sprinkler line (if applicable)
- Fire Department Connection (if applicable)

**(12) Landscaping**

- Clearing limits
- Landscaping plan
- Summary of landscaping requirements as required by Village Code

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**(13) Signage**

- Master sign plan per applicable provisions of Village Code

**(14) Certificate of Plan Approval**

The design engineer shall affix the "*Construction Plan Approval*" block to each sheet of the site/construction drawings. A copy of this approval block is contained in the Appendices of this manual.

**c. Revisions to Previously Approved Plans:**

Revised plans shall be resubmitted and approved by the Village and affected State regulatory agencies (if required) prior to construction of any facilities for which the revisions are proposed. The submittal procedure for revised plans shall be as previously specified for the original submittal.

**1.04 Record Drawings & Certifications (As-Builts)**

Record drawings, which reflect "as-built" conditions, must be submitted prior to final acceptance of the streets and utilities by the Village of Pinehurst. The record drawings must be labeled "RECORD DRAWINGS" and certified by the Project Engineer of record. The record drawings submitted to the Village of Pinehurst shall be permanent, reproducible drawings - on polyester film (Mylar) sepia, 2-mil minimum weight. A digital copy of the Record Drawings. Once approved, a digital format copy of the Record Drawings in AutoCAD 2000 or later format shall accompany the final hard copy of the approved Record Drawings. No scanned documents shall be accepted for meeting the purposes of the digital record drawing submittal requirement.

Record drawings shall include the following information overlain onto the originally approved vellums:

- All water valve locations, with no less than two (2) primary reference dimensions from permanent features - such as power poles, transformers, fire hydrants, manholes, etc. Additional reference dimensions may include ties to other valves, back of curb, etc.
- Locations where bacteriological samples were taken.
- Final invert and top elevations of manholes, lengths and slope of sanitary sewers.
- "As built" dimensions and details of wastewater pumping stations
- Location of all pipe materials, identified by type and size.

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- Location of geotextile fabric used to supplement subgrade.
- Any deviations from the original construction drawings.

A checklist is contained in the Appendix to assist in development of As-Built Plans for submission to the Village Engineer.

Upon completion of the improvements, the Project Engineer of record shall issue the certificates as required by the NC Department of Environment and Natural Resources, Division of Health Services and the NC Department of Environment & Natural Resources, Division of Water Quality. Copies of the certifications shall also be submitted to the Village of Pinehurst.

**1.05 Construction of Proposed Improvements**

Prior to commencing any phase of construction of the proposed facilities, the Developer shall obtain all permits, encroachments, easements, right of ways, etc., which are required to complete the construction proposed in the approved plans.

The following certificate shall be attached to the cover sheet of the drawings and shall be presented to the Village for signature after all permit information is completed:

<b>AUTHORIZATION TO CONSTRUCT IMPROVEMENTS</b>		
<b>PART I - Record of Permits Issued by Other Regulatory Agencies</b>		
Water System Extension:	Permit # _____	Issue Date: _____
Wastewater Collection System Extension:	Permit # _____	Issue Date: _____
Land Disturbing Permit:	Permit # _____	Issue Date: _____

When the **Authorization to Construct Improvements** is received from the Village, and when all easements, encroachments have been obtained, the Developer shall call the Village Engineering Department to schedule a pre-construction conference with Village officials, the project engineer, and the selected contractor(s). NCDOT Representatives shall also be contacted to attend this meeting if any work is contemplated within NCDOT Rights-of-Way. All Conferences shall be scheduled at least five (5) business days in advance.

The Village of Pinehurst will perform periodic inspections of the work in progress to assure compliance with approved plans and Village specifications. Inspections will be performed by Village personnel or by a duly authorized representative of the Village Engineer. The developer shall provide the services of a certified testing laboratory, at

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the expense of the developer, to perform compaction tests and other miscellaneous testing as prescribed hereinafter in these Standard Specifications.

Prior to scheduling the Pre-Construction Conference, the Developer shall furnish to the Village four (4) complete sets of the approved plans, specifications, permits. Failure to supply current plans, specifications and permits with all approved revisions will result in work being halted until all specified materials and documents are delivered to the Village.

No infrastructure work shall be permitted outside of regular business hours without prior written approval from the Village Engineer. The developer shall reimburse the Village for inspections performed at times other than during the Village's normal business hours at the rates set by the Village Engineer and Village Finance Director. Inspections performed by the Village shall be scheduled no less than 48 normal business hours in advance.

Upon completion of the proposed improvements, the Developer shall request a comprehensive inspection by the Village to establish a list of deficient items, which must be corrected prior to final acceptance of the subdivision. Inspections such as this generally require a minimum of five (5) business days notice for scheduling.

Final acceptance by the Village will occur upon completion of the following:

- (1) Correction of all items found to be deficient during the previous comprehensive inspection. A follow-up inspection is required.
- (2) Issuance of a final certificate of compliance by the Sedimentation and Erosion Control Division of NCDENR for erosion control and permanent stabilization.
- (3) Submittal of record drawings as previously specified. Accuracy of the record drawings will be checked during the final inspection.
- (4) Submittal of certification by the Project Engineer as required by the State Regulatory Agencies for water & wastewater facilities. No certificates of occupancy shall be issued prior to proof of submission of these certifications.
- (5) Submittal by the Developer of evidence from the NCDOT that any improvements constructed in DOT right-of-way have been completed to the satisfaction of the DOT inspector. This in no way relieves the Developer of his obligations to the DOT as outlined in the encroachment agreements.
- (6) Submittal of the letter of warranty, prescribed bonding, and supporting documents as required under paragraph 2.10 of these Specifications and in the Village's Codes and Ordinances.

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**1.06 Stop Work Orders**

The Village Engineer may issue a Stop Work Order (written or verbal with written follow-up) instructing that the Developer/Contractor to immediately cease (any or all) work if such work poses a threat or hazard to the public or to Village owned facilities or is being performed without proper approvals, or a current set of the approved plans onsite. In the event work is undertaken prior to appropriate approvals being secured or is not properly inspected by the Village Representative, the Village Engineer may require removal and reinstallation of all work not properly inspected or approved and may also issue a "Stop Work" order for all other construction at the site until the matter in question has been fully corrected to the satisfaction of the Village Engineer. The Stop Work Order may also include instructions for remedial work or repairs deemed necessary to correct such threats or hazards. In the event that corrective measures are not taken properly or in a timely manner, the Village reserves the right to implement such corrective measures and will pursue any and all legal means to seek reimbursement for any costs to the Village incurred as a result. The Village will not bear any responsibility for consequential damages incurred by the Developer/Contractor or others resulting from issuance of a Stop Work Order, such damages including, but limited to, lost time or liquidated damages, loss of materials, payroll and overhead costs, equipment rental costs, permit costs, fines or legal costs, etc.

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**SECTION 2 - GENERAL PROVISIONS**

**2.01 General**

All construction shall conform to the requirements and dimensions on the approved construction plans, Village Standard Details, the Code of the Village of Pinehurst, or as stated in these Specifications. The material requirements for stone, concrete, asphalt, and other construction products shall conform in full to the latest edition of the NCDOT "Standards and Specifications" unless otherwise modified by this manual or as directed by the Village Engineer.

**2.02 Abbreviations & Definitions**

**a. ABBREVIATIONS**

AASHTO	American Association of State Highway and Transportation Officials
A.F.F.	Above Finished Floor
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
APWA	American Public Works Association
AWWA	American Water Works Association
CO	Certificate of Occupancy
°C	Degrees Celsius
°F	Degrees Fahrenheit
DIP	Ductile Iron Pipe
DIPRA	Ductile Iron Pipe Research Association
ETJ	Extraterritorial Jurisdiction
ft	foot
gpd	gallons per day
gpm	gallons per minute
ID	Inside Diameter
ISO	Insurance Services Office
lbs	pounds
MCPUD	Moore County Public Utilities Department
MSL	Mean Sea Level
MUTCD	Manual on Uniform Traffic Control Devices
NCDEH	North Carolina Division of Environmental Health
NCDENR	North Carolina Department of Environment, and Natural Resources

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<b>NCDOT</b>	<b>North Carolina Department of Transportation</b>
<b>NCDWQ</b>	<b>North Carolina Division of Water Quality</b>
<b>NCGS/USGS</b>	<b>North Carolina Geodetic Survey/United States Geodetic Survey</b>
<b>N.C.G.S.</b>	<b>North Carolina General Statutes</b>
<b>NCRLA</b>	<b>North Carolina Registered Landscape Architect</b>
<b>NCPE</b>	<b>North Carolina Registered Professional Engineer</b>
<b>NCPLS</b>	<b>North Carolina Professional Land Surveyor</b>
<b>N.E.C.</b>	<b>National Electric Code</b>
<b>NFPA</b>	<b>National Fire Protection Association</b>
<b>NRCS</b>	<b>Natural Resource Conservation Service (formerly SCS)</b>
<b>NYDOT</b>	<b>New York Department of Transportation</b>
<b>OD</b>	<b>Outside Diameter</b>
<b>OSHA</b>	<b>Occupational Safety and Health Administration</b>
<b>P.C.</b>	<b>Point of Horizontal Curvature</b>
<b>ppm</b>	<b>parts per million</b>
<b>psi</b>	<b>pounds per square inch</b>
<b>P.C.</b>	<b>Point of Curvature</b>
<b>P.I.</b>	<b>Point of Intersection</b>
<b>P.T.</b>	<b>Point of Tangency</b>
<b>PVC</b>	<b>Polyvinyl Chloride</b>
<b>P.V.C.</b>	<b>Point of Vertical Curvature</b>
<b>P.V.I.</b>	<b>Point of Vertical Intersection</b>
<b>P.V.T.</b>	<b>Point of Vertical Tangency</b>
<b>SU</b>	<b>Single Unit Truck (with 20 foot wheelbase and 30 foot overall length)</b>
<b>UL</b>	<b>Underwriters' Laboratories, Inc.</b>
<b>V</b>	<b>Volts</b>
<b>VAC</b>	<b>Voltage - Alternating Current</b>

**DEFINITIONS** - Where the words "Village Engineer", "Engineer", or "Village Representative" are used in these Specifications, it shall mean the Village Engineer of Pinehurst, an assistant to the Village Engineer, or other representative duly authorized by the Village Engineer.

Where the word "Village" is used in these Specifications, it shall be the Village of Pinehurst, North Carolina.

Where the word "Developer" or "Contractor" is used in these Specifications, it shall be the developer of the project, or his authorized contractor performing work on the site. For purposes of these Specifications, these words are to be considered synonymous. All Con-

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tractors performing construction or installation of any public facilities in the Village's jurisdiction shall be properly licensed for the work by the NC Licensing Board for General Contractors in accordance with N.C.G.S. 87. Prior to commencing work, the Contractor shall submit proof of licensure. The Contractor shall also submit information including mailing and street address for the firm, ownership information, telephone numbers for contact during regular business hours and emergency telephone numbers for contact during nights, weekends and holidays.

Where the words "Project Engineer" or "Project Designer" are used in these Specifications, they shall mean the design engineer retained by the developer, and the person responsible for the preparation of the final construction drawings. All Engineers shall be properly licensed by and in current good standing with the North Carolina State Board of Registration for Engineers and Land Surveyors.

- **AIR CURTAIN BURNING** - A stationary or portable combustion device that directs a plane of high velocity forced air into a pit with walls in such a manner as to maintain a curtain of air over the surface of the pit and a re-circulating motion of air under the curtain.
- **CERTIFICATE OF OCCUPANCY** - Approval granted by the Village for a new or renovated structure to be occupied.
- **CODE** - The Village of Pinehurst Code of Ordinances, including the Pinehurst Development Ordinance.
- **CONTRACTOR** - The entity performing the work indicated in the plans.
- **COUNCIL** - The Village Council of the Village of Pinehurst.
- **DETAILS** - The drawings found within the Village of Pinehurst Standard Specifications and Details Manual.
- **EASEMENT** - An interest in land owned by another that entitles its holder to a specific use.
- **FIRE OFFICIAL/FIRE MARSHAL** - The Fire Chief, an assistant or other representative duly authorized by the Village.
- **INSPECTOR** - The Construction Inspections Administrator, an assistant, or other representative duly authorized by the Village Engineer.
- **INVERT** - The lowest point in the internal cross section of a pipe or culvert.
- **PLANS** - The approved design drawings that show the work to be done.

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- **RIGHT OF WAY** - The area which encompasses public streets, sidewalks, and utility strips.
- **SPECIFICATIONS** - The "Village of Pinehurst Engineering Standards and Specifications" manual.
- **SUBBASE** - See SUBGRADE
- **SUBGRADE** - That portion of the roadbed prepared as a foundation for the stone and asphalt or concrete pavement structure.
- **VILLAGE** - The Village of Pinehurst, North Carolina
- **VILLAGE ENGINEER** - The Director of the Engineering Department, an assistant, or other representative duly authorized by the Village.
- **VILLAGE MANAGER** – The Village Manager appointed by the Village Council of the Village of Pinehurst.
- **VILLAGE REPRESENTATIVE** – see "Inspector", above.

If an item is not specifically defined in the listing above or elsewhere in this manual, the definition established by the Village Engineer shall govern.

### **2.03 Insurance Requirements & Damage to Existing Facilities**

If work is to be performed within any Village street right-of-way or on Village owned property, the Developer/Contractor shall submit a current and valid certificate of insurance to the Village stating that such coverage is in effect during the project duration. The limits of coverage shall be at a minimum in accordance with the Schedule of Insurances as set annually by the Village's Risk Management team.

Any damages caused to any existing infrastructure due to construction and/or development activities, the party causing the damage shall repair all damages to the full satisfaction of the Village Engineer prior to any further work occurring. If the party in question fails to repair the damages in a timely manner as determined by the Village Engineer, a Stop-Work order may be issued until all repairs have been satisfactorily made. The Village may also elect to have the repairs done by a third party or Village forces, in which case the party causing the damage shall be liable in full for all repair costs plus an administrative fee determined by the Village. Any such costs shall be paid in full prior to re-initiation of any work associated with the project in question.

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**2.04 Erosion & Sedimentation Control**

**a. General Requirements:**

Temporary and permanent erosion control measures shall be provided in accordance with the erosion control plan approved by either the Land Quality Section, NCDENR, or the Village of Pinehurst, depending upon the amount of land disturbance proposed. The approved Erosion Control Plan and any Approval Certificates shall be kept on site by the Contractor at all times that work is being performed.

All permanent erosion control measures shall be incorporated into the work at the earliest practicable time, and in no case shall an area remain denuded for more than seven (7) calendar days. Temporary erosion control measures shall be coordinated with permanent erosion control measures and all other work on the project to ensure economical, effective and continuous erosion control throughout the construction and post construction period and to minimize siltation of streams, lakes, reservoirs, and other water impoundments, ground surfaces, roadways, or other property. In the event compliance with the timelines established in this section are not complied with or offsite siltation occurs, including tracking of mud onto public streets, the Village may issue a "Stop-Work" order until such time as all areas have been properly restored and all required erosion control measures installed or properly repaired.

**b. Seeding & Mulching:**

Seeding and mulching shall be carried out immediately behind construction in accordance with the following specifications:

**SEEDING SPECIFICATIONS**

**SHOULDERS, SIDE DITCHES, SLOPES (MAX. 4:1)**

<b>SEEDING PERIOD</b>	<b>TYPE</b>	<b>APPLICATION RATE</b>	
		<b>Per Acre</b>	<b>Per 1000 SF</b>
Aug 15 - Nov 1	Abruzzi Rye	25#	1.0#
	Common Bermudagrass	85#	2.8#
Nov 1 - Mar 1	Abruzzi Rye	25#	1.0#
Mar 1 - Apr 15	Abruzzi Rye	25#	1.0#
	Common Bermudagrass	85#	2.8#
Apr 15 - Jul 30	Hulled Common Bermudagrass	85#	2.8#
Jul 15 - Aug 15	Hulled Common Bermudagrass <u>and</u>	60#	1.4#
	*Browntop Millet	35#	0.8#
	* <u>or</u> Sorghum-Sudan Hybrids	30#	0.7#

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\*Temporary - Reseed according to optimum season for desired permanent vegetation. Do not allow temporary cover to grow over 12" in height before mowing, otherwise fescue may be shaded out.

Consult NCDENR-Fayetteville Regional Office or USDA-Natural Resources Conservation Service staff for additional information concerning other alternatives for vegetation of denuded areas. The above vegetation rates are those that do well under local conditions; other seeding rate combinations are possible.

**SEEDBED PREPARATION**

- (1) Chisel compacted areas and spread topsoil 3 inches deep over adverse soil conditions, if available.
- (2) Rip the entire area to 6-inch depth.
- (3) Remove all loose rock, roots, and other obstructions leaving surface reasonably smooth and uniform.
- (4) Apply agricultural lime, fertilizer, and superphosphate uniformly and mix with soil (see below\*).
- (5) Continue tillage until a well-pulverized, firm, reasonably uniform seedbed is prepared 4 to 6 inches deep.
- (6) Seed on a freshly prepared seedbed and cover seed lightly with seeding equipment or cultipack after seeding.
- (7) Mulch immediately after seeding and anchor mulch.
- (8) Inspect all seeded areas and make necessary repairs or reseedings within the planting season, if possible. If stand should be over 50% damaged, re-establish following original lime, fertilizer and seeding rates.
- (9) Consult either NCDENR Land Quality Inspector for suggested maintenance treatment and fertilization after permanent cover is established.

\*Apply:   Agricultural Limestone   - 2 tons/acre (3 tons/acres in clay soils)  
          Fertilizer (10-10-10)       - 1,000 lb/acre  
          Superphosphate           - 500 lb/acre - 20% analysis  
          Mulch                     - 2 tons/acre - small grain straw  
          Anchor                    - Asphalt Emulsion @ 300 gals/acre

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**c. Construction Entrances:**

Gravel construction entrance pads shall be constructed of #5 or #57 washed stone at each point of construction access to the site. The gravel pads shall be maintained in such a manner as to prevent the deposition of mud and debris onto existing public roadways adjacent to the site.

Gravel pads shall be 50 feet long. The width shall be equal to that of the proposed street or 25 feet minimum. The washed stone shall be placed to a nominal depth of 12 inches for the first 20 feet and 6 inches for the remaining 30 feet.

**Special Note:** It shall be the developer's responsibility to see that the construction entrance pads are properly maintained so that mud is not tracked onto adjacent streets. In the event that the gravel construction entrances are not properly maintained, or are otherwise ineffective, the Village Representative may issue a Stop Work Order which shall remain in effect until such time as the pads are restored and replenished and until any resulting mud and debris has been satisfactorily removed from the adjacent streets by the Contractor.

**d. Clearing Limits:**

All clearing limits shall be clearly identified and staked prior to any construction. The Village shall be given 48-hour notice prior to beginning clearing operations.

**2.05 Earthwork**

**a. General:**

Earthwork shall be defined as the removal of soil (including rock) from its natural location and the depositing of such material into the proper fill areas as indicated on the plan.

**b. Rock Excavation - by Blasting:**

- (1) Permit - Where rock must be removed by blasting, a written permit must first be obtained from the Village of Pinehurst Planning Department a minimum of 24 hours before any explosive materials or blasting agents are used within the corporate limits of the Village of Pinehurst. A certificate of insurance must be submitted to the Village prior to any blasting operations.
- (2) Hours of Blasting - Blasting for rock removal shall be conducted only Monday through Friday during normal business hours.

**c. Removal of Unstable Material:**

Where unstable material, including organic material ("muck"), is encountered in trenches or in roadways, the material shall be completely removed and replaced with suitable material

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as approved by the Village Engineer and thoroughly compacted. The Village Engineer reserves the right to require appropriate geotechnical testing of all materials used to replace unsuitable materials.

**d. Placement of Fill:**

Fill material for roadway embankments shall be free from stones greater than 4 inches in size, construction material debris, frozen material, organic matter or other unstable material. Fill material placed in roadway embankments shall be placed in lifts of 8 inches or less and compacted to a density of not less than 95% of maximum dry density as measured by AASHTO Method T-99. The compaction requirement shall be increased to 100% in the uppermost 12" of subgrade. These compaction requirements shall apply for that portion of the roadway measured from the back of curb and extending on a slope of 1 to 1, limits may be compacted to a density of not less than 90% of maximum dry density as measured by AASHTO T-99.

Attention is called to Section 3 of the Village Specifications for the inspection and testing requirements.

**e. Compaction Tests:**

During roadway construction, the Village Representative shall require the developer or Contractor to provide compaction tests to demonstrate compliance with the compaction requirements outlined herein. Such tests may be required at any time that the Village Representative believes the compaction to be less than the required density.

All compaction testing shall be performed by a certified testing laboratory with all results sealed by a North Carolina Professional Engineer with specific experience in Geotechnical Engineering. The cost of such testing shall be borne by the developer. The Village reserves the right to adopt and maintain a listing of "Approved Geotechnical Engineering Firms." Any such listing will be maintained by the Village Engineer's office and may be amended from time to time as necessary.

Once all subgrade work has been completed and the subgrade fine-graded to design subgrade, the Contractor shall contact the Village Engineering Department to schedule a proofroll of all subgrade areas, including those to be located under curb & gutter and sidewalks.

**2.06 Safety & Workzone Traffic Control**

The Contractor shall provide for and maintain safety measures necessary for the protection of all persons on the work; and shall fully comply with all laws and regulations and building code requirements to prevent accident or injury to persons on or about the location of the work, including all applicable provisions of OSHA regulations. The Contractor shall protect all trees and shrubs designated to remain in the vicinity of the operations and barricade all walks, roads, and areas to keep the public away from the construction. All trenches, excavations, or other hazards in the vicinity of the work shall be well barricaded, and properly lighted at night.

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The Contractor shall be responsible for the entire site and the necessary protection as required by the Village and by laws or ordinances governing such conditions. He shall be responsible for any damage to Village property, or that of others, by the Contractor, his employees, subcontractors or their employees, and shall correct and/or repair such damages to the satisfaction of the Village of Pinehurst and/or other affected parties. He shall be responsible for and pay for any such claims against the Village.

### **2.07 Maintenance of Traffic & Work Zone Traffic Control**

Existing public streets or highways shall be kept open to traffic at all times by the Contractor unless permission to close the streets, or portions thereof, is granted by the Village Representative. The Village of Pinehurst Police Department must also be contacted by the Contractor a minimum of 48 hours before any streets are to be temporarily closed or partially closed. Proper and sufficient barricades, lights, signing and other protective devices shall be required to be installed when deemed necessary by the Police Department or the Village Representative. All traffic control shall conform to the standards set forth in the MUTCD, any NCDOT amendments to the MUTCD, and any supplemental traffic control measures required by the Village Representative above those specified in the MUTCD & NCDOT manuals.

Failure to comply will result in issuance of a Stop Work Order as well as fines and penalties as specified in the various Village and/or NCDOT codes, ordinances, and laws.

### **2.08 Concrete**

Concrete shall be only plant-mixed or transit-mixed concrete conforming to ASTM C33 for aggregates and to ASTM C94 for ready-mixed concrete. Any concrete poured that has a slump over 4 inches as per ASTM C143, or has a batched time of more than 90 minutes, will be considered unacceptable and shall be immediately removed. All concrete shall meet the requirements of the most recent edition of the NCDOT "Standard Specifications" for the use intended. The Village Engineer may require additional strength concrete and/or addition of fiber reinforcement when in the best interest of the Village. Any costs for additional strength mixes and/or fiber reinforcement shall be the responsibility of the developer/contractor.

Concrete shall not be deposited on frozen subgrade. Concrete shall not be poured when the air temperature is falling and below 40 degrees F, and the predicted low temperature for the succeeding 24-hour period is less than 32 degrees F. All concrete when placed in the forms shall have a temperature of between 50 and 90 degrees F and shall be maintained at a temperature of not less than 50 degrees F for at least 72 hours for normal concrete and 24 hours for high-early strength concrete, or for as much time as is necessary to secure proper rate of curing and designed compressive strength. The Village Representative may require use of insulating blankets or other measures as deemed appropriate to minimize the possibility of the concrete freezing.

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All formwork and subgrades shall be inspected and approved by the Village Engineer prior to placement of any concrete. Any forms or subgrades found to be deficient shall be corrected to the satisfaction of the Village Representative and re-inspected prior to placement of any concrete. All forms shall be properly oiled to ensure clean release when removed. All reinforcing steel and forms shall be fully inspected and approved by the Village Representative prior to placement of any concrete.

Concrete shall be air entrained at 5% ( $\pm 1\%$ ). Retarding and accelerating admixtures shall be used only upon prior approval of the Village Representative.

**2.09 Installation of Utilities Not Furnished by the Village**

The Developer shall arrange for the installation of all utilities that are not furnished by the Village. This shall include electric service, telephone service, and, where available, cable television and natural gas. Location of these utilities within public street right-of-ways shall be in accordance with the schedule set by the Village. Restoration of Village right-of-way disturbed by installation of these types of utilities shall be the ultimate responsibility of the Developer. The Developer shall provide the Village Engineer a copy of the installation plan for these types of utilities at least ten (10) business days prior to actual installation of these utilities taking place.

**2.10 Materials**

All materials incorporated in work to be accepted by the Village of Pinehurst for maintenance shall be new, first quality material installed in accordance with the manufacturer's instructions or these Specifications, whichever, in the opinion of the Village Representative, is more stringent.

It is the intent of this Specification to provide materials and construction methods of high standard and quality; and to provide materials free from defects in workmanship and product. Equal materials not specified herein may be submitted for consideration of use in the project provided documentation (shop drawings) and samples are furnished to the Village not less than twenty-one (21) days before their delivery to the construction site. A sufficient number of copies shall be submitted such that the Village may retain three (3) copies. The Village Engineer will issue written approval or disapproval of the proposed alternate materials. The current Village Specifications and/or the latest revisions of the material manufacturer shall apply in all cases where materials are described by these Specifications.

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**2.11 Warranty Periods and Financial Guarantees**

The Developer shall provide a written guarantee on workmanship and materials for a period of at least one (1) year after the date of acceptance by the Village of Pinehurst. Any defects observed within the one (1) year guarantee period shall be repaired and/or replaced to the Village's satisfaction. The guarantee shall apply to street and sidewalk construction, water lines and appurtenances, sanitary sewers and appurtenances, storm sewers and structures (including ditches, drainage channels, etc.), pumping stations, force mains, controls, and appurtenances. The guarantee shall apply to any improvements proposed by the approved plans and any revisions of the plans approved by the Village Engineer. The Village Engineer, in consultation with the Village Manager, may elect to require an extended warranty period on any or all of the improvements constructed as part of any project.

The Developer shall submit, as part of his letter of warranty, a financial security in the form and amount as required by the applicable Pinehurst Village Ordinances or as specified by the Village Engineer. This financial guarantee shall be drawn on an entity licensed to conduct business in the State of North Carolina and redeemable within a 75 mile driving radius of the Village Hall.

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**SECTION 3 - STREETS**

**3.01 General**

Unless otherwise provided herein, all materials and street construction methods shall at a minimum conform to the applicable requirements as outlined in the ***Standard Specifications for Roads & Structures***, latest edition, as published by the North Carolina Department of Transportation.

Whenever the following terms are used in said NCDOT specifications, the intended meaning of such terms shall be as follows:

"State" or "Commission" shall be replaced by the words "sampling and testing by the Village or its authorized testing agent."

"Inspection by Commission" shall be replaced by "inspection by Village or its duly authorized representative."

**3.02 Design**

**a. General:**

Street design shall conform to the standards and typical sections set forth in the applicable sections of this manual, current NCDOT and AASHTO manuals, and any direction provided by the Village Engineer. Information on specific design criteria is shown in Figure 3-1 at the end of this section. Private streets shall meet in full the same design, construction, and inspection standards as set forth herein for Public Streets.

At intersections in residential areas, all streets shall be rounded with radii not less than:

Curb Radius - 30 Feet (at back of curb)  
Property Lines - 20 Feet

In non-residential areas, the curb and right-of-way radii shall be increased as directed by the Village Engineer to accommodate anticipated truck traffic. The NCDOT Roadway Design Manual shall be followed for preliminary design of intersections in non-residential areas.

The minimum clear roadway width (exclusive of gutter width) shall be 20 feet with greater widths as required by the Village Engineer to meet roadway classification standards and traffic conditions. All streets, except those in the Old Town Overlay District, and private gated streets that are being added to an existing neighborhood as a

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subsequent phase and receive a waiver from the Village Council, shall have curb & gutter conforming to the standards set forth in Section 4 of this manual. For areas within the Old Town Overlay District that utilize 'ribbon' asphalt paving, the minimum width of paving shall be 22'. Alternate types of curb & gutter meeting special Village Engineering Standards may be used in the Old Town Overlay District.

A sight triangle easement shall be provided at all intersections of new streets with existing or proposed collector streets, highways, or other major street classifications. Sight triangle easements shall be not less than 15 feet by 100 feet. The 15-foot dimension shall be the setback from the right-of-way of the major street, and the 100-foot dimension shall be measured along the right-of-way of the major street. Such sight triangle easements shall be shown on the final plat for the subdivision. Landscape & Planting materials placed in sight triangle shall be limited to a height of 30 inches at maturity. No signage may be placed in the right-of-way without prior written approval of the Village Engineer, including submission of a completed Village Right of Way Encroachment agreement permit.

Stopping Sight Distance (SSD) shall apply to both Horizontal and Vertical elements of the street geometry and shall at a minimum, meet the criteria set forth in the AASHTO "Greenbook", latest edition. The Village Engineer may increase or modify these requirements on a project-by-project basis.

Intersection Sight Distance (ISD) shall apply to all streets covered by this manual. Intersection sight distance shall at a minimum meet the criteria set forth in the AASHTO "Greenbook", latest edition. The Village Engineer may increase or modify these requirements on a case-by-case basis.

**b. Soils Evaluation & Pavement Design:**

Pavement design for all new streets shall be based upon subgrade soil conditions, a 20-year (minimum) design life and projected traffic loadings (ADT and percent trucks).

The pavement design and subgrade soils evaluation procedure shall include the following as a minimum:

- (1) Perform standard penetration test (SPT) borings to a depth of five feet below design subgrade, or, in the case of fill sections, to a depth of five feet below existing ground. The standard penetration test borings shall be obtained along the centerline of all roadways at intervals not greater than 300 feet.
- (2) Perform classification tests of representative SPT soil samples.
- (3) Obtain bag samples of prevalent soils and perform moisture-density tests.

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- (4) Select a soil type for pavement design - usually a weaker soil among those expected to be present at subgrade level. Re-mold a sample and perform a California Bearing Ratio (CBR) using soaked values.
- (5) Prepare pavement design calculations based on the soaked CBR values and typical traffic loading as prescribed for the category of the affected street.

Soils testing work shall be performed by a qualified geotechnical engineering firm. The pavement designs shall be performed by a qualified professional engineer using standard methods developed by the NCDOT, AASHTO, The Asphalt Institute, or other similar methods as may be approved by the Village Engineer.

The final pavement thickness shall be the calculated thickness, but in no case shall the thickness be less than that shown in the standard street section details, or that required by the NCDOT for streets to be maintained by the State, with the most stringent condition governing.

In all cases, the *minimum* pavement section for Public and Private Streets within the Village' jurisdiction shall be eight (8") inches compacted thickness ABC with a two and one-half inch (2-1/2") I-2 asphalt surface course overlay, placed in an initial lift of 1-1/2 inches with the final 1-inch lift being placed once all conditions specified in Section 3.03(c) have been met in full. Firelane sections shall be 8" compacted thickness ABC with a wearing surface of 2" I-2 asphalt, placed in one lift. The Village may require use of full-depth asphalt in lieu of ABC base courses. Additional thickness pavement sections may also be required by the Village Engineer. A full width asphalt surface course overlay shall be provided as a final wearing surface in all cases where additional lanes, roadway widening, or other improvements are required to an existing road are required. The overlay shall cover the full width of the street, both the pre-existing section and the new improvements and shall extend at least 50 feet each way beyond the limits of improvements.

Two (2) copies of the Laboratory Soil Test Report and the Pavement Design Calculations shall be submitted with the initial design documents as prescribed under Sub-Section 1.02 hereof.

### **3.03 Construction Requirements**

#### **a. General:**

All roadway subgrade, storm sewer and utility construction shall be inspected and approved by the Village Representative prior to placement of the base course materials.

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All streets shall be cleared and graded for the full width of the right-of-way within 50 feet of any street intersection. Additional street clearing and grading shall be as follows:

- (1) Major Thoroughfare - the full width of the right-of-way, generally 90'.
- (2) Principal Arterial - the full width of the right-of-way, generally 80'.
- (3) Major Collector - the full width of the right-of-way, generally 70'.
- (4) Minor Collector - the full width of the right-of-way, generally 65'.
- (5) Minor Commercial - the full width of the right-of-way, generally 65'.
- (6) Major Local, Local & Cul-De-Sac Streets - the full width of the right-of-way on the sidewalk side and a minimum of eight (8) feet from back of the curb on the non-sidewalk side. Right of way for this class of streets is generally 60'. The Village Engineer may allow lesser right of way widths for minor cul-de-sacs and residential streets on a case-by-case basis. In no case shall the right of way be less than 50'

**b. Placement of Aggregate Base Course:**

No Base Material shall be placed on any roadway or firelane until the subgrade, stormdrainage system and structures, water & sewer system, all appurtenances, other utilities such as cable and power, and any other subsurface work has been inspected and approved by the Village Engineer.

Aggregate base course shall be placed and compacted in strict conformance with the requirements of the NCDOT. Each layer shall be compacted to a density equal to at least 100 percent of the maximum dry density as determined by AASHTO Method T-180 as modified by the NCDOT.

**c. Placement of Bituminous Surface Course:**

No Bituminous surface courses shall be placed on any roadway or firelane until all Base Course materials have been placed and approved by the Village Engineer. The 1-2 bituminous surface course pavements (for minor collector streets, local streets and cul-de-sac streets) shall have a total thickness of not less than 2-1/2 inches as shown on the standard details. The bituminous surface course material shall be placed in two lifts, each in strict conformance with the requirements of the NCDOT. The second lift shall be 1-inch nominal thickness and its placement shall be delayed during the period of initial residential or commercial site construction activity and until such time as all defects to the first lift have been completed and approved by the Village Engineer and 75% buildout of the area serviced has been attained. The final lift shall be covered by a financial guarantee posted by the Owner/Developer in an amount and form satisfactory to the Village Engineer.

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For major collector streets, thoroughfares, etc. that require a 8-1/2" minimum full depth asphalt pavement thickness (6" H, 2-1/2" I-2) on top of the stone base course, the Village may require the 6" H binder to be initially sealed with a 1-1/2" layer of I-2 followed by placement of the final 1" layer at a later date to be determined by the Village Engineer. If the final lift is delayed, the Village will require a financial guarantee be posted for the final lift in an amount and form deemed suitable by the Village Engineer.

The contractor shall provide temporary drains through the concrete gutter at all low points to allow the first lift to drain and to eliminate ponding at the low points. Prior to placing the final lift of I-2 surface course, the initial course shall be thoroughly cleaned and repaired. Bituminous tack shall be applied prior to surfacing to assure bond between lifts, along gutters and around castings.

### **3.04 Inspection**

#### **a. Proof-Rolling:**

Street embankments shall be graded and compacted as described in Section 2 of these Specifications. After all utilities and storm sewers have been installed, the subgrade shall be fine graded and restored to required grade, and then proof-rolled, utilizing a fully loaded tandem axle truck having a gross weight not less than 40,000 pounds and with the tires inflated to not less than 70 psi. The Village Engineer reserves the right to require presentation of weight tickets prepared by a State of North Carolina- Certified "Scalemaster" verifying the loaded weight of the proofroll truck.

Should any "pumping" or displacement be observed during the proof-rolling, the defective area(s) shall be excavated to a depth no less than 18" below subgrade and backfilled with suitable material, thoroughly compacted. If deemed appropriate by a geotechnical engineer, geotextile fabric may be utilized below base course material. The geotextile shall be installed in strict accordance to the manufacturer's recommendations with respect to overlap, depth of cover, etc. Prior to installing geotextile fabric, a copy of the manufacturer's literature shall be submitted to the Village, along with the geotechnical engineer's recommendations. The locations of geotechnical fabric shall be indicated on the Record Drawings.

Proof-rolling shall be repeated until there is no evidence of "pumping" or displacement.

#### **b. Compaction Testing - Subgrade:**

Upon completion of the proof-rolling, the Developer/Contractor shall furnish to the Village Representative a report from a certified soils testing laboratory. The report shall present the results of a Proctor analysis demonstrating that the subgrade compaction is

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acceptable in accordance with standard requirements of the NCDOT. The subgrade shall then be inspected by the Village Representative, and upon its acceptance and approval, the stone base course may be placed. However, no stone base may be placed prior to backfilling behind the curb.

One field density (compaction) test shall be required for 3,000 SY of street surface - for each lift of fill material placed into the roadway embankment. The Village Engineer may require additional testing beyond that specified above.

The cost of all geotechnical laboratory and field testing of subgrade compaction required by the Village shall be borne by the Developer/ Contractor.

**c. Base Course & Surface Course Inspection Requirements:**

Prior to placement of bituminous surface course material, a Proctor analysis shall be furnished on the Aggregate Base Course placed in the roadway. The report shall be prepared by a certified testing laboratory and shall evidence compliance with the compaction requirements. Quarry tickets shall also be presented to the Village Representative to enable a check for yield at the specified final thickness. The base material shall then be inspected by the Village Representative, and upon acceptance and approval, the bituminous surface course may be placed.

The frequency and number of base course field density tests shall be in accordance with requirements of the NCDOT or as may otherwise be directed by the Village Representative or the Engineer.

Bituminous surface course material shall be placed and compacted in accordance with NCDOT requirements. Copies of delivery tickets shall be furnished to the Village Representative to enable a check for yield at the specified final thickness.

Should there be a question as to the final thickness of Aggregate Base Course or bituminous surface course, the Village Representative reserves the right to require the Developer/ Contractor to provide random corings by an independent testing laboratory to demonstrate actual thickness of base and surface courses. Core samples shall be taken by a certified testing laboratory and the results shall be presented to the Village Representative. Should the corings reveal insufficient thickness, the Contractor shall provide additional surface course as may be required or shall furnish other remedial measures as may be acceptable to the Village Representative.

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The cost of all ABC and asphalt product compaction testing and coring work shall be borne by the Developer.

### 3.05 Pavement Marking & Signage

The Developer shall be responsible for furnishing and installing all street identification (name) and regulatory signs. Signs materials shall conform to those specified by the Village. In general, all street name, regulatory, and warning signs shall be installed on treated wood posts as specified by the Village. The Developer shall also be responsible for striping and markings required by the Village as part of the project on all public streets constructed and/or modified as part of the development project as follows:

- Stop Bars and Crosswalks - all streets in accordance with the Village's Standard Details and the MUTCD, latest edition.
- Continuous Centerline Striping - double yellow line on all collector, thoroughfare and marginal access streets as designated by the Village.
- Edgelines - 4" white edge lines on all collector, thoroughfare, and marginal access streets as designated by the Village.

#### a. Pavement Markings - Materials:

Pavement markings shall be made with reflectorized thermoplastic. The thermoplastic marking material shall be applied by fusing to the pavement surface by application of heat. Materials and application methods shall comply fully with the requirements set forth in latest edition of the ***Standard Specifications for Roads & Structures***, as published by the North Carolina Department of Transportation. Use of markings shall conform to the latest edition of the MUTCD, any modifications or clarifications of the MUTCD promulgated by NCDOT, and the direction of the Village Engineer with the most stringent governing. The Village Engineer may require use of alternate methods or materials when determined by the Village Engineer to be in the best interest of the Village.

#### b. Street Identification Signs:

Street identification signs shall be placed at each intersection and shall clearly identify each street. On Village maintained streets, such signs shall be constructed of Wolmanized 5/4" X 6" SYP, stained in accordance with the stain coloration standards set by the Public Works Director, with 4" high gloss white, routed lettering overlaid with reflective glass beads meeting NCDOT Traffic Control specifications. Signs shall be fastened to the 4 x4 supporting post with a minimum of 5 stainless steel #12 x 4" wood

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screws. On State-maintained routes, identification signs shall conform to NCDOT standards. Sign location placement shall be as directed by the Village. All required signs shall be placed by the developer/owner at no cost to the Village.

**c. Regulatory Signs:**

Regulatory signs shall meet the requirements of the *Manual on Uniform Traffic Control Devices*, latest edition and any modifications thereto established by the NCDOT. Materials shall meet the requirements set forth in the applicable Sections of the *Standard Specifications for Roads & Structures*, latest edition, as published by the North Carolina Department of Transportation. The location and types of regulatory signs shall be indicated on the construction drawings. Signs shall be mounted on galvanized steel U-channel posts meeting current NCDOT standards or on pressure treated 4x4 SYP posts meeting current NCDOT standards.

**d. Sign Posts & Placement:**

On Village maintained routes, signs shall be mounted on Wolmanized 4 x 4 SYP posts. Posts shall be furnished in 12' lengths and driven 4' into the ground, or cut off and set in concrete 2' deep.

On NCDOT-maintained routes, signs posts shall be in accordance with NCDOT Standards and specifications.

Sign placement on all routes shall be in accordance with the "Manual on Uniform Traffic Control Devices (MUTCD)", latest edition.

**3.06 Private Irrigation Systems, "Invisible" dog fences, & above-ground fencing**

Private irrigation systems proposed to be located within existing or proposed Village right-of-way shall be reviewed and a permit to encroach upon Village right-of-way shall be issued by the Village prior to installation. The following requirements or features must be indicated on the construction drawings:

- (1) All irrigation systems shall be equipped with a Village-approved backflow preventer located in a freeze-proof enclosure as specified in Section 6 of this document. This requirement shall apply to all systems within the Pinehurst ETJ whether supplied by the Pinehurst PUD system or by a private well utilizing the Middendorf aquifer.
- (2) All backflow preventers, control boxes, and other above ground devices shall be located outside of Village right-of-way. Only flush-type sprinkler heads and buried piping and control wiring may be located within the Village right-of-way. No

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sprinkler heads or other devices shall be installed within 5 feet of curbs or edges of pavement.

- (3) Within the Village right-of-way, all control wiring shall be in electrical conduits and installed with no less than 30" of cover, unless greater cover is required by either the applicable electrical codes or the Village Engineer.
- (4) All irrigation piping crossing beneath Village streets shall be encased in steel or ductile iron casing pipe, extending no less than 5 feet beyond curbs or edges of pavement with no less than 24" of cover. All casings shall meet NCDOT standards & specifications.
- (5) Sprinkler heads shall be located and adjusted so that the spray pattern does not enter the roadway or create a visual obstruction within sight triangles.
- (6) The owner of the irrigation system shall be fully responsible for operation, maintenance and repair of the system. The owner shall also be responsible for any damage to Village streets or utilities resulting from failure of or repair to the irrigation system. The Village shall not be responsible for damage of any kind to private irrigation systems or components located within Village right-of-way for any reason.
- (7) The owner of the irrigation system shall maintain accurate as-built information regarding the system and shall be responsible for providing this information to the Village or any other public utility. Ownership and contact information of the irrigation system shall be provided to the Director of Public Works and permanently posted on the backflow preventer enclosure, visible to the roadway.

In the event that the Village Representative deems that the owner failed to properly install, operate or maintain a private irrigation system within Village right-of-way, he/she will contact the Village Engineer, who may revoke permission for the encroachment upon Village right-of-way. Upon revocation of permission to encroach upon Village right-of-way, the encroaching facilities shall be removed by the owner, at the expense of the owner, within 14 calendar days following said revocation. Failure to remove the encroaching facilities within the specified time period shall be cause for the Village to remove the facilities with all costs to the Village being billed to the owner and execution of other remedies as provided for in the Village's Municipal Code.

### **3.07 Mailboxes**

Mailboxes located within Village right-of-way for the purpose of receiving delivery from the US Postal Service shall conform to the requirements set forth by the US Postal

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Mailboxes located within Village right-of-way for the purpose of receiving delivery from the US Postal Service shall conform to the requirements set forth by the US Postal Service. All portions of the mailbox, support or any appurtenance thereto shall be no less than 12" from the back of curb (where streets have curb & gutter) or the 24" from the edge of pavement along non-curb & gutter section streets. No brick or other "hardened" structures shall be used to support the mailbox for any installation within a Village-owned right-of-way. The Village reserves the right to require submission of installation details prior to mailbox installation and to require modification or removal of any mailbox structure deemed to constitute a safety hazard.

### **3.08 Public Utility Encroachments**

All public utilities not owned by the Village that desire to utilize any portion of the Village's right-of-way or easements for installation of any above or below ground facilities shall be required to execute an Encroachment Agreement with the Village for each installation. The installation shall, at a minimum, comply with the latest edition of the NCDOT "*Policies and Procedures Manual for Accommodating Utilities on Highway Right-of-Ways*" Manual, as modified by the Village Engineer, and in accordance with the Standard Details contained in this manual and any Special Provisions issued by the Village Engineer as part of the Encroachment Agreement. The Village Engineer may require additional depths of bury, alternate materials, or other installation modifications on a case-by-case basis.

Failure to comply fully with all specified conditions shall be grounds for revocation of the Encroachment Agreement and refusal for consideration of any further encroachment requests until the non-compliant installation has been brought into full compliance. Further, the Village may elect pursue all remedies against the encroaching party as allowed under all local, State, and Federal codes, laws, and rules.

### **3.09 Private Utility and Private Structure Encroachments**

No privately owned utilities or structures, including forcemains, pumps, cables, pipes, fences, sheds, or any other associated private utility facility or privately owned structure shall be allowed within any Village right-of-way or easement. In the event such an installation is found, the encroaching party shall promptly and completely remove the facility and restore the easement or right-of-way to the satisfaction of the Village Engineer. Failure on the part of the encroaching party to remove the facility within seven Village business days shall result in removal by the Village with all costs being born by the encroaching party. Further, the Village shall not be liable for any damages

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to the encroaching facility or any associated facilities removed by the Village. The Village may also elect to seek other remedies as provided for in various Village, State, and Federal codes and laws.

### **3.10 Firelanes**

All Firelanes shall be installed and inspected in accordance with the Public Street requirements contained in this manual. Fire Lanes shall be provided as required by the Village Fire Marshal.

Fire Lanes shall be at least 20 feet in width, with the edge closest to a building or fire hazard located at least 25 feet away from said hazard, unless otherwise directed by the Fire Marshal. All firelanes shall have a pavement section of 8" ABC stone and 2 inches of 1-2 asphalt.

Fire Lanes shall be designated by pavement markings and signage as specified in the Village Standard Details and as required by the Fire Marshal with the most stringent requirement governing.

All site plans shall include a fire lane plan and fire lane marking/signage plan for review by the Village Engineer and Fire Marshal.

### **3.11 Traffic Impact Studies**

Where required, all Traffic Impact Studies shall conform to the standards set by the Village Engineer. Any proposed improvements cited in these studies shall be constructed by the Developer/Owner at no charge to the Village in conformance with Village and NCDOT standards and specifications.

It shall be the responsibility of the Developer/Owner to contact the Village in advance to determine the specific study requirements for their proposed project.

### **3.12 Parking**

Parking facilities shall be provided in accordance with the standards set forth in the Village's PDO. The Layout and design of all parking facilities shall conform to the standards and guidelines set forth by ITE for the type of facility being serviced, as well as fully incorporating any modifications designated by the Village Engineer and/or Fire Marshal. All parking facilities shall have, at a minimum, the dimensions as outlined on Figure 3-2.

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Parking lots shall be designed to provide safe maneuverability of vehicles. A minimum parking stall dimension of 9' x 18' shall be provided, with larger dimensions as required by the Village Engineer. Handicap parking spaces shall be a minimum dimension of 8 feet with a five (5) foot lane adjacent to the space (or minimum lane width of eight (8) feet where van accessibility is required) properly marked with signage in accordance with the N.C. Building Code.

At locations where sidewalk abuts an 18 foot deep parking bay, the sidewalk shall be a minimum width of six (6) feet. Likewise, the bay depth may be increased to allow use of standard concrete wheelstops to prevent vehicular overhang from obstructing any portion of the sidewalk.

A minimum pavement structure consisting of 6 inches of ABC and 2 inches of I-2 shall be used along the travel aisle on parking facilities for multi-family and nonresidential developments. Access drives for these facilities shall also meet this minimum pavement standard. In the event any travel aisle or access drive areas are determined by the Fire Marshal to be 'firelanes', the paving section of those areas shall be increased to meet the firelane paving requirements set forth in this manual.

All minimum stall depths and module widths shall be measured to the face of curb when curb and gutter is used. For non-curb & gutter facilities, the Village Engineer may require use of require additional stall depth and concrete wheelstops.

All paved parking facilities shall be striped in accordance with the MUTCD with four (4) inch white lines. All firelane areas within any parking facility shall be marked and signed in accordance with the standards set forth in this manual and any guidance provided by the Fire Marshal.

**FIGURE 3-1**

	<u>Horizontal Curve Controls</u>			<u>Vertical Curve Controls</u>			
	Minimum Design Speed (MPH)*	Maximum Superelevation (ft/ft)**	Minimum Radii (ft)	Maximum Grade (%)	Length Crest	Length Sag (ft)	Minimum Length(ft)
Major Streets (Thoroughfares)							
Collector Street – Non-Residential	40	0.04	500	6%	55A	55A	150
Collector Streets – Residential	35	0.04	300	7%	35A	35A	125
Non-Residential Local Streets	30	reverse crown	300	7%	30A	40A	100
Residential Local Streets	30	normal crown	150	8%	30A	30A	100
Cul-de-sacs (600 feet or less)	25	normal crown	100	8%	25A	25A	75

Design standards to be determined for each case individually by a Professional Engineer using AASHTO guidelines & the NCDOT Roadway Design Manual with approval by the Village & NCDOT.

- Notes:
1. The Village Engineer may allow a lower design speed on residential streets. Approval must be given on a case by case basis.
  2. The minimum clear section for local streets shall be 20 feet, exclusive of the gutter section, with 24' required for ribbon paving.
  3. A minimum tangent of 100 feet shall be provided between all horizontal curves with a minimum of 150 feet for collector level and higher classification streets.
  4. The minimum grade for any street shall be 0.5%. The maximum grade allowed for all streets when approaching an intersection shall be limited to 3% for the last 100 feet of pavement prior to the intersection.
  5. The minimum curb radius return shall be 30' with longer returns required as determined by the Village Engineer in non-residential areas and on Major Streets.
  6. Special typical section standards apply in the Old Town Overlay District. Contact the Engineering Department for specific guidance.
- \* -Design Speed to be at least 5 mph greater than posted speed except for cul-de-sacs in which case the design speed shall be the posted speed.
- \*\* - The superelevation tables found in the AASHTO "Greenbook" latest edition will be used for determining the actual "e" for various centerline radii.

**FIGURE 3-2  
RECOMMENDED PARKING LOT STALL DIMENSIONS**

**DIMENSIONS FOR 90-DEGREE PARKING**

APPLICATION		(S) STALL WIDTH (feet)	(C) STALL LENGTH (feet)	(D) STALL DEPTH (feet)	(L) LINEAR DEPTH (feet)	(A) AISLE WIDTH (feet)	(W) MODULE WIDTH (feet)
CUSTOMER, high turnover	RECOMMENDED	10	10	18	18	24	60
	STANDARD	9	9.5	18	18	25	61
CUSTOMER AND EMPLOYEE, low turnover	RECOMMENDED	10	10	18	18	23	59
	STANDARD	9.5	9.5	18	18	24	60
	MINIMUM	9	9	18	18	25	61

**DIMENSIONS FOR 60-DEGREE PARKING**

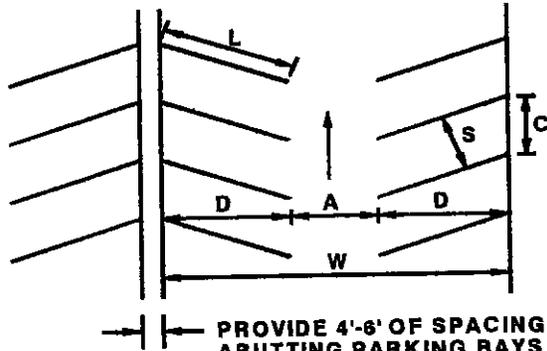
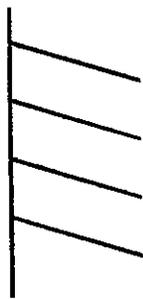
APPLICATION		(S) STALL WIDTH (feet)	(C) STALL LENGTH (feet)	(D) STALL DEPTH (feet)	(L) LINEAR DEPTH (feet)	(A) AISLE WIDTH (feet)	(W) MODULE WIDTH (feet)
CUSTOMER, high turnover	RECOMMENDED	10	11.5	15.6	18	22.8	54
	STANDARD	9	11	15.6	18	23.8	55
CUSTOMER AND EMPLOYEE, low turnover	RECOMMENDED	10	11.5	15.6	18	20.8	52
	STANDARD	9.5	11	15.6	18	21.8	53
	MINIMUM	9	10.4	15.6	18	22.8	54

**DIMENSIONS FOR 45-DEGREE PARKING**

APPLICATION		(S) STALL WIDTH (feet)	(C) STALL LENGTH (feet)	(D) STALL DEPTH (feet)	(L) LINEAR DEPTH (feet)	(A) AISLE WIDTH (feet)	(W) MODULE WIDTH (feet)
CUSTOMER, high turnover	RECOMMENDED	10	14.1	12.7	18	22.6	48
	STANDARD	9	13.4	12.7	18	22.6	48
CUSTOMER AND EMPLOYEE, low turnover	RECOMMENDED	10	14.1	12.7	18	21.6	47
	STANDARD	9.5	13.4	12.7	18	22.6	48
	MINIMUM	9	12.7	12.7	18	23.6	49

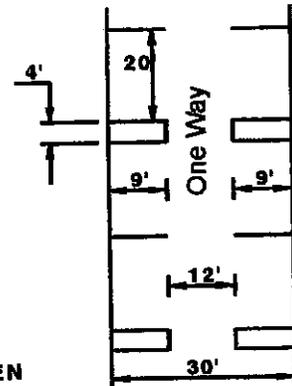
**DIMENSIONS FOR PARALLEL PARKING**

APPLICATION		(S) STALL WIDTH (feet)	(C) STALL LENGTH (feet)	(D) STALL DEPTH (feet)	(L) LINEAR DEPTH (feet)	(A) AISLE WIDTH (feet)	(W) MODULE WIDTH (feet)
CUSTOMER, *One-Way Only ** Minimum, See Detail	STANDARD	9	20**			12*	30*



PROVIDE 4'-6" OF SPACING BETWEEN ABUTTING PARKING BAYS

NOTE: C=S FOR 90 DEGREE PARKING  
D=L FOR 90 DEGREE PARKING



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**SECTION 4 - CURB & GUTTER, DRIVEWAYS, GREENWAYS, AND  
SIDEWALKS**

**4.01 Materials**

**a. Concrete:**

Concrete for curb and gutter, driveways, or sidewalks shall be Portland cement concrete having a 28-day strength of 4000 psi when tested in accordance with ASTM C39. Detailed specifications for concrete shall conform to the specifications contained in Section 2.07 hereof and with applicable sections of NCDOT "Standard Specifications for Construction of Highways & Bridges" latest edition, as modified by the Village Engineer.

**b. Bituminous Concrete (Asphalt):**

Asphalt for driveways shall meet the requirements as set forth in the 1995 Edition of the NCDOT Specifications for type I-2 and grade 85-100 (AP-3). PG64-22 liquid binder may be used.

**c. Joint Fillers:**

Joint fillers shall be a non-extruding joint material conforming to ASTM D1751.

**4.02 Dimensions**

The minimum thickness of a sidewalk shall be 4 inches, except at driveway crossings where the sidewalk shall be a minimum of 6" in thickness. Sidewalks shall have a uniform slope perpendicular to the curb of not less than 1/4-inch per foot and the utility/street tree strip between the sidewalk and the back of curb shall have a slope of not less than 1/4" per foot nor greater than 1/2" per foot toward the back of curb. All sidewalks shall be five (5) feet in clear width. All sidewalks shall be within the Village street right of way unless installed within a dedicated and platted Sidewalk Easement that is approved in advance by the Village Engineer.

Curb and gutter shall be standard 30" combination curb and gutter in accordance with the Village's Standard Details. Standard median curb (18-inch) may be used on entrance islands and medians. Standard 24" combination curb and gutter may be used on residential streets provided approval is granted by the Village Engineer prior to plan submittal. In the event use of standard 24" combination curb and gutter is approved, a *back of curb* transition section into and exiting all catch basins shall be required. The length of the transition section shall be at least five feet (5') on each side of the catch basin. Rolled or valley type concrete curb & gutter shall not be used unless specifically authorized in writing by the Village Engineer. No asphalt 'wedge' curbing shall be permitted within the Village's jurisdiction. Brick curbing, conforming to special standards prepared by the Engineering Department, may be used in Commercial Areas of the Old Town Overlay District or in other areas as determined acceptable by the Village.

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**4.03 Construction Methods**

**a. Subgrade:**

The subgrade shall be excavated to the required depth to allow placement a minimum of 3" of aggregate base course beneath the curb, and shaped to the proper cross-section. Where tree roots are encountered, they shall be removed to a depth of 1 foot for the full width of the excavation. The subgrade shall be stable and thoroughly compacted, as specified in Section 3.04.

**b. Forms:**

Forms shall be set and maintained true to the required lines, grades, and cross sectional dimensions as shown on the Standard Details and on the Drawings. Forms shall be constructed with material of such strength and with such rigidity to prevent any appreciable deflection between supports. Straight forms shall be within a tolerance of ¼ inch in 10 feet from a true line horizontally. Vertical grade control of the forms shall be conducted by use of stringlines tied to adequate offset grade staking. Offsets shall be at least five feet (5') from the proposed back of curb. Forms shall be thoroughly cleaned of all dirt, mortar and foreign material before being used. All inside form surfaces shall be thoroughly coated with commercial quality form oil.

Curbing forms or "stringline" guides shall be carefully placed to assure that the curbing will be constructed to accurate grades and no depressions or "bird baths" are created. Curved sections shall be placed such that the radii are smooth and continuous, without abrupt bends.

**c. Expansion, Contraction and Control Joints:**

Contraction and control joints shall be cut to a depth equal to at least 1/3 of the total concrete thickness. Contraction or control joint spacing shall be 10 feet maximum for curbing and driveway aprons. Expansion joints for curbing shall be no more than 50 feet on centers, with the joint material extending the full depth of the concrete with the top of the filler 1/8-inch below the finished surface. Expansion and contraction joints shall be spaced such that no final curb section shall be less than 5 feet long (including repair sections). Expansion joints for sidewalks shall be spaced no greater than 50 feet apart. Sidewalks shall be finished to grade and cross-section with a float, troweled smooth, and finished with a broom. Contraction joints shall be no less than 1/8-inch in width and cut at intervals equal to the width of sidewalk.

**d. Driveway Aprons:**

Where driveway aprons are to be installed in an existing curb, the entire curb and gutter section shall be removed. Saw cutting and removing the curbing, and leaving the existing gutter in place, shall not be allowed. Contraction, control and expansion joints shall be located as previously specified and shown in the Village's Standard Details.

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The flow line of the gutter shall be maintained across driveway aprons. Driveway aprons shall be a minimum of 6 inches thick and constructed in accordance with the Village's Standard Details contained in this manual.

### 4.04 Pedestrian Crossings

Pedestrian crossings, curb cuts and ramps shall be provided at all intersections in accordance with NCGS 136-44.14. Construction, pavement marking, etc. shall conform to the Village's standard details.

### 4.05 Driveway Criteria

a. General – No property shall have more than two (2) driveway cuts or turnouts onto any street. The spacing of all drives shall be as approved by the Village Engineer. The Village Engineer may restrict the location and/or number of driveways to a parcel when felt to be in the best interest of the overall safety of the Village. The edge of all driveways shall be offset at least 10 feet from any adjacent property lines. Greater offsets may be required in multi-family, commercial, and other non-residential zoning districts.

- a. Residential, Single Family – on curb & gutter streets, all residential driveways shall be installed and inspected in accordance with the standards and specifications contained herein and any direction provided by the Village Engineer. On non-curb & gutter streets, the driveways shall be installed in accordance with the Village's standard details and shall include an asphalt or concrete paved apron that extends at least fifteen (15') feet from the edge of the roadway back into the right of way. Residential driveways shall be at least 12 feet wide and no more than 16 feet wide. The end point of the driveway radii for all residential driveways shall be at least thirty (30') feet back from the tangency point of the radii formed by the nearest street intersection.
- b. Commercial, Institutional, Residential Multi-Family – all driveways in this class shall be fully paved. For sites requiring a Fire Lane, the driveway shall be paved and constructed to meet the Fire Lane requirements set forth in this manual. The arrangement of driveways shall be related to driveways for adjacent sites and nearby street intersections. The end point of the driveway radii for all residential driveways shall be at least one hundred (100') feet back from the tangency point of the radii formed by the nearest street intersection. The Village Engineer may require greater setback distances on a site-by-site basis.

Where two driveways are proposed along a single property frontage to facilitate operations, the minimum distance between the centerlines of the two driveways shall be at least 300 feet, with greater offset distances as required by the Village Engineer and/or NCDOT. A Street-type turnout shall be utilized when the

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estimated ADT of the site is greater than 100 vehicles/day, large vehicles such as fire apparatus must be accommodated, or as required by the Village Engineer.

All non-residential driveways shall be at least 20 feet in width, excluding any islands. If an entrance island is used, the entrance lane shall be at least 14 feet in width. A 14 foot wide exit lane shall be required for one exiting lane, and a 24 foot exit shall be used for two exit lanes.

Non-residential driveways which are unpaved shall have a 30 foot paved strip that extends back from the paved apron area and is at least 20 feet in width. This strip shall conform to the paving criteria set in this manual for Fire Lanes.

### **4.06 Inspection**

No concrete or other paving shall be placed until all forms, subgrades, and base courses have been inspected and approved by the Village Engineer. Offset or reference points shall be maintained in place to allow for proper inspection of the forms by the Village Engineer. Where machine extruded curbing is used, the "stringline" shall be inspected and approved by the Village Representative prior to placement of any curbing. A minimum of five (5') foot offset shall be used for all hubs, reference points, etc to allow for adequate room to install stringlines while minimizing the disturbance of the reference points.

### **4.07 Greenways**

All greenways shall have a minimum section of 6" compacted thickness stone screenings. Hard surfacing such as asphalt paving may be required by the Director of Parks & Recreation if felt to be in the best interest of the Village. The minimum width of all greenways shall be 6 feet clear width, with a 4' shoulder/swale area on each side, with additional width as required by the Director of Parks & Recreation to meet the requirements of specific sites or areas, such as high pedestrian counts, or to accommodate other needs. All greenways shall be crowned to provide for proper drainage. The maximum allowable longitudinal gradient shall be 10%. Drainage shall be provided at all crossings and shall accommodate at least the 10-year storm event, with increased drainage requirements as determined by the Village Engineer and the Director of Parks & Recreation. All greenways shall be located within a platted 15' wide (minimum) 'Village of Pinehurst Greenway Easement.' Greenways may be placed in Floodzone areas, provided that a hard surfacing is utilized and that the greenway shall be constructed in such a manner as to not alter the Floodzone elevations.

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**SECTION 5 - STORM DRAINAGE**

**5.01 Design**

Storm drainage facilities shall be designed to collect and dispose of stormwater generated upon or passing through the project location. The determination of the quantities of water that must be accommodated will be based upon peak flows from storms having the following return periods:

<u>Drainage Structure</u>	<u>Storm Event - Return Frequency</u>
Curb inlets & Gutters	10-year storm <sup>(1)</sup>
Storm Sewer System Collector	10-year storm
Cross Street Drainage	25 to 100-year storm <sup>(2)</sup>
Roadways in Flood Plain	100-year storm <sup>(3)</sup>

(1) Assuming 50% blockage in sag inlets. Inlets shall also be located just prior to all points of 'rollover' to prevent runoff from running horizontally across the street section. Additional inlets may be required in high pedestrian traffic areas.

(2) Depending upon Street Classification, as determined by the Village Engineer.

(3) Roadways in flood plain areas should withstand the 100-year storm without over-topping or sustaining damage. The roadway embankments shall be fully protected from flows that may occur during a 100-year event. The backwater pool shall also be shown on the plans.

Prediction of the peak flow rates shall be calculated using the procedure in the USDA Soil Conservation Service Method TR-55, the Rational Method, or other calculation methods as approved by the Village Engineer. The size of storm water culverts shall be determined by utilizing the standard energy equation for inlet control or outlet control and headwater nomographs as published by various federal agencies – Federal Highways Administration (Fhwa) - H.D.S. #5, Soil Conservation Service, etc.

Calculation submittals shall include analyses of pre and post development run off rates for the 2, 10, 50, and 100-year storm events. All calculations shall be performed under the responsible charge of an appropriately licensed design professional and sealed by that professional. All submittals shall include a full analysis and justification for the determination of C or CN factors, Tc, and other data used in the development of the computations.

For areas up to 200 acres, the Rational Method shall be used and the Kirpich equation used to determine Tc. Intensity data used in computations (inches/hour) for various return period and duration storms shall be based upon data applicable to this geographical region. For areas greater than 200 acres, SCS methods shall be used. If an automated software program other than those specifically developed by SCS/NRCS is used, adequate data regarding the program shall be submitted to the Village Engineer

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for approval prior to use on any project. The Village reserves the right to require the use of specific software programs to minimize review times. The minimum pipe grade in all cases shall be 0.5% or the slope required to develop a 2.5 fps flow velocity at the design condition and the maximum pipe grade shall be 8% unless special anchoring details are approved by the Village Engineer.

Design of stormwater collection systems for public and private streets shall include inlet spread/capture computations utilizing HEC-12/HY-22, piping computations based upon 'just-full' flow (gravity flow) in accordance with the Manning Equation, and a hydraulic grade line analysis to verify the system performance. Such computations shall be submitted in a neat, tabular format under the seal of the design engineer and include a clear numbering/labeling scheme for all structures shown on the plans as part of the proposed system. In the event software programs are used to determine inlet location and spread, such programs shall be approved by the Engineering Department in advance. The Village reserves the right to require use of specific programs to minimize review time.

All storm drainage facilities shall be designed in a manner such that upstream and downstream properties are not adversely affected. The Village Engineer may also require submission of an engineering analysis of the overall receiving watershed to a point downstream at which the runoff from the site in question is less than ten percent of the total predicted return period event flow for the receiving watershed. The Village may require offsite improvements to be made by the developer down to this point if deemed prudent by the Village to minimize the impact of runoff on downstream properties.

The Village Engineer may require stormwater management facilities to be included as part of any project on a case-by-case basis. If these facilities are required, the general design shall follow the standards set forth in the publication 'Elements of Urban Stormwater Design' by H. Rooney Malcolm, PhD., P.E. Alternate types of stormwater management facilities may be allowed on a case-by-case basis. It shall be the responsibility of the designer to contact the Village Engineer in advance to discuss such facilities and the applicable standards. All stormwater management facilities shall be maintained by the property owner. The Village may elect to require the developer to post bonds or other financial guarantees as deemed prudent by the Village to ensure ongoing and proper maintenance. Adequate easements shall be provided for all stormwater management facilities, as directed by the Village Engineer, to allow for inspection of these facilities by the Village.

The minimum pipe size to be used shall be 15-inch diameter. The minimum size for a culvert crossing under a public or private street shall be 18 inches. All public storm drainage facilities shall be installed in dedicated street rights-of-way (i.e. pipe inlets and outlets shall be within street rights-of-way). If a property owner/developer desires to extend storm drainage piping to eliminate open channels on private property, such pipes shall be installed and maintained at the property owner's expense, with

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appropriate computations and plans submitted to the Village Engineer to ensure that such extensions will not adversely affect the performance of the existing system. No off right-of-way extension of any stormdrain system serving a public right-of-way shall be made until such time as all computations and plans for the same have been reviewed and approved. A manhole or junction box shall be provided at the public right-of-way boundary.

The minimum depth of cover shall be 2 feet below finished subgrade for all traffic bearing areas and 1 foot below finished grade for all non-load bearing areas or as directed by the Village Engineer.

Minimum widths of storm drainage easements shall be the greater of 1) the width as dictated by the appropriate following configurations listed below; or 2) the width necessary to contain the predicted 100-year water elevation plus two feet in depth:

- 20 feet for single pipes up to and including 36 inches in diameter or open channels up to 36 inches in top width
- 20 feet plus the maximum conduit or channel width (in feet) for single pipes or channels larger than 36 inches wide
- 10 feet from the edge line of the outside conduits where multiple, parallel pipes are installed.

The Village of Pinehurst shall maintain only the storm sewer systems located with Village maintained rights of way and on Village owned property unless a drainage easement meeting the criteria set forth in this manual has previously been offered and accepted by the Village. Storm drainage systems located on private property shall be maintained by the property owner, including those shown within a drainage easement, unless the easement has been accepted by the Village.

Erosion and sedimentation control measures shall be so designed to provide control from the calculated post-development peak rates from a 10-year frequency storm. Discharge from drainage systems shall not be of such a velocity as to cause damages after leaving the pipe.

At all pipe outlets, flared end sections or head walls shall be provided, with rip-rap or improved vegetated aprons designed to reduce velocity and dissipate energy so that downstream damage does not occur. The Village reserves the right to require use of water quality Best Management Practices (BMP's) at the outlet of all pipes to minimize the impact on sensitive receiving waterways such as wetlands and perennial streams as shown on USGS Quad mapping and NRCS (SCS) Soils mapping. Such BMP's shall be required in water supply watershed districts consistent with the requirements of Section 12.4, Water Protection Overlay of the Village of Pinehurst Development Ordinance.

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Approved BMP's include Level Spreaders, Vegetated Filter Strips, Bio-retention areas, Riparian Buffers, and Sand Filters. No BMP shall be allowed within the proposed or platted public or private street right of way. Adequate platted easements shall be provided around all such devices to allow for access and maintenance by the Property or Homeowners Association. Design of these devices shall follow the criteria set forth by NCDENR – DWQ and NCDENR-LQS and shall not create a tailwater condition that allows for ponding or sedimentation within any pipe or piping system.

No channel within an easement may have side slopes that exceed 3:1 (H:V) and flatter side slopes are encouraged in all cases. Channels shall be designed to have a minimum velocity of 1.5 fps to avoid siltation and capacity reduction. Maximum acceptable velocities are as shown in Figure 5-1 at the end of this section.

For shoulder section streets permitted in the Old Town Overlay District, and private gated streets that are being added to an existing neighborhood as a subsequent phase and receive a waiver from the Village Council regarding the installation of curb & gutter, the roadway swales shall be sized to handle a minimum of the 10-year storm without erosion or overtopping. Where possible, preference shall be given to utilizing grass-lines swales in lieu of rip-rap for erosion control, and the maximum front and back slopes in these areas shall be 5:1 (H:V) to allow for routine mowing and maintenance, with flatter side slopes encouraged in all cases.

Manholes or structures shall be installed at each deflection of line or grade. No "blind" junction boxes shall be permitted. The minimum cover for reinforced concrete pipe shall be 2 feet from finish subgrade to the top of pipe under roadways and 1 foot under a non-roadway area.

Stormwater shall not be allowed to flow across streets. Drainage structures shall be provided to intercept flow prior to the radius point(-s) of an intersection, or the design of the street shall indicate a continuous grade around the radius to allow the flow to continue down the intersecting street. Water shall be picked up before the spread into the street exceeds 4 feet for local residential-class streets. The inlets shall be spaced on other classification streets using the standards set forth in the NCDOT's Hydraulic Design Guidelines, latest edition, as modified by the Village. Maximum flow to a single curb inlet shall be limited to 3 cfs. No curb inlets shall be installed in the curb radius of any intersection.

Storm sewer systems shall not discharge into the front yards of lots, but shall extend to within 20 feet of the rear property line in lots up to 1/2 acre in size and shall extend a minimum of 175 feet from right of way in lots larger than 1/2 acre.

Pipes, drains, flumes or other concentrated stormwater devices shall not discharge across a sidewalk or greenway, but rather shall be piped.

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**5.02 Pipe Materials**

**a. General:**

All storm sewer pipes to be installed in projects within the public street rights of way belonging (or to be dedicated) to the Village of Pinehurst, within any Private Street right-of-way, under any driveway within the Village, or within the limits of any Fire Lane required by the Village Fire Marshal shall be reinforced concrete pipe (RCP). Approval to use any materials other than RCP may only be granted by the Village Engineer.

**b. Reinforced Concrete Pipe (RCP):**

RCP shall be as per ASTM C76, Table III, IV, or V with a minimum diameter of 15-inches. All RCP shall be of the highest quality materials, no seconds or lesser quality pipe shall be used. Joints shall be sealed with a plastic cement putty meeting Federal Specification SS-S-00210 such as "Con-Seal" or "Ram-Nek."

**5.03 Materials - Storm Drainage Structures**

**a. General:**

All structures - manholes, curb inlets, catch basins, junction boxes, etc. shall be constructed of concrete brick masonry units or pre-cast concrete. Endwalls and headwalls shall be constructed of reinforced pre-cast concrete, or structural cast-in-place concrete in accordance with NCDOT and Village Standards.

**b. Concrete Brick Masonry Units:**

Concrete brick masonry units shall be solid units meeting the requirements of ASTM C55, Grade S-II. All such units shall be color tinted in accordance with NCDOT standards and specifications.

**c. Pre-cast Concrete Structures:**

Pre-cast concrete structures shall meet the requirements of ASTM C478. Structures shall have joints sealed with a pre-formed plastic gasket per Federal Specifications SS-S-00210. Manholes shall be sized in accordance with the requirements set forth in Section 7.03.

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**e. Mortar:**

Mortar shall be proportioned as shown below for either Mix No. 1 or Mix No. 2. All proportions are by volume. Water shall be added only in the amount required to make a workable mixture.

MIX NO. 1: 1 part Portland Cement  
1/4 part Hydrated Lime  
3 3/4 parts Mortar Sand (maximum)

MIX NO. 2: 1 part Portland Cement  
1 part Masonry Cement  
6 parts Mortar Sand (maximum)

Portland cement shall be ASTM C-150, Type 1. Hydrated lime shall conform to ASTM C207, Type S. Masonry cement shall meet the requirements of ASTM C91. Mortar sand shall be standard size 4S, per requirements of the NCDOT.

**f. Castings:**

- (1) General - Samples of casting(s) proposed for use shall be provided to the Village Representative for review and approval. In addition to samples, the names of other users of the castings shall be furnished along with names and telephone numbers of persons whom the Village Engineer may contact for an evaluation of the casting. All manufacturers shall be on NCDOT's Approved for Use status listing.

All castings shall meet the requirements of ASTM A48, Grade 30 iron. All castings shall be of domestic origin.

- (2) Curb Inlet Grate, Frame & Hood - Curb inlets shall be of the grate, frame and hood type conforming to NCDOT 840.03, Type E, F and G, based on flow direction. All Curb Inlet grates shall be of a 'bicycle-safe' type as per NCDOT. All castings shall be fully compliant with all NCDOT standards & specifications.
- (3) Grates & Frames - Cast iron grates and frames for yard inlets shall conform to NCDOT 840.16 and be of the size indicated on the approved plans. Grates and frames shall only be used outside of street rights-of-way.
- (4) Manhole Rings & Cover - Cast iron manhole rings and covers shall conform to NCDOT 840.54, with the words "STORM SEWER" cast on the cover. Covers shall have four 1-inch holes. Manhole castings shall be machined to provide a continuous bearing around the full periphery of the frame.

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- (5) Manhole Steps shall be of polypropylene material reinforced with a 1/2 inch diameter reinforcing rod. They shall be designed for a vertical load of 400 pounds and a horizontal pullout load of 1000 pounds, and shall be set 16" on center. Holes for the installation of manhole steps shall not project through the manhole wall, but shall stop a minimum of one inch from the outside wall. Steps shall be at least 10 inches clear width and shall project at least 4 inches from the wall into which they are embedded. Steps in precast concrete structures shall be installed by the manufacturer.

**g. Portland Cement Concrete:**

Portland cement concrete used for storm drainage structures, endwalls, etc. shall conform to the technical requirements presented in sub-section 2.06 of these Specifications, and shall have a minimum compressive strength of 3,000 psi at 28 days. Primary structures, such as box culverts, may require concrete having a compressive strength greater than 3,000 psi, and may require the submission of mix designs and testing of the concrete by an independent laboratory. These special requirements may be imposed by the Village Representative for all such structures where recommended by the Engineer.

**h. Reinforcing Steel:**

Reinforcing steel shall be new billet steel conforming to ASTM A615 for grade 60. Reinforcing steel shall be deformed per ASTM A305.

**5.04 Miscellaneous Materials**

**a. Riprap:**

Riprap shall be large aggregate of the size and class shown on the approved drawings. Riprap shall be supplied from a quarry certified by and in good standing with NCDOT.

**b. Erosion Control Materials**

Any erosion control materials proposed for use shall be approved in advance by the Village Engineer. Adequate information shall be submitted to the Village Engineer to allow for a complete evaluation to determine the suitability of the material in the intended. Such information shall include technical data, samples/swatches, and other data deemed necessary for evaluation.

**c. Geotechnical Fabrics**

Any geotechnical fabrics/materials proposed for use shall be approved in advance by the Village Engineer. Adequate information shall be submitted to the Village Engineer to allow for a complete evaluation to determine the suitability of the material in the

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intended. Such information shall include technical data, samples/swatches, and other data deemed necessary for evaluation.

**5.05 Construction Methods**

**a. Trenching & Bedding for Storm Sewers:**

The trench shall be excavated to the line and grade indicated on the Drawings. The trench bottom shall provide a firm and uniform support for the pipe. Where bell and spigot type pipe is used, recesses shall be excavated to receive the pipe bell.

Where the foundation is found to be of poor supporting value, the pipe foundation shall be conditioned by undercutting the unacceptable material to the required depth as directed by the Village Representative, and backfilling with stone or other approved material. Where necessary, surface water shall be temporarily diverted in order to maintain the pipe foundation in a dry condition. The flow of water from such temporary diversions shall be directed into suitable erosion control devices.

**b. Pipe Laying:**

Concrete pipe culverts shall be laid carefully with bells or grooves up grade and ends fully and closely joined. Joints of concrete pipe shall be made with cement mortar or with plastic gasket material as specified. Where mortar is used, the joint shall be thoroughly wetted before making the mortar joint. Before succeeding sections of pipe are laid, the lower portions of the bell or groove of the pipe shall be filled on the inside with cement mortar of sufficient thickness to bring the inner surface of the abutting pipes flush and even. After the pipe is laid, the remainder of the joint shall be solidly filled with mortar and sufficient additional mortar used to form a bead or ring around the outside of the joint. The inside of the joint shall be wiped and finished smooth. Pipe which is not true to alignment, or which shows any settlement after laying, shall be taken up and relaid.

Multiple-barrel culvert installations shall be fully bedded and encased with #67 washed stone, up to the pipe crown. Stone shall be placed evenly on each side and tamped firm to fully support the pipe without displacement. Following the initial stone backfill, a layer of Village-approved geotextile shall be placed across the stone backfill to prevent migration of soil backfill and subgrade materials into the bedding and haunching stone. Installation of this separation layer shall be in accordance with the manufacturer's recommendations and any direction provided by the Village Engineer.

A structure meeting the Village standards shall be required at all changes in line and/or grade. No 'blind' or inaccessible structures shall be permitted.

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No pipe may enter through the corner of any pre-cast 'waffle box.'

**c. Backfilling:**

The storm sewer trench shall be backfilled with approved material free from large stones or clods in 6-inch layers, loose measurement, and compacted to 95% of maximum dry density (AASHTO T-99), where the trench is within an area to be paved, or where the trench is immediately behind the curb. In streets the compaction requirement shall be increased to 100% of maximum dry density within 12" of subgrade. The backfilling shall be done on both sides of the pipe simultaneously to prevent displacement of the pipe. The backfilling shall be done on both sides of the pipe simultaneously to prevent displacement of the pipe. The backfill materials shall be moistened when necessary in the opinion of the Engineer, to obtain maximum compaction. Water settling or puddling shall not be permitted. Backfill in trenches not within the limits to be paved may be compacted in 12-inch layers after backfill is one foot above the top of the pipe.

All trash, forms, debris, etc., shall be cleared from around all pipes and structures before backfilling. Backfilling around structures shall be done symmetrically and thoroughly compacted in 6-inch layers with mechanical tampers to the specified 95% density.

**d. Masonry Structures:**

Excavations shall be made to the required depth, and the foundation on which the brick masonry is to be laid shall be approved by the Village Representative. The brick shall be laid so that they will be thoroughly bonded into the mortar by means of the "shove-joint" method. Buttered or plastered joints will not be permitted. The headers and stretchers shall be so arranged as to thoroughly bond the mass. Brickwork shall be of alternate headers and stretchers with consecutive courses breaking joint. All mortar joints shall be at least 3/8 inches in thickness. The joints shall be completely filled with mortar. No spalls or bats shall be used except for shaping around irregular openings or when unavoidable to finish out a course. Competent bricklayers shall be employed on the work and all details of construction shall be in accordance with approved practice and to the satisfaction of the Village Representative.

Steps as shown on the plans shall be placed in all catch basins and inlets when they are greater than four (4) feet in depth. The steps shall be set in the masonry as the work is built up, thoroughly bonded, and accurately spaced and aligned.

Inverts in the structures shall be shaped to form a smooth and regular surface free from sharp or jagged edges. They shall be sloped adequately to prevent sedimentation within the structure.

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The castings shall be set in full mortar beds. All castings when set shall conform to the finish grade shown on the Drawings. Any castings not conforming shall be adjusted to the correct grade.

**e. Concrete Construction:**

The forming, placing, finishing and curing of Portland cement concrete shall be performed in strict accordance with all applicable requirements as contained in the ***Standard Specifications for Road & Structures***, latest edition, as published by the NCDOT, and as modified by the Village Engineer.

**f. Installation of Pre-cast Concrete Structures:**

Pre-cast concrete manholes, junction boxes, etc. shall be installed level and plumb upon a firm, dry foundation, approved by the Village Representative. The Village reserves the right to require the use of bedding stone under pre-cast structures when, in the opinion of the Village Engineer, poor subgrade conditions are encountered. Structures shall be backfilled with suitable materials, symmetrically placed and thoroughly compacted so as to prevent displacement. Castings shall be set in full mortar beds to the required finished grade.

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FIGURE 5-1

MAXIMUM PERMISSIBLE VELOCITIES IN LINED CHANNELS (1)

Cover	Slope range (% Grade) See Note 1	PERMISSIBLE VELOCITY (See Note 1)	
		Erosion Resistant Soils (ft. per sec)	Easily Eroded Soils (ft. per sec)
Bermuda grass	0-5	8	6
	5-10	7	5
	over 10	6	4
Bahia	0-5 5-10 over 10	7 6 5	5 4 3
Buffalo grass			
Kentucky Bluegrass			
Smooth Brome			
Blue Grama			
Grass Mixtures	0-5 (See Note 1)	5	4
Reed Canary grass	5-10	4	3
Lespedeza Sericea Weeping Lovegrass Yellow Bluestem Redtop Alfalfa Red Fescue	0-5 (See Note 2)	3.4	2.5
Common Lespedeza Sudan grass (See Note 3)	0-5 (See Note 4)	3.5	2.5

**NOTES:**

1. Do not use on slopes steeper than 10 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
2. Do not use on slopes steeper than 5 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
3. Annuals -- use on mild slopes or as temporary protection until permanent covers are established.
4. Use on slopes steeper than 5 percent is not recommended.

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**SECTION 6 - WATER DISTRIBUTION**

**6.01 Preliminary Considerations**

All water main extensions and distribution facilities, which connect to the water distribution system of the Village of Pinehurst, shall be considered as public facilities up to the metering point. Therefore, all such facilities must be installed in public street rights-of-way or in easements, having a width of not less than 20 feet. Any water distribution facilities proposed for installation in easements shall be approved by the Village Engineer and Moore County Public Utilities Department Director prior to plan submittal. All such easements shall be fully platted and recorded with the Moore County Register of Deeds office.

Where public water mains are installed within easements crossing private property, the Village's Engineering and Public Works Departments and the Moore County Public Utility's Department shall have the right to enter upon the easement for purposes of inspecting, repairing or replacing the water mains and appurtenances and performing easement maintenance. Where paved private streets, driveways, parking lots, etc. have been installed over the public water mains, the Village of Pinehurst shall not be responsible for the repair or replacement of pavement, curbing, etc. which must be removed to facilitate repairs. Any excavations shall be backfilled by the Moore County Public Utilities Department to approximately the original grade and a temporary stone surface placed in traffic areas. Replacement of privately owned pavement, curbing, walkways or other features shall be the responsibility of the property owner or owners' association.

Water mains shall extend fully to the far end of the property frontage or tract being served. Dead end mains shall terminate with one joint of pipe having an anchor ring, concrete thrust collar and a blow-off assembly. Waterlines, which may be extended in the future, shall terminate with a main line valve immediately upstream of the pipe and blow-off assembly.

**6.02 Design**

**a. Location:**

Water mains shall be generally located either in the north or east side of the street pavement. Water mains may also be located within the road shoulder on a case-by-case basis if approval is granted by both the Moore County Public Utilities Director and Village Manager.

Water mains shall be laid at least 10 feet laterally from existing or proposed sewers. Where local conditions prevent a lateral separation of 10 feet, the water main may be laid closer, provided that the elevation of the bottom of the water main is at least 18 inches above the top of the sewer with a horizontal separation of at least 3 feet.

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Where a water main and a sanitary sewer cross, and the vertical separation is less than 18 inches, or the water line passes under the sewer, both the water main and sewer shall be ductile iron pipe, equivalent to Village of Pinehurst water main standards for a distance of 10 feet on each side at the point of crossing. The water and sewer line pipe section shall be centered at the point of crossing.

**b. Size of Mains:**

Water mains shall be sized to provide a minimum system pressure of 20 psi at all points of the Village's distribution system during a fire flow condition with peak system demands and at least 40 psi at all points under Average Daily Demand conditions. If higher pressures and/or flows are required, it is the responsibility of the water customer to provide the necessary booster pumping equipment and facilities. If booster pumps are required on the fire suppression system, the designer shall contact the Village's Engineering Department to determine the additional requirements (back-flow, etc.) that will apply. The booster pumps should be clearly noted on the construction plans if they are required.

- (1) The C-factor to be used shall be C=120. Pipe Flow velocities shall be limited to a maximum of 10 fps under design flow conditions. The Village Engineer may require design flow conditions to be met with lower pipe flow velocities and/or pipe segment headlosses on a case-by-case basis.
- (2) The design flow shall include:
  - a. The peak domestic demand, plus
  - b. The sprinkler demand, plus
  - c. The fire flow demand. The fire flow demand, at a minimum, shall be the greater of the ISO equation results or 1,500 gpm, plus
  - d. Any other background flow that will contribute to demand on the main
- (3) For projects designed with more than one phase, the design analysis shall check each phase to ensure that these guidelines are satisfied during each phase of construction as well as after final completion of all phases.
- (4) The Developer/Engineer shall be responsible for contacting the Village of Pinehurst Engineering Department to determine the estimated fire flow available at the point of connection to the Village-MCPUD water system. The Village will provide fire flow information based on actual field data in the vicinity of the proposed development. The Developer/Engineer shall submit information on the required fire flow and calculations in accordance with the submittals section to confirm the required fire flow is available. A minimum of a ten percent buffer shall be deducted from the hydrant test results prior to incorporation into the project model. The Fire Marshal, in consultation with the Village Engineer may require an increase in this allowance on a case-by-case basis.
- (5) The hydraulic/fire flow model shall include:
  - a) Static condition indicating only new domestic demand.
  - b) Separate fire flow models from each hydrant to indicate each hydrant is

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capable of providing the fire flow demand while concurrently providing peak domestic and sprinkler demand. Adequate system design and performance information including C-factors, proposed elevations, pipe flow velocities and headlosses under fire flow conditions shall be submitted to allow for a complete review of the proposed system. The Village reserves the right to require use of specific software programs for hydraulic modeling to minimize review time and to allow for incorporation of the data into the overall Village water system model.

- (6) Conformance to the Pinehurst Water Facilities Plan - Water mains shall be sized in accordance with the ***MCPUD - Pinehurst Water Facilities Plan***, where applicable, and as determined by the Village Engineer.
- (7) Residential Zoning Districts - Water mains shall be 6-inch and 8-inch in residential districts, unless larger mains are required as part of the major water distribution network, or are otherwise necessitated to meet fire flow requirements in multi-family, high density districts. Generally, 6-inch mains shall not exceed 500 feet in length, unless connected to a larger feeder main at each end, in which case the maximum length between connections shall not exceed 1,000 feet. The maximum length of 8-inch water mains shall not exceed 2,000 feet between connections to larger feeder mains. Single family residential cul-de-sacs may be served with 4-inch water mains where the 4-inch main does not exceed 200 feet in length, provided all other criteria including minimum pressure constraints are fully met, and all proposed structures will be within 300' of a hydrant as determined by the Village Engineer and Fire Marshal. All transitions in main sizes shall occur at street intersections unless otherwise permitted by the Village Engineer. Main sizes less than 4-inch are not allowed. Any special cases regarding water main sizing shall be submitted to the Village Engineer for approval prior to submission of any construction plans.
- (8) Business, Commercial, Industrial Zoning Districts - Water mains shall be 8-inch and 12-inch, unless larger mains are required as part of the major distribution network, or are otherwise necessitated to meet the fire flow requirements. Eight-inch shall be used only when it completes a good grid and the maximum length of 8-inch lines without connection to a larger feeder main shall be 1,200 feet unless special approval for deviation from this requirement is approved in advance by the Village Engineer.

**c. Needed Fire Flow Calculations (NFF):**

An estimate of fire flow required for a given structure or fire area shall be based on the following ISO formula:

$$NFF = C_i \times O_i \times (X+P)_i$$

where: NFF is the needed fire flow in gallons per minute;  $C_i$  is a Construction Factor that depends on the structure under consideration;  $O_i$  is an Occupancy Factor that depends on the combustibility of the occupancy; and  $(X+P)_i$  is an

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Exposure Factor that depends upon the extent of exposure from and to adjacent structures. (Ref: NFPA "Fire Protection Handbook", 18<sup>th</sup> Edition).

For further information on the formula and its proper application, refer to the NFPA "Fire Protection Handbook", 18<sup>th</sup> Edition or contact the Village Fire Marshal.

Regardless of the calculated value; the fire flow shall not exceed 8,000 gpm for wood-frame or ordinary construction, or 6,000 gpm for noncombustible or fire-resistive buildings; except that for a normal one-story building of any type it may not exceed 6,000 gpm. In all cases, the required fire flow shall not be less than 1,500 gpm with greater amounts where required by the ISO equation and/or the Village-adopted State of North Carolina Fire Code tables unless otherwise modified by the Village Fire Marshal.

The calculated (required) fire flow shall be reviewed by the Village Engineer and Village Fire Marshal and the flows *may* be adjusted as determined appropriate by the Village Fire Marshal for site specific conditions.

**d. Fire Hydrants - Locations:**

- (1) Residential (Single Family) Zoning Districts - Fire hydrants shall be located at each street intersection. In addition, the maximum distance between fire hydrants in residential districts, measured along street centerlines, shall not exceed 500 feet. In all cases, all parts of all buildings shall be within 300 feet of hose run from a fire hydrant.
- (2) Business, Commercial, Industrial, Multi-Family Zoning Districts - There shall be at least one fire hydrant located at each intersection. In addition, the maximum distance between fire hydrants in these districts, measured along street centerlines, shall be 500 feet. All parts of all buildings shall be within 300 feet of hose run from a fire hydrant. Hose run lengths shall be measured along a route not closer than 20 feet from the building(s). All fire hydrants shall have full vehicular access via durable, all weather paved surface meeting the specifications contained within this manual and shall not be located within 30 feet of a structure or the anticipated "collapse zone," whichever is greater. Supplemental hydrant locations shall be as directed by the Village Engineer and the Village Fire Marshal. All FDC's shall be within 50 feet of a fire hydrant.
- (3) Main Size - Water mains supplying fire hydrants shall be 6" or larger. Only one (1) fire hydrant may be fed from a single feed (dead end) 6" water main.

**e. Valves:**

Valves shall be installed on all branches from feeder mains and on hydrant branches according to the following schedule:

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- 3 valves at cross intersections
- 2 valves at tee intersections
- 1 valve on hydrant branches
- 1 valve at "stub outs" for future extensions

In certain cases, the Village may require additional valves to be placed at crosses and/or tees if the addition of a valve will improve the water distribution system's capability to isolate portions of the system or keep existing customers in service during a shut-down.

Main line valves on straight runs between intersections shall be spaced at interval distances not exceeding the following:

<u>MAIN SIZE</u>	<u>MAXIMUM SPACING</u>
6"	600'
8"	800'
12"	1,200'
16" (and larger)	1,600'

However, main line valves should also coincide with fire hydrants and must be within fifty feet of the nearest hydrant.

Gate valves shall be used for water mains through 12-inch size. For water mains 16-inch and larger, use of butterfly valves or gate valves shall be as directed by the Village Engineer.

**f. Cross Connection Control:**

No new service connection to the Village of Pinehurst Water distribution system may be made without the prior approval of the Village Engineer and the MCPUD - Director of Public Utilities, and no connection shall be made to a plumbing system that does not conform to the requirements of the North Carolina Plumbing Code, latest edition.

All residential water meter setters shall be equipped with backflow preventer. The backflow preventer on meter setters shall be an integral dual check valve. Non-residential services shall have a backflow preventers that is either a double check valve assembly or a reduced

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pressure zone backflow preventer, depending upon whether the connection is considered to be a high hazard service as determined by the Village Engineering Department. On fire suppression systems where chemicals are added by the user on site to reduce freezing, pipe corrosion, etc., backflow protection shall be provided by using a Village and USC-approved reduced pressure zone (RPZ), detector type preventer.

Non-residential and irrigation backflow preventers shall be installed outside of the Village's right-of-way in a separate, heated enclosure such as a "Hot Box" or approved equal. The maintenance, testing and repair of irrigation and other non-residential backflow preventers shall be the responsibility of the customer. These units shall be tested annually by an authorized technician on the Village's current approval listing, and the certified test results shall be submitted to both the Village Engineer and the MCPUD Director of Public Utilities. Failure to test and/or maintain non-residential and irrigation backflow preventers will result in termination of water service.

**g. Services:**

- (1) General - Each connection to the Village's water distribution system shall be metered. Multiple occupancy buildings may be master metered or the individual units metered separately. Where "gang" meters are installed, permanent placards shall be provided inside the meter box to indicate the unit served by each meter. The only exception to this metering requirement shall be in the case of building fire sprinkler systems, where such services shall be equipped with a detector meter on the backflow prevention device. Where irrigation or other service connections are requested for uses that do not return water to the Village's sanitary sewer system, a separate meter may be installed.

Water services shall be extended from the main to a meter box located within the street right-of-way or within an easement. All taps from existing mains shall be made by the MCPUD in accordance with their adopted Fee Schedule. In the event taps are to be made from a new main installed by a developer, the installation of the tap, service line, and meter box shall be the responsibility of the Developer or the property owner, and shall be performed in the presence of the Village's inspector and the MCPUD inspector.

MCPUD shall provide and install all water meters subject to the Developer or property owner having installed specified improvements or guaranteed their installation and having paid all required fees.

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- (2) Multiple Meters - Multiple meters on branched services are acceptable for multiple occupancy buildings, providing they conform with the following table:

<u>SIZE OF INDIVIDUAL SERVICE (METER)</u>	<u>SIZE OF FEEDER SERVICE</u>	<u>NUMBER OF BRANCHES (MAX.)</u>
3/4"	3/4"	2
3/4"	1"	4
3/4"	1 1/2"	5-10

- (3) Meter Installation – MCPUD shall provide and install the water meters subject to the following conditions:

- Developer (or property owner) has paid prescribed meter fee
- Developer has installed all specified improvements to the satisfaction of the Village or provided the required financial guarantees for their installation as prescribed herein and elsewhere in the Village's Standards, Codes, and Ordinances and all applicable MCPUD requirements.

- (4) Backflow Preventer - Installation - Reduced Pressure Zone (RPZ) backflow preventers shall be installed above ground to ensure positive drainage. The installation shall include a heated, insulated enclosure such as a "Hot Box" or approved equal. On fire services, a touch pad type meter shall be provided for reading the detector meter. Double Check Valve (DCV) backflow preventers may be installed in an underground vault provided adequate drainage and access provided to ensure proper testing and maintenance can be easily conducted.

**h. Air Release Valves:**

Air release valves shall be provided on water mains 12" and larger at locations determined by the Village Engineer where grade changes are likely to result in air pockets. Air Release valves may be required by the Village Engineer on smaller mains if felt to be in the best interest of the Village's water system. All Air release valves shall be of a make and model approved by the Village Engineer and installed in accordance with the Village's Standards. Three (3) copies of all manuals, parts listings, and other manufacturers documentation as well as one complete set of repair parts shall be provided to the Village for all installed ARV's prior to acceptance by the Village of the main served by said ARV.

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**6.03 Materials**

**a. General Requirements - Water Distribution Mains:**

All water mains to be installed within the jurisdictional limits of the Village of Pinehurst shall be ductile iron pipe or C-900 PVC pipe. All water mains located within the Village Commercial Zoning District shall be ductile iron pipe. All "transmission" mains (defined as mains that customers generally will not tap into) that are located under asphalt shall be ductile iron pipe.

**b. Ductile Iron Pipe:**

All ductile iron pipe shall be designed as per AWWA Standard C150 for a minimum working pressure of 200 psi, laying condition 1. Pipe up to and including 12" diameter pipe shall be Pressure Class 350 (min.), while pipe greater than 12" diameter shall be at least Pressure Class 250. The Village Engineer may require heavier class pipe on a case-by-case basis. Pipe shall be manufactured in accordance with all applicable requirements of AWWA Standard C151.

Generally, pipe joints shall be of the push-on type as per AWWA Standard C111. Mechanical or special joints may be used as project requirements dictate or as required by the Village Engineer. Pipe lining shall be cement mortar with a seal coat of bituminous material, all in accordance with AWWA Standard C104.

Ductile iron pipe shall be as manufactured by Griffin, U.S. Pipe, American, or Clow, and shall be furnished in 20 foot lengths.

**b2. C-900 Polyvinyl Chloride (PVC) Pipe:**

Polyvinyl Chloride (PVC) Pipe shall comply with applicable AWWA and Uni-Bell standards. PVC pipe shall be rigid polyvinyl chloride with integrally formed, factory fabricated bell, for rubber type joint rings. It shall be suitable for all conditions imposed by Plan locations and for a maximum working pressure of 200 psi, plus 100 psi surge allowance at 73 degree F. Pipe shall be Type 1, Grade 1, made from clear virgin material and shall conform to the requirements of AWWA Specifications C-900-07 or latest revision, DR18 class 235. These are the minimum designs allowed for the system. The Design Engineer shall verify if potential operating pressure are in excess of these ratings and if additional pressure ratings are necessary.

All pipe shall bear the National Sanitation Foundation Seal of Approval for potable water, the manufacturer's name, and class of pipe. Laying lengths shall be 20-feet except that random lengths may be furnished for special connections and other uses. Pipe shall be furnished in factory-packaged units. Provisions shall be made for expansion and contraction to each joint, through the rubber gasket and pipe bell.

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Iron fittings shall be provided for PVC pipe conforming to Section 6.03 (i) of these specifications.

All PVC pipe shall be installed with #12 coated copper tracing wire and magnetic detector tape.

**c. Fire Hydrants - Types & Fire Sprinkler System Connections:**

Fire hydrants shall be of the compression type meeting AWWA C502-80 standards, designed for a minimum working pressure of 150 psi and a hydrostatic test pressure of 300 psi with the valve in both the open and closed positions.

All hydrants shall be equipped with two 2-1/2-inch nozzles and one 4-1/2 inch pumper nozzle. Each nozzle shall be bronze with cast iron caps secured thereto with a suitable steel chain. Nozzles shall have National Standard threads.

The hydrants shall be open-left and equipped with a pentagon-type operating nut (National Standard) measuring 1-1/2 inches from point to flat. Hydrants shall be of the "dry top" type with the upper rod threads completely enclosed in a sealed grease or oil chamber, equipped with "O" ring seals and a Teflon thrust bearing. All hydrants shall be of the "open left" or counter-clockwise type and shall be so marked.

The hydrant valve opening shall be of sufficient size to insure such flows and corresponding minimum losses as set forth by the American Water Works Association. The minimum valve opening shall be 4-1/2 inches.

The hydrants shall have a 6-inch shoe or boot, mechanical joint. Hydrants shall have bronze to bronze threads provided between the hydrant seat or seat ring and the seat attaching assembly. The hydrant shall be of the "safety" type so that, if the upper barrel is broken off, the hydrant valve will remain closed and reasonably tight. All hydrants shall be furnished with barrel and stem extensions as required by the final field location to provide a nominal minimum bury of three feet, six inches (3'-6"), or greater, if indicated on the Drawings.

Hydrants shall be Mueller "Super Centurion", American "Mark 73", Clow "Medallion" or Kennedy K-81 D "Guardian."

A hydrant shall be located within 50 feet of all automatic fire sprinkler system connections. The Fire Sprinkler System connection, also known as the "Fire Department Connection" (FDC) shall be a 5-inch "Storz" connection, located outside of the anticipated collapse zone of the building/structure to be served. The Fire Marshall shall determine the final location for all FDC's. The Storz connections shall be installed in accordance with the Village's Standard Details. All piping for the fireline from the Village's water supply main into the building and for that serving the FDC shall be ductile iron pipe meeting the specifications contained herein unless otherwise approved in writing by the Village Engineer.

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**d. Gate Valves:**

- (1) 12-inch and Smaller - Gate valves 12-inch and smaller shall be of the resilient wedge type conforming to AWWA Standard C-509. They shall be designed for a working pressure of 200 psi. The gate valves shall be open-left, non-rising stem, gray cast iron or ductile iron body, with O-ring seals and a 2" square operating nut.
- (2) 16-inch and Larger - Gate valves 16 inches and larger shall be designed for a working pressure of 150 psi and shall be hydrostatically tested to 300 psi. Sixteen-inch gate valves shall meet all other requirements as stipulated above for valves 12-inch and smaller. Gate valves larger than 16-inch size shall be manufactured and supplied with other special features, such as gears and by-pass, etc., as may be recommended by the Engineer.
- (3) Tapping Valve - All tapping valves shall conform to the Standard Specification for gate valves, 12 inches and smaller, as noted above, except that the inlet end shall be flanged, faced and drilled per ANSI B16.1 for 125 lb. standard. The outlet end shall be of the mechanical joint type capable of receiving a standard tapping machine.
- (4) Manufacture - Acceptable valves are as follows:

Resilient Wedge Gate Valves (AWWA C-509) - shall be American, Kennedy, Mueller, or Waterous.

**e. Butterfly Valves:**

Butterfly valves shall be used in lieu of gate valves for water mains 16-inches or greater.

Butterfly valves shall meet or exceed AWWA Specification C-504 for Class 150-B, latest revision.

Valve bodies shall be of close grain cast iron conforming to ASTM designation A-126, Class B. Valve disc shall be cast bronze or cast iron with bronze or stainless steel sealing surfaces. The disc shall have adjustable stops preset by the factory and the seats shall be natural rubber.

Butterfly valves shall be open-left, manually operated with the operator assembly meeting all requirements of Section 12, AWWA C-504. Operating torquers shall comply with Table 1 of C-504 for Class 150-B valves. Valves shall have mechanical joint ends and a 2-inch square operating nut, unless otherwise indicated on the approved project drawings.

**f. Valve Boxes:**

All valve boxes shall be of the adjustable type equal in quality and workmanship to Vulcan V-8470, US Foundry 7510 or Southern Foundry SF-126 (slip type). Valve boxes shall be cast from close-grained gray iron, in three pieces consisting of a lower base piece, upper

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part and cover. The lower base piece shall be flanged at the bottom to fit around the valve and shall also be flanged on the lower end and of such size as to telescope over the lower part with the upper end cast on the upper surface in raised letters the word "WATER." Valve boxes shall be painted prior to shipment with a coat of protecting asphaltic paint.

The use of PVC or soil pipe for valve box extensions shall not be permitted.

**g. Tapping Sleeves:**

Tapping sleeves used to tap any existing main, regardless of main material, within the Village's service area shall conform to the following:

- (1) Stainless Steel - Stainless tapping sleeves shall be the "wrap around" type constructed from welded, Type 18-8 stainless steel. The flange shall be machined and drilled to accept a standard tapping valve. A test plug shall be provided on the branch stub. Stainless steel tapping sleeves as manufactured by Ford, Rockwell and Romac are acceptable. Following installation and tapping, the coupon shall be presented to the Village's representative.

**h. Blow-Off Assemblies:**

Blow-off assemblies shall be constructed in accordance with the Village Standard Detail for Blow-Off Assemblies or as directed by the Village Engineer.

**i. Iron Fittings:**

Iron fittings shall be manufactured in accordance with AWWA C-110, latest revision and addendum. The fittings shall be tested and the manufacturer shall provide certified test results upon request by the Village Engineer. This testing shall include hydrostatic proof testing of the fittings.

All fittings shall be cast iron or ductile iron and shall have a minimum working pressure rating of 250 psi and a minimum iron strength of 25,000 psi.

Iron fittings shall be all-bell mechanical joint conforming to AWWA C-111. Where restrained joints are indicated, special restraining glands, equal in all respects to GripRing<sup>TM</sup>, as manufactured by Romac Industries; Megalug<sup>TM</sup> Series 1100, as manufactured by EBAA Iron Sales; or Uni-Flange Series 1300, shall be furnished. Restraining glands utilizing only set screws clamping directly upon the pipe wall shall not be used.

All fitting interiors shall be cement mortar lined, with bituminous seal coat in accordance with AWWA Standard C-104 and the outside shall be bituminous coated.

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**J. Water Service Accessories:**

- (1) General Requirements - Service saddles shall be used for taps to all water mains. Direct taps are not allowed. Service connections larger than 2" on existing water mains shall be made by means of a tapping sleeve and valve. On new water mains, a "tee" and gate valve shall be utilized for water services greater than 2".

For services up to 2" being served by new mains, all water service tubing shall be Type 'K' copper. All copper services shall be of the following standard sizes: ¾", 1", 1-1/2", or 2". Ductile iron pipe shall be used for services larger than 2". For services up to 2" being installed by the Village's PUD on existing mains, either Type 'K' copper or CTS Polyethylene (PE) service lines may be utilized. All PE service lines shall be of the following standard sizes: ¾", 1", 1-1/2", or 2".

Multiple or 'gang' meters may be installed only in accordance with the Standard Details.

The Contractor shall furnish samples of all service accessories proposed for use to the Village Engineer and MCPUD for approval and to demonstrate compliance with these Specifications. Samples shall include saddles, corporation stops, meter setters, meter boxes, etc.

- (2) Service Saddles - Service saddles shall be all bronze with double bronze straps and with a neoprene "O"-ring gasket attached to the body. The outlet shall be AWWA tapered threads for direct connection to the corporation stop. Service saddles shall be Mueller H-16100 Series, Ford Style 202-B, or approved equal.
- (3) Corporation Stops - Corporation stops shall be designed and manufactured in accordance with AWWA Standard C800, latest revision. Corporation stops shall be equipped with an AWWA standard tapered thread on the inlet end and a compression connector on the outlet end for connection of plain end copper tubing. The stops shall be fully shop tested for leaks with air pressure under water. The stops shall have a minimum rated working pressure of at least 100 psi, with a safety factor of at least 2 times the rated working pressure. No 'ground key' corporations shall be used. The corporation stops shall be as manufactured by Mueller, Ford, or Village-approved equal.
- (4) Copper Service Tubing - Copper tubing shall be Type K soft copper tubing conforming to ASTM Standard B88. The longest available length of service line should be used with no unions. As an example, for a ¾ inch service, connection, no union shall be used in the installation of a service of 60 feet or less. For ¾ and 1 inch, only one union will be allowed for each 100 foot section or fraction thereof. Unions shall be made with a pack joint fitting with a retaining screw.
- (5) PE Service Tubing - shall meet in full AWWA C-901, and be clearly marked with the following data: Nominal size, rated operating pressure at 73.4 degrees F, type of pipe ("water service pipe"), material designation code, Date Code – month, year, day, Manufacturer's brand name, National Sanitation Foundation logo indicating approval for

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potable water usage and compliance with ASTM Specifications, plant location code, and ASTM D-2239 approval.

- (6) Meter Boxes for 3/4-Inch & 1-inch Services - shall be cast iron, equivalent to Vulcan V-8403-3, Southern Foundry SF-120 or equal. A minimum of 3" of No. 67 washed stone shall be placed in the bottom. A 1" diameter hole shall be provided in the cover for installation of a "touch read" pad.
- (7) Meter Setting Equipment for 3/4" and 1" Services –
- a. Copper Meter Setter - 15" high with a lockable angle ball valve on the inlet and ASSE approved dual check valve on the outlet. Connections shall be of the compression type for plain end copper tubing (not of the "pack joint" type). Setters shall be either Ford or Mueller.
  - b. PE Meter Setter – 15" high with a lockable angle ball valve on the inlet and ASSE approved dual check valve on the outlet. Connections shall be of the compression type with a stainless steel insert required for use with any fitting that compresses the outside of the service line to hold the line in place. Setters shall be either Ford or Mueller.
- (8) Meter Boxes for Services Larger than 1-inch - shall be as shown on the Standard Detail 6.04 or 6.05, as applicable. A 1" diameter hole shall be provided in the cover for installation of a "touch read" pad.

**k. Backflow Preventers:**

The class of required backflow preventer shall be, at a minimum, that set forth in the NCDEH "Greenbook". The Village may require higher levels of protection on a case-by-case basis where deemed needed by the Village Engineer and/or Director of Public Utilities. A listing of approved devices is shown below. Additional devices may be approved upon written request being made to the Village Engineer.

(1) Reduced Pressure Zone Backflow Preventers & Enclosures

Reduced pressure zone backflow preventers, where required by the NCDEH Standards for high hazard connections, shall be one of the following devices:

Febco            - Model 825, 825Y or 845

Watts            - Model 009 or 909

Wilkins          - Model 575 or 575M

Reduced pressure backflow preventers shall be installed above ground in an insulated aluminum or fiberglass enclosure with an integral heating unit. The enclosure shall have a hinged access door and a removable top. Screened relief ports shall be

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provided at each end of the enclosure. The unit shall have stiffening ribs and shall be insulated with 2" of fiberglass insulation on the interior. The unit shall be installed on a 4-inch thick (minimum) concrete pad. The enclosure shall be "HOT-BOX" as manufactured by Commercial Insulation Company, Inc. of Jacksonville, Florida or Village-approved equal.

**(2) Double Check Valve Assemblies**

Double Check Valve Assemblies shall be one of the following devices:

- Febco - Model 865 or 805Y
- Watts - Model 007 or 709
- Wilkins - Model 5550 or 550M

Double check valve backflow preventers may be installed either above ground in an insulated aluminum or fiberglass enclosure with an integral heating unit or below ground in either a precast concrete or brick vault with proper drainage and full opening access to the ground surface.. The enclosure shall have a hinged access door and a removable top. Screened relief ports shall be provided at each end of the enclosure. The unit shall have stiffening ribs and shall be insulated with 2" of fiberglass insulation on the interior. The unit shall be installed on a 4-inch thick concrete pad. The enclosure shall be equivalent to "HOT-BOX" as manufactured by Commercial Insulation Company, Inc. of Jacksonville, Florida.

- (3) Fire Sprinkler Service** - All backflow preventers utilized on fire sprinkler services shall be of the detector type with appropriate backflow preventer on the meter branch. The meter shall be equipped with a touch pad type remote reader, mounted through the enclosure. Enclosures shall be similar to that previously specified.

**I. Air Release Valves:**

Air release valves shall be equivalent to Apco No. 200, Crispin PL-10 or PL-20 or Empire Fig. 912. Air release valves shall be located inside a precast manhole in accordance with the Village Standard Details and the manhole cover shall be marked "WATER". Air release valves shall be required on all mains 12 inches diameter and greater at all points where the change in vertical grade from sag to crest is equal to or greater than 15 feet. Air release valves may also be required at other points and along mains of smaller size where in the opinion of the Village Engineer such additional air release valves will be to the benefit of the distribution system.

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**6.04 Installation of Water Mains, Fittings, Valves & Appurtenances**

**a. Unloading & Storage of Materials:**

The unloading and loading of pipe, fittings, valves, and related accessories shall be performed with care so as to avoid any damage to these materials. All such materials shall not be stored directly on the ground, but shall be on pallets, or other suitable supports, so as to prevent the entry of mud and debris into the pipe or other materials. Contractors shall also endeavor to store these materials in accordance with any special practices as may be recommended by the manufacturer.

**b. Trench Excavation:**

Water main trenches shall be excavated to such depth that the pipe will have a minimum cover of at least 3 feet as measured from final, finished grade, based on the approved typical sections and/or grading plans to the crown of the installed pipe. Pipes greater than 12" diameter shall have a minimum of 4 feet of cover unless otherwise directed by the Village Engineer. In general, installation depth shall be limited to a maximum of 5' in depth unless otherwise approved by the Village Engineer due to conflicts with other subsurface structures. Where water mains are installed in new subdivision streets, the depth of cover shall be measured from the finished subgrade.

Trench width shall be a minimum of 16 inches plus the outside diameter of the pipe barrel and a maximum of 24 inches plus the outside diameter of the pipe barrel, unless approval for deviation from this requirement is granted by the Village Engineer.

Where water main trench excavation is in rock, the rock shall be excavated to a minimum depth of 6 inches below the bottom of the pipe. This space shall be filled with No. 67 stone or other material approved by the Village Engineer. Rock excavation requirements for water mains shall conform to requirements outlined in this manual.

In trenches where water is present or where dewatering is required, the trench bottom shall be stabilized with No. 67 stone. When material of poor supporting value (i.e. "muck") is encountered in the trench, it shall be removed and replaced with No. 67 stone or other material approved by the Village Engineer.

All water main trenches shall be protected from the entrance of surface water. Any water observed in the trench shall be promptly removed by pumping, provided that water pumped from trenches is directed to suitable erosion control devices to prevent deposition of sediment into nearby streams, ponds, etc. The Contractor shall use all means necessary to prevent the entrance of water, including the construction of temporary berms or dikes.

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**c. Pipe Installation:**

- (1) General - All water main pipe shall be clean before installation. Any dirty pipe shall be thoroughly swabbed by the Contractor. Pipe showing evidence of oil or grease contamination shall not be used.

Pipe laying and jointing shall be accomplished in strict accordance with the recommendations of the pipe manufacturer. Care shall be taken during pipe installation so as not to exceed the maximum joint deflection as prescribed below .

**MAXIMUM JOINT DEFLECTION IN INCHES**

<u>Pipe Size</u>	<u>MJ</u>	<u>Push-On-Joint</u>
6"	27"	19"
8	20	19
10	20	19
12	20	19
14	13	11
16	13	11
18	11	11
20	11	11
24	9	11

Open ends of the pipe shall be plugged at all times that pipe laying is not in progress.

Bell ends shall generally face the direction of laying. Where water mains are installed on an appreciable slope, the Village Engineer may require that the bell ends face upgrade.

- (2) Pipe Locating Materials - All water main shall be installed with a metallic detector tape in accordance with the Village's Standard Details. Magnetic detector tape shall be bonded to all intermediate valve boxes for continuity. The detector tape shall be as manufactured by Allen or Reef Industries. The Village may also require use of copper locating wire with each end exposed to the surface at a valve box or electrically connected to the valve box to allow for alternate means of tracing and locating.

**d. Pipe Bedding:**

The barrel of the pipe shall bear uniformly upon the supporting trench bottom at all times. The foundations of water pipe shall conform to the minimum requirements described below and as described in Section 6.04(b), above.

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- (1) Pipe - shall rest on a firm and stable flat bottom trench with bell holes excavated such that the pipe rests uniformly on its entire barrel length.

**e. Backfilling:**

All water mains shall be backfilled in accordance with these specifications and the Village's Standard Details as applicable.

No rocks, boulders, or stones shall be included in the backfill material for at least two (2) feet above the top of the pipe. In non-traffic areas, the backfill shall be placed in lifts not exceeding 12" and compacted to 90% of maximum dry density (AASHTO T-99). In traffic areas, the final backfill shall be placed in 6-inch layers, and compacted to 95% of maximum dry density (AASHTO T-99) to a point 12" below subgrade. The top 12" shall be compacted to 100% of maximum dry density (AASHTO T-99).

Where deemed necessary, the Village Engineer may require compaction tests to be performed (at the Contractor's expense) on backfill placed in water main trenches.

**f. Setting Valves & Valve Boxes:**

Valves shall be set at locations shown on the plans with care being taken to support the valve properly and to accurately position the valve box over the operating nut of the valve. Where located within paved areas, the box shall be adjusted to finished street grade and a concrete pad (2' square and 6" thick) shall be placed around the valve box with the valve box protruding above the concrete a distance equal to the final pavement thickness. When valves are located in street right-of-way, but out of pavement, the boxes shall be adjusted to finish grade and a concrete block 2 feet square and 6 inches thick shall be poured around the box one-half inch from the top. When valves are located outside of street rights-of-way, the boxes shall be adjusted 6 inches above the finished grade, and a concrete block 2 feet square and 6 inches thick shall be poured-in-place concrete blocks, and upon approval of the Village Engineer, the Contractor may use a 27-inch diameter precast concrete valve box pad, Brooks Products, Inc. or approved equal.

**g. Setting Fittings:**

Fittings shall be installed at the location indicated on the drawings with care taken to insure that joints are fully homed and that the fittings are fully and properly supported.

**h. Reaction Blocking:**

Fittings shall be blocked to solid, undisturbed earth with concrete. This reaction blocking shall be of sufficient size to prevent the fitting from blowing off the main at maximum test pressure, and as indicated in the Standard Details.

All dead end lines shall be plugged and anchored by using pipe, thrust collars and blocking as shown in the Standard Details.

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**i. Setting Blow-Offs:**

Blow-offs shall be installed on all dead end lines as noted on the Plans. The blow-off assembly shall be constructed in accordance with the Standard Details.

**j. Setting Hydrants:**

Fire hydrants shall be installed at all points indicated on the drawings and in strict accordance with the standard detail. Hydrants shall be set plumb with the steamer nozzle facing the street. The area surrounding the hydrant shall be generally flat and clear for a distance of 3 feet in each direction of the hydrant. The traffic flange shall be 2" above the finish grade. New hydrants shall be factory or field painted to match existing Village hydrants. Hydrants shall be lubricated upon completion of installation.

**k. Tapping Existing Water Mains:**

Where new water mains are to be connected to an existing water main by tapping, the Contractor shall exercise extreme caution in locating the existing main. The existing main shall be carefully and completely cleaned prior to installing the tapping sleeve or saddle. All surfaces of the existing main encompassed by the sleeve, along with the inside of the sleeve and the inside of the tapping valve, shall be disinfected during installation by swabbing with a chlorine solution or dusting with calcium hypochlorite (HTH) powder. Once these surfaces are disinfected, the Contractor shall not allow dirt, mud, trench water or any other contaminants come in contact with these surfaces.

Once the tapping sleeve and valve are installed on the main, a pressure test shall be performed by applying 100 psi compressed air to the test port for a period of at least 15 minutes. During this period, all joints shall be mopped with a soap/water solution to locate leaks. This test shall be performed in the presence of the Village Engineer and the MCPUD inspector.

Upon satisfactory completion of the installation and pressure testing of the tapping sleeve and valve, the existing main shall then be tapped using a tapping device equipped with a pilot drill and shell type cutter which retains the pipe coupon. Once the tap is complete and the tapping machine removed, the tapping valve shall be cleaned of any cuttings and then kept plugged until the water main is installed.

**l. Inspection:**

All fittings, valves, blocking, pipe, and other appurtenances shall be inspected by the Village Engineer and MCPUD inspector prior to backfilling.

**6.05 Installation of Steel Casing Pipes by Boring & Jacking**

The installation of steel casing pipe across designated roadways, railroads, etc. for the placement of water mains shall conform to the specifications presented in Section 7.16 of these Specifications.

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**6.06 Cutting & Replacement of Existing Pavements**

The open cutting of existing pavements may be permitted for water line installations across designated Village streets and State maintained roads. The cutting and replacement of such pavements shall conform to the specifications presented in Section 7.17 of these Specifications. Prior written approval shall be secured by the encroaching party prior to initiation of any work.

**6.07 Water Service Connections**

Water services shall be installed using only materials as specified herein under sub-section 6.03.

Taps on new mains to serve new development activities shall be made as part of the overall main construction and shall be pressure tested and chlorinated at the same time as is the new main.

Services larger than 2 inches shall be made by using a tapping sleeve and valve, or by installing a tee and branch valve.

**6.08 Water Meter Installations**

Water meter installations shall conform to the Village's Standard Details for meter sizes through 4-inch. All meters shall be installed by the MCPUD following all inspections and payment of all required fees and charges.

Installations larger than 4-inch shall require a special detail and are subject to the review and approval of the Village Engineer and the MCPUD - Director of Public Utilities on a case by case basis. Such installations shall be made using ductile iron pipe, complete with bypass line. The installation may be similar to that required for a 4-inch meter except that the vault size shall be increased accordingly.

**6.09 Preliminary Filling and Flushing**

No valve in the existing Village of Pinehurst Water System shall be operated without giving a minimum 24 hours notice to the Village Engineer and to the MCPUD. No Contractor or other non-Village personnel shall at any time operate any valve on the Village's system. (See Section 6.13)

New or empty water mains shall be slowly filled with water at a rate that will allow complete evacuation of air from the line.

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- Each valved section of the completed main shall be flushed prior to chlorination as thoroughly as possible with water pressure and outlets available. If no hydrant is provided at the end of the main section, a tap shall be installed at the main section extremity, large enough to develop a velocity in the main of at least 2.5 fps. The flushing operation shall be done after the pressure test has been made. Each valved section of the newly laid pipe shall be flushed separately. Flushing sites shall have adequate drainage and shall be approved by the VILLAGE. The Contractor shall provide hoses, pipe, etc. to divert water from flushing operations into drainageways to avoid damage to yards and erosion.

**6.10 Hydrostatic Testing**

No valve in the existing Village of Pinehurst Water System shall be operated by any party other than authorized Village or MCPUD employees. A minimum 48 hours notice shall be provided to the Village Engineer and the MCPUD for all valve operations requests related to testing and filling of new mains. (See Section 6.13)

The line shall be tested to a pressure of 200 psi for a duration of 24 hours. The pressure gauge used in the hydrostatic test shall be calibrated in increments of 5 psi or less. At the end of the test period, the leakage shall be measured with an accurate water meter.

Pipe size and the corresponding allowable leakage (gal.) per 1000 feet of pipe are as follows:

<u>PIPE SIZE</u>	<u>ALLOWABLE LEAKAGE/1000 FT. (Gallons)</u>
4"	0.85
6"	1.28
8"	1.70
12"	2.56
16"	3.40
20"	4.24
24"	5.10

All visible leaks at pipe joints, services, and at any appurtanances are to be repaired regardless of the amount of leakage.

**6.11 Disinfection**

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No valve in the existing Village of Pinehurst-MCPUD Water System shall be operated by any person other than authorized Village or MCPUD Employees. All non-emergency requests for valve operations shall require at least 48 hours notice to the Village Engineer and MCPUD. (See Section 6.13)

All additions or replacements to the Pinehurst water system shall be chlorinated and must pass a bacteriological test before being placed into service. Such chlorination must take place under the supervision of both the Village Engineer and the MCPUD inspector. The utility contractor performing the chlorination of the main shall be responsible for any health or environmental damage that might occur as a result of his operations.

Chlorination of a completed line shall be carried out in the following manner:

- (a) Taps will be made at the control valve at the upstream end of the line and at all extremities of the line including valves. The taps shall be strategically located so as to allow HTH solution to be fed into all parts of the line.
- (b) A solution of water containing high-test hypochlorite (70%) available chlorine shall be introduced into the line by regulated pumping at the control valve tap. The solution shall be of such a concentration that the line shall have a uniform concentration of 50 ppm total chlorine immediately after chlorination. The chart below shows the required quantity of 70% HTH compound contained in solution in each 1000 feet of line to produce the desired concentration of 50 ppm.

<u>PIPE SIZE</u>	<u>POUNDS OF HIGH TEST HYPOCHLORITE (70%) PER 1000 FEET OF LINE - TO PRODUCE 50 PPM</u>
6"	0.88
8"	1.56
10"	2.42
12"	3.50
16"	6.22

The HTH solution shall be circulated in the main by opening the control valve and systematically manipulating hydrants and taps at the line extremities. The HTH solution must be pumped in at a constant rate for each discharge rate in order that a uniform concentration will be produced in mains.

HTH solution shall remain in lines for no less than 24 hours, but longer than 24 hours if so directed by the Village Engineer and/or the MCPUD.

Extreme care will be exercised at all times to prevent the HTH solution from entering existing mains.

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**6.12 Bacteriological Sampling**

Free residual chlorine after 24 hours shall be at least 10 ppm, or the Village Engineer will require that the lines be re-chlorinated.

No valve in the existing Village of Pinehurst Water System shall be operated without giving a minimum 48 hours notice to the Village Engineer and the MCPUD. (See Section 6.13)

Flushing of lines may proceed after 24 hours, provided the free residual chlorine analysis is satisfactory. Flushing shall be continued until an orthotolidine check shows that the lines contain only the normal chlorine residual. The flushing operation shall be monitored at all times by the Contractor.

Within 24 hours after flushing is complete, the Contractor shall collect samples in the presence of the Village Engineer for bacteriological analysis testing to an independent laboratory approved by the NC Department of Environment & Natural Resources. The sampling points shall be identified on the Record Drawings and the sample ID indicated. The Village Engineer and the MCPUD authorized representative shall observe the collection of samples. Copies of the test results shall be mailed directly to the Project Engineer, MCPUD, and the Village Engineer.

In the event that three successive bacteriological tests fail, that section of the main shall be re-chlorinated by the Contractor and new test performed prior to moving to the next section of the main.

No new water lines may be placed into service until such time as final approval to place into service has been granted by the Village, MCPUD, and NCDEH. The Village will not grant approval to service for any installation that has not completed all construction punchlist items, submitted approved record drawings in accordance with this manual, submitted all required certifications, and successfully completed all testing & inspection requirements of the Village.

**6.13 Operation of Existing Valves**

No valve in the Village of Pinehurst's existing distribution system shall be operated by any party other than authorized Village or MCPUD employees. This includes the operation of tapping valves installed as part of the improvements.

New water mains shall remain valved off unless filling or flushing operations are under way. No more than one valve shall be opened at any time between the new and existing mains. Valves shall be closed immediately upon completion of filling and flushing operations and shall remain closed until the new mains have been tested and deemed ready for service.

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**6.14 Water Use During Construction**

The Contractor shall make arrangements with the MCPUD for water to be used in the filling, testing, flushing, etc. of newly installed water mains. Proof of water use account arrangements with the MCPUD shall be provided by the Contractor to the Village Engineer prior to requesting any inspections that require use of water for the main. Proof of payment for all water used in the installation, testing, and approval of new mains shall be provided to the Village Engineer by the Contractor prior to final plat approval. All work requiring water shall be carried out in a manner, which will minimize the volume of water required. Water for construction activities other than those associated with new public water mains shall be purchased from the Village or supplied by the Contractor. Contact the MCPUD for information on purchasing water, account setup for construction water, and for approved hydrant meter arrangements.

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**SECTION 7 - SANITARY SEWERS**

**7.01 Design**

**a. General Requirements:**

Sanitary sewer extensions shall comply with the design guidelines set forth herein as well as the minimum design criteria set forth by the Division of Water Quality of the NC Department of Environment & Natural Resources. In the event of a discrepancy, the more stringent requirements will apply.

At the time these specifications were prepared, waters classified as WS-II and WS-III by the Division of Water Quality of the NC Department of Environment & Natural Resources were present in the Pinehurst service area. Hence, for sanitary sewers constructed in these areas, the requirements set forth for constructing sewers adjacent to waters in one of these classifications shall also apply.

**b. Location:**

All public sanitary sewer mains shall be within dedicated street rights-of-way or dedicated sanitary sewer easements. When sanitary sewer mains are installed in street rights-of-way, they shall be located where practical, in the south or west side of the pavement. All sanitary sewers shall be extended to all upstream property lines to readily enable future connection to adjoining property.

On dead end sewers, defined as those which can not be further extended upstream due to topographical constraints, the sewer main shall extend to a point where the terminal manhole is contiguous to the most upstream lot being served. In streets, the terminal manhole shall be inside the lot line extended, so as to be within the street frontage of the lot being served.

**Note: Lesser widths may be allowed by the Village Manager for retrofits of existing facilities and in extenuating circumstances.**

Minimum widths of permanent sanitary sewer easements, for public and private sewer mains, are:

<u>Diameter of Sewer</u>	<u>Minimum Permanent Easement Width</u>
8" & 10"	20 feet wide
12" & Larger	30 feet wide

Sewer mains shall be centered in the easement. Where any sewer exceeds 10 feet in depth, the minimum easement width easement shall be increased in width by two times the depth (in feet) in excess of 10 feet, rounded up to the nearest 5 feet. Extra width easements shall extend for the entire segment (i.e. manhole to manhole). Off street sewer

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easements shall have a terraced, graveled path 20 feet wide, with a maximum cross slope of 5%, to allow access by maintenance vehicles. Culverts meeting Village Standards shall be provided at stream crossings so that each manhole is accessible. All easements shall be accessible from public roadways, or 30 foot wide access easements shall be provided. Sanitary sewer easements shall not overlap with drainage easements. No permanent building structures of any kind are allowed within the sewer easement. A gate shall be provided in any fences constructed within easements for maintenance access. Any improvements constructed within Village sewer easements are subject to removal in the event that access is required. If such obstructions are removed by the Village, replacement and/or repair of said obstruction shall be the responsibility of the encroaching property owner.

Proposed sewers paralleling a creek or drainage way shall be designed to a proper depth to allow lateral connections to be installed beneath the drainageway bottom elevation. The top of the sewer pipe should be at least 3 feet below the stream bed elevation. The centerline of a main paralleling a creek should be a minimum of 25 feet from the top of the closest creek bank, edge of impoundment, unless a lesser separation is approved by the Village Engineer due to special site conditions or constraints. Sanitary sewers shall not be installed under any part of an existing impoundment or beneath any area to be impounded.

Sanitary sewer mains and services crossing beneath drainageways shall be ductile iron, and shall cross no less than 3 feet below the bottom of the drainageway. The pipe shall be wrapped in 6 mil PE film and encased in concrete for the entire crossing, and the encasement shall protrude into the creek banks for a distance of 10 feet on each side. Crossings shall be perpendicular to the centerline of the drainageway. Banks disturbed shall be stabilized and protected from erosion.

Sanitary sewers shall be laid at least 10 feet laterally from existing or proposed water mains unless the elevation of the top of the sewer is at least 18 inches below the bottom of the water main with a horizontal separation of at least 3 feet.

Where a water main and a sanitary sewer cross, and the vertical separation is less than 18 inches, or the water line passes under the sewer, both the water main and sewer shall be ductile iron pipe, equivalent to water main standards for a distance of 10 feet on each side at the point of crossing. The sewer shall be ductile iron pipe for the entire segment - pipe transitions are allowed only at manholes.

Sanitary sewers shall have the top of pipe at least 12 inches below the bottom of storm sewer pipe when the horizontal separation is 3 feet or less from existing or proposed storm sewer. Where a sanitary sewer and a storm sewer cross, and the vertical separation is less than 12 inches with the sanitary below the storm or the sanitary is above the storm, the sanitary sewer shall be ductile iron pipe.

**c. Depth of Cover:**

All sanitary sewer mains in non-traffic areas shall be installed with a minimum cover of 4 feet measured from the finish grade to the top of the pipe. In non-traffic areas, lesser cover

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may be allowed with the prior approval of the Village Engineer, provided ductile iron pipe is used. In traffic areas, the minimum depth of cover shall be 5 feet measured from finish subgrade to the top of the pipe. In all areas in which flotation is possible, anti flotation measures satisfactory to the Village Engineer shall be specified and installed.

The depth of sewer mains shall be great enough to serve adjoining property, sufficient to meet both the Village's minimum depth standards and to allow for sufficient grade on the service line. Service connections are to be into manholes or into the top quarter of sewer mains. No service connections may be made in any portion of the manhole from the cone section to the manhole frame. All services connection larger than 4 inches shall be made at a manhole.

For sewer mains installed 14 feet deep or more, additional special bedding details will be required. These details must be provided to and approved by the Village Engineer prior to installation.

**d. Construction Drawings:**

Construction drawings for sanitary sewer collection systems shall be prepared by or under the direct supervision of a professional engineer licensed to practice in North Carolina. Drawings shall conform to the applicable requirements outlined in sub-section 1.03 of these Specifications and to the guidelines established by the NC Department of Environment & Natural Resources, Division of Water Quality.

Plans shall indicate the deflection angles at all manholes. Profile elevations shall be on NCGS datum and benchmarks shall be shown and described on the Drawings. The NCGS monument shall be specified on the plans and include all monument data.

**e. Size:**

All new Gravity sewer mains shall be designed to serve the total natural drainage basin. Total off-site drainage area in acres must be shown on the plans. An 8-inch main shall be the minimum size permitted. In major drainageways, pipe sizes shall sized to conform to the following, with the most stringent governing:

1. MCPUD - Pinehurst Wastewater Facilities Plan.
2. Village Engineer's Directive
3. Village of Pinehurst Design Loading & Sizing Criteria contained herein
4. NCDWQ Design Loading & Sizing criteria

Sewers shall be designed so as to carry the total peak tributary flow at one-half of full depth (50% capacity) for sewers 16-inch and smaller, and two-thirds of full depth (approximately 75% of full capacity) for sewers 18-inch and larger. The minimum flow velocity under design conditions shall be at least 2.5 feet per second. For all reaches of sewer determined by the Village Engineer to be 'terminal' reaches, the minimum pipe grade shall be at least 1%.

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For residential zoning districts, sewer size shall be based on an average daily flow of 360 gpd per dwelling unit and a peak/average ratio of 2.5, which includes an allowance for infiltration. Where average daily flow is less than 10,000 gpd, the peak/average ratio shall be increased to 3.0. For non-residential flow, the guidelines set forth by the NC Department of Environment & Natural Resources, Division of Water Quality may be used. The project engineer shall furnish complete calculations to establish the basis for pipe sizing.

Pipe diameter changes and/or pipe material transitions shall occur only in a manhole with the pipe crowns matched as long as a minimum drop of approximately 0.20 feet is maintained between inverts. No 'reverse flow' manholes will be permitted.

The minimum gradient for sanitary sewers and the peak design flows shall conform to the following:

<b>SEWER SIZE</b>	<b>MINIMUM SLOPE (ft/100 ft)</b>	<b>PEAK DESIGN FLOW (mgd)</b>
8"	0.400	0.25
10"	0.280	0.37
12"	0.220	0.54
15"	0.150	0.81
18"	0.120	1.56
21" & Larger	***Contact Village Engineer ***	

*NOTE: These slopes are the minimum allowed by NCDENR. Greater slopes are recommended when feasible. The Village reserves the right to require additional pipe slope where, in the opinion of the Village Engineer, it is determined to be in the best interest of system maintenance.*

The maximum gradient for sanitary sewers shall be 10 percent, or such lesser gradient as may result in a maximum velocity of 10 fps under design loading condition unless otherwise approved in writing by the Village Engineer.

**f. Manholes:**

Manholes shall be spaced a maximum distance of 400 feet apart. Manholes shall be installed at each deflection of line and/or grade with a minimum drop of 0.2 feet. Drop manholes shall be required where the difference in pipe inverts exceeds 2.5 feet in elevation. The minimum angle between pipes entering and exiting manholes shall be 90 degrees. No 'reverse flow' connections will be permitted. Manholes shall be constructed of pre-cast concrete and shall utilize Con-Seal or approved equal mastic at all joints. All connections shall be cored with an approved coring machine. Under no circumstance may the wall of any manhole be broken out with a hammer. In areas prone to high water, the top rim of each manhole shall be set no less than 2 foot above the predicted 100-year water elevation unless special manhole construction details are approved for use by the Village Engineer.

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**g. Service Laterals:**

(1) General

4-inch service laterals may be tapped directly into the top quarter of 8, 10 and 12-inch mains or manholes. All service connections 6-inch and larger shall be made into manholes. Connections to sewer mains 15-inch and larger shall only be made at manholes. All individually owned structures shall require at least one sewer tap unless otherwise approved by the Village Engineer. Clean-outs for sewer services shall be located at the easement and/or right-of-way boundary, but in no case at intervals greater than 50 feet for 4" pipe and 100 feet apart for 6" pipe. Multiple service connections are to be for private use only and will not be maintained by the Village of Pinehurst. A clean-out (or manhole) shall be installed of each serviced lot's right-of-way or easement for the Village's use, and shall extend a minimum of 6 inches above the finish grade. Minimum grade for service laterals shall be 1/8 inch per foot (1%) for 4-inch and 1/8 inch per foot (1%) for 6-inch. No service lateral may enter into a manhole in a manner that would create a 'reverse flow' condition.

(2) Sewage Backflow Prevention

Any structure having a first floor elevation or basement floor elevation (if the basement is sewerded) which is lower than the elevation of manhole rim immediately upstream of the site plus one foot is considered to be susceptible to sewage backup. In such cases, the sewer service lateral for the affected building shall be equipped with a suitable sewage backflow valve as per the NC Plumbing Code. The backflow valve shall be located on private property in an accessible location for maintenance. Any lots or structures where such backflow preventers are required shall be indicated on the construction drawings.

The operation and maintenance of these devices shall be the responsibility of the property owner.

(3) Grease Traps

All commercial and institutional establishments engaged in the preparation of food shall install a grease trap in accordance with State and Village Ordinances. The grease trap shall be located outside the building and shall intercept all kitchen wastes, floor drains, and can wash drains. Domestic waste from toilets and lavatories shall not be directed to the grease trap.

The following design formula for liquid capacity should be used as follows (the minimum size shall be 500 gallons):

$$LC = D \times GL \times ST \times LF \times CO$$

Where: LC = liquid capacity (gallons)

D = the greater of the number of seats in dining area or number of meals prepared/day

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GL = gallons of wastewater per meal (1.5 - fast food, take-out or delivery only; 2.5 - full service with dish washing)

ST = storage capacity factor (1.0 for municipal sewer)

LF = Loading Factor = 1.00 - without under sink interceptors  
= 0.75 - with under sink interceptors

CO = Clean Out Factor = 4 divided by number of clean outs per year

The grease trap tank shall be of precast concrete construction. The length and width ratio shall not be less than 3:1 to maximize cooling.

The baffle wall opening shall extend down at least 50% of the liquid depth.

The outlet shall consist of a sanitary tee which shall extend down to approximately 12 to 24 inches above the tank bottom.

**(4) Grease/Oil/Sediment Traps**

All washing facilities, such as vehicle washes, car wash areas, etc. shall be equipped with a grease/oil/sediment trap and trash basket. Sizing calculations shall be submitted with the initial site/construction plans for review by the Village Engineer.

**h. Pipe Material Transitions:**

Pipe material transitions may occur only at manholes. Transition couplings are not allowed. In the event an existing sewer must be modified via inclusion of a length of ductile iron pipe to meet other specifications contained herein, the Village Engineer may, on a case-by-case basis, allow use of transition couplings found to be acceptable to the Village.

**i. Aerial Sewers:**

Where aerial sewers are required, the Project Engineer shall consult with the Village Engineer regarding specific design considerations and material requirements. All aerial sewers shall at a minimum meet the Village specifications for the same as shown in the attached construction details. Detailed plans and material specifications shall be provided with complete construction drawings. Aerial sewers shall be located above the predicted 100-year floodwater elevation and shall be constructed to withstand any effect caused by water elevation and flow up to the predicted 100-year event. All segments of aerial sewers shall be accessible by vehicle, with additional width easements as determined necessary by the Village Engineer. Aerial sewers, where permitted, shall be constructed in strict accordance with the Details provided by the Village. Piers shall not be located within stream channels. All foundations shall be designed to anchor the pipe from flotation as well as overturning. Aerial sewers shall be air tested and tested for exfiltration. Aerial sewers will only be allowed where no practical alternate for maintaining gravity flow sewer exists.

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**7.02 Pipe Materials for Gravity Sewers**

**a. General:**

Sanitary sewer collection lines, trunk sewers and interceptors shall be constructed using any of the following materials: Ductile Iron Pipe (DIP) or PVC Pipe - SDR 35.

**b. Ductile Iron Sewer Pipe:**

Ductile iron pipe shall be designed in accordance with ANSI Standard A21.50, latest revision. Unless noted otherwise on the Drawings, the pipe thickness class shall be Class 50 and shall be designed for an 8-foot minimum cover and a "Type 1" laying condition as denoted in Figure 1 of ANSI A21.50.

The ductile iron pipe shall be manufactured in accordance with ANSI A21.51, latest revision. Pipe shall have cement mortar lining and sealcoat in accordance with ANSI A21.4. Joints for ductile iron pipe shall be mechanical or of the "push-on" type conforming to the requirements of ANSI A21.11. Special joints may be used as conditions dictate.

**c. PVC Gravity Sewer Pipe (SDR 35):**

PVC sewer pipe for gravity flow installations shall be manufactured in accordance with all requirements of ASTM Standard D3034, "*Standard Specification for Polyvinyl Chloride (PVC) Sewer Pipe and Fittings*". Laying length shall be 13 or 20 feet, +/- 1 inch.

PVC sewer pipe (SDR 35) and fittings shall be of PVC material having a cell classification of 12454-B, as defined in ASTM D-1784. PVC of other cell classifications will not be accepted. This pipe shall be appropriately marked.

Pipe joints for PVC Sewer Pipe shall be of the bell and spigot type with rubber gasket conforming to ASTM F-477. The joint shall conform to ASTM D3212

**d. Steel (Casing) Pipe:**

Steel encasement pipe shall be welded or seamless, consisting of grade "B" steel with a minimum yield strength of 35,000 psi and manufactured in accordance with ASTM A139, NCDOT, and other Village-approved Standards.

The pipe thickness shall be as specified on the encroachment agreement or approved plans, and the ends shall be beveled and prepared for field welding of the circumferential joints.

**7.03 Manholes & Accessory Materials**

**a. General Requirements:**

All new manholes shall be of precast concrete construction.

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The minimum interior diameter of gravity sewer manholes shall be 4-feet for manholes less than 12 feet in depth and 5-feet for manholes 12 feet and greater in depth. In addition, the manhole shall be 4-feet in diameter for pipe sized up to 18-inches in diameter, 5-feet for pipe sized of 21-inches to 30-inches in diameter, and 6-feet for pipe sized of 36-inch to 42-inch diameter. A minimum access diameter of 22-inches shall be provided. Hydrostatic uplift restraint shall be provided for manholes installed in areas that are subject to floating/uplift.

The minimum interior diameter for manholes containing drop structures shall be 5-feet.

**b. Precast Manholes:**

- (1) Design - Precast concrete manholes shall be designed and manufactured in accordance with ASTM C478. The manhole walls shall be a minimum of 5 inches thick and the base slab shall have a minimum thickness of 6 inches. The minimum compressive strength of the concrete shall be 4,000 psi. The manhole sections shall have reinforcement as required to provide resistance to the hydrostatic and passive earth pressures to which they will be subjected, and to provide adequate resistance to temperature and shrinkage cracking.

All manholes shall be equipped with a flexible watertight connection and sealing system for all pipe penetrations.

- (2) Joints - Manhole sections shall have a standard tongue and groove joint with a rubber "O"-ring, conforming to ASTM Standard C-443. Manhole sections may also be sealed using a Butyl Resin joint sealant such as "Conseal" or "Ramneck."
- (3) Cone Sections - The upper precast cone sections shall be of the eccentric type with a minimum height of 24 inches. Concentric cones may be used where required for shallow manholes not located within a street. Flat tops shall be used only on off-street manholes where the manhole top is greater than 3 feet above-grade.

**c. Manhole Ring and Cover:**

Manhole ring and cover shall meet the requirements of ASTM Specifications for Gray Iron Castings, latest edition for Class 30. Minimum weight for the ring and cover shall be 190 lbs. and 120 lbs. respectively. The cover shall have the words "SANITARY SEWER" cast in and be perforated with 2 - 1" diameter holes unless otherwise noted on plans. Manhole covers shall comply with NC DOT 840.54. Standard ring & covers shall be equivalent to Vulcan V-1384, US Foundry 669-KL or Southern Foundry SF-101. Watertight manholes shall be Vulcan V-2384, US Foundry 361-CJ-BWT or Southern Foundry SF-138. Where deemed necessary in low areas of streets, solid manhole covers may be required by the Village Engineer to prevent surface water inflow into the sewer. Flush type rings shall be used on flat top manholes. Manhole castings shall be machined to provide a continuous bearing surface around the full periphery of the frame. All castings shall be as provided by Domestic manufacturers.

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For outside drop manholes, the clean-out cover shall be equal to Vulcan V-8515 or US Foundry 7610.

**d. Mortar:**

Mortar used in manhole invert construction shall consist of one part Portland Cement and two parts sand. Portland Cement shall meet the requirements of the latest ASTM Specifications C-150, Type I. Sand used for mortar shall meet the requirements of ASTM Specifications C-144, latest edition. Mortar shall be mixed in a clean, tight mortar box or in an approved mechanical mixer and shall be used within 45 minutes after mixing.

**e. Flexible Sealing System for Joining Pipes to Precast Manholes:**

Each connection to a manhole shall be sealed watertight by means of a flexible sleeve or gasket type sealing system as approved by the Village. The flexible sleeve type system, if used, shall be equal to Flexible Manhole Sleeve as manufactured by the Interpace Corporation. The gasket type system, if used, shall be equal to the PSX system as manufactured by the Press Seal Gasket Corporation.

The sealing system shall be furnished by the manhole manufacturer.

**f. Stone for Stabilization of Trench Foundation:**

Stone used for pipe bedding and trench stabilization shall meet the gradation requirements of table 905-1 for standard aggregate size number 67 as contained in Section 905 of the *Standard Specifications for Roads & Structures* as published by the NC Department of Transportation - January 1, 1984 edition. In all areas of unsuitable soil and/or organics, the pipe shall be bedded in at least 12" of No. 67 stone with an additional 12" of stone above the crown of the pipe.

**g. Special Coating Requirements:**

- (1) Force Main Terminus - Manholes located at the terminus of any force main shall have an interior coating of coal tar epoxy, no less than 20 mils in thickness, applied in two (2) layers. The first layer shall be applied prior to installing the manhole, and the second layer shall be applied after the manhole is installed, and all previously non-coated or damaged areas shall then be touched-up. The Village reserves the right to require interior coating of additional manholes downstream of the receiving manhole.
- (2) Exposed Manholes - Manholes located in easements or other non-paved areas shall receive an exterior coating on all exposed concrete surfaces. Prior to coating the concrete, all lifting holes and damaged areas shall be patched and smoothed. All exposed surfaces shall be coated with a gray cementitious coating such as Thoroseal or gray epoxy paint suitable for concrete.

**7.04 Service Lateral Materials**

**a. General Requirements:**

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All sewer service laterals shall be constructed of either PVC Schedule 40, PVC SDR-35, or ductile iron (as previously specified). The use of lightweight cast iron soil pipe or ABS solid wall pipe (SDR 23.5) shall not be permitted. Ductile iron pipe, as specified herein, shall be used for all service laterals crossing beneath creeks or drainageways.

Prior to beginning work, the Contractor shall furnish samples of service material fittings to the Village Engineer for approval. Samples shall include saddles, wyes, cleanouts, adapters, couplings, etc.

**b. PVC Service Pipe & Fittings:**

PVC pipe and fittings for sewer laterals shall conform to ASTM D2665 "PVC Plastic Drain, Waste & Vent Piping" and shall be Schedule 40 and NSF approved. Laying lengths may be 10 or 20 feet. Joints shall be of the solvent weld type.

All cement shall have a trace color to allow for visual indication of uniform application.

**c. Service Saddles on Ductile Iron Sewer Pipe:**

Service saddles for connection of laterals to ductile iron sewer pipe shall be cast iron, 45-degree deflection, equipped with a single stainless steel clamp. The saddle shall be furnished with adapters as required to properly receive the service pipe to be used. A pipe cutter shall be used for tapping ductile iron pipe - no torch cutting is allowed. In lieu of service saddles, wye branches may be used on ductile iron sewers.

**d. Service Saddles on ABS or PVC Composite ("Truss") Pipe (Existing Pipe Only):**

Service saddles for connection of laterals to existing ABS or PVC Composite pipe shall be of the same material as the main, either ABS or PVC. The saddle shall be 45-degree deflection and shall conform to ASTM D2680, ASTM D2751 and with ASTM 3034 as applicable. The saddles shall be equipped with two (2) stainless steel service clamps, and with adapters as required to properly receive the service pipe to be used.

**e. Saddles for PVC Sewer Pipe (Up to 12" diameter sewers only):**

Saddles for PVC sewer pipe shall be of PVC material, 45-degree deflection, conforming to the requirements of ASTM D3034. The saddle shall be equipped with two (2) stainless steel clamps and bell adapters as required to properly receive the service pipe to be used. The saddle service branch shall stub slightly into the sewer main so that when installed, the saddle shall not slip or rotate. The saddle shall be bedded and haunched with at least 6" of #78-M stone.

**f. Service Cleanout Protector Boxes:**

Each service cleanout installed within any travelway area such as a driveway, alley, or sidewalk shall be equipped with a cast iron protector box. The protector box shall be equivalent to the standard water valve boxes specified in Section 6.03 f of these specifications, with the exception that the word "SEWER" be cast into the top.

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**7.05 Trench Excavation & Preparation**

**a. General Requirements:**

The pipeline trench shall be excavated to the line and gradient shown on the approved drawings. The minimum width of the trench as measured at the top of the pipe shall be the outside diameter of the pipe barrel, plus 8 inches on each side. The maximum trench width measured at the top of the pipe shall not exceed the outside diameter of the pipe barrel, plus 12 inches on each side.

The length of trench which may be open ahead of pipe laying operations shall be no more than 100 feet and no less than 20 feet unless warranted by special circumstances, and then only upon approval of the Village Engineer.

The trench bank shall be vertical from the bottom to a point not less than one foot above the top of the pipe. The Contractor shall do all bracing, sheeting, sloping of bank, shoring, pumping, etc., as required to prevent caving of the banks, all in strict accordance with applicable O.S.H.A. regulations. Trench sheeting shall be cut off and left in place where its removal might adversely affect the sewer pipe installation.

During trench excavation operations, the Contractor shall endeavor to separate the excavated materials by soil types, so that the better materials (if any) may be used in the bedding, haunching, and initial backfill zones.

**b. Dewatering:**

The ground adjacent to the excavation shall be graded to prevent surface water from entering the trench. The Contractor will, at his expense, remove by pumping or other means approved by the Village Engineer, any water accumulated in the trench and shall keep the trench dewatered until bedding and pipe laying are complete. When water is pumped from the trench, the discharge shall follow natural drainage channels. Proper erosion control measures shall be employed for prevention of siltation.

**c. Rock Excavation:**

In the event rock is encountered, the trench shall be excavated to a depth of not less than 6 inches beneath the bottom of the pipe and then refilled with No. 67 stone. For ductile iron sewer pipe, or cast iron soil pipe, the bedding may be other native granular soil as may be approved by the Village Engineer. The trench width in rock excavation shall be as previously specified.

**d. Blasting Procedures:**

Blasting for trench rock may be initiated only after the permitting requirements prescribed in Section 2.04 of these Specifications have been complied with. The Contractor is also reminded of the work hour limitations for blasting, as also established in Section 2.04.

Blasting Procedures shall conform to all applicable local, state, and Federal laws and ordinances. The Contractor shall take all necessary precautions to protect life and property,

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including the use of an approved blasting mat where there exists the danger of throwing rock or overburden. The Contractor shall keep explosive materials which are needed on the job site in specially constructed boxes provided with locks. These boxes shall be painted red and plainly identified as to their contents. After working hours, the boxes containing explosive material shall be removed from the job site.

Failure to comply with this specification shall be grounds for suspension of blasting operations until full compliance is made. No blasting shall be allowed unless a galvanometer is employed to check cap circuits. Where blasting takes place within 500 feet of a utility, structure, or property which could be damaged by vibration, concussion, or falling rock, the Contractor shall be required to keep a blasting log containing the following information for each and every shot:

1. Date of shot
2. Time of shot
3. Foreman's name
4. Number and depth of holes
5. Approximate depth of overburden
6. Amount and type of explosive used in each hole
7. Type of caps used (instant or delay)
8. The weather

This blasting log shall be made available to the Village Engineer upon request and shall be kept in an orderly manner. Compliance by the Contractor with these specifications does in no way relieve him of legal liabilities relative to blasting operations.

The Village Engineer reserves the right to require removal of rock by means other than blasting where any utility, residence, structure, etc. is either too close to, or so situated with respect to the blasting hazardous.

**e. Excavation in Unstable Material:**

In trenches where water is present or where dewatering is required, the trench bottom shall be undercut and stabilized with No. 67 stone, having a minimum depth of 12 inches.

**7.06 Soils Classifications - for Bedding and Backfill**

Soils for pipe bedding and backfill are described in the ASTM D 2587 Figure 1 soils classification chart and for purposes of these specifications are grouped in five (5) categories as follows, according to their suitability for this application:

**a. Class I Soil:**

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

**b. Class II Soil:**

Coarse sands and gravels with maximum particle size of 40 mm (1-1/2"), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW, and SP are included in this class.

**c. Class III Soil:**

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.

**d. Class IV Soil:**

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 are not recommended for bedding, haunching, or initial backfill on PVC sewer pipes.

**e. Class V Soil:**

Includes the organic soils - types OL, OH, and PT, as well as soils containing frozen earth, debris, rocks larger than 1" diameter, and other foreign materials. These materials are not recommended for bedding, haunching, or initial backfill for any of the accepted sewer pipe materials.

**7.07 Pipe Bedding Classes - Definition**

For these specifications, pipe bedding classes will be those classes as defined below:

**a. Class "D" Bedding** is that condition existing when the ditch is excavated slightly above grade and cut to finish grade by hand. Bell holes are dug, and the pipe bears uniformly upon the trench bottom. Soil is tamped to 90% of maximum Proctor Density (AASHTO T-99) around the pipe and to a point one foot above the pipe; the remainder of the soil to ground surface is compacted to specified density.

**b. Class "C" Bedding** is that condition existing when the trench bottom is undercut a minimum of 2 inches below the pipe bell and filled to pipe grade with native granular material in such a manner that the pipe will be bedded in granular material to a vertical

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height of one-sixth the outside diameter of the pipe barrel. The remainder of the soil to ground surface is compacted to specified density.

**c. Class "B" Bedding** is that condition existing when the trench bottom is undercut a minimum of 4 inches and No. 67 stone is placed in the trench in such a manner that the pipe is bedded to the pipe spring line in stone. Soil of a granular nature is placed to the top of the pipe and compacted to 90% of maximum Proctor Density (AASHTO T-99). Soil is then compacted to specified density to ground surface.

**d. Class "A" Bedding** is that condition existing when the trench bottom is undercut a minimum of 4 inches and the pipe bedded in No. 67 stone to the spring line. The top half of the pipe is then covered with a monolithic arch or reinforced, 2000 psi concrete, extending to a point at least 4 inches above top of pipe barrel. Backfill is compacted to a specified density to ground surface.

**7.08 Pipe Bedding Requirements - Ductile Iron Pipe**

The trench bedding for these sewer pipe materials shall be Class "D" as defined under Section 7.07 hereof.

**7.09 Pipe Bedding Requirements - Sewer Pipe - SDR 35**

The trench bedding for these sewer pipe materials shall be Class "B" as defined in Section 7.07 hereof - i.e. No. 67 Stone from 6 inches beneath pipe to the springline in all cases (See Section 7.07).

**7.10 Pipe Bedding Requirements - Schedule 40 PVC and SDR-35 Service Pipe**

The trench bedding for Schedule 40 PVC Service Pipe shall be Class "C", as defined under Section 7.07 hereof, i.e. - 2" native, granular material bedding.

**7.11 Unloading and Storage of Pipe Materials**

The unloading and loading of all pipe, fittings, and other accessories shall be in accordance with the manufacturer's recommended practices and shall at all times be performed with care to avoid any damage to the material.

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Once on the job site, all materials shall be stored in accordance with the manufacturer's recommended practices, and within the limits of the Project site.

**7.12 Pipe Laying**

After the trench bedding has been prepared and properly shaped and bell holes excavated as required, the gravity sewer pipe, including service laterals, shall be installed so as to have a full and uniform bearing throughout its entire length. Sewer pipe shall be installed in strict accordance with the manufacturer's recommendations and the requirements of these Specifications. Pipe shall be carefully handled and in no case shall pipe be dumped or dropped into the trench. Any damaged pipe shall be rejected and replaced.

All gravity sewer lines and manholes shall be laid to the line and grade shown on the approved drawings with no deviations whatsoever unless approved by the Village Engineer. Laser equipment shall be used by the Contractor for maintaining proper alignment. The installation shall begin at the downstream end of a sewer segment and progress upstream, with bell ends upstream.

The pipe interior shall be kept clean throughout the pipe laying operation. Pipe ends shall be plugged at the end of each work day. Plugs shall be watertight to prevent the entrance of foreign matter into the pipe.

**7.13 Backfilling**

**a. General:**

Backfilling shall be completed as soon as possible, so as to minimize the length of time that the trench or any part thereof is left open. Material classification for backfill materials as may be noted hereinafter shall conform to the allowable soil classifications as defined in Section 7.06 hereof.

**b. Backfilling - Ductile Iron Pipe:**

These pipe material shall be backfilled with suitable native materials. The initial backfill to a point 12 inches above top of the pipe shall be placed in shallow 6 inch layers, individually compacted. See last paragraph of this section for the final backfill requirements.

**c. Backfilling - PVC Sewer Pipe - SDR 35**

The initial backfill for these pipe materials shall be Class I, Class II, or Class III soils placed in 6-inch layers to a point 12 inches above the top of the pipe. No soils in the Class IV group may be utilized for the initial backfill of these pipe materials. The initial backfill placed directly over the top of the pipe should receive very little tamping to avoid disturbing the embedded pipe. This initial backfill zone shall extend to a point 12 inches above the top of the pipe. If there is a question as to soils classification, the Contractor shall have

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Engineer samples of the soil(s) classified by an approved testing laboratory to ensure that Class IV materials have been excluded from the initial backfill zone. The Village may require a minimum of 12" of # 67 stone as initial backfill in areas in which unsuitable soils are present. See subsection "e" of this Section for final backfill requirements.

**d. Backfilling - Schedule 40 PVC and/or SDR-35 Service Lateral Pipe:**

The initial backfill for this pipe material shall be Class I soils, Class II soils, Class III soils or Type ML and CL soils in the Class IV grouping, placed in 6 inch layers with extreme care taken to ensure that the material in the "haunching" zone (up to the spring-line of the pipe) is carefully and properly placed and compacted as necessary to ensure that the pipe is properly supported in accordance with the manufacturer's recommendations. This initial backfill zone shall extend to a point 12 inches above the top of the pipe. See last paragraph of this section for final backfill requirements.

**e. Final Backfill - All Pipe:**

The remaining or final backfill for all pipe materials shall be suitable native material. No rocks, boulders, or stones shall be included in the backfill material for at least two (2) feet above the top of the pipe. In non-traffic areas, the backfill shall be placed in lifts not exceeding 12" and compacted to 90% of maximum dry density per AASHTO T-99. In traffic areas the final backfill shall be placed and compacted in 6 inch layers, and compacted to 95% of maximum dry density (AASHTO T-99) to a point 12" below subgrade. The top 12" shall be compacted to 100% of maximum dry density (AASHTO T-99).

Where deemed necessary, the Village Engineer may require compaction tests on any or all lifts of backfill placed in sewer line trenches. The cost for such tests shall be borne by the Contractor or Developer.

**f. Final Grade - Off Street Sewers:**

All easements for off street sewers shall be completely stabilized prior to acceptance by the Village. An access corridor with a cross slope not exceeding 4% shall be provided. Easements shall be left in a mowable condition using a standard bush hog and tractor. All easement areas shall allow for full and safe vehicular access by standard work trucks. The Village may require installation of an 12-foot wide, 8" compacted thickness ABC driveway, crowned at 1/4" per foot for drainage in all easement areas.

**7.14 Manhole Construction**

**a. General:**

Precast concrete manholes shall be set true to the alignment and elevation indicated on the plan. The monolithic base section shall be set on an 8" thick, No. 67 stone base. Inlet and outlet piping shall be connected using the gasket seal system as previously specified, in strict accordance with the manufacturer's recommendation. All pipe openings shall be made by coring holes and installing a pipe sealing system as specified.

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Backfill around manholes shall be placed uniformly in shallow layers thoroughly compacted with mechanical tampers and with care taken to ensure against displacement of the structure.

Inverts shall be constructed in all manholes and shall be of concrete or of approved masonry construction. The inverts shall be shaped to form a small and regular surface free from sharp and jagged edges. The benches shall be sloped so as to prevent sedimentation. The inverts from intercepted lines shall be tied into the main flow line wherever possible, so as to provide a smooth transition. Wherever such cross lines tie-in at a substantial higher elevation than that of the downstream invert, the connecting line extend into the manhole a sufficient distance to enable the flow to spill the flow line rather than onto the invert bench.

**NOTE - DEAD END MANHOLE:** On dead end manholes receiving service connections, the invert must be constructed and the invert flow line shall extend through the manhole so that all flow entering the manhole shall be readily conveyed downstream.

The manhole rings shall be set in full mortar beds. The rings with covers shall be set to the final grade indicated on the plans or as may be directed by the Village Engineer. No more than 12" of grade rings shall be used to reach final grade. Any rings and covers not conforming to the correct grade shall be adjusted as required by the Contractor.

Watertight manhole rings shall be sealed to the concrete using "Con-Seal," "Ram-Nek" or a similar mastic sealing material and bolted using four (4) 1/2" diameter anchor bolts.

The exterior surface of all manholes shall be thoroughly cleaned of all grease, dirt, etc. All lifting lugs shall be removed and holes patched thoroughly with non-shrink mortar, color to match that of the manhole where such patches are exposed. Exposed manholes shall be coated as specified hereinbefore.

**b. Special Provisions - Drop Manholes:**

Where drop manholes are noted on the Drawings, they shall be constructed in accordance with the Village's standard details. Drop pipe and fittings shall be ductile iron blocked with concrete as shown.

**7.15 Construction of Sewer Service Laterals - Additional Provisions**

All connections to new sanitary sewer mains shall be made by use of inline wyes. Connections to existing sewer mains shall be made by means of a special saddle and 1/8 bend as previously specified and shown on the detail and specifically designed to fit the

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sewer pipe selected. The inlet connection shall include any required adapters to accommodate the selected service pipe material.

The saddle shall be installed in strict accordance with the manufacturer's recommendations and shall be properly bedded and backfilled so as to prevent slippage or rotation on the sewer main.

The service laterals shall terminate with a combination wye and 1/8 bend. A vertical riser shall extend and project slightly above grade (3 inch nominal). The riser shall terminate with a removable plug. A cast iron service protector box as specified in Section 7.04(g) shall be installed as shown in the details.

All specifications previously presented relative to bedding and backfill shall apply. Four inch service pipe shall be laid on a gradient of not less than 1/4-inch per foot. Minimum gradient for 6-inch pipe shall 1/8-inch per foot.

Where service laterals connect to a manhole, an invert shall be constructed wherever possible to provide a smooth flow line. Where the drop is 18 inches or greater, a service drop connection with cleanout shall be provided in accordance with the standard detail.

### **7.16 Installation of Steel Casing Pipes by Boring & Jacking**

Steel casing pipe to be installed by simultaneous boring and jacking shall be constructed to meet required standards of the NC DOT. For railroad crossings, the construction requirements shall conform to the requirements of the affected railway company.

The project drawings shall show a plan and profile for each casing pipe to be installed. The plan shall clearly note the casing pipe wall thickness and length. For railroad crossings, the Contractor shall be certain that a proper license agreement has been obtained and that any special insurance requirements are complied with.

### **7.17 Cutting & Replacement of Existing Pavements**

Open-cut of existing bituminous pavement may be permitted on certain Village streets as determined by the Village Engineer, certain State maintained roads as determined by the NCDOT District Engineer, and on private driveways. Where bituminous pavements are open-cut, the pavement shall be restored with pavement replacement conforming to the Village's standard detail shown on the approved drawings. No pavement cutting work shall be initiated until written approval has been obtained from the Village and/or NCDOT.

Open-cut of concrete pavement may also be permitted where required at existing private driveways. Concrete pavement shall be restored with pavement replacement conforming to the standard detail and to the complete satisfaction of the affected property owner.

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The pavement shall be cut to true neat lines, with cutting equipment as may be approved by the Village Engineer, and in such a manner as not to damage the pavement outside the cutting line. The cut pavement shall then be broken up as necessary and then hauled away before trench excavation is begun to prevent its being mixed with excavated material which would be used for backfill. The edge of the pavement cut shall be at least 12 inches beyond the edge of the trench line.

Specifications previously presented relative to excavation, bedding, and backfilling shall apply with special care taken to ensure that backfill material is of select quality, and is placed and compacted in shallow 6-inch lifts.

After completion of the trenching and pipe laying operations, the backfill shall be brought to the required subgrade depth, from which point, the remaining depth (8" - 12") shall be backfilled with Aggregate Base Course, compacted in two lifts. The base course shall remain for a minimum of four (4) days prior to placement of paving, so as to allow for further natural settlement which may result from normal traffic. When final settlement is obtained, a portion of the ABC shall be removed as required to accommodate the final pavement section. All materials and pavement placement methods shall be in strict accordance with the requirement of the NC DOT - *Standard Specifications for Roads & Structures*, latest edition.

**NOTE:** Black base - type HB shall be used in lieu of ABC, if required by the Village and/or NC DOT.

### **7.18 Inspection & Testing of Gravity Sewers**

#### **a. Visual Inspection of Pipeline Interior and Manholes:**

Upon completion of any designated portion of the sewer lines, a visual inspection of the manholes and pipeline interior shall be conducted by both the Village Engineer and the MCPUD in the presence of the Contractor. The test shall be conducted by flashing a light between manholes, by use of mirrors, or by such other devices as will allow an adequate inspection of the line to detect inflow, ponding, misalignment or structural defects. Any portion of the line which does not exhibit a true alignment and uniform grade, or which shows any defect shall be corrected to the complete satisfaction of the Village Engineer.

The Village Engineer may re-inspect the line at any time prior to final acceptance if any damage or displacement is suspected to have occurred subsequent to the initial inspection. If any such failures are noted, they shall be promptly repaired by the Contractor and re-inspected by the Village.

#### **b. Low Pressure Air Tests:**

Portions of the sewer lines, which do not exhibit ground water in the trench during and after construction, shall be subjected to a low-pressure air test. The portions of the line to be so tested shall be as determined by the Village Engineer.

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The low pressure air testing shall be conducted in accordance with ASTM C-828. Prior to testing, the sewer line shall be clear of debris and flushed with water as necessary. The line shall be plugged and the plugs shall be securely braced to prevent slippage. The line shall be pressurized with air to 4 psi and allowed to stabilize for a period of two (2) minutes. After the initial stabilization, the air pressure will be decreased to 3.5 psi. The Village Engineer will then determine the length of time for the pressure to drop to 2.5 psi.

To simplify the ASTM procedure, the following table shall be used to determine the test time. If there are multiple sizes, add the various times together.

**Low Pressure Sewer Air Testing**

<u>Normal Pipe Size (inches)</u>	<u>Time (t) - Minutes/100 ft.</u>
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6

If the pressure stays between 3.5 and 2.5 psi for the required test time length as noted above, the pipe acceptable.

Should the section of the pipe being tested fail to meet these requirements, the source of leakage shall be determined and repaired. The section shall then be retested until it is deemed to be acceptable.

The Contractor shall furnish all plugs, compressors, hose, gauges, etc., as required to conduct the low-pressure air test. All testing equipment shall be approved by the Village Engineer.

**c. Infiltration Tests:**

Portions of the sewer lines installed in areas that exhibit a higher ground water table (in the trench) during construction shall be tested for infiltration. The portions of the line to be infiltration tested shall be determined by the Village Engineer.

The portion of the sewer line designated by the Village Engineer shall be tested for infiltration by installing a V-notch weir or other suitable measuring device in the downstream end of the pipe to be tested. When a steady flow occurs over the weir, the rate of flow

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(infiltration) shall be measured. The rate thus measured shall not exceed 25 gallons per 24 hours per inch of sewer pipe diameter per mile of pipe.

Weirs and other equipment required for infiltration tests shall be furnished by the Contractor and the tests shall be performed in the presence of the Village Engineer.

Should the infiltration tests reveal leakage in excess of the allowable, the leaking joints shall be relaid if necessary or other remedial construction shall be performed by and at the expense of the Contractor. The section of sewer thus repaired shall then be retested to determine compliance with the Specifications.

**d. Deflection Testing of PVC Sewer Pipe (SDR-35)**

If PVC Sewer Pipe (SDR-35) is used for gravity sewers, a deflection test shall be conducted on all such pipe installed. These pipes shall be mandrelled with a rigid device sized to ensure that the final long term deflection or deformation of the pipe barrel has not exceeded 5 percent for PVC sewer pipe.

The mandrel (Go/No-Go) device shall be cylindrical in shape and constructed with nine or ten evenly spaced arms or prongs. Mandrels with less arms will (in odd or even numbers) be rejected as not sufficiently accurate. Mandrels exhibiting significant wear will be rejected for use.

The outside diameter of the 9-arm mandrel shall be as shown below. The mandrel diameter shall have a tolerance of + or - 0.01". Contact length shall not be less than 12 inches.

**MANDREL DIMENSIONS**

**For PVC Pipe (SDR-35)**

<b><u>Main Size</u></b>	<b><u>Mandrel Dimension</u></b>
8"	7.28"
10"	9.08"
12"	10.79"
15"	13.20"

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The contact length of the mandrel shall be at least 12 inches.

Any lines not meeting this test shall be corrected by the Contractor and the test repeated.

Allowances for pipe wall thickness tolerances or ovality shall not be deducted from the "D" dimension but shall be counted in as a part of the deflection allowance.

The mandrel shall be hand-pulled by the Contractor through all PVC sewer lines. Any sections of sewer not passing the mandrel shall be uncovered and the Contractor shall re-round or replace the sewer to the satisfaction of the Village Engineer. These repaired sections shall be retested.

The initial inspection shall be conducted no earlier than thirty (30) days after reaching final trench backfill grade. Deflection testing shall be accomplished at such times as may be directed by the Village Engineer. Upon completion of all work, the Village Engineer may require such final deflection testing as may be deemed necessary to ensure that the long term deflection has not exceeded the allowed maximum deflection allowance.

The mandrel shall be approved by the Village Engineer. Drawings of the mandrel with complete dimensions shall be furnished by the Contractor to the Village Engineer.

Any portions of the sewer lines not meeting the test shall be corrected by the Contractor and the test repeated.

**e. Exfiltration Tests:**

All sewers and manholes that are exposed (i.e. aerial) shall be subjected to exfiltration tests. Each segment of pipe and manholes shall be plugged and filled with water to a depth no less than the rim of the downstream manhole for a period of 1 hour. **No leakage shall be allowed.** This work shall be carried out beginning at the high end of the aerial segment in order to minimize the amount of water necessary for testing.

**f. Vacuum Testing - Manholes**

All Manholes shall be subjected to vacuum testing in accordance with the following table. Any manhole that fails to meet the testing criteria shall be uncovered, properly repaired to the satisfaction of the Village Engineer utilizing non-shrink grout or other Village approved materials/methods while the vacuum is still being drawn and retested.

All compressors, hoses, gages, plugs, and other equipment necessary to conduct the vacuum testing shall be supplied by the Contractor. All testing equipment shall be approved by the Village Engineer. The manhole vacuum tester shall as manufactured by Cherne' Manhole Testing or Village-approved equal.

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<u>Manhole Depth</u>	<u>Diameter of Manhole</u>		
	<u>4' Diameter</u>	<u>5' Diameter</u>	<u>6' Diameter</u>
10 feet or less	60 sec.	75 sec.	90 sec.
>10 feet but less than 15 feet	75 sec.	90 sec.	105 sec.
> 15 feet	90 sec.	105 sec.	120 sec.

Times shown are the minimum elapsed time for maintaining initial vacuum draw of 10 inches mercury with no greater than a 1 inch of mercury drop in vacuum.

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**SECTION 8 - WASTEWATER PUMPING STATIONS & FORCE MAINS**

**8.01 General**

In situations where gravity flow to an existing Village sewer is not feasible, the Village will consider the installation of a wastewater pumping station and a force main. Certain factors must be addressed by the developer for the project for consideration by the Village of Pinehurst. The factors include:

- (1) Determine the wastewater flow that would be generated by the total natural drainage basin based upon the existing zoning. Design flow factors for this use are found in Section 7.01 (e) of these Specifications.
- (2) Evaluate the capacity of the receiving sewer main at the point of discharge and downstream facilities to determine that sufficient capacity is available for the transferred sewer flow.
- (3) Perform a cost analysis of the pumping versus gravity alternative to demonstrate that gravity service is not feasible. The estimated installed cost of the gravity alternative must be not less than 4 times more costly than the pumping station alternative (excluding easement acquisition) in order for the Village to allow a pumping station.

**Note:** In the event that an individual structure is sited such that gravity flow is not possible to the service point, a private sewage ejector or grinder pump system may be used. In all such cases, the grinder pump shall be as manufactured by E-One Corporation. Installations such as these shall serve only one water/sewer customer and shall comply fully with the applicable chapters of the State of North Carolina Plumbing Code. Sufficient computations shall be provided to the Village Engineer for review to ensure that such an installation will not overload any receiving sewer. Private grinder/ejector pumps shall be connected to a standard 4" gravity sewer service. Review and inspection of private ejectors and pumps shall be performed by the Plumbing Inspector having jurisdiction. Maintenance of private ejectors or pumps shall remain the responsibility of the water/sewer customer and/or property owner. All such lots shall be clearly noted on the record ( as-built) drawings and all plats of record that are filed with the Moore County Register of Deeds. Failure to maintain private pumping equipment in such condition to prevent overflows or spills will result in termination of water service from the Village. The Village may also seek other remedies as allowed under the Village of Pinehurst Ordinances, as well as enforcement of State and Federal laws pertaining to illegal wastewater discharges, until all problems with the equipment have been fully resolved to the satisfaction of the Village.

**8.02 Design**

**a. General Requirements:**

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Site or subdivision plans which propose a wastewater pumping station shall show in summary form the number of lots or units served, the off-site drainage area and zoning, the average daily flow, peak daily flow, and the rated capacity of pumps at a specified total dynamic head. Complete system curves shall be provided, showing one and two pump operation. Calculations shall also include an analysis of hydrostatic uplift and surge/water hammer conditions.

All new pump stations shall be of the submersible-type or the Enclosed Above Grade Self-Priming Package-Type Station, as manufactured by Gormann-Rupp unless otherwise approved in writing by the Village Engineer. Submersible pumps shall be as manufactured by Flygt, ABS, Gormann-Rupp, Myers, or Village-approved equal.

All stations shall have a minimum of two (2) pumps of equal capacity, with each pump sized to handle design flow, and shall be capable of handling flows in excess of the expected peak flow. Where three or more pumps are required, they shall be of such capacity that with any one unit out of service, the remaining units will have capacity to handle peak sewage flows. Where pumping stations may be designed to handle larger future flows, the wetwell, piping, electrical equipment, etc. shall be sized to accommodate the future flow.

Where a pumping station is sized to accommodate growth and will operate at less than 25% of its nominal capacity, chemical feed facilities shall be provided for odor and corrosion control. These facilities shall include all feed equipment and storage facilities, including secondary containment and shall be approved in advance by the Village Engineer.

A receiving manhole, separate from the wetwell, shall be provided within 20 feet (but outside of the station fence) of each wetwell. Where multiple sewers converge at a pumping station, they shall be brought together at the receiving manhole and only one influent line shall enter the wetwell. This manhole shall be situated to facilitate future downstream extensions of the sewer.

Pumping station piping shall be sized to maintain flow velocities between 2.5 and 5.0 fps. Force main sizing shall be such to provide a minimum velocity in the force main of 2.5 fps and a maximum velocity of 5.0 fps. The minimum size forcemain shall be 4" diameter.

Sewer air release valves shall be provided at all high points where gas pockets may accumulate. Combination air/vacuum valves shall be located where the force main is subject to draining and filling.

Wastewater pumping stations, structures, electrical equipment, etc. shall be protected from physical damage by siting no less than 1 foot above the predicted 100 year flood water elevation. Stations shall remain fully operational and accessible during the 100-year flood. The predicted 100-year flood elevation shall be shown on all site plans. The final station elevation shall be indicated on the record drawings.

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**b. Standby Power:**

All wastewater-pumping stations shall be equipped with on-site standby power (engine-generator set) with automatic switching. The standby power system shall conform to Section 8.06.

**c. Site Work - General:**

The site work shall be generally level graded to remove runoff from site in a non-erosive manner. Drainage swales shall be provided to direct drainage away from the site.

The site shall be stabilized by #57 crushed stone 6" thick, bordered with pressure treated 6" X 6" timbers. A barrier fabric shall be placed beneath the stone surface to retard weed growth. A landscaped buffer shall be constructed outside of the fence to screen the station from adjoining properties. The proposed landscaping shall be shown on the approved plans. All proposed landscaping shall be of species suited to the Pinehurst-Sandhills climate region and require minimal maintenance.

An all-weather access road constructed of 8" of compacted aggregate base course and located within a 25-foot access easement shall be provided to the pumping station site. The road shall be a minimum of 15 feet in width, with shoulders, side ditches and cross drainage as needed. A turn around area large enough for a fuel oil truck (NCDOT-SU design vehicle) shall be provided outside of the pump station fence. The maximum roadway grade shall be 8 percent for stone base roadways. Steeper roads shall be paved.

A 150-watt high pressure sodium light fixture shall be strategically located upon a lighting standard or timber utility pole. The light fixture shall be operated by a Hand-Off-Auto selector at the rainshield, with a photocell control for the automatic mode. Mounting height shall be 20 feet (minimum) above finished grade.

Suction and discharge piping shall be C-900 PVC pipe or ductile iron pipe designed and manufactured per AWWA Specifications C150 and C151.

**d. Site Work - Fencing:**

All pumping station sites shall be fenced for security. Pumping stations located in remote areas shall have a chain link fence as described below. Stations that are adjacent (visible) to residential and commercial areas shall have a wooden shadow box style fence.

**(1) Wooden Fencing**

Where a wooden fence is provided around the pumping station site, the fence shall have the following features:

<u>Height:</u>	6-½' to top of pickets
<u>Gates:</u>	1 – 12' double-leaf vehicle gate 1 – 4' single-leaf personnel gate

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The fence shall be of the shadow box style (80% opaque), with vertical pickets (alternating inside and out), constructed entirely of pressure treated lumber with galvanized hardware and fasteners.

- (1) Vertical Pickets - shall be 5/4" by 6" by 6' nominal dimension treated lumber
- (2) Posts - shall be 6" by 6" by 10' nominal dimension treated lumber, with the tops beveled at a 45-degree angle each way (pyramid top)
- (3) Horizontal Rails - shall be 2" by 4" by 7'-6" nominal dimension treated lumber, three per panel section

Posts shall be set at 8' centers, maximum, at each corner and at each side of each gate. All posts shall be set 36" deep in concrete. Horizontal rails shall be set 12", 42" and 72" above grade. Pickets shall be attached to the horizontal rails with the bottoms 6" above grade and alternating inside and out. All lumber shall be pressure treated Southern Yellow Pine and bear the mark of the American Wood Preservers Association Standard No. C2/C9.

All gates shall be equipped with lockable latches and tamper proof hinges. For vehicle gates, keepers shall be provided to hold gates in the open position.

**(2) Chain Link Fencing**

Where a chain link fence is provided around the pumping station site, the fence shall have the following features:

- |                     |   |
|---------------------|---|
| <u>Height:</u>      | 6' to center of top rail  |
| <u>Barbed Wire:</u> | 3 strands at top  |
| <u>Gates:</u>       | 1 – 12' double-leaf vehicle gate<br>1 – 4' single-leaf personnel gate |

All fencing materials shall be vinyl coated galvanized steel, green or black in color and shall conform to the requirements set forth in the Village's PDO. The fencing materials shall be as follows:

- (1) Vinyl Coated Chain Link Fence - woven 2-inch mesh of No. 9 ga. (0.1483 in.) copper bearing steel wire, 72 inches wide, galvanized after fabrication. Minimum tensile strength of wire shall be 90,000 psi. The top and bottom edge shall be barbed.
- (2) Steel Line Posts - line posts shall be 2½" OD vinyl coated galvanized steel pipe weighing 3.65 lbs per lineal foot.

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- (3) Steel Top Rails - the top rails shall be 1-5/8" OD vinyl coated galvanized pipe weighing 2.27 lbs per lineal foot, with expansion couplings of outside sleeve type. Rails shall be continuous for outside sleeve type for full length of fence.
- (4) Steel Terminal, End, Corner & Pull Posts - (referred to herein as terminal posts) - 3" OD vinyl coated galvanized steel pipe weighing not less than 5.79 lbs per lineal foot. Posts shall be of sufficient length to permit the bottom 36 inches to be set in concrete.
- (5) Bracing for Use Between Terminal, End, Corner, Gate & Pull Posts and First Adjacent Line Posts - 1-5/8" OD vinyl coated galvanized steel pipe weighing not less than 2.27 lbs per lineal foot.
- (6) Gate Posts - 4" OD vinyl coated galvanized steel pipe weighing 9.11 lbs per lineal foot.
- (7) Tension Bars - 3/16" X 3/4" minimal steel, vinyl coated galvanized and one-piece for full height of fabric.
- (8) Stretcher Bar Bands - steel, wrought iron, or malleable iron (painted or vinyl coated) to secure stretcher bars to terminal, end, pull, corner and gate posts. Space not over 12-inch oc.
- (9) Fabric Bands - No. 9 ga. vinyl coated galvanized steel wire for securing fabric to line posts and rails. Fabric bands for securing fabric to terminal posts, aluminum straps. Space bands not greater than 24-inch oc.
- (10) Gate Frames - 2" OD vinyl coated galvanized steel pipe weighing not less than 2.72 per lineal foot. A 12' double swing gate (two 6'0" leaves) and a 4' single-swing gate shall be provided.
- (11) Gate Hardware:
  - Hinges - pressed or forged steel or malleable iron to suit gate size, or non-lift-off heavy duty type, offset to permit 180° gate opening. Provide 1« pair on each leaf over 6 foot nominal height.
  - Latches - provide latching devices, lockable with padlock from either side. Latches for double gates with automatic engaging latch on one leaf and drop rod type latch on the other leaf. Furnish drop rod complete with suitable casting set in concrete to hold gate leaf in place when drop rod is engaged.
  - Keepers - provide keepers for all gates to automatically engage gate leaf and hold it in open position until manually released.

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- (12) Anchorage - line posts, gate posts and corner posts shall be set in concrete 36" deep X 12" dia. (minimum). Concrete shall have a minimum compressive strength of 3,000 psi at 28 days.
- (13) Combination Post Top Cap & Barbed Wire Supporting Arm - steel, wrought or malleable iron complete with provisions for anchorage to posts and attaching 3 rows of barbed wire. Provide one cap and vertical arm for each post where barbed wire is required.
- (14) Barbed Wire - vinyl coated galvanized two (2) strand, 12-½ ga. wire with 14 ga. 4-point barbs spaced 5 in. oc.
- (15) Miscellaneous Items & Materials - provide as required to complete fence installation. Items and materials shall be consistent in quality with the materials listed above.

Only experienced and skilled mechanics shall be used in erecting the fence. The fence shall be installed in true and correct alignment, with all posts plumb. Line posts shall be spaced at a maximum interval of 10 feet.

Top rails shall be installed with expansion couplings at intervals of not more than 20 feet and shall be attached to the posts with appropriate wrought iron fittings.

Bracing assemblies shall be installed on all terminal posts, gate posts and at both sides of corner posts and pull posts. Diagonal tension members shall not be less than 3/8" diameter, with a tension take-up device, and shall extend from compression member to base of posts. Posts shall be plumb when diagonal rod is under the correct tension.

Fabric shall be installed tight, free of bulges and sags, on the outside of the fence, and as close to the ground as possible (2-inch maximum gap). Fabric shall be attached to all posts at not more than 12 inches oc, and to top rails at 24 inches oc. "U" shaped wire conforming to diameter of posts and rails shall be used with the ends bent to minimize hazards to persons and clothing. Stretcher bars should be threaded through fabric and secured to posts with metal bands spaced at not more than 15 inches oc.

Gate frames shall be constructed with heavy malleable iron fittings at the joints to produce rigid joints. Bracing shall be installed so as to provide a rigid, non-sagging or twisting gate. Gate fabric shall be the same as fence fabric and attached in a like manner. Frames shall be furnished with three (3) strands of barb wire at the top.

**e. Piping & Valves:**

A check valve and a plug valve shall be provided for the discharge line of each pump. Valves shall be rated for 200 psi working pressure, and shall have full port openings equal to 100% of the adjacent pipe area. Check valves and shut-off valves shall be mounted in the horizontal position. Check valves shall be swing type with outside lever and spring.

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All piping, couplings, fittings, valves, etc. shall be Class 125 flanges meeting ANSI B16.1 Specifications, unless class 250 flanges are required for high head installations. All piping shall be factory flanged. Flanged couplings, equal to Dresser Style 127, Rockwell 912, shall be provided on one side of the check valve to allow removal and replacement.

Discharge piping shall be designed to provide adequate thrust restraint during pump operating cycle.

Surge relief and air release valves shall be provided in the valve vault as dictated by hydraulic conditions. Discharge shall be piped into the wetwell.

**f. Structural:**

All pump station structures shall be designed to withstand the hydrostatic forces that they will be subjected to, including uplift.

Cover slabs for wet well and valve vaults shall be reinforced concrete with integral cast in place access hatch covers. Cover slabs shall be reinforced as per ACI Code and specially reinforced around openings. Access covers shall be sized and positioned according to pump unit installation. Access covers and frames for pumps shall be a double leaf aluminum diamond pattern floor hatch certified by the manufacturer of being capable of withstanding a minimum of 150 psf loading without permanent damage. Each leaf shall open 90 degrees and be attached to the frame by steel hinges. The door shall have a lock in the open position and vinyl grip handle to release lock for closing. A separate trash basket access hatch shall be provided.

A separate valve vault shall be required for submersible pump stations. The valve vault shall consist of a precast rectangular base section, or a cast-in-place custom built section, or a precast rectangular structure all complete with drain, access ladder or steps, and access cover cast in the structure roof.

Wet well structures may be cast in place reinforced concrete or precast concrete construction. If precast units are utilized, they shall conform to the requirements of ASTM C478, with watertight joints per ASTM C443. The minimum wetwell diameter shall be 6 feet.

**g. Wet Well Features:**

- (1) Vents - All wet well structures shall have screened vents to allow the escape of gases and to enable air intake during pump down. The vent shall be constructed using flanged ductile iron pipe and fittings.
- (2) Corrosion Protection - The interior of the wet well shall receive two successive coats of coal-tar epoxy material. The coating material shall meet the requirements of the Corps of Engineers Specifications C-200. The coal-tar epoxy shall have a finished dry thickness of 20 mils. The materials shall not be applied prior to filling all voids, or repairing all interior surface blemishes. The coating material shall be Koppers "Bitumastic No. 300M", or equal.

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**(3) Screening Facilities**

Consideration shall be given to protecting pump station structures and equipment from physical damage or clogging from solid material normally present in wastewater through the use of screening and baskets.

If a bar screen is utilized, the influent sewer and pump shall have an open flange connection within the wet well and have a bar screen with a maximum clear opening of two and one-half inches. Design consideration shall be given to the loss of head through the bar screen. The bottom of the screen channel shall be placed at least twelve (12) inches below the invert of the incoming sewers to allow for some accumulation of screening without effecting the high water level in the wetwell. Adequate clearances for ease of maintenance shall be provided. Bar screen shall be constructed of aluminum or stainless steel.

As an alternate to the bar screen, a removable aluminum trash basket may be furnished and installed at the pumping station. The basket shall be mounted directly in front of the incoming sewer line and shall be completely removable by means of stainless steel or aluminum guide rails.

The trash basket shall be rectangular in shape, 18" wide, 24" tall and 14" deep. The basket shall be formed from 2" x 1/4" aluminum bars spaced 2 1/4" center to center. Grating, wire mesh, or perforated plates shall not be accepted as substitutes. The basket shall be fabricated with cross members and bracing to provide structural stability under full loading. The basket shall be equipped with wheels to roll in the guide rails. Sliding type arrangements are not acceptable. All bolted connections in the wet well shall be made using stainless steel nuts, bolts and washers. The basket shall be raised and lowered by means of a stainless steel cable and shall permit the raised basket screen to be maneuvered into or out of the wet well through a special hatch.

**h. Pump Controls:**

**(1) Control Sequence**

On rising liquid level in the wet well, a mercury type float switch shall initiate operation of the lead pump at the elevation indicated on the DRAWINGS. Should the liquid level continue to rise to a point above the lead pump setting, a second mercury float switch would initiate operation of the Lag Pump. The pump(s) would continue to operate until the liquid level recedes to the point where a third mercury float switch would stop the pumps.

The two (2) pumps shall automatically alternate between the "lead" and "lag" positions by means of an electric alternator in the panel.

Should the liquid level continue to rise to a point above the "Lag Pump On" level, a fourth mercury float switch would activate the alarm circuit.

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The float settings shall be set such that the pump manufacturer's minimum submergence is maintained, there are 4 to 6 operating cycles per hour during average influent flow conditions, there is no less than 6" between the lead and lag setting, there is no less than 6" between the lag and high level setting and there is no less than 12" between the high level setting and the invert in to the wetwell.

(2) Control Panel

The duplex pump control panel shall be furnished to operate the pumps in the specified sequence. The control panel and all control equipment shall utilize equipment and components approved by a third party testing agency that is accredited by the NCBCC and accepted by the State of North Carolina, **and shall be so labeled as an assembled panel.**

The control equipment shall be housed in a NEMA 3R enclosure with hinged outer and dead-front inner doors. The outer door shall be fastened by quick release latches that require no tools to operate. The enclosure shall be constructed of 14 gauge cold-rolled steel sheet, mill phosphatized before painting per ASTM A-526. The enclosure shall have a rust inhibiting base primer coating and exterior grade baked enamel coating. The panel shall contain the following elements and accessories:

- (a) Incoming power circuit breaker - 3 pole. The circuit breaker must have a minimum ampere interrupting capacity of 10,000 symmetrical RMS amps.
- (b) A lightning arrestor shall be supplied in the control panel and connected to each line on the incoming side of the power input terminals. The arrestor shall protect against damage due to lightning strikes on the incoming power line.
- (c) A phase-loss/unbalance/reversal, under-voltage protection assembly with adjustable nominal voltage setting shall be supplied with three extractor type line voltage fuses. This device shall drop-out the pump control and autodialer power circuit if all phases drop below 90% or if any one phase drops below 80-83% nominal voltage. This device shall have a «-second dropout delay and adjustable restoration time delay of up to five minutes.
- (d) A thermal magnetic molded case circuit breaker shall be supplied as branch circuit protection for each pump motor. The circuit breaker must have a minimum ampere interrupting capacity of 10,000 symmetrical RMS amps.
- (e) A NEMA-rated magnetic motor starter with ambient-compensated, quick-trip Class 10 overload sensing in each phase shall be furnished to provide over current and running protection for each pump motor. Pumps rated 50 horsepower and greater shall have reduced voltage, autotransformer type starters. Over current protection shall be provided by accurately sized, replaceable heater elements. Units requiring replacement of complete

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over load block to match motor current are not acceptable. Overloads shall be equipped with auxiliary contacts for reporting an overload trip out to the alarm dialer.

- (f) An oil-tight pilot light for each pump shall be provided to indicate "Pump Running", "Overtemperature", "Overload Tripped" and "Seal Fail" conditions. An additional lamp indicating "Control Power On" shall also be provided. The pilot lights shall have a replaceable, screw or bayonet base bulb. A "push to test" circuit shall be provided to enable testing of individual lamps.
- (g) A separate circuit breaker for control circuit shall be supplied to provide short circuit protection and a disconnect means for the control circuit.
- (h) Control power transformer (on 480 VAC stations) no less than 2 kVA.
- (i) Condensation heater with adjustable thermostats shall be provided.
- (j) Running time meter for each pump shall be provided to measure hours and tenths of hours of operation, up to 10,000 hours. These shall be 120 VAC devices operating from the control voltage by an auxiliary contact of the motor starter.
- (k) Seal failure protection shall be provided to operate in conjunction with the moisture sensor in each pump motor. The control shall provide a dry contact closure for the alarm dialer. The circuitry shall include a seal failure indicating light. A set of dry contacts shall be provided for the alarm dialer.
- (l) Over temperature protection shall be provided to operate in conjunction with the over-temperature switch in each pump or motor, depending on the pump style. The control shall provide lockout of pump operation upon occurrence of high temperature. The circuitry shall include a high-temperature indicating light and reset button for each pump for high-temperature alarm indication and manual reset capability. A set of dry contacts shall be provided for the alarm dialer.
- (m) Wet well level responsive automatic pump and alarm control system using four direct-acting liquid level sensors in the wet well shall be provided. The control system shall include a Hand-Off-Auto selector switch for each pump, automatic alternator (with manual override selector), 24-volt control power transformer for floats, control relays, alarm relays, control terminal board, and internal wiring as required. The control panel shall be configured such that the pumping station will restart automatically after a power failure. An adjustable time delay relay (0 to 60 second range) shall be

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provided in the "lag" pump circuitry to delay starting the "lag" pump after a power service interruption.

- (n) Red xenon strobe high level alarm light shall be mounted externally as shown on the DRAWINGS.
- (o) Power feed from the control circuit (after the phase monitor) to the alarm dialer.

**(3) Control Floats & Accessories**

Level control float switches shall be a molded polyethylene body with internal redundant polyurethane foam floatation, and containing a mercury tube-type switch inside. Each float switch shall have potted cable and switch connections and fine-strand #18 AWG cable with heavy duty synthetic rubber jacket. Cable length shall be as required to run unspliced to the control panel.

Float switches shall be installed on a stainless steel cable and weight utilizing stainless steel clamps and hardware. The cable shall be suspended from a stainless steel bracket at the top slab of the wet well adjacent to the hatch cover.

**i. Pump Station Electrical Work:**

All wiring and electrical equipment shall conform to all applicable sections of the National Electrical Code (NEC), latest edition, and local electrical codes.

All pump stations shall be serviced with 3-phase, 4 wire power, with the neutral brought in and bonded. Stations with pump motors larger than 15 horsepower shall have 480 volt, 3-phase power. Single phase to three phase converters shall not be allowed.

Plans shall include all conduit and wiring sizes, power riser and distribution diagrams, and switchgear sizes. All conduit shall be rigid metallic with threaded joints, with the exception of buried conduits, which may be PVC. Each conduit entering the pump control panel from the wet well shall be equipped with a conduit body immediately adjacent to the pump control panel. The conduits shall be sealed in the conduit bodies and at the wet well end to prevent the migration of wet well vapors and moisture. Where power or control cables exit conduits, conduit bells and strain relief devices shall be provided.

All switchgear, controls, distribution panels, etc. shall be located under an aluminum rain shield constructed of 3/16" material. In the case of very large control panels, a separate rain shield may be required. The rain shield shall be supported on schedule 40, 3" diameter galvanized steel posts, anchored in concrete, located at distances not to exceed 4 feet on center. An outdoor type, 40 watt fluorescent work light shall be installed under the rain shield. This light shall be operated by a weatherproof switch. A GFCI convenience receptacle shall also be located under the rain shield.

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A separate electrical distribution panel shall be provided for supplying the area light, work light, receptacles, RPZ enclosure, generator engine block heater and battery charger. This panel shall be fed from the feeder between the automatic transfer switch and the pump control panel and shall remain energized if the pump control panel main breaker is in the off position. On 480 volt stations, a dry transformer (10 kVA minimum) shall be provided for 120/240 volt power.

**j. Alarm Dialer:**

On all wastewater pumping station installations, an automatic alarm dialer shall be furnished and installed. The dialer unit shall conform to the specifications presented herein under Section 8.05.

**k. Water Service Line:**

Each pumping station shall have a potable water supply service line consisting of a 1" service line with a Village approved RPZ-type backflow preventer and terminating at the pump station site with a freeze-proof yard hydrant. An insulated and heated enclosure shall be provided to protect the RPZ from freezing. A 1-1/2 inch or larger water supply line may be required in cases where a pumping station is more than 400 feet from a water main.

**8.03 Package-Type Self-Priming Pumping Stations**

**a. General:**

Package-type pumping stations shall be furnished to include features as follows:

- (1) Factory-built Fiberglass Reinforced Plastic Enclosure - with steel base assembly. The enclosure shall be equipped with a walk in access door and also configured to be slid to one side on a roller and track system to facilitate major maintenance.
- (2) Duplex, Non-Clog, Self-Priming Pumps - capable of passing a 3-inch solid. The pumps shall be horizontally mounted, self-priming, centrifugal, solids-handling type. Pumps shall be equipped with high temperature shut down circuitry, with local alarm reporting and contact closure for reporting to the autodialer. The use of vacuum pumps for priming is not allowed. Each pump shall be driven by electric motors with V-belt drives, utilizing no less than 2 V-belts. All isolation, check and air release valve shall be factory-installed so that the station is shipped as one complete and functional unit. Motors shall be open, drip-proof, squirrel cage induction type with NEMA B speed torque design, capable of continuous duty at full load with a temperature rise of 40 degrees centigrade and a 1.15 service factor. Motors shall be non-overloading at all points on the performance curve. Suction and discharge pressure gauges shall be provided.
- (3) Control Panel - as previously specified, except mounted inside the pump enclosure.

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- (4) Heater - 1500 watt with integral thermostat to maintain a minimum temperature of 50 degrees F.
- (5) Ventilation System - thermostatically controlled and sized to provide minimum size for 6 air changes per hour.
- (6) Interior Lights - two 200-watt enclosed lights with guards.
- (7) Precast Wet Well - 6 foot minimum diameter, with trash basket.
- (8) Site Work Improvements - as required per Section 8.02 (c) hereof.
- (9) Alarm Dialer System - as required per Section 8.05 hereof.
- (10) Water Supply Line - as required per Section 8.02 (j) hereof.

**b. Manufacturer:**

Package-type, factory-built wastewater pumping stations and accessory equipment shall be equal in all respects to the 7' by 10' above ground standard line with "T" series pumps as manufactured by Gorman-Rupp.

**c. Shop Drawings:**

Prior to purchase of factory-built pumping equipment, the Contractor shall submit not less than four (4) sets of data to the Village Engineer for approval, including pump performance data, control panel wiring diagrams and other material required to determine compliance with these Specifications.

**d. Operation & Maintenance Manuals:**

Three (3) complete O & M Manuals shall be furnished to the Village Engineer covering all equipment furnished - pumps, motors, controls, alarm dialer, etc.

**e. Spare Parts:**

At the time that the pumping station is accepted for operation and maintenance by the Village of Pinehurst, certain spare parts shall be furnished, consisting of:

- (1) Replacement pump shaft seal assembly & wear sleeve
- (2) Complete set of volute gaskets
- (3) Suction check valve
- (4) Spare indicator lamps and fuses for the control panel (3 sets)
- (5) Spare control float

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- (6) Spare set of drive belts
- (7) Other items as may be recommended by the manufacturer

**f. Warranty:**

The manufacturers of the factory-built pump station and dialer shall warrant to the Village of Pinehurst that the equipment that is supplied shall be free of defect in materials and workmanship for a period of 12 months following acceptance of the facility for maintenance by the MCPUD. The warranty shall name the MCPUD as warrantee and a copy of this documentation shall be delivered to the Village Engineer at the time of final acceptance.

**8.03b Submersible Pumping Stations**

**a. General:**

**(1) Pumps**

Submersible-type pumping stations shall include duplex submersible pumps with motors installed on lift-out rail systems, concrete wet wells, access hatch, controls, piping, valves, and other necessary appurtenances as specified herein. Pump shall be designed for automatic connection to the discharge connection elbow, guided by no less than two (2) guide bars extending from the top of the station to the discharge elbow.

Submersible pumps shall be designed and manufactured for continuous duty pumping of raw, unscreened wastewater. Pumps shall be installed in such a way that solids are fed in an upflow direction to the impeller with no feet, rails or other obstructions below inlet. Pump selection shall consider the duty requirements as well as the physical and chemical characteristics of the wastewater being conveyed. Materials used in pump construction shall also be suitable from the physical and chemical characteristics of the wastewater being conveyed.

Pump stations conveying residential, commercial, institutional, or industrial domestic wastewater shall be provided with pumps that are suitable for continuous duty in conveying raw unscreened wastewater.

Pumps shall be capable of handling a three-inch solid and any trash or stringy material that can pass through a four-inch hose unless a mechanical means of solids reduction is installed at the pump station. Pumps shall be made non-clog either by passing solids, trash, and stringy material through a non-clog or vortex-type impeller or by grinding, chopping, or cutting them prior to passing them through the impeller. Impellers shall have blades that are generally forward rounded or otherwise configured to avoid catching solids, trash, and stringy material. Acceptable means of solids reduction shall include mechanical bar screens, trash buckets, or other devices approved by the Village Engineer.

Sufficient submergence of the pump shall prevent vortexing in the wet well. In no case

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shall the all pumps-off activation level be less than the minimum level required for successful pump operation as recommended by the pump manufacturer. Wet wells shall be provided with the depth required to maintain the active storage volume and the emergency storage volume for the existing area and potential growth area.

(2) Control Panel shall be as specified elsewhere in this section.

(3) Motors

Motor shall be sealed, submersible type with 1.15 service factor. Motors shall be non-overloading at all points on the pump's operating curve. A heat sensor thermostat shall be imbedded in top of winding and be connected in series with the motor starter coil in control box to stop motor if temperature rises in motor to over 220° F for any reason. Thermostat to reset automatically when temperature drops to a safe limit. Motors shall also be equipped with a moisture sensor which signals an alarm if moisture is present between the two seals.

Pump motor cables shall be suitable for submersible pump applications. Cable sizing shall conform to NEC requirements for the full load currents of the motors.

**b. Manufacturer:**

Submersible pumps shall be as manufactured by Flygt, ABS, Gormann-Rupp, Myers, or Village-approved equal.

**c. Shop Drawings:**

Prior to purchase of pumping equipment, the Contractor shall submit not less than four (4) sets of data to the Village Engineer for approval, including pump performance data, control panel wiring diagrams and other material required to determine compliance with these Specifications.

**d. Operation & Maintenance Manuals:**

Three (3) complete O & M Manuals shall be furnished to the Village Engineer covering all equipment furnished - pumps, motors, controls, alarm dialer, etc.

**e. Spare Parts:**

At the time that the pumping station is accepted for operation and maintenance by the Village of Pinehurst, certain spare parts shall be furnished, consisting of:

- Upper and Lower Mechanical Seal
- Motor Cable
- Cable Grommet
- Inspection Plug Washer
- Upper Bearing
- Lower Bearing

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Wear Ring  
Cable Entry Washer  
O-Ring Kit  
Impeller Bolt  
Impeller Key

**f. Warranty:**

The manufacturers of the pumps and appurtenances shall warrant to the Village of Pinehurst that the equipment that is supplied shall be free of defect in materials and workmanship for a period of 12 months following acceptance of the facility for maintenance by the MCPUD. The warranty shall name the MCPUD as warrantee and a copy of this documentation shall be delivered to the Village Engineer at the time of final acceptance.

**g. Manufacturer's Nameplate**

A manufacturer's nameplate shall be securely and permanently mounted to each individual piece of equipment furnished under this Section. The nameplate shall be constructed of a durable, non-corrosive material. Critical information shall be clearly engraved or otherwise permanently stamped on the nameplate, and shall be fully legible. The information contained on the manufacturer nameplate shall include at least the following:

- 1 Manufacturer's Serial Number
- 2 Name, address and telephone number of equipment manufacturer
- 3 Model and/or Part Number, including pump impeller sizes, when applicable
- 4 Performance Criteria (i.e., capacity, design point, etc.)
- 5 Motor size, speed and voltage
- 6 Enclosure Type or Rating
- 7 Any other pertinent information

**h. Supplier and Service Nameplate**

A durable nameplate, stamp or sticker shall be adhered to each individual piece of equipment containing the name, address, and telephone number of the local business that supplied the equipment, and the name, address and telephone number of the local business that can provide service and replacement parts for the equipment. A 24-hour emergency service telephone number should also be included.

**i. Testing**

Each pump shall be field tested by the manufacturer's technical representative to demonstrate that the pump performance meets the requirements of the drawings and specifications. The manufacturer shall provide and install any gauges, meters or other devices needed for the field tests.

Pump start-up and testing shall be done in the presence of the Village Engineer or his designated representative and shall demonstrate conformance to the conditions shown on the contract drawings.

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**8.04 Alarm Dialer System**

**a. General:**

Each pump station shall be equipped with an automatic monitoring and alarm dialer system.

It shall be the responsibility of the Developer/Contractor to install the necessary switches, contacts, relays, etc. and associated wiring required to monitor and report the alarm conditions as noted herein. The Contractor shall also be responsible for arranging for the telephone service in the name of the MCPUD and installation of the required phone jack.

The alarm dialer system shall be completely self-contained and fully automatic. The system shall monitor a minimum of eight (8) independent alarm conditions, plus power failure. (Common alarm conditions shall be wired together (in series or parallel, as appropriate) to limit the number of independent conditions. Alarm status shall be indicated by the operation of any single or multiple set of normally open or closed isolated contacts. Multiple faults shall be reported in one (1) call if necessary. Alarms shall be capable of being acknowledged by either local or remote means.

The system shall be connected into the telephone line network through a self-contained FCC approved coupler and shall plug into a standard RJ 11 telephone jack supplied with the telephone line. A regular telephone line shall be used with the system. The dialer shall have surge protection on the power and telephone lines.

The system shall operate from a 120 VAC source (fed from the pump control circuit - to sense phase loss as a power failure) with continuously float charged batteries capable of 24 hours standby operation during power outages. The operating temperature range shall be -20°F to 130°F.

Upon operation of any alarm contact, the system shall address the telephone line, wait for a dial tone, and begin dialing the first eight (8) field-programmed telephone numbers, up to sixteen (16) digits in length. The dialer shall be capable of either tone or pulse dialing. The voice message shall be electronically recorded in the field to clearly state alarm conditions.

Alarm contact connections to the dialer system shall be provided through standard wiring from the within in the pump control panel, as previously described in these Specifications, and the generator control panel.

**b. Alarm Conditions:**

The following alarm conditions shall be monitored at the pump station. The fault conditions shall be grouped to provide eight (8) alarm groups to the dialer:

- |                               |                               |
|-------------------------------|-------------------------------|
| Fault I - High Level Wet Well | Fault VI - Low Generator Fuel |
| Fault II - Pump #1 Failure    | Fault VII - Spare             |
| Fault III - Pump #2 Failure   | Fault VIII - Spare            |

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Fault IV - Generator Operating                      Power Failure  
Fault V - Generator Fail

Each pump failure alarm condition shall include failure due to overheating, overloading and seal failure (submersible pumps only). The alarm conditions above shall appear on a label to be mounted to the dialer.

**c. Enclosure & Mounting:**

The system shall be housed in a heavy gauge, JIC, UL listed steel cabinet painted with epoxy or baked-on enamel paint, NEMA 4. A thermostatically controlled strip heater shall be provided inside the enclosure. A power feed for the enclosure heater, separate from the dialer operating power, shall be provided.

The unit shall be mounted on the electrical rack under the rainshield.

**d. Shop Drawings:**

The supplier shall furnish six (6) copies of Shop Drawings giving complete descriptive information on the alarm dialer system to be provided.

**e. Manufacturer:**

The alarm dialer system shall be the "Chatterbox" model as manufactured by RACO, or equal approved by the MCPUD. The appropriate expansion module(s) shall be included to provide a sufficient number of alarm inputs.

**f. Dialer Programming:**

The alarm dialer shall be programmed in accordance with the MCPUD's directives.

**g. Telephone Service:**

The CONTRACTOR shall arrange for telephone service, in the name of the MCPUD, to the pump station electrical rack. Wiring from the telephone system network interface to the automatic dialer enclosure shall be completed by the CONTRACTOR.

**h. Start-Up Services:**

The supplier shall provide complete installation and operating instructions for use by the MCPUD. Start-up by a factory representative is required and shall be conducted in the presence of the Village Engineer and MCPUD staff.

**8.05 Standby Power Generator System**

**a. General:**



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**f. Engine Fuel System:**

Fuel ..... #2 Diesel  
Fuel filter ..... 5 micron  
Injection type ..... Direct  
Fuel pump ..... Mechanical, engine driven  
Fuel tank ..... Double wall base type, listed by a third party testing agency that is accredited by NCBCC and accepted by the State of NC  
Fuel tank capacity ..... 24 (min.) hours @ rated load  
Fuel tank accessories: ..... Fuel level indicator  
Low fuel indicator switch (on at 20% capacity)  
Screened vent for double wall cavity  
Drain port

**g. Engine Exhaust System:**

Silencer ..... Critical  
Mounting ..... External with weather cap  
Connection ..... Flexible stainless steel pipe

**h. Engine Combustion Air Intake:**

Air cleaner ..... Replaceable dry cartridge

**i. Engine Electrical:**

Starter motor ..... 12 or 24 volt  
Battery charge alternator ..... 30 amps (min)  
Crank limiter ..... Solid state  
Battery ..... 2 - 12 volt (series or parallel, as appropriate)  
Battery mounting ..... Rack inside enclosure  
Polarity ..... Negative ground  
Standby charger ..... 10 amp, automatic float

**j. Generator:**

The generator shall meet the following requirements:

**Generator Specifications:**

Generator type ..... 4 pole, revolving field



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Output current

Gauge Selector switch ..... 3 position with "off"  
Manual voltage adjustment ..... Rheostat, 5% adj. range

**Alarm Output Contacts:**

Generator Fail  
Generator Operating  
Low Fuel

Alarm output contacts are to be wired to the alarm dialer, see Section 8 for alarm channels.

**I. Generator Set Enclosure & Mounting:**

The engine-generator set shall be enclosed in a weatherproof housing which meets the following specifications:

Access panels ..... Lockable (keyed alike), hinged and removable  
Hardware ..... Stainless steel  
Finish ..... Baked enamel over zinc coated steel  
Mounting ..... Welded steel base with vibration isolators  
Mounting location ..... Top of fuel tank

**m. Automatic Transfer Switch:**

The automatic transfer switch to be supplied as part of the standby power system shall meet all applicable requirements set forth by the National Electrical Code and OSHA. The transfer switch shall also conform to the requirements as specified below:

**Enclosure:**

Mounting type ..... Surface  
Enclosure type ..... NEMA 3R, lockable

**Electrical Ratings:**

Operating voltage ..... Compatible with station voltage  
Operating current ..... No less than main disconnect  
Withstand and closing rating ..... 10,000 Amps, RMS, Symm. (min.)

**Transfer Switch:**

Operating mechanism ..... Single solenoid  
Holding mechanism ..... Mechanical

**VILLAGE OF PINEHURST  
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Interlock.....Mechanical and electrical  
Contact material ..... Silver alloy  
Neutral delay .....0.1 - 10 seconds

**Timer Setting Ranges:**

Utility dropout .....70-95%  
Utility pick-up .....70-95%  
Utility interrupt delay ..... 0.1-10 sec.  
Engine min. run ..... 5-30 min.  
Engine warm-up ..... 5-180 sec.  
Return to utility delay ..... 1-30 min.  
Engine cooldown ..... 1-30 min.  
Standby voltage.....70-90%  
Standby frequency .....80-90%  
Exerciser ..... Once/week

**Operation Selectors:**

Exercise ..... With/Without load  
Engine warm-up bypass ..... On/Off  
Neutral delay ..... On/Off  
Mode selector .....Manual Test/Standby/Off

**n. Standby Power System Capacity:**

The standby power system shall be capable of providing continuous standby power for the wastewater pumping station. The generator set shall be capable of starting the two pump motor loads sequentially with the full miscellaneous load applied, with no more than 30% dip. **The *minimum acceptable generator set rating shall be 25 KW for any station.*** The CONTRACTOR/DEVELOPER shall coordinate the starting requirements of the exact pumps being furnished on the project with the generator set supplier to insure that the generator set has adequate motor starting capability.

**o. Installation:**

The generator set shall be mounted and anchored to a reinforced concrete pad, located to provide adequate access for fueling and servicing. The exact dimensions of the pad, conduit entries and anchor bolts shall be based on the manufacturer's shop drawings. The pad shall have outer dimensions 1 foot greater than the footprint of the base tank, to provide 6" of exposure on all sides. The minimum thickness of the pad shall be 12", with a single mat of #6 rebar, 12" OCEW and located in the lower third of the concrete thickness. The weight

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of the mounting pad shall be equal to or greater than the weight of the generator set. All exposed edges shall be chamfered or rounded with an edging tool.

The automatic transfer switch shall be mounted beneath the rainshield as shown on the DRAWINGS. All electrical work shall conform to the National Electrical Code.

**p. Tests:**

The CONTRACTOR/DEVELOPER shall provide start-up and testing services utilizing personnel specifically authorized to perform such services by the standby power system manufacturer. The start-up services shall be scheduled with the Village Engineer with no less than 7 business days notice. The start-up and testing service shall include a complete inspection of the installation, initial break-in of the engine, testing the system performance, and servicing the engine. The following tests shall be performed in the presence of the Village Engineer.:

- (1) Generator output voltage unloaded and loaded, each phase, based on 2-hour load bank test
- (2) Voltage dip as loads are applied
- (3) Complete operating sequence (simulated utility power failure and restoration)
- (4) Pressure test engine cooling system for leaks
- (5) Test battery charging systems
- (6) Test operation of all safety systems

Upon completion of break-in and testing, the engine shall be serviced as follows:

- Change engine oil and filter
- Verify anti-freeze protection (-34° F)
- Refill fuel tank (tank shall be left full)
- Check belt tension
- Check battery connections and state of charge

During this start-up period, the MCPUD Utility maintenance personnel shall be fully instructed in the proper maintenance of the standby power system.

**q. Manufacturer:**

The generator set, controls, and transfer switch shall be furnished by a single supplier. The generator set and accessory equipment shall be supplied by Caterpillar/Olympian, Detroit Diesel/Spectrum or Kohler.

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The supplier shall be the authorized dealer of the engine-generator set manufacturer, and shall be fully qualified and authorized to provide service and parts for the engine and generator at any time during the day or night. Parts and service shall be available 24 hours per day 7 days a week, from a location within a 100-mile driving radius of the location of the installed generator set.

**r. Shop Drawings:**

Prior to purchase of stand-by power generation equipment, the Contractor shall submit not less than four (4) sets of data to the Village Engineer for approval, including equipment data, accessories, sizing calculations, etc., as may be appropriate to determine compliance with these Specifications.

**s. Operating Instructions:**

Six (6) complete copies of operating instructions and parts list shall be provided prior to acceptance of the unit. Parts list shall include schedule of type and quantity of parts recommended for stock.

**t. Spare Parts:**

The following spare parts shall be furnished at the time of start-up to MCPUD:

Engine Fan & Accessory Drive Belts .....	1 sets
Oil, Fuel & Air Filters .....	2 sets
Spare Indicator Lamps & Fuses .....	2 sets

Spare parts shall be boxed and labeled with the pumping station identification.

**u. Warranty:**

The complete standby power generating system shall be warranted for one year after the acceptance of the generating system by the MCPUD. The warranty shall cover all defects in equipment, parts, assembly and installation. The warranty shall be issued in writing by the supplier and delivered to the MCPUD with a copy to the Village Engineer.

**8.06 Force Main Materials**

**a. General:**

Force mains shall be constructed of ductile iron pipe or C-900 PVC pipe as specified herein. Force mains constructed within the Village Commercial Zoning District shall be ductile iron pipe as specified herein.

Force mains from pumping stations which are to be maintained by the MCPUD shall not be less than 4-inch nominal diameter, so as to convey a 3-inch solid which may be passed by

**VILLAGE OF PINEHURST  
ENGINEERING STANDARDS & SPECIFICATIONS**

a non-clog solids handling wastewater pump. Force mains shall be sized such that velocities are not less than 2.5 fps nor greater than 5.0 fps.

**b. Ductile Iron Pipe:**

All ductile iron pipe shall be designed as per AWWA Standard C150 for a working pressure of 200 psi plus a surge allowance (min. of PC350), laying condition 1. Pipe shall be manufactured in accordance with all applicable requirements of AWWA Standard C151.

Pipe joints shall be of the push-on type as per AWWA Standard C111. Pipe lining shall be cement mortar with a seal coat of bituminous material, all in accordance with AWWA Standard C104.

Ductile iron pipe shall be as manufactured by Griffin, U.S. Pipe, American, or Clow. The pipe shall be furnished in 20-foot lengths.

**b2. C-900 Polyvinyl Chloride (PVC) Pipe**

Polyvinyl Chloride (PVC) Pipe shall comply with applicable AWWA and Uni-Bell standards. PVC pipe shall be rigid polyvinyl chloride with integrally formed, factory fabricated bell, for rubber type joint rings. It shall be suitable for all conditions imposed by Plan locations and for a maximum working pressure of 200 psi, plus 100 psi surge allowance at 73 degrees F. Pipe shall be Type 1, Grade 1, made from clear virgin material and shall conform to the requirements of AWWA Specifications C-900-7 or latest revision, DR18 class 235. These are the minimum designs allowed for the system. The Design Engineer shall verify if potential operating pressures are in excess of these ratings and if additional pressure ratings are necessary.

All pipe shall bear the manufacturer's name, and class of pipe. Laying lengths shall be 20-foot except that random lengths may be furnished for special connections and other uses. Pipe shall be furnished in factory-packaged units. Provisions shall be made for expansion and contraction at each joint, through the rubber gasket and pipe bell.

Iron fittings shall be provided for PVC pipe conforming to Section 8.06 (c) of these specifications.

All PVC pipe shall be installed with #12 coated copper tracing wire and magnetic detector tape.

**c. Fittings:**

Fittings for ductile iron pipe force mains, 4-inch diameter and larger, shall be ductile or cast iron conforming to the specifications for fittings as previously presented for water distribution under Section 6.03 paragraph "k" of these Specifications.

**e. Air Release & Combination Air/Vacuum Valves:**

Air release valves shall be located at all high points of force mains where gas pockets may accumulate. Sewer air release valves shall be equal to Empire Fig. 925, Crispin SL-20 or

**VILLAGE OF PINEHURST  
ENGINEERING STANDARDS & SPECIFICATIONS**

30, or Apco No. 400. Combination air/vacuum valves shall be installed at high points where the force main is subject to filling and draining cycles. Combination sewer air/vacuum valves shall be equal to Empire Fig. 955, Crispin SL-20/S-20A, or Apco 400/401. Each valve shall be equipped with flushing connections and one set of flushing hoses. Sewer air/vacume release valves shall be installed in accordance with the Village's Standard Details.

**8.07 Force Mains - Installation Methods**

**a. General Requirements:**

All force main construction methods, including trench excavation, bedding, backfill, etc. shall conform to the requirements for water main installation as specified herein under Section 6.04.

All force main pipe and fittings shall be adequately blocked against thrust reaction, as are water mains, in accordance to the Village's Standard Details.

The engineering drawings for all force mains shall include a profile drawing for the entire length of the main. Sewer air valves and/or air and vacuum valves shall be installed at all high points on the force main.

**b. Testing of Force Mains:**

All force mains shall be tested to water main standards. The section of force main to be hydrostatically tested shall be slowly filled with water at a rate which will allow complete evacuation of air from the line.

The line shall be tested to a pressure of 200 psi as measured at the lowest elevation of the line for a duration of at least 2 hours. The pressure gauge used in the hydrostatic test shall be calibrated in increments of 5 psi or less. At the end of the test period, the leakage shall be measured with an accurate water meter.

Pipe size and the corresponding allowable leakage (gal.) per 1000 feet of pipe are as follows:

<u>PIPE SIZE</u>	<u>ALLOWABLE LEAKAGE/1000 FT. (Gallons)</u>
4"	0.85
6"	1.28
8"	1.70
12"	2.56
16"	3.40

All visible leaks are to be repaired regardless of the amount of leakage. For larger size pipes, allowable leakage shall be in accordance with the formulas set forth by AWWA.

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**c. Magnetic Locator Tape:**

All force mains shall have magnetic locator tape installed 18" below finish grade and extended into valve boxes and manholes to facilitate location.

**d. Receiving Manholes:**

All receiving manholes shall be fully coated inside with coal tar epoxy. See Section 7.03 (g).

**e. Sewer Air or Combination Valves**

Sewer air or combination valves shall be installed in manholes at all high points along the force main as shown on the plan and profile drawings. The manholes shall comply with Standard Detail 7.11.

**\*\*\* END OF SECTION 8 \*\*\***



## **Appendix**

**Plan Approval Stamps  
Inspections Notice to Contractors  
Engineering Inspection Fees Worksheet  
Permit forms  
As-Built Checklist  
Warranty & Bond Forms**

**"Certificate of Plan Approval" Block**

**Village of Pinehurst  
Construction Plan Approval**

All Construction Methods and Materials shall be in accordance with the Village of Pinehurst, Moore County Public Utilities, and NCDOT Standards and Specifications. In the event of a conflict between standards, the more stringent shall govern unless a written waiver is issued by the Village Engineer. Utility installations and other Public Facilities, including streets, sidewalks, and handicap ramps, have been approved by the Village of Pinehurst and shall be so installed unless a change is authorized by prior written approval. Public Sanitary Sewer and Utility Easements shall be recorded prior to final acceptance and /or issuance of a Certificate of Occupancy by the Village.

Plan Approval Number \_\_\_\_\_

Engineering \_\_\_\_\_

Fire Department \_\_\_\_\_

Planning \_\_\_\_\_

Moore Co. Public Utilities \_\_\_\_\_

These improvements shall be constructed in accordance with the following drawings and with the Standard Specifications of the Village of Pinehurst.

I, \_\_\_\_\_, PE, certify that the Standard Specifications of the Village of Pinehurst have been thoroughly checked and found to be applicable to this project. All exceptions to the applicable Village standards have been previously approved by the Village of Pinehurst and said exceptions are shown on Sheet(s) \_\_\_\_\_ of these drawings.

By: \_\_\_\_\_, PE

SEAL

Date: \_\_\_\_\_



## **INFRASTRUCTURE INSPECTION NOTICE TO CONTRACTOR**

This is to advise you that the Village of Pinehurst is now requiring a **minimum** of Forty-eight (48) hours of notice when requesting an Engineering Inspection. Inspection requests may be made by calling the Engineering Department at 295-1900. *Items requiring an Engineering Inspection include, but are not limited to:*

1. Subgrade inspection/proof rolling (streets, sidewalks, firelanes, etc.) Density tests from an approved geotechnical engineering firm may be required.
2. Placement and inspection of base course materials including proof-rolling. Density tests from a Village-approved geotechnical engineering firm may be required/accepted by the Village.
3. Placement and compaction of pavement materials including concrete and asphalt surface courses. Includes stringlines/grade control, paving & rolling operations, material inspections.
4. Installation of water and sewer mains and services including pressure testing, pipe laying, chlorination of water mains, bacterial testing, mandrel pulls, etc. necessary to meet the Village's Utility ordinances. NOTE: The Contractor shall also contact Moore County Public Utilities Department Engineering Division at 947-6315 to schedule utility inspections as required by MCPUD
5. Installation of formwork and placement of concrete (sidewalks, curb & gutter, etc.) within the public right of way.
6. Installation of storm drainage systems (pipes, trenches, catch basins, frames/grates, outlet protection, etc.)

**Failure to schedule the required inspections shall be grounds for rejection of all work not inspected and issuance of a stop-work order until the project is in compliance.**



**VILLAGE OF PINEHURST**  
**PLAN REVIEW FEES**  
**WORKSHEET**

Engineering Department  
 395 Magnolia Road  
 Pinehurst, NC 28374  
 Phone: (910) 295-1900  
 Fax: (910) 295-1853

PROJECT NAME: \_\_\_\_\_  
 DESIGN FIRM: \_\_\_\_\_  
 DESIGNER OF RECORD & PROJECT CONTACT \_\_\_\_\_  
 ADDRESS: \_\_\_\_\_  
 PHONE #: \_\_\_\_\_ FAX #: \_\_\_\_\_

Worksheet must be signed & sealed by the NC Registered Design Professional responsible for the Project. Plan Review Fees must be paid prior to review of plans. Review Fees cover two (2) bond paper reviews and one (1) mylar signoff. If additional reviews are required due to failure of project team to address all comments, then additional review fees may be levied.

**SINGLE FAMILY SUBDIVISIONS**

Base Fee: \$300.00 = \$ \_\_\_\_\_  
 + Lot Fee: \_\_\_\_\_ # Lots X \$100.00/lot = \$ \_\_\_\_\_

**COMMERCIAL & MULTI FAMILY**

Base Fee: \$300.00 = \$ \_\_\_\_\_  
 + Acreage Fee: \_\_\_\_\_ # Acres X \$100.00/acre = \$ \_\_\_\_\_  
 (Note: Acreage is gross project site acreage)

**FEMA FLOOD STUDY REVIEW** \$1,000.00/study = \$ \_\_\_\_\_

**TRAFFIC IMPACT STUDY REVIEW** Cost + 10% = \$ \_\_\_\_\_  
 (Note: Traffic Impact Studies shall be conducted by a firm chosen by the Village Engineering Department, with all costs to be paid by the Developer. Please contact the staff early in the project process to determine if a TIA study will be required so that delays may be avoided.)

**TOTAL FEES DUE = \$ \_\_\_\_\_**

I certify that the above information recorded on this worksheet is a true and accurate compilation of the specified project.

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_ SEAL



**VILLAGE OF PINEHURST**  
**INFRASTRUCTURE INSPECTION**  
**FEES WORKSHEET**

Engineering Department  
 395 Magnolia Road  
 Pinehurst, NC 28374  
 Phone: (910) 295-1900  
 Fax: (910) 295-1853

**PROJECT NAME:** \_\_\_\_\_

**REFERENCE #:** \_\_\_\_\_

Please submit completed worksheet to Village of Pinehurst Engineering Department prior to Construction Approval (Subdivisions) or along with completed Building Permit Application (Site Plans). Worksheet must be sealed by the NC Registered Design Professional responsible for the Project.

<b>WATER LINE</b> (Includes privately-owned mains on owner's side of meter)	_____ Linear Feet X \$1.00/lin.ft. =	\$ _____
<b>SEWER LINE</b> (Includes private and public mains and collector mains)	_____ Linear Feet X \$1.00/lin.ft. =	\$ _____
<b>NEW ROADWAY</b>	_____ Linear Feet X _____ # Lanes X \$0.75 =	\$ _____
<b>WIDENING OF EXISTING ROADWAY</b>	_____ Lin. Ft. X _____ # Lanes Widened X \$0.75 =	\$ _____
	**Not Less than One Lane**	
<b>FIRELANES ON PRIVATE PROPERTY</b>	_____ Linear Feet X _____ # Lanes X \$0.40 =	\$ _____
<b>SIDEWALK AND PATHWAYS</b>	_____ # Linear Feet X \$0.50/LF =	\$ _____
<b>CURBCUTS FOR DRIVEWAYS</b>	_____ # Drives X \$50.00/each =	\$ _____
<b>TAP INSPECTION FEES (water &amp; sewer)</b>	_____ # Taps X \$50.00/each =	\$ _____
<b>STORMWATER FEES</b>	_____ # Ft. of Pipe X \$0.45/ft.=	\$ _____
	_____ # Structures X \$40.00/each=	\$ _____
<b>TOTAL FEES DUE =</b>		<b>\$ _____</b>

*Note: All Fees must be paid prior to Construction Plan Approval for Subdivisions or Issuance of any Building or Grading Permits for Site Plans.*

I certify that the above information recorded on this worksheet is a true and accurate compilation of the specified project.

**SIGNATURE:** \_\_\_\_\_ **DATE:** \_\_\_\_\_ **SEAL**

VILLAGE OF PINEHURST  
ENCROACHMENT AGREEMENT

STATE OF NORTH CAROLINA  
COUNTY OF MOORE

VILLAGE OF PINEHURST  
and

RIGHT-OF-WAY ENCROACHMENT AGREEMENT  
MUNICIPAL STREET SYSTEM  
STANDARD FORM

THIS AGREEMENT, made and entered into the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between the Village of Pinehurst, herein after referred to as "VILLAGE" and \_\_\_\_\_, herein after referred to as "COMPANY",

WITNESSETH:

THAT WHEREAS, the Company desires to encroach on the right-of-way of the public road designated as \_\_\_\_\_ located \_\_\_\_\_ with the construction and/or erection of \_\_\_\_\_;

WHEREAS, it is to the material advantage of the Company to effect this encroachment, and the Village in the exercise of authority conferred to it by statute, is willing to permit the encroachment within the limits of the right-of-way as indicated, subject to the conditions of this agreement.

\*NOW, THEREFORE, IT IS AGREED that the Village hereby grants to the Company the right and privilege to make this encroachment as shown on the attached plan sheet(s), specifications, and special provisions that are made a part hereof upon the following conditions, to wit:

That the installation, operation, and maintenance of the above described facility will be accomplished in accordance with the Village of Pinehurst Engineering Design and Construction Standards and other Village ordinances and policies as applicable.

That the said Company binds and obligates itself to install and maintain the encroaching facility in such safe and proper condition that it will not interfere with or endanger travel upon said street, nor obstruct nor interfere with the proper maintenance thereof. The Company agrees to reimburse the Village for the cost incurred for any repairs or maintenance to its roadways and structures necessary due to the installation and existence of the facilities of the Company.

That, if any time the Village shall require the removal of, or changes in, the location of the said facilities, then the Company binds itself, its successors and assigns, to promptly remove or alter the said facilities, in order to conform to the said requirement, without any cost to the Village.

That the Company agrees to provide, during construction and any subsequent maintenance, proper signs, signal lights, flagmen and other warning devices for the protection of traffic in conformance with Village standards and the latest Manual on Uniform Traffic Control Devices for Streets and Highways and Amendments or Supplements thereto.

That the Company agrees to restore all areas disturbed during installation and maintenance to the satisfaction of the Village.

The Company agrees to give a minimum of 48 hours notice to the Village both before work is initiated and once all work contained herein has been completed.

That it is agreed by both parties that this agreement shall become void if actual construction of the work contemplated herein is not begun within six (6) months from the date of authorization by the Village unless written waiver is secured by the Company from the Village.

IN WITNESS WHEREOF, each of the parties to this agreement has caused the same to be executed as of the date first above written.

VILLAGE OF PINEHURST  
ENGINEERING DEPARTMENT

By: \_\_\_\_\_  
Director of Engineering (or designee)

\_\_\_\_\_  
Name of Company

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Please print name and title

\_\_\_\_\_  
Address

\_\_\_\_\_  
City, State, & Zip

\_\_\_\_\_  
Fax Telephone

\_\_\_\_\_  
24 Hour Emergency contact name and telephone number

NO OPEN STREET CUTS

THIS ENCROACHMENT REQUEST  
INCLUDES (Applicant to check all that are applicable)

Open cut(s) of roadway(s)

Bore(s) of roadway(s)

Repair of existing facilities

overhead

underground

New overhead facilities

_____ Inspector Name	_____ Phone Number
-------------------------	-----------------------

ALL INSTALLATIONS SHALL BE AT LEAST 24" BELOW GRADE

1. Call North Carolina One-Call Center, Inc. at 1-800-632-4949 and Moore County Public Utilities at (910) 947-6315 for Utility locations 48 hours before digging. Field locates by MCPUD personnel shall be approximate. It shall be the responsibility of the Company to field verify/spot-locate MCPUD utilities.
2. Attach 8 1/2" x 11" Plans to this Document.
3. An approved copy of this document must be present on the job site at all times.
4. The installation of utilities in Village of Pinehurst' right-of-way may be performed only during regular business hours (8:00 a.m. to 4:00 p.m.) on Monday through Thursday and between 8:00 a.m. and 12:00 noon on Fridays. No work shall be performed in the Village's right-of-way on weekends or holidays.
5. All bores must be minimum 24 inches in depth. The Village reserves the right to require additional bore/burial depth for any and all installations.

- Copy to Utility Company
- Copy to Notebook
- Copy to Public Works

\$ \_\_\_\_\_ Total Fee

# VILLAGE OF PINEHURST

## AS-BUILT CHECKLIST

All entities who construct public waterlines or facilities, public sanitary sewer lines or facilities, or streets to be publicly maintained or private streets and travel lanes shall submit to the Village of Pinehurst Engineering Department, an as-built set of construction drawings as a part of the Village's acceptance process. **As-builts must be submitted prior to acceptance of the improvements or issuance of a certificate of occupancy.** The following check list must be attached to each set of as-builts submitted for approval. Each blank must be initialed by the applicant as being included on the as-builts or marked N/A if not applicable to the project. Staff suggests applicants submit a "Blackline" Bond paper Preliminary As-built for review *prior* to plotting and submitting vellums or mylars. Lettering shall be bold, clear and a minimum of 1/8" in height. **All applicable information listed below must be included on all as-built drawings.**

### All Final As-built Submittal Packages shall contain:

- \_\_\_ 1 set of plan sheets - 24" X 36" mylar or vellum, and
- \_\_\_ 2 sets blackline bond paper copies, and
- \_\_\_ 1 digital copy of the as-builts in AutoCAD 2002 format.

### 1. AS-BUILT INFORMATION

Submitted by \_\_\_\_\_  
Phone # \_\_\_\_\_

(Please check)

Blue Line For Review Only [ ]  
Mylar or Vellum (Final) [ ]

Transmittal Date \_\_\_\_\_

## 2. SITE DATA (Tabular Form)

Page # \_\_\_\_\_

- \_\_\_\_\_ A. Acreage in total tract
- \_\_\_\_\_ B. Average lot size
- \_\_\_\_\_ C. Total number of lots
- \_\_\_\_\_ D. Total linear footage of infrastructure chart, Page # \_\_\_\_\_

- \_\_\_\_\_ Streets (List individually in lengths)
- \_\_\_\_\_ Water mains (Identify size and length)
- \_\_\_\_\_ Sewer mains (Identify size and length)
- \_\_\_\_\_ Number of valves (For each size)
- \_\_\_\_\_ Number of fire hydrants
- \_\_\_\_\_ Number of manholes
- \_\_\_\_\_ Other (Any additional appurtenances)

## 3. GENERAL INFORMATION

Page # \_\_\_\_\_

- \_\_\_\_\_ A. Copy of recorded plat or deed of easements, indicating easements and right of way
- \_\_\_\_\_ B. Boundary of tract by courses and distance with references
- \_\_\_\_\_ C. Tie to N.C. grid coordinate system (x,y,z). All sets shall be tied to grid with monument noted.
- \_\_\_\_\_ D. 500 scale vicinity map
- \_\_\_\_\_ E. Scale of drawings and bar scale
- \_\_\_\_\_ F. North arrow
- \_\_\_\_\_ G. Location of benchmark with M.S.L. elevations
- \_\_\_\_\_ H. Seal and signature of North Carolina registered P.E. and/or P.L.S. on each sheet that performed as-builts
- \_\_\_\_\_ I. All easements identified and dimensioned
- \_\_\_\_\_ J. Statement designating drawings are "as-built" on each sheet

## 4. STREETS (Public or Private)

Page # \_\_\_\_\_

- \_\_\_\_\_ A. Horizontal alignment with radii, P.C.'s, and P.T.'s of all curves
- \_\_\_\_\_ B. Vertical alignment with centerline grades, vertical curve lengths and station and elevation of all PVC's and PVT's and centerline profile.
- \_\_\_\_\_ C. Dimensioned right of way and street widths

- \_\_\_\_\_ D. Pavement section
- \_\_\_\_\_ E. Typical cross section

## 5. STORM DRAINAGE

Page # \_\_\_\_\_

- \_\_\_\_\_ A. Outline of 100 year flood plain (FEMA and/or culvert backwater profile)
- \_\_\_\_\_ B. Pipe material
- \_\_\_\_\_ C. Structure invert and top elevations
- \_\_\_\_\_ D. Pipe size
- \_\_\_\_\_ E. Pipe slope and distance
- \_\_\_\_\_ F. Size of riprap dissipation pad
- \_\_\_\_\_ G. Statement of stormwater velocity at all outlets
- \_\_\_\_\_ H. Show permanent stormwater best management practice
- \_\_\_\_\_ I. A separate, recorded easement dedication plat for utility extensions outside right of way
- \_\_\_\_\_ J. Maintenance agreement responsibility statement

## 6. WATER SYSTEM

Page # \_\_\_\_\_

- \_\_\_\_\_ A. Pipe material labeled
- \_\_\_\_\_ B. Pipe size labeled
- \_\_\_\_\_ C. Separation from sanitary and storm sewer shown on plans
- \_\_\_\_\_ D. Locations with distance references (2 each per appurtenance)
  - \_\_\_\_\_ Valves
  - \_\_\_\_\_ Fire hydrants
  - \_\_\_\_\_ Blow-offs
  - \_\_\_\_\_ Meters
  - \_\_\_\_\_ Air release valves
- \_\_\_\_\_ E. Certification by N.C.P.E. of construction in accordance with the water extension permits
  - \_\_\_\_\_ Certification on the plans
  - \_\_\_\_\_ A separate certification sheet is provided
- \_\_\_\_\_ F. A separate, recorded easement dedication plat for utility extensions outside right of way

**7. SANITARY SEWER SYSTEM**

Page # \_\_\_\_\_

- \_\_\_\_\_ A. Pipe material labeled
- \_\_\_\_\_ B. Pipe size labeled
- \_\_\_\_\_ C. Manhole top elevations
- \_\_\_\_\_ D. Invert in and out elevations
- \_\_\_\_\_ E. Pipe slope
- \_\_\_\_\_ F. Locations with distance references (2 each appurtenance)

- \_\_\_\_\_ Clean outs
- \_\_\_\_\_ Air release valves
- \_\_\_\_\_ Manholes
- \_\_\_\_\_ Force main valves

- \_\_\_\_\_ G. Horizontal control (angles at manholes)
- \_\_\_\_\_ H. 100-year flood plain elevation
- \_\_\_\_\_ I. Certification by N.C.P.E. of Construction in accordance with sanitary sewer extension permits

- \_\_\_\_\_ Certification on the plans
- \_\_\_\_\_ A separate certification sheet shall be provided

\_\_\_\_\_ J. A separate, recorded easement dedication form for utility extensions outside right of way

**Village of Pinehurst Use Only**

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As-Builts Reviewed by \_\_\_\_\_ Date \_\_\_\_\_

Approved \_\_\_\_\_

Returned \_\_\_\_\_

**VILLAGE OF PINEHURST**  
**MAINTENANCE GUARANTEE**

**APPLICANT**

**SURETY**

**DESCRIPTION OF MAINTENANCE GUARANTEE:**

<b>AMOUNT OF BOND</b>	<b>Subdivision Name</b>
	<b>Final Plat</b>
	<b>Date of Acceptance</b>
	<b>Type of Improvement</b>

KNOW ALL MEN BY THESE PRESENTS, That we the APPLICANT and SURETY above named, are held and firmly bound unto the VILLAGE OF PINEHURST, North Carolina, hereinafter called the VILLAGE, in the amount stated above for the payment for which sum we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

NOW, THEREFORE, the APPLICANT does hereby guarantee the improvements installed by or on behalf of the APPLICANT against defects in workmanship or materials for a period of 365 days from the date of the acceptance of said improvements, exclusive of the date of acceptance. If thirty (30) days prior to the expiration of this Maintenance Guarantee any defects in workmanship and materials are repaired to the satisfaction of the VILLAGE, which shall be expressed in writing by the VILLAGE DIRECTOR OF ENGINEERING, or his agents, or employees, then this obligation shall be void at midnight on the above specified date. If the APPLICANT fails to make said repairs or does not do so to the written satisfaction of the VILLAGE, this obligation shall remain in full force and effect through and including the thirtieth day following the written satisfaction of the VILLAGE to repairs made under this SURETY BOND. The intent and purpose of this paragraph is to implement Section 15 of the Pinehurst Development Ordinance of VILLAGE and shall be interpreted consistent with the intent of that section.

IN WITNESS WHEREOF, the above—bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

**(Seal of Applicant)**

**APPLICANT (Type name of Applicant)**

**Attest:**

**By:**

**Title**

**Title**

**(Seal of Surety)**

**(Name of SURETY)**

**By: Attorney-in-Fact**

**Note: Attach Power of Attorney and Certificate of Authority of Attorney-in-Fact.**

STATE OF NORTH CAROLINA  
COUNTY OF MOORE

**IRREVOCABLE LETTER OF CREDIT  
SUBDIVISION IMPROVEMENTS  
LOAN NO.**

TO: Village of Pinehurst Village Council  
c/o The Office of the Village Manager  
395 Magnolia Road  
Pinehurst, North Carolina 28374

Mayor and Village Council:

We hereby open our irrevocable credit in your favor available by your drafts at sight on us for a sum not exceeding  
for the account of \_\_\_\_\_

\_\_\_\_\_ (\$ \_\_\_\_\_ }  
hereinafter known as "Customer." When presented for negotiation, drafts must be accompanied by the signed statement from the Village Manager of the Village of Pinehurst that the drawing is due to default or failure to perform by Customer, the following improvements in the subdivision of

*Required Improvements*

*Approximate Price*

\_\_\_\_\_ on or before the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

Upon the Lender's honor of such drafts and payment to the Beneficiary, Lender shall be fully discharged of its obligations under this Letter of Credit with respect to such demand for payment and shall not thereafter be obligated to make any further payments under this Irrevocable Letter of Credit in respect of such demand for payments to Beneficiary or any other person.

The term of this irrevocable credit is either through and including the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_ , or upon written notice from the Village Manager of the Village of Pinehurst that the required improvements have been timely completed, whichever is earlier. In that event that circumstances beyond the control of the Customer delay the completion of any of the required improvements, this Irrevocable Letter of Credit shall be reviewed and renegotiated to establish a new term. This shall be done prior to the expiration of the original term.

**IRREVOCABLE LETTER OF CREDIT**

Acting through the Village Manager of the Village of Pinehurst, you will notify us when either of the following occurs:

1. The required improvements have been timely completed and the credit may be released; or
2. The Customer has failed to perform or is in default thereunder

*All drafts drawn hereunder must be marked as follows:*

\_\_\_\_\_  
“ \_\_\_\_\_, Contractor.”  
*(Provider of improvements from page one (1))*

The amount of any draft drawn under this credit must, concurrently with negotiation, be endorsed on the reverse side hereto, and the presentment of any such draft shall be a warranty by the negotiating bank that such endorsement has been made.

This Letter of Credit shall be transferable and/or assignable.

This Letter of Credit, except as otherwise expressly provided herein, is governed by the Uniform Commercial Code in force in the State of North Carolina on the date hereof.

The Letter of Credit shall be governed by the laws of the state identified in Lender's address to the extent not governed by the Uniform Customs and Practice for Documentary Credits (1993 Revision), International Chamber of Commerce Publication Number 500 and to the extent such laws are not inconsistent with the terms of this Letter of Credit.

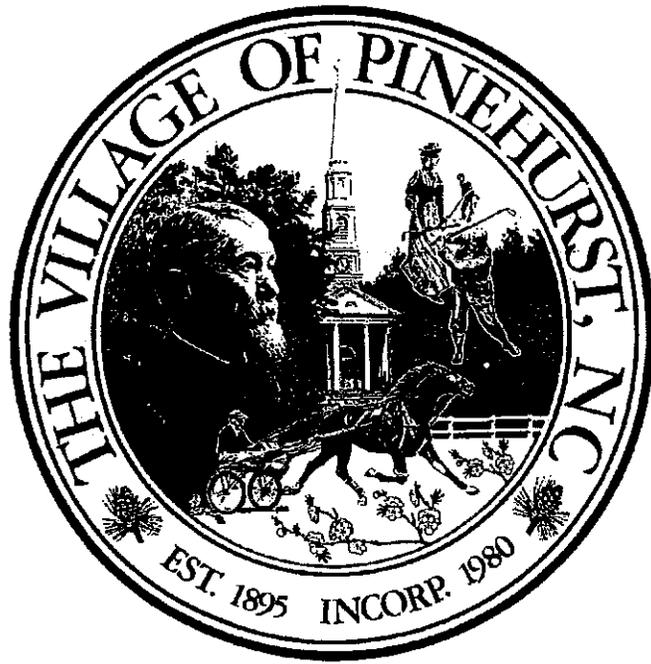
Very truly yours,

By:

Accepted by Village of Pinehurst

By:

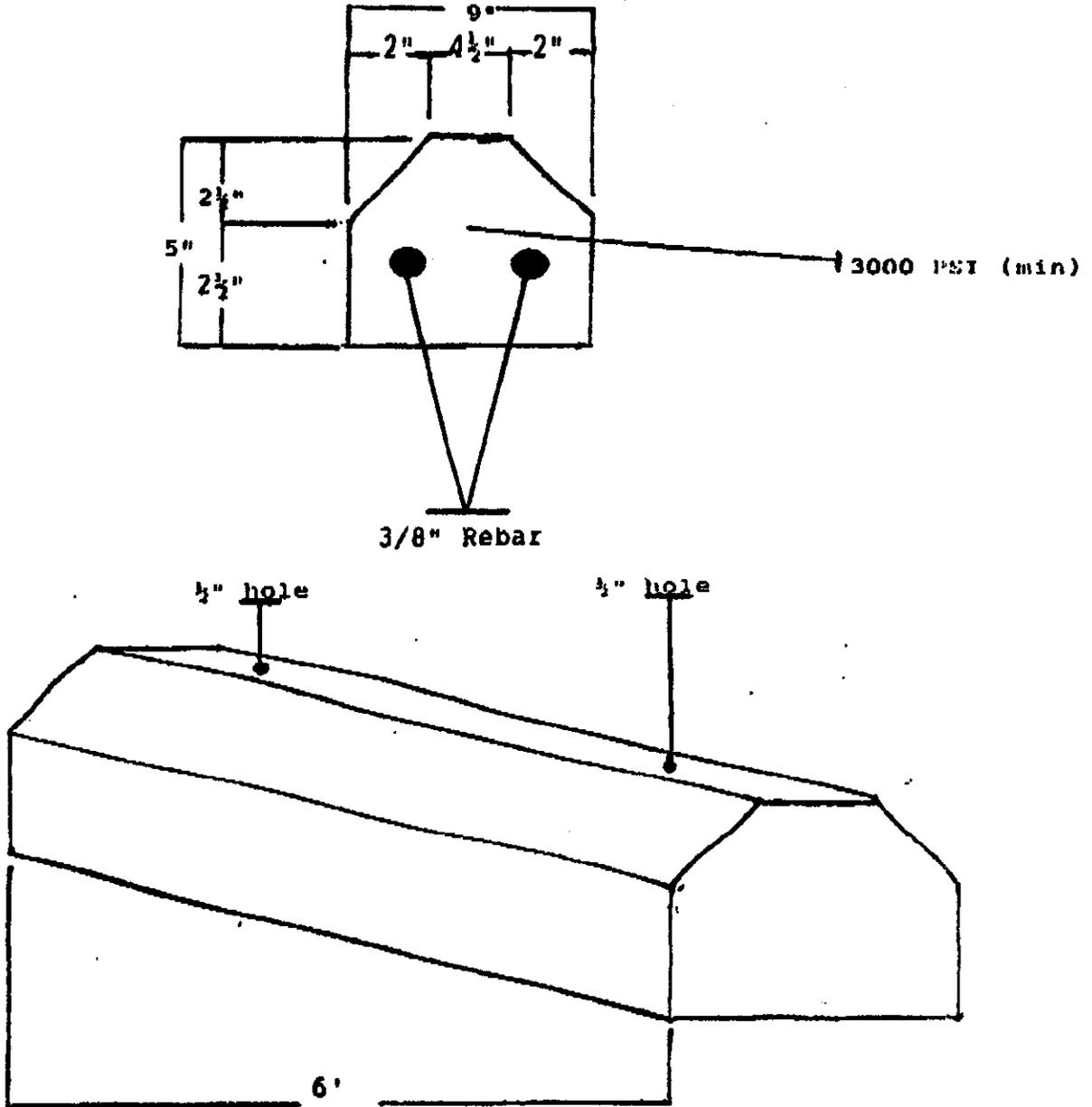
*This Letter of Credit represents the complete and integrated understanding between Lender and Beneficiary pertaining to the terms and conditions hereof. The undertaking represented by this Letter of Credit shall not be amended, amplified, or limited by any other document or agreement except as set forth herein.*

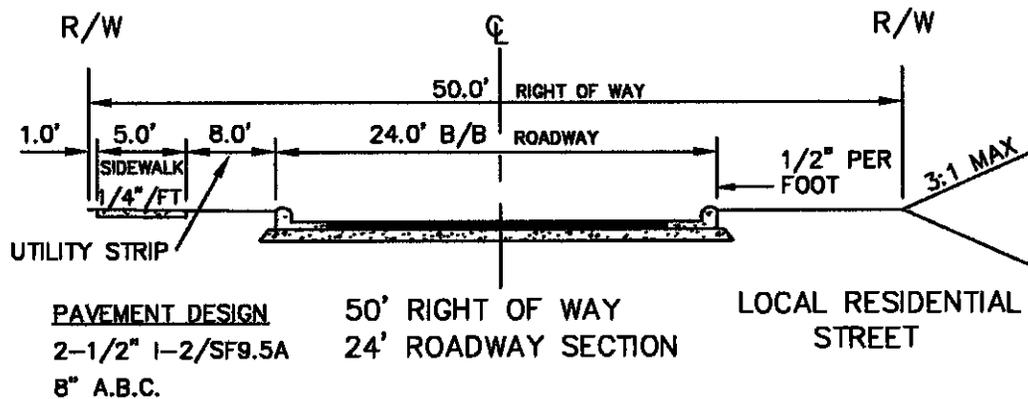
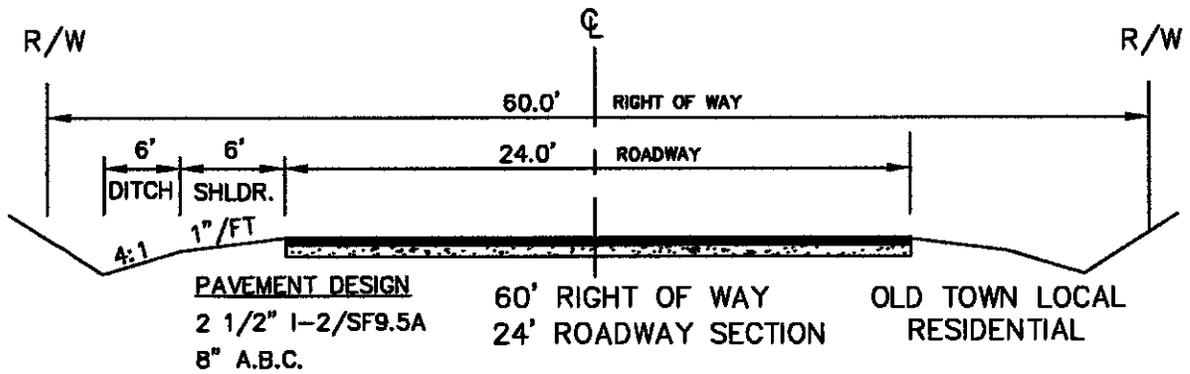


## STANDARD DETAILS

# TROY READY MIX, INC.

P.O. BOX 137 TROY, NORTH CAROLINA 27371  
(910) 572-1011 FAX (910) 572-3711  
1-800-525-9053

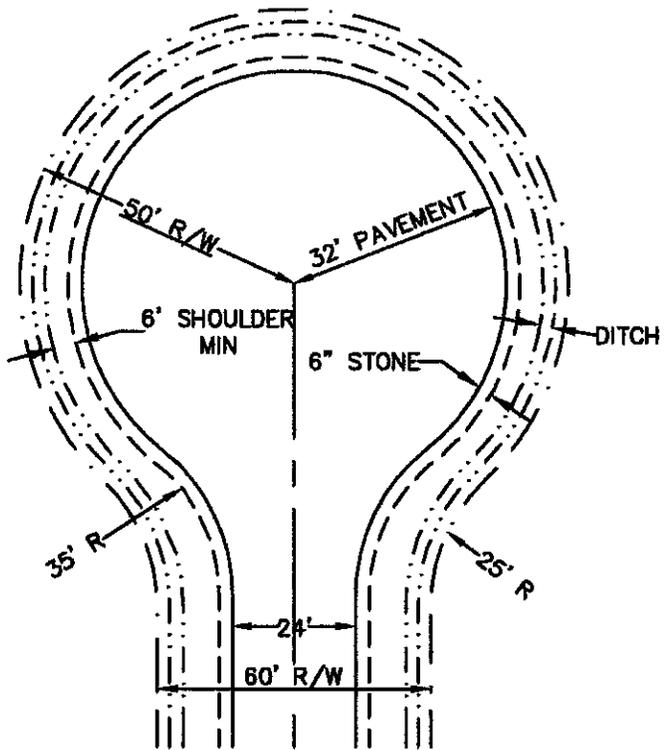




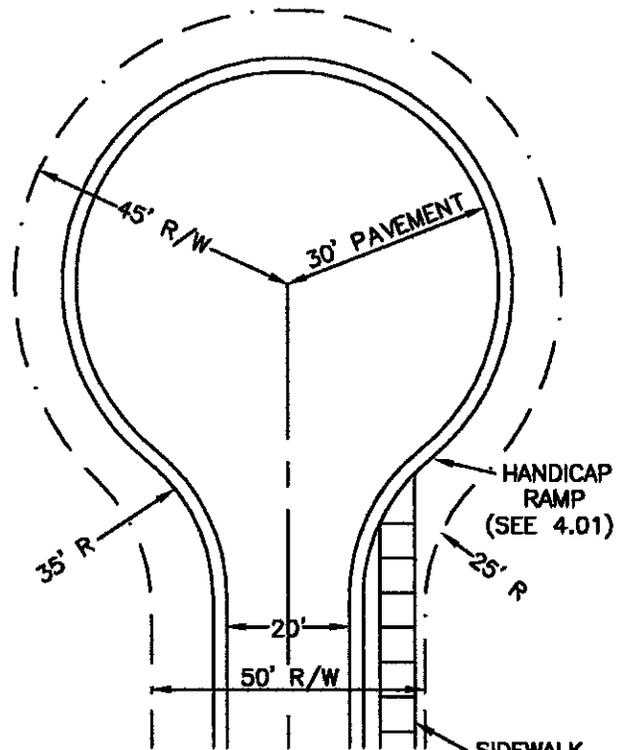
**NOTES:**

1. NORMAL CROWN OF 1/4" PER FOOT UNLESS OTHERWISE DIRECTED BY VILLAGE ENGINEER.
2. THE VILLAGE COUNCIL MAY WAIVE THE REQUIREMENT FOR CURB AND GUTTER ALONG GATED PRIVATE STREETS THAT ARE BEING ADDED TO AN EXISTING NEIGHBORHOOD IF IT IS DETERMINED THAT IT IS IN THE BEST INTEREST OF THE PUBLIC TO ALLOW FOR THE CONTINUATION OF THE DEVELOPMENT PATTERN WITHIN THE EXISTING SECTIONS OF THE DEVELOPMENT. PROPER DRAINAGE MEASURES AND RIGHT-OF-WAY AREAS SHALL BE INCORPORATED INTO THE ROADWAY DESIGN IN THESE AREAS AND APPROVED BY THE VILLAGE.

REV	DESCRIPTION	DATE	APPROVED BY	TYPICAL SECTIONS LOCAL RESIDENTIAL STREETS	
1	ADD NOTE #2	08/10	MSA		
NOT TO SCALE		DWG NO. 3.01	SHEET 1 OF 1		



DITCH TYPE  
OLD TOWN



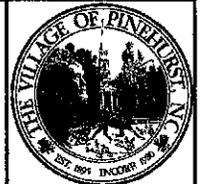
CURB AND GUTTER

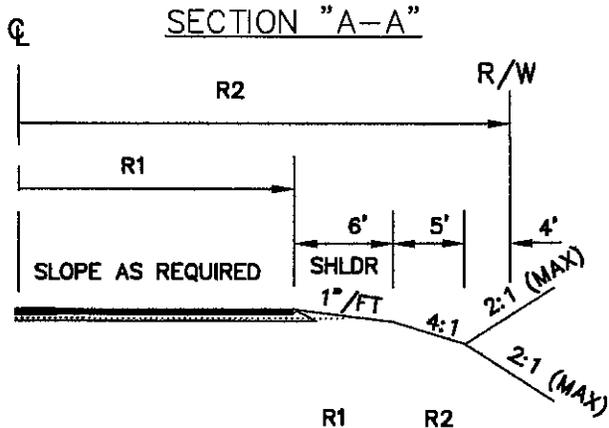
**NOTES:**

1. CURB AND GUTTER STREETS SHALL BE 24" STANDARD CURB AND GUTTER. (SEE DETAIL 4.03).
2. THE CROWN FOR PAVEMENT SHALL BE 1/4" PER FT FROM THE CENTER OF THE CUL-DE-SAC.
3. MAXIMUM CUL-DE-SAC LENGTH IS 500'.
4. THE DITCH TYPE/OLD TOWN DETAIL SHALL APPLY TO AREAS WHERE THE VILLAGE COUNCIL WAIVES THE REQUIREMENT FOR CURB AND GUTTER ALONG GATED PRIVATE STREETS.

REV	DESCRIPTION	DATE	APPROVED BY
△	ADD NOTE #4	08/10	MSA
NOT TO SCALE	DWG NO. 3.02-A	SHEET 1 OF 1	

CUL-DE-SAC  
LOCAL RESIDENTIAL  
DETAIL

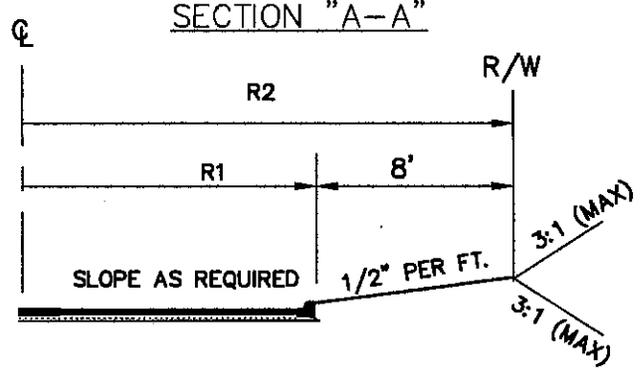
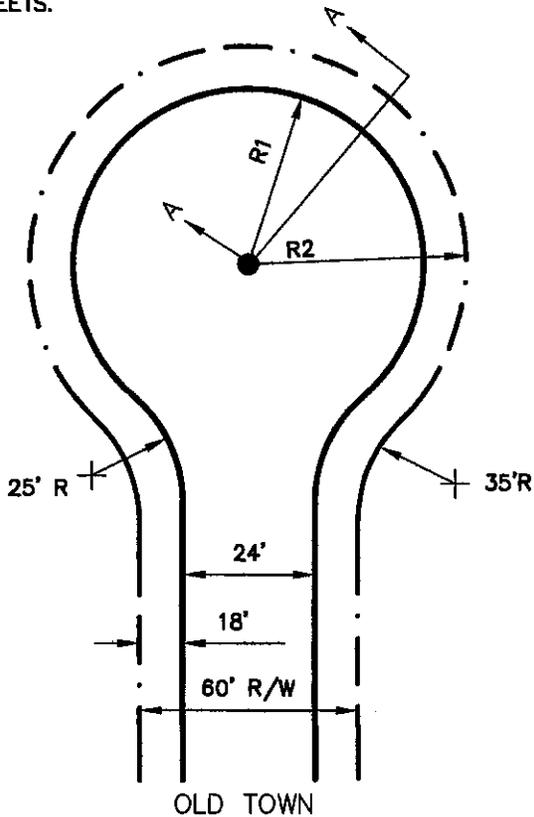




TYPE	R1	R2
RESIDENTIAL	35' *	50'

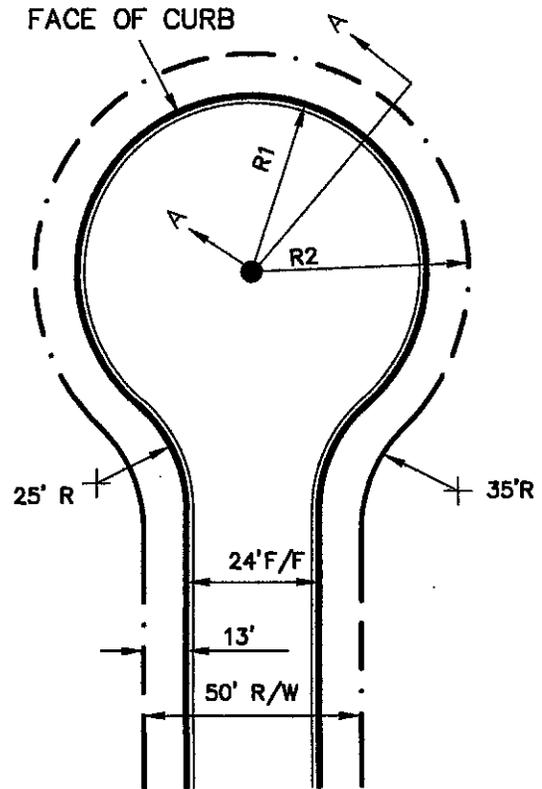
\* MAY USE R1=32' WITH APPROVAL BY VILLAGE ENGINEER

NOTE:  
1. THIS DETAIL SHALL APPLY TO AREAS WHERE THE VILLAGE COUNCIL WAIVES THE REQUIREMENT FOR CURB AND GUTTER ALONG GATED PRIVATE STREETS.



TYPE	R1	R2
RESIDENTIAL	34.5'*	45'

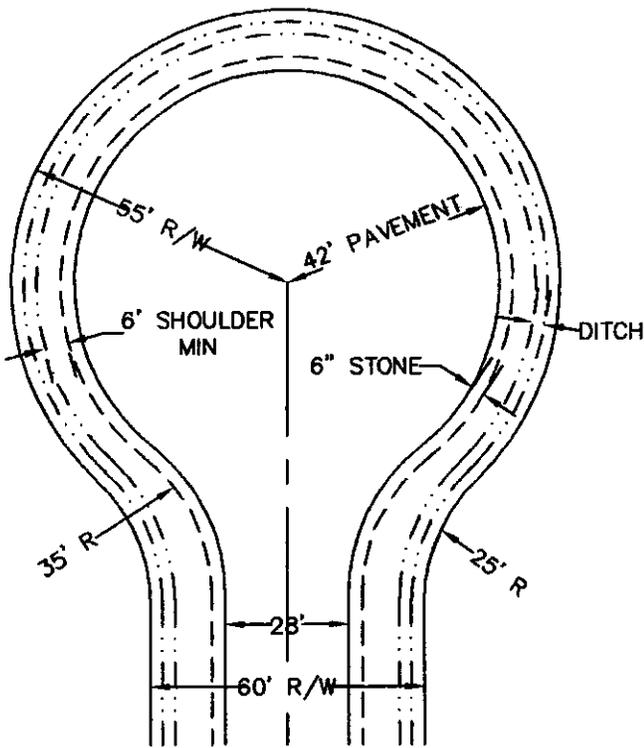
\* MAY USE R1=32' WITH APPROVAL BY VILLAGE ENGINEER



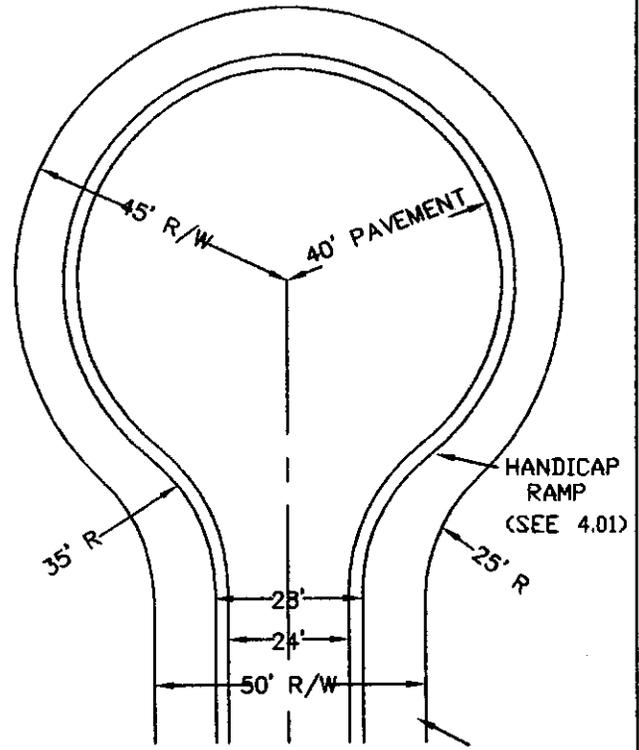
REV	DESCRIPTION	DATE	APPROVED BY
△	ADD NOTE #1	08/10	MSA
NOT TO SCALE		DWG NO. 3.02-B	SHEET 1 OF 1

TYPICAL SECTIONS  
RESIDENTIAL  
CUL-DE-SAC





DITCH TYPE

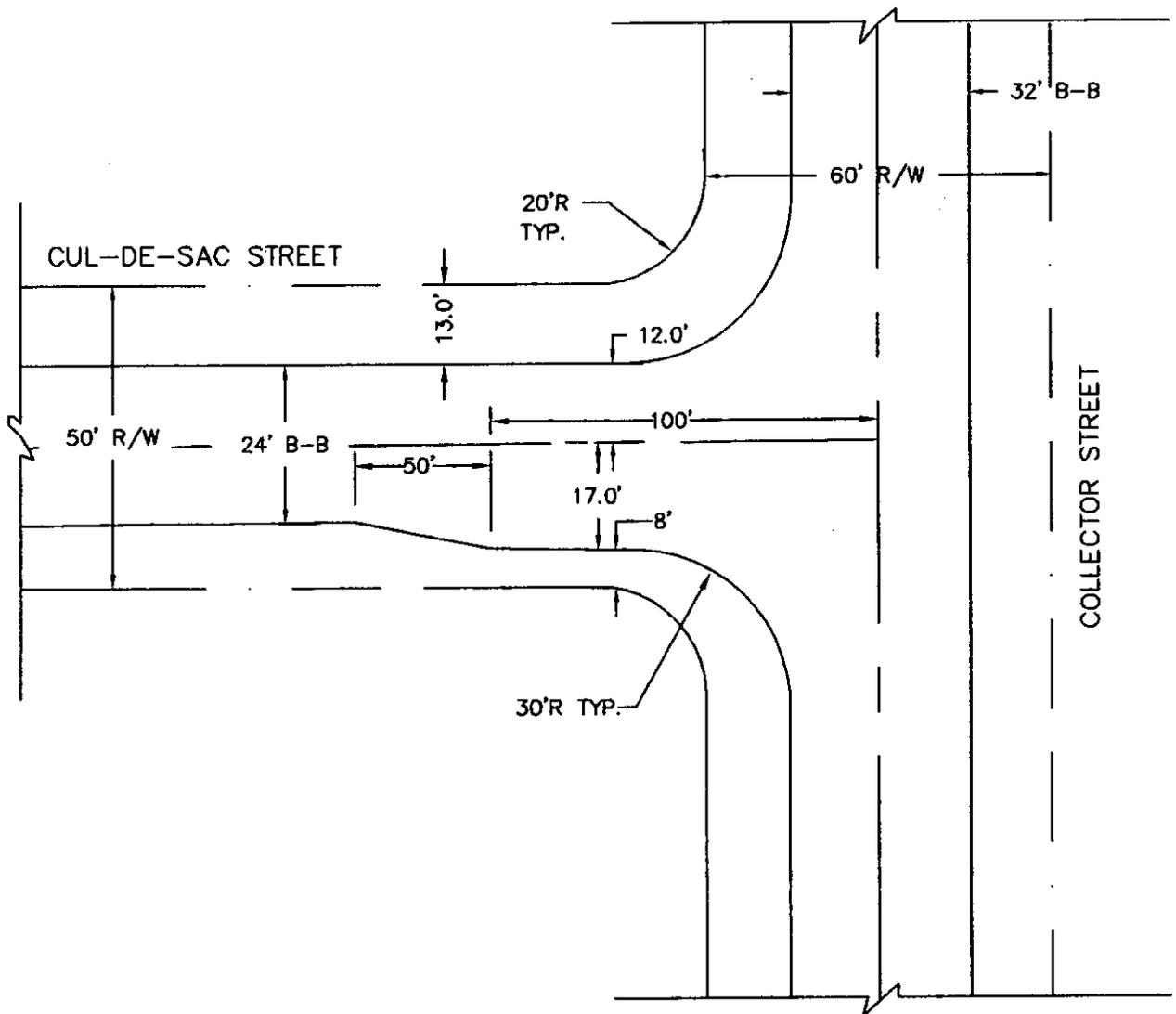


CURB AND GUTTER

**NOTES:**

1. CURB AND GUTTER STREETS SHALL BE 24" STANDARD CURB AND GUTTER. (SEE DETAIL 4.03)
2. THE CROWN FOR PAVEMENT SHALL BE 1/4" PER FT FROM THE CENTER OF THE CUL-DE-SAC.
3. MAXIMUM CUL-DE-SAC LENGTH IS 500'.
4. ALTERNATIVE CUL-DE-SAC DESIGNS, INCLUDING ISLANDS SHALL BE SUBMITTED TO THE VILLAGE OF PINEHURST ENGINEERING DEPARTMENT FOR APPROVAL PRIOR TO PLAN SUBMITTAL.
5. PAVEMENT SECTION SHALL CONFORM WITH THE DESIGN REQUIREMENTS FOR COMMERCIAL STREETS.
6. THE CROWN FOR PAVEMENT SHALL BE 1/4" PER FT FROM THE CENTER OF THE CUL-DE-SAC.
7. THE TYPICAL SECTION DIMENSIONS SHOWN ARE MINIMUMS AND MAY BE INCREASED BY THE VILLAGE ENGINEER.

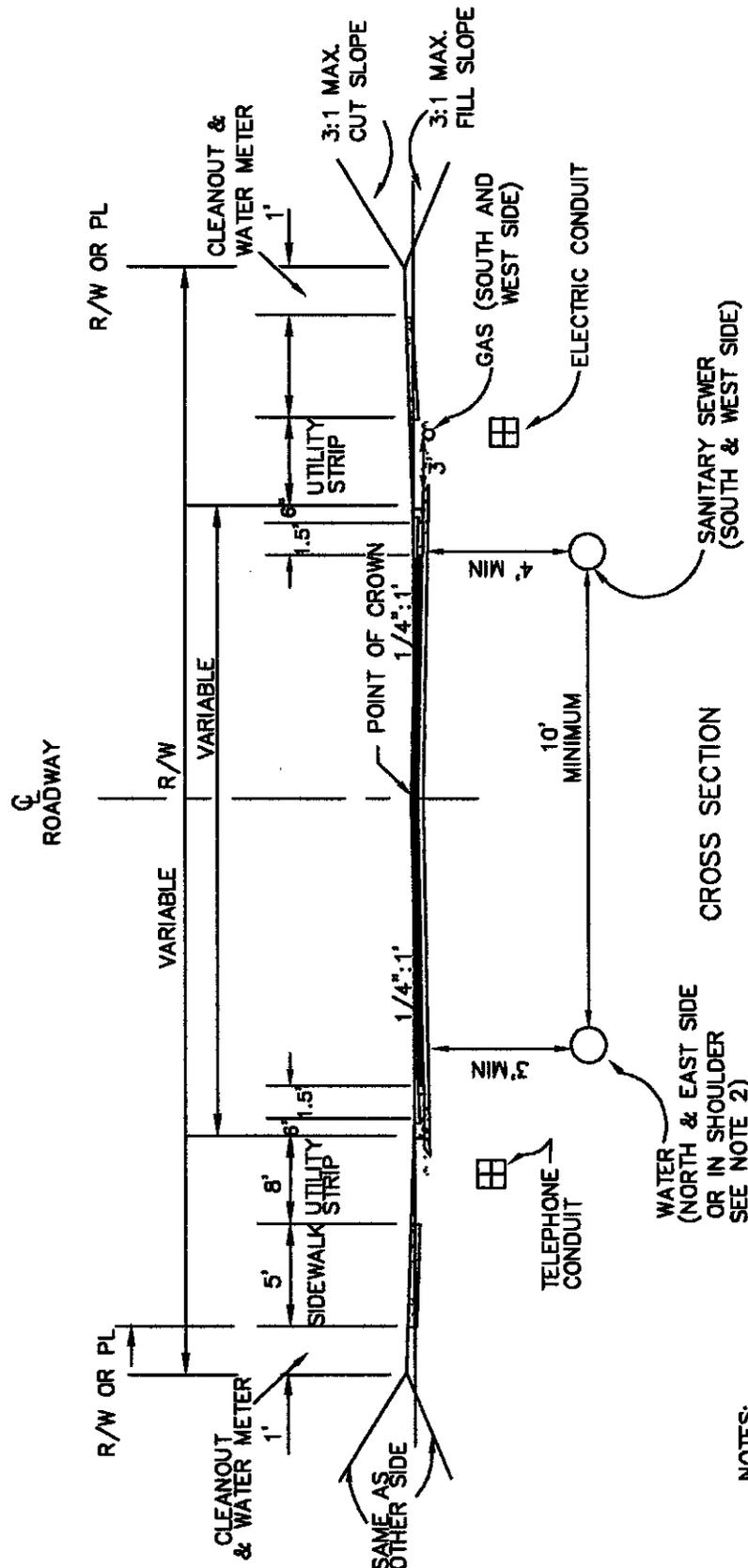
REV	DESCRIPTION	DATE	APPROVED BY	<b>COMMERCIAL CUL-DE-SAC DETAIL</b>	
△	ISSUE FOR PUBLICATION	06/04	HJG		
NOT TO SCALE		DWG NO. 3.03	SHEET 1 OF 1		



REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE DWG NO. 3.04		SHEET 1 OF 1	

CURB & GUTTER CUL-DE-SAC  
INTERSECTION W/  
COLLECTOR ROAD





NOTES:

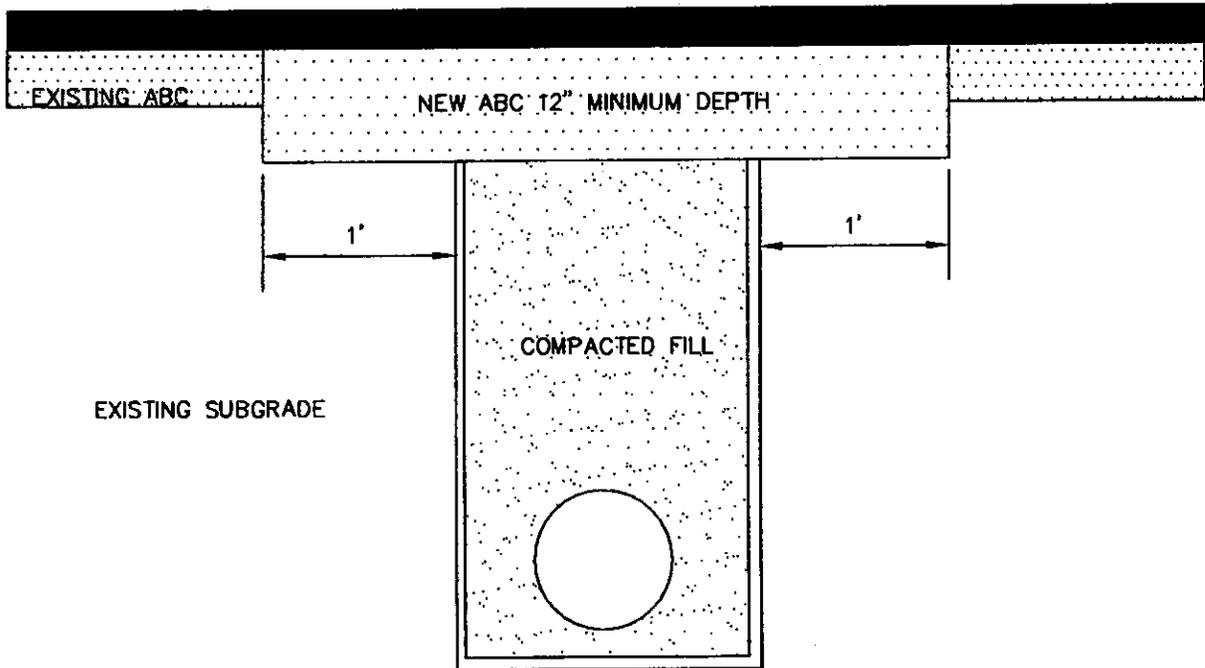
1. THERE SHALL BE AN 18" VERTICAL SEPARATION BETWEEN WATER AND SEWER LINES.
2. WATER MAIN LOCATIONS IN THE ROAD SHOULDER SHALL BE JOINTLY APPROVED BY THE VILLAGE MANAGER AND MOORE COUNTY PUBLIC UTILITIES DIRECTOR.

REV	DESCRIPTION	DATE	APPROVED BY
1	MODIFY SEWER, ADD NOTE 2	09/10	MSA
NOT TO SCALE		DWG NO. 3.05	SHEET 1 OF 1

STANDARD STREET CROSS SECTION

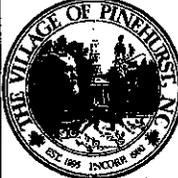


# ASPHALT PAVEMENT PATCH



**NOTES:**

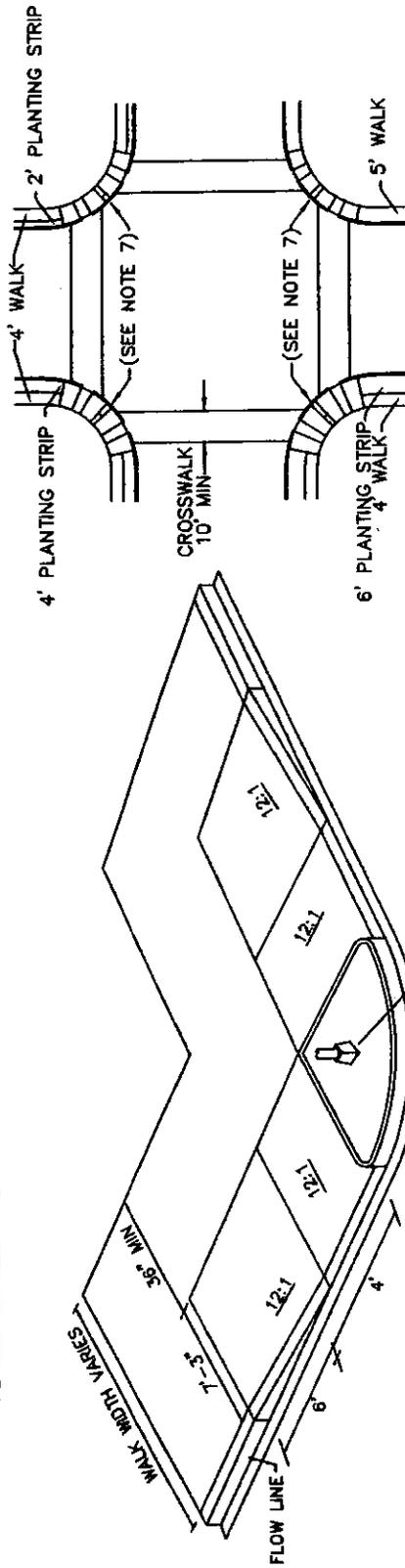
1. THE PAVEMENT SHALL BE DEFINED BY A STRAIGHT EDGE, PREFERABLY A MACHINED SAW CUT: TACKED.
2. THE TRENCH SUBGRADE MATERIAL SHALL BE BACKFILLED WITH SUITABLE MATERIAL AND COMPACTED TO A DENSITY OF AT LEAST 95% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T-99 AS MODIFIED BY NCDOT.
3. THE FINAL 1' OF FILL SHALL CONSIST OF ABC MATERIAL COMPACTED TO A DENSITY EQUAL TO 100% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T-180 AS MODIFIED BY NCDOT. BITUMINOUS BASE OR BINDER MAY BE SUBSTITUTED IF APPROVED BY THE ENGINEER.
4. THE ENTIRE THICKNESS/VERTICAL EDGE OF THE CUT SHALL BE TACKED.
5. THE SAME DEPTH OF PAVEMENT MATERIAL WHICH EXISTS SHALL BE REINSTALLED, BUT IN NO CASE SHALL THE ASPHALT BE LESS THAN 2" THICK.
6. THE ASPHALT PAVEMENT MATERIAL SHALL BE INSTALLED AND COMPACTED THOROUGHLY TO ACHIEVE A SMOOTH LEVEL PATCH.

REV	DESCRIPTION	DATE	APPROVED BY	ASPHALT PAVEMENT PATCH	
△	ISSUE FOR PUBLICATION	03/04	HJG		
NOT TO SCALE DWG NO. 3.06			SHEET 1 OF 1		

ROADWAY  
PLAN SYMBOL  
**ACC**  
FOR PROPOSED  
ACCESSIBLE RAMP

**NOTES:**

1. RAMP AND WING SLOPES SHALL NOT BE STEEPER THAN 12:1.
2. GUTTER FLOW LINE AND PLAN PROFILE SHALL BE MAINTAINED THROUGH THE RAMP AREA.
3. THE SURFACE OF THE RAMP SHALL BE FLUSH WITH THE FLOWLINE OF THE CURB AND GUTTER.
4. THE RAMP OPENING (AT THE FULLY DEPRESSED CURB) SHALL BE LOCATED WITHIN THE PARALLEL BOUNDARIES OF THE CROSSWALK MARKINGS. THE RAMP CENTERLINE SHALL BE LOCATED AT THE CORNER RADIUS CENTERLINE UNLESS OTHERWISE DIRECTED BY THE ENGINEER. DIAGONAL CURB RAMPS SHALL HAVE A SEGMENT OF STRAIGHT CURB AT LEAST 24 INCHES LONG LOCATED ON EACH SIDE OF THE WING SLOPE AND WITHIN THE CROSSWALK MARKINGS.
5. THE WING AND RAMP SURFACES SHALL BE 3600 PSI CONCRETE WITH A SIDEWALK FINISH IN ACCORDANCE WITH CURRENT EDITION NCDOT STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES.
6. DRAINAGE STRUCTURES, MAST ARMS, LIGHT POLES AND OTHER OBSTRUCTIONS SHALL NOT BE PLACED IN LINE WITH RAMPS. LOCATION OF THE RAMP SHALL TAKE PRECEDENCE OVER LOCATION OF OBSTRUCTIONS EXCEPT WHERE EXISTING OBSTRUCTIONS ARE BEING UTILIZED IN THE NEW CONSTRUCTION.
7. AT ALL LOCATIONS, NOT LESS THAN 2 FEET OF FULL HEIGHT CURB SHALL BE PLACED BETWEEN THE RAMPS.

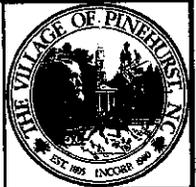


FOR TYPICAL LOCATION OF ACCESSIBLE  
RAMPS AND PEDESTRIAN CROSSWALKS  
ON STATE SYSTEM STREETS  
(SEE NCDOT STANDARD DRAWINGS)

PLACEMENT FOR OBSTRUCTED CORNER RADIUS OR  
CORNER RADIUS LESS THAN TEN FEET

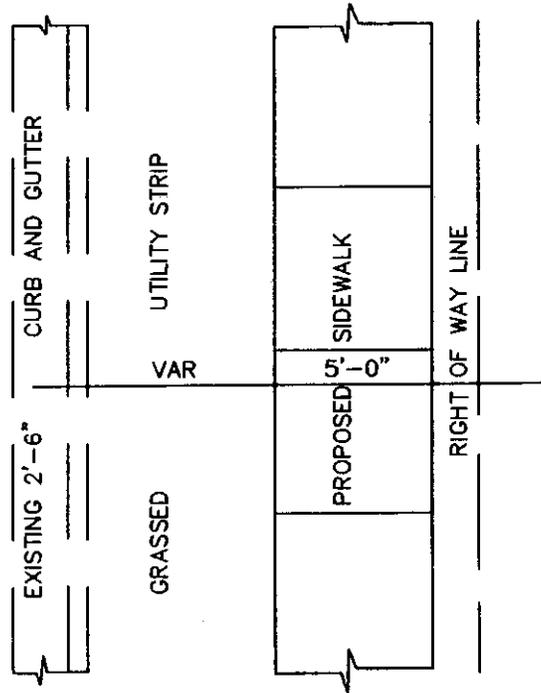
REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	03/04	HJG
NOT TO SCALE		DWG NO. 4.01	SHEET 1 OF 1

STANDARD PLACEMENT  
OF ACCESSIBLE RAMP  
& GENERAL NOTES

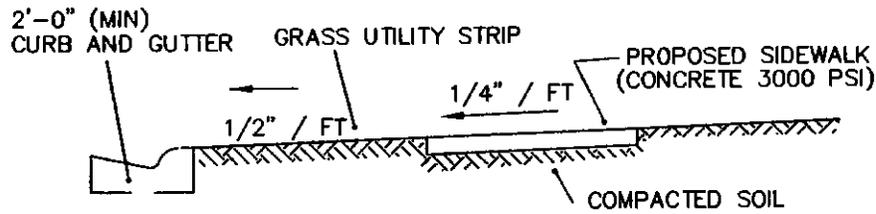


**NOTES:**

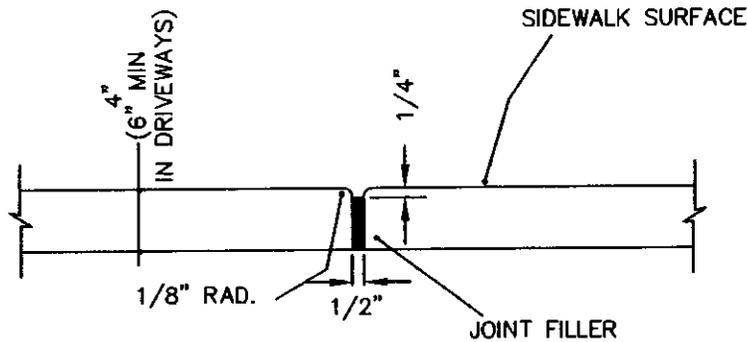
1. TRANSVERSE EXPANSION JOINT TO BE A MAXIMUM OF 50 FT. (90' - EXTRUDED CURB).
2. ALL CONCRETE TO BE FINISHED WITH CURING COMPOUND.



PLAN VIEW



TYPICAL SECTION



TRANSVERSE EXPANSION JOINT

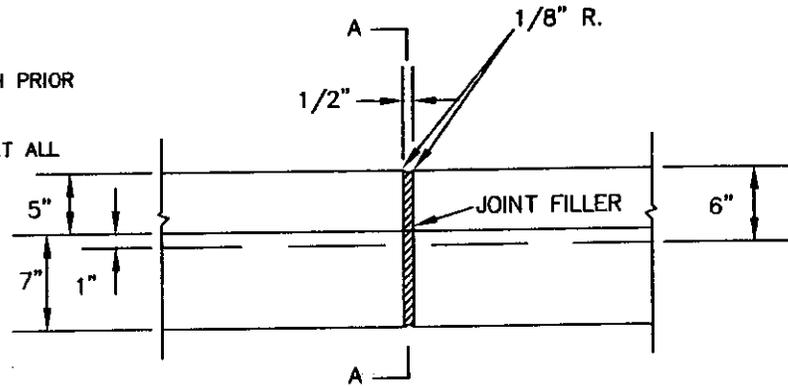
REV	DESCRIPTION	DATE	APPROVED BY
0	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE DWG NO. 4.02		SHEET 1 OF 1	

STANDARD  
CONCRETE  
SIDEWALK

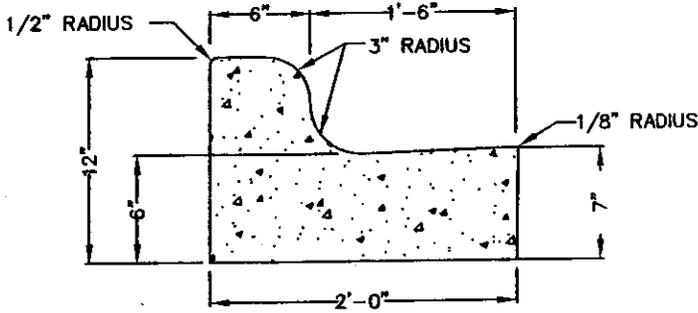


**NOTES:**

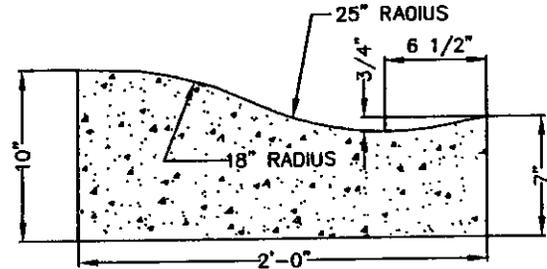
1. 2'-0" VALLEY GUTTER TO BE USED ONLY WITH PRIOR APPROVAL FROM VILLAGE ENGINEER.
2. MAINTAIN 50' MAXIMUM BETWEEN JOINTS OR AT ALL RIGID OBJECTS.



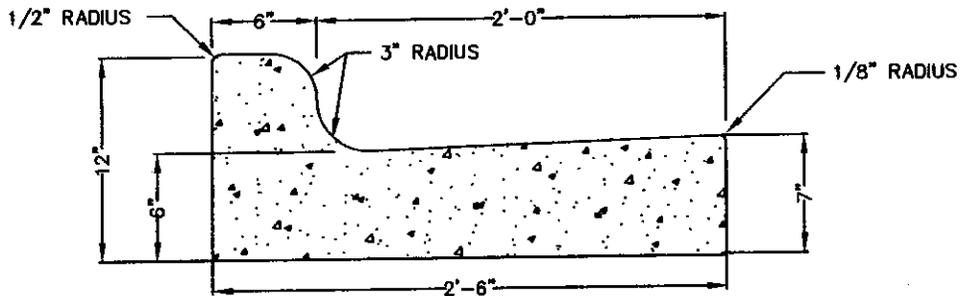
FRONT ELEVATION  
TRANSVERSE EXPANSION JOINT



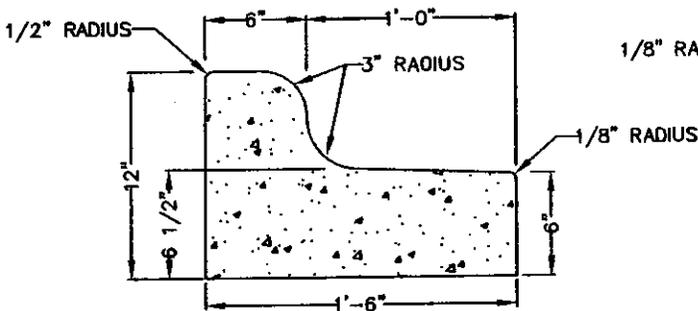
STANDARD 2'-0" CURB AND GUTTER



2'-0" VALLEY GUTTER

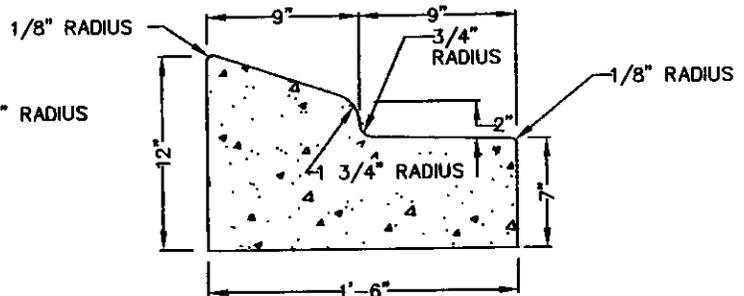


STANDARD 2'-6" CURB AND GUTTER (NCDOT STREETS)



1'-6" MEDIAN CURB AND GUTTER

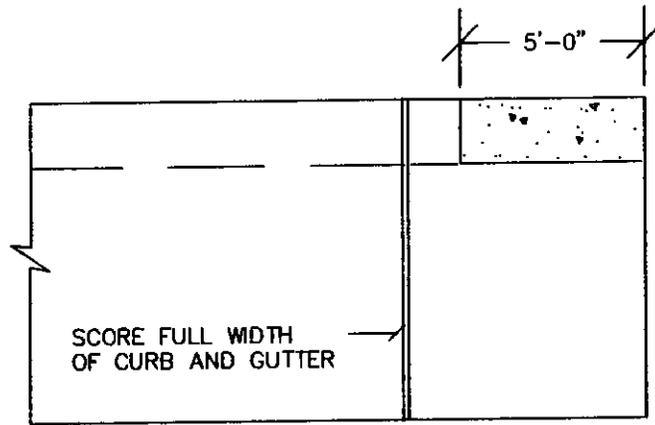
TO BE USED IN MEDIANS WHEN LANES ARE SLOPED FROM ISLAND.



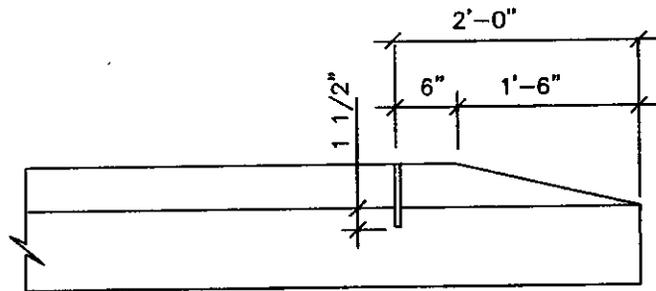
1'-6" MOUNTABLE CURB AND GUTTER

TO BE USED IN MEDIANS ONLY.

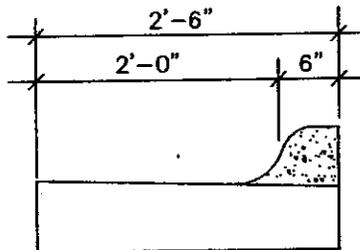
REV	DESCRIPTION	DATE	APPROVED BY	CURB AND GUTTER	
△	ISSUE FOR PUBLICATION	06/04	HJG		
NOT TO SCALE DWG NO. 4.03		SHEET 1 OF 1			



PLAN



FRONT

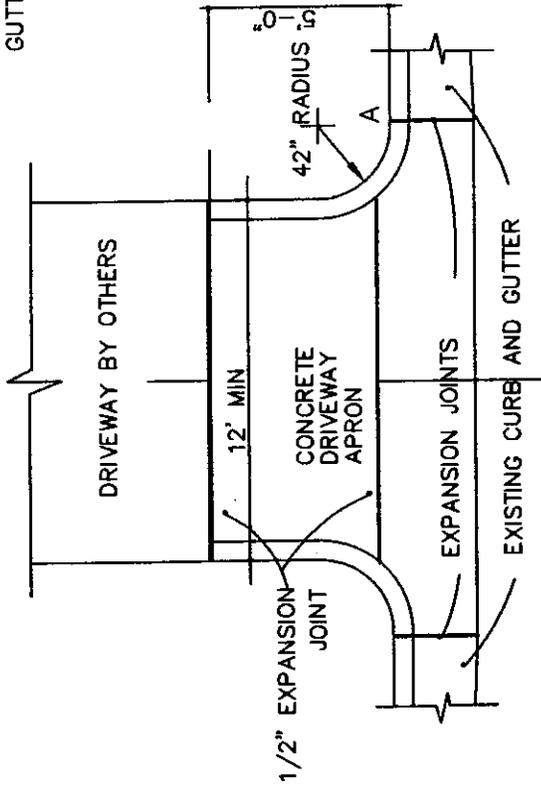
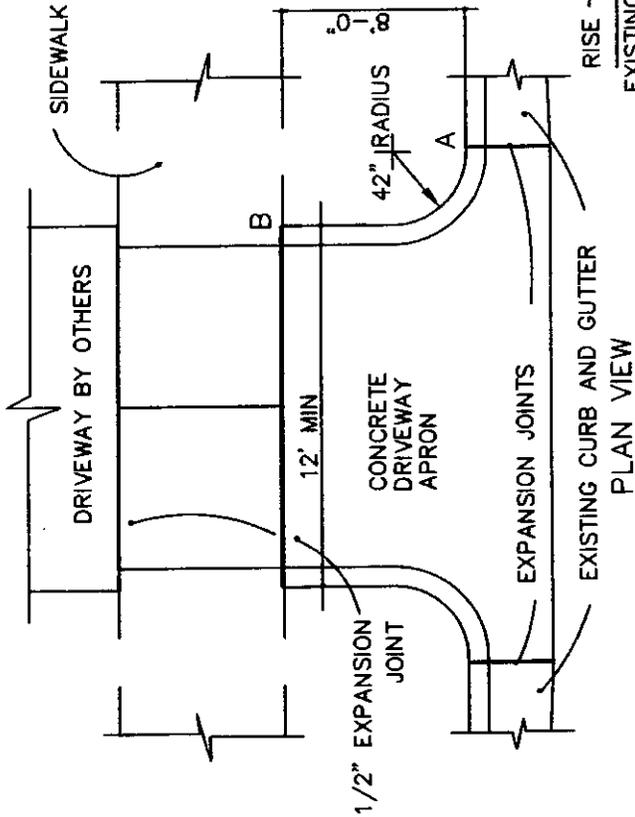


END

REV	DESCRIPTION	DATE	APPROVED BY	STANDARD METHOD ENDING CURB AND GUTTER	
△	ISSUE FOR PUBLICATION	06/04	HJG		
NOT TO SCALE	DWG NO. 4.04		SHEET 1 OF 1		

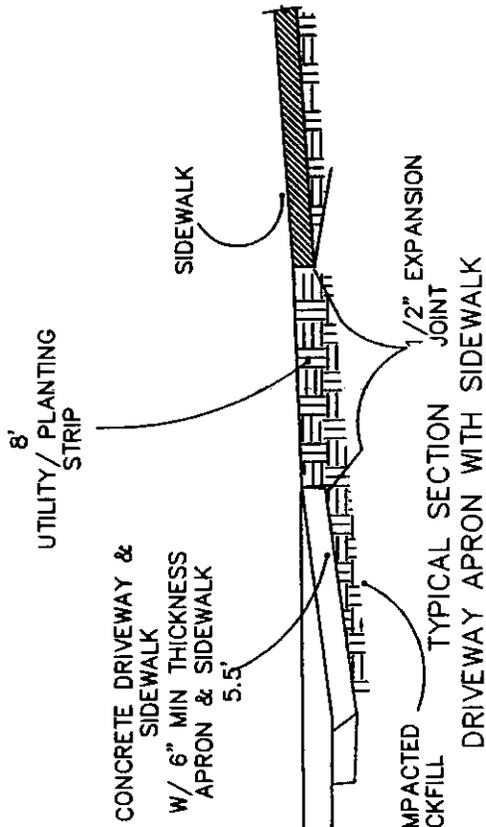
**NOTES:**

1. RESIDENTIAL DRIVEWAY TO BE 12' TO 18' IN WIDTH.
2. COMMERCIAL AND INDUSTRIAL DRIVEWAY TO BE A MAXIMUM OF 30' WIDE.
3. ALL CONCRETE SHALL BE 3000 PSI.
4. CURB RADIUS SHALL NOT RISE MORE THAN 1 INCH.
5. IF CUT IS WITHIN 5' FROM A JOINT THEN THE CUT SHALL BE MADE TO THAT JOINT.

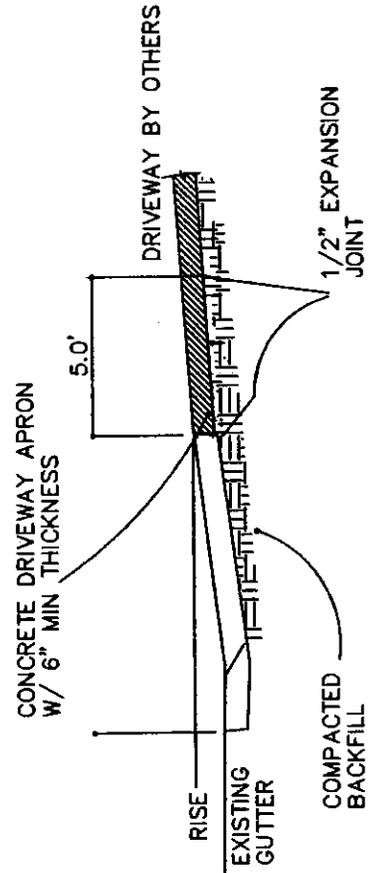


PLAN VIEW

MONOLITHIC POUR



TYPICAL SECTION  
DRIVEWAY APRON WITH SIDEWALK

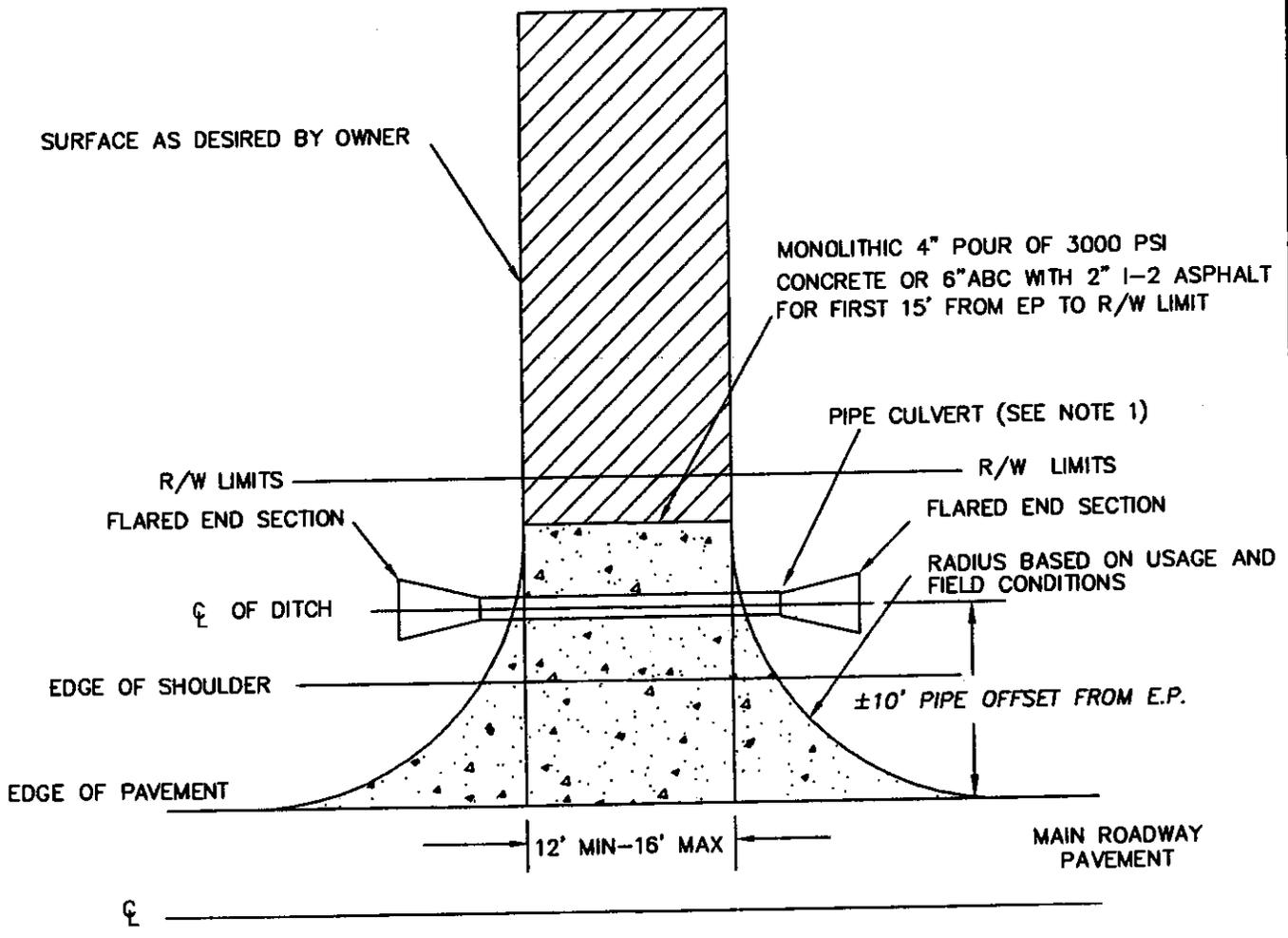


TYPICAL SECTION  
DRIVEWAY APRON WITHOUT SIDEWALK

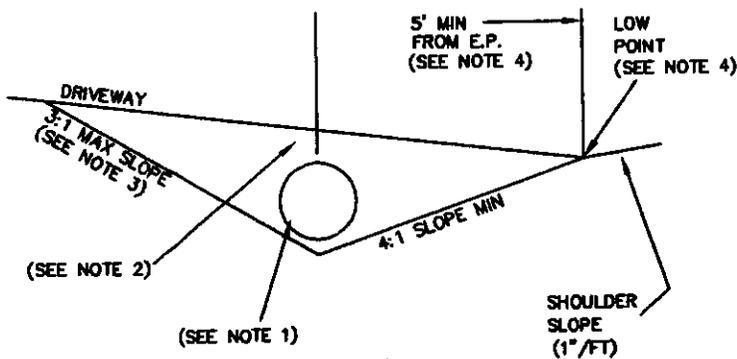
REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE DWG NO. 4.05		SHEET 1 OF 1	

RESIDENTIAL  
DRIVEWAY  
APRON





WITH UNPAVED ROADSIDE DITCH



NOTES:

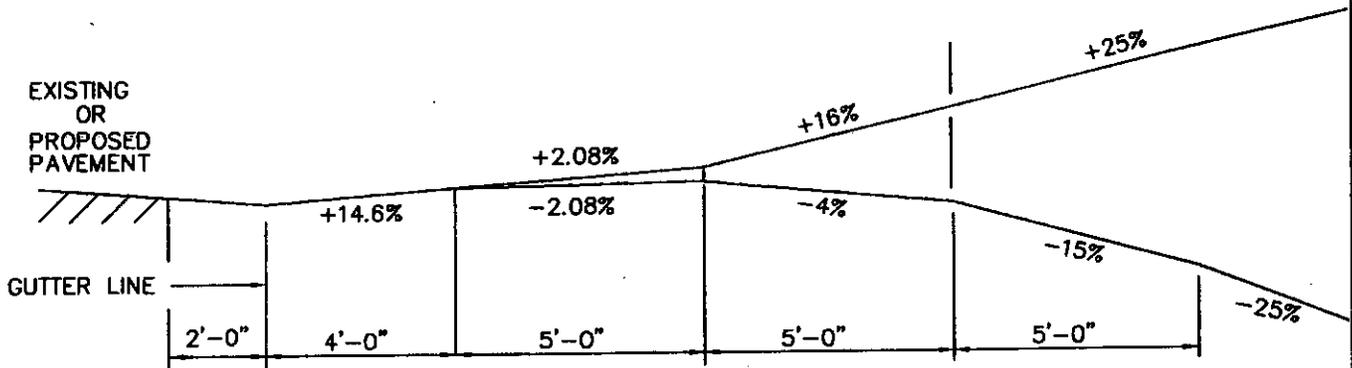
1. PIPE TO BE RCP, 15" MINIMUM, AND SIZED TO CARRY THE DESIGN FLOW OF THE DITCH.
2. 6" MINIMUM COVER OVER PIPE.
3. STEEPER SLOPES CAN BE ALLOWED WHERE SPECIAL STABILIZATION IS PROVIDED IN ACCORDANCE WITH EROSION AND SEDIMENTATION CONTROL ORDINANCE.
4. USE 5' VERTICAL CURVE FOR TRANSITION.
5. SOD FULL EXTENT OF R/W LIMITS ALONG FRONTAGE FINISHED GRADE OF SOD TO BE 1" BELOW EDGE OF ROADWAY.

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
△	RESIDENTIAL D/W WIDTH	1/05	HJG
NOT TO SCALE DWG NO. 4.06-A			SHEET 1 OF 1

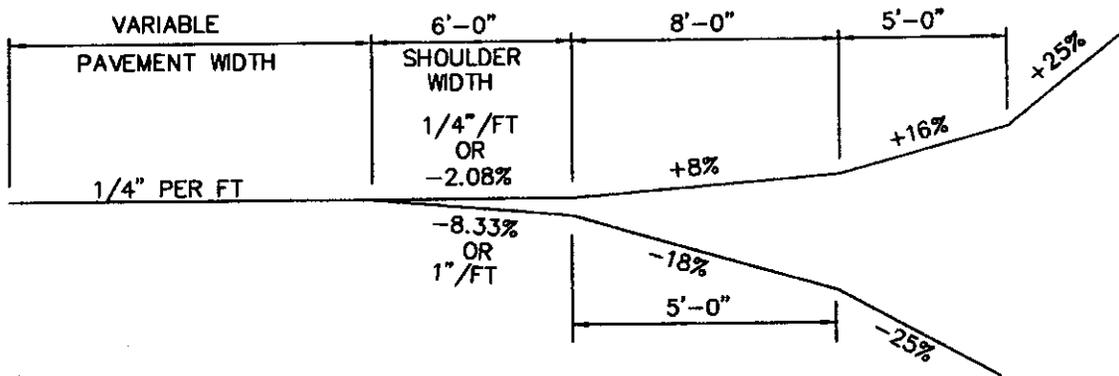
RESIDENTIAL  
DRIVEWAY APRON  
ON NON C&G STREETS



# DRIVEWAY GRADES



A) CURB & GUTTER, SIDEWALK SECTION

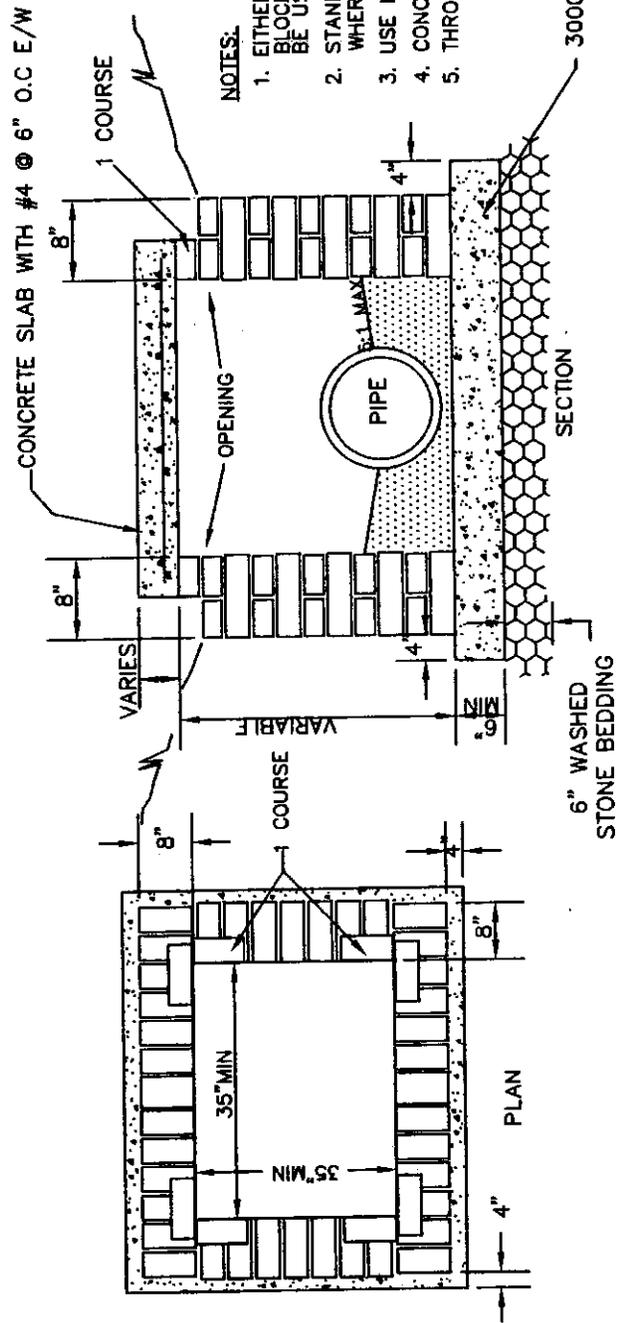
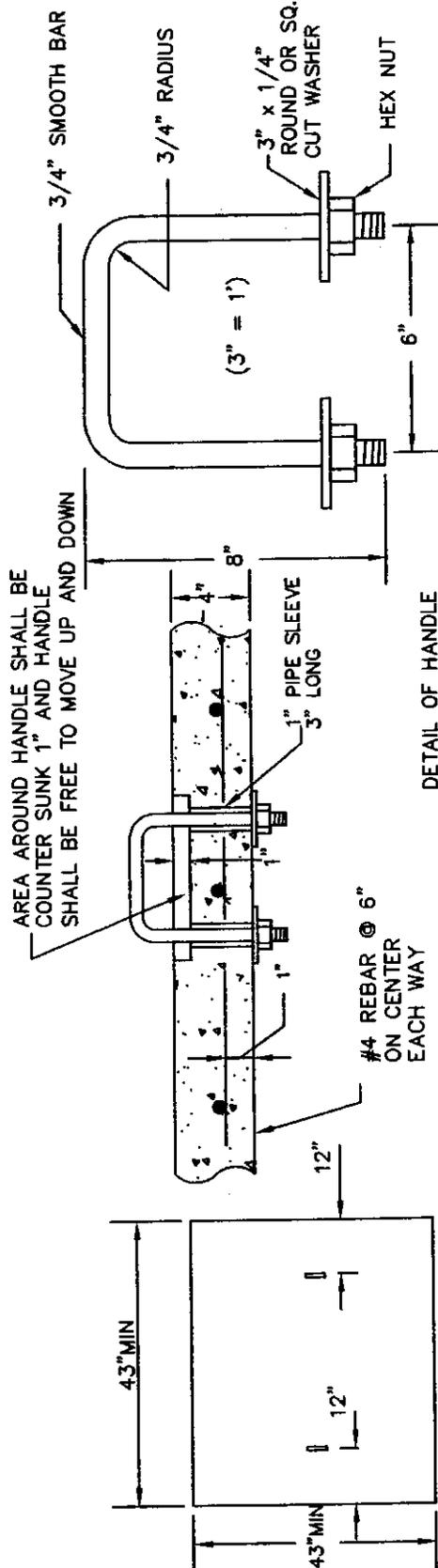


B) SHOULDER SECTION

**NOTES:**

1. IF THE SLOPE BETWEEN THE TOP OF CURB AND GUTTER AND A POINT 30 FEET FROM THE CURB AND GUTTER EXCEEDS 20%, THIS SLOPE CAN BE ADJUSTED TO A MAXIMUM OF 8.33% (1"/FT) UP OR 4.17% (1/2"/FT) DOWN.

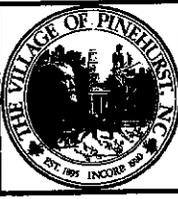
REV	DESCRIPTION	DATE	APPROVED BY	TYPICAL DRIVEWAY SECTIONS NON C&G	
△	ISSUE FOR PUBLICATION	06/04	HJG		
NOT TO SCALE	DWG NO. 4.06-B	SHEET 1 OF 1			

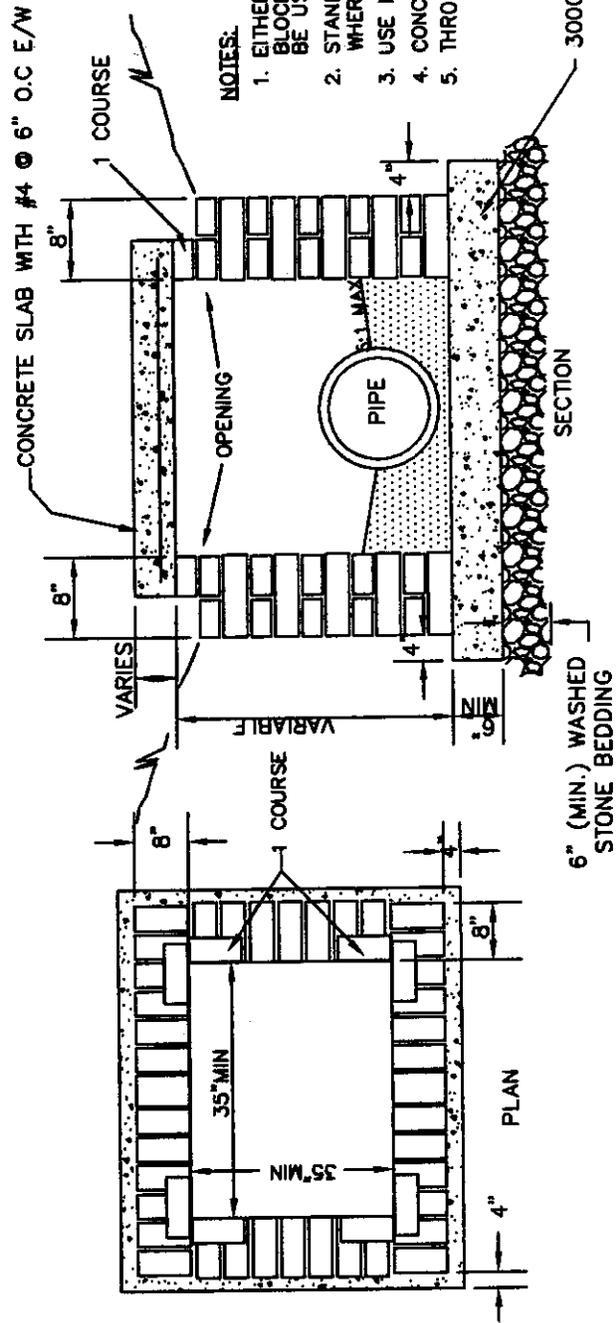
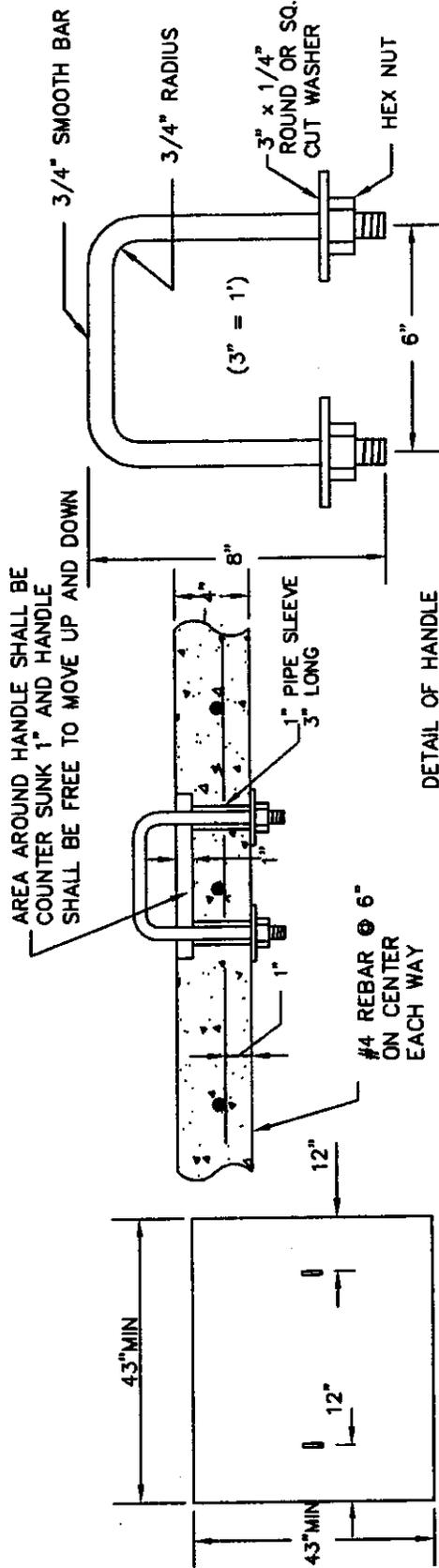


- NOTES:
1. EITHER SOLID CONCRETE BRICK, SOLID BLOCK OR PRECAST CONCRETE MAY BE USED.
  2. STANDARD STEPS REQUIRED @ 16" O.C. WHERE DEPTH EXCEEDS 5'.
  3. USE MIN 3000 PSI CONCRETE MIX.
  4. CONCRETE WALLS TO BE 6" THICK.
  5. THROAT OPENING TO BE 5" MIN, 7" MAX.

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE	DWG NO. 5.01	SHEET 1 OF 1	

STANDARD YARD  
INLET WITH  
CONCRETE SLAB LID



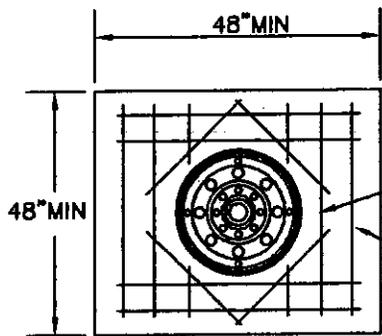


- NOTES:
1. EITHER SOLID CONCRETE BRICK, SOLID BLOCK, OR PRECAST CONCRETE MAY BE USED.
  2. STANDARD STEPS REQUIRED @ 16" O.C. WHERE DEPTH EXCEEDS 5'.
  3. USE MIN 3000 PSI CONCRETE MIX.
  4. CONCRETE WALLS TO BE 6" THICK.
  5. THROAT OPENING TO BE 5" MIN, 7" MAX.

REV	DESCRIPTION	DATE	APPROVED BY
1	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE	DWG NO. 5.01-A		SHEET 1 OF 1

STANDARD YARD  
INLET WITH  
CONCRETE SLAB LID

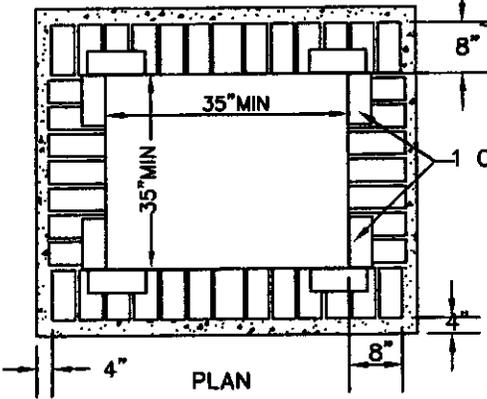




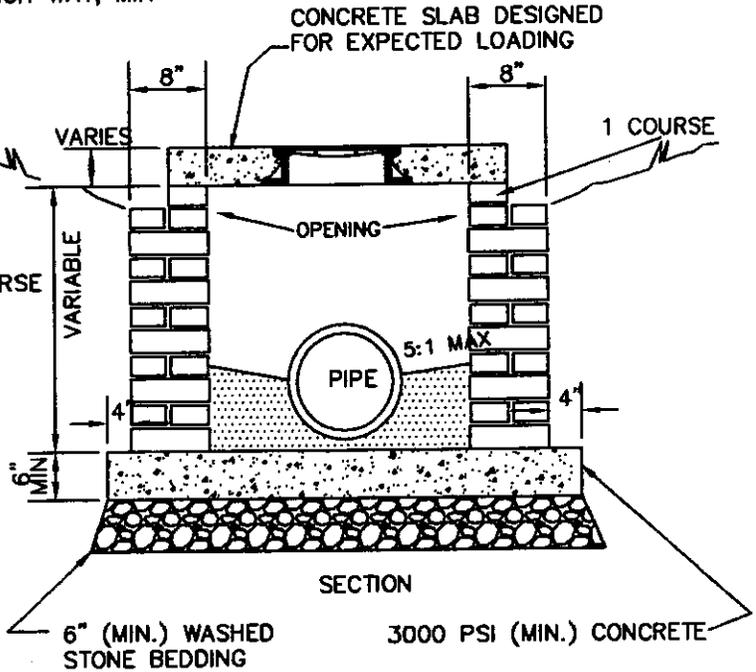
STD. MANHOLE RING AND COVER. RING TO BE CAST IN FLUSH TO TOP OF SLAB

#4 REBAR, 6" ON CENTER EACH WAY, MIN

CONCRETE SLAB



PLAN



SECTION

6" (MIN.) WASHED STONE BEDDING

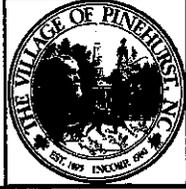
3000 PSI (MIN.) CONCRETE

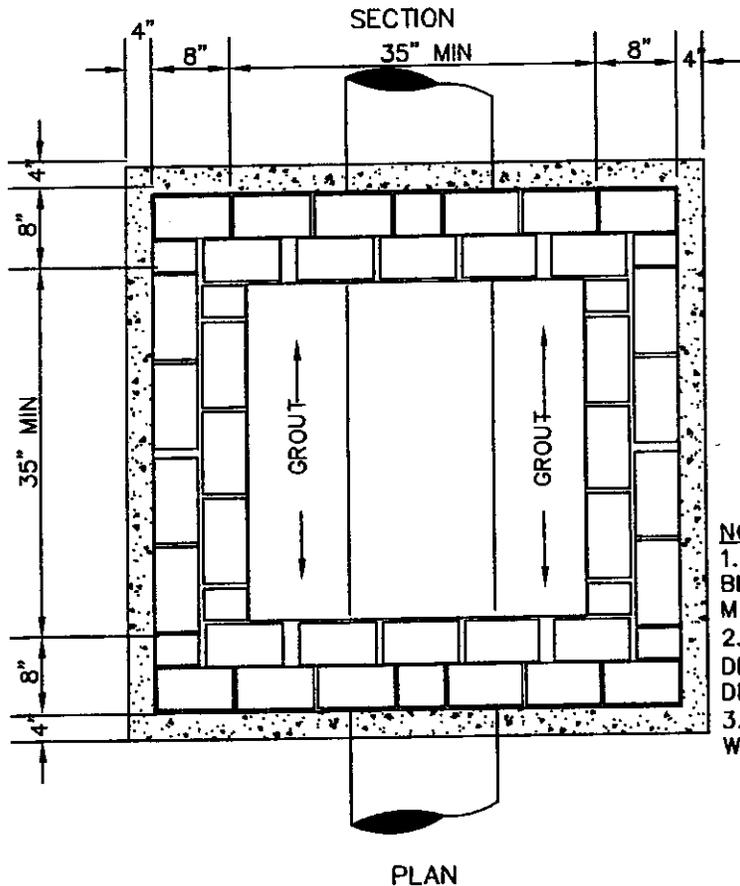
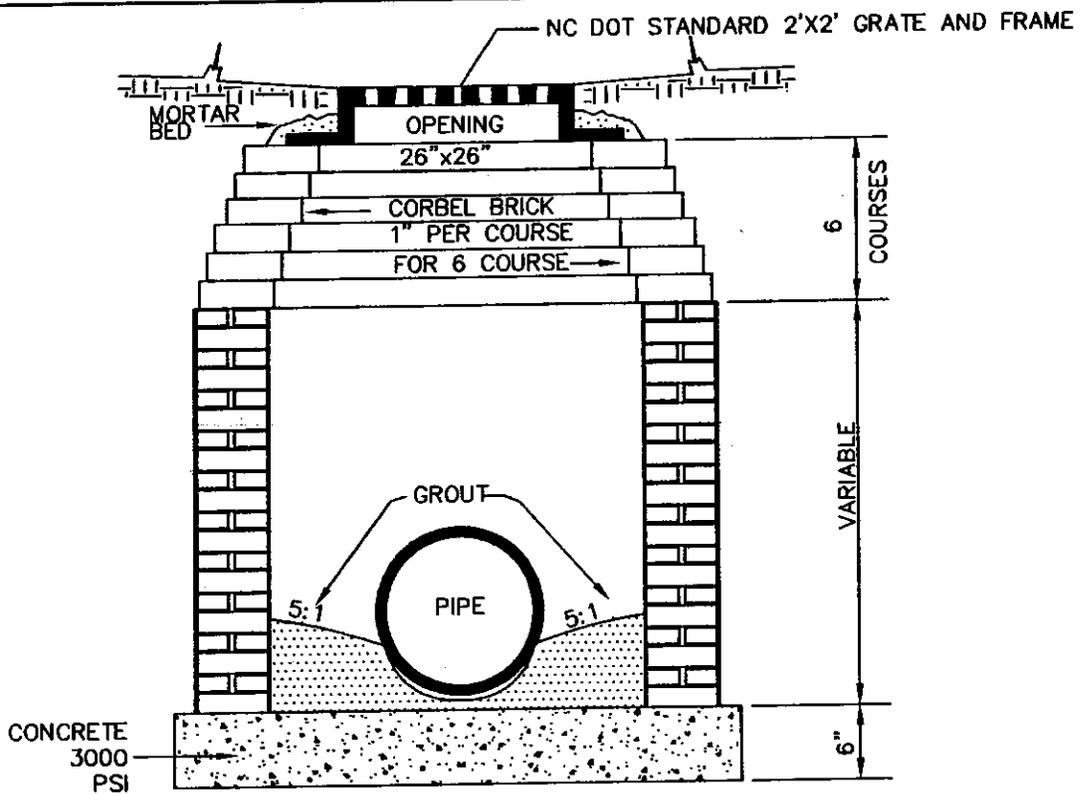
**NOTES:**

1. EITHER SOLID BRICK, SOLID BLOCK, OR PRECAST CONCRETE MAY BE USED.
2. STANDARD STEPS REQUIRED @ 16" O.C. WHERE DEPTH EXCEEDS 3'.
3. USE MIN 3000 PSI CONCRETE MIX
3. INSIDE DIMENSION FOR 24" PIPE AND GREATER USE PIPE DIA. PLUS 12".

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 5.01-B	SHEET 1 OF 1

STANDARD JUNCTION BOX





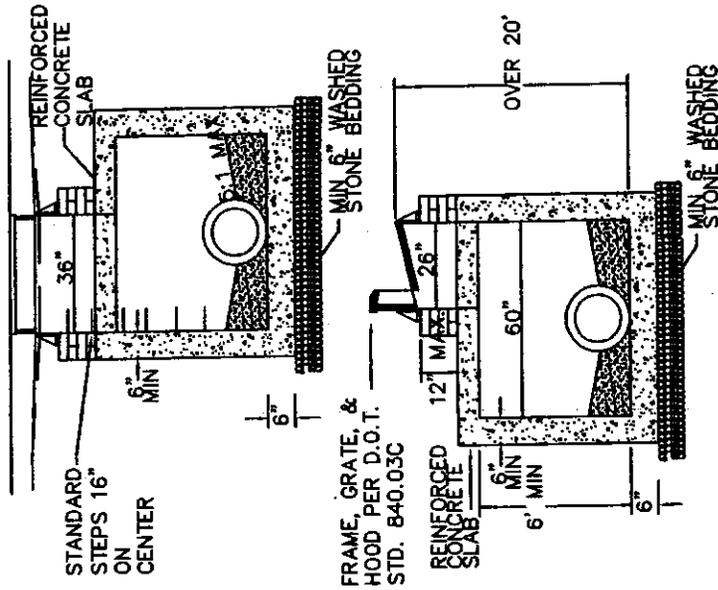
- NOTES:**
1. EITHER SOLID CONCRETE BRICK, SOLID BLOCK OR PRECAST CONCRETE BOX MAY BE USED.
  2. FOR 24" R.C.P. AND LARGER USE PIPE DIA. PLUS 12" FOR MINIMUM INSIDE DIMENSION.
  3. STANDARD STEPS REQUIRED @ 16" O.C. WHERE DEPTH EXCEEDS 3 FEET.

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE DWG NO. 5.02		SHEET 1 OF 1	

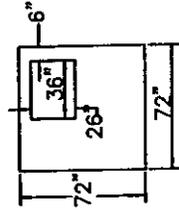
STANDARD YARD  
INLET WITH GRATE  
AND FRAME



**DEEP TYPE (5'X5')**  
(OVER 20 FEET IN DEPTH)

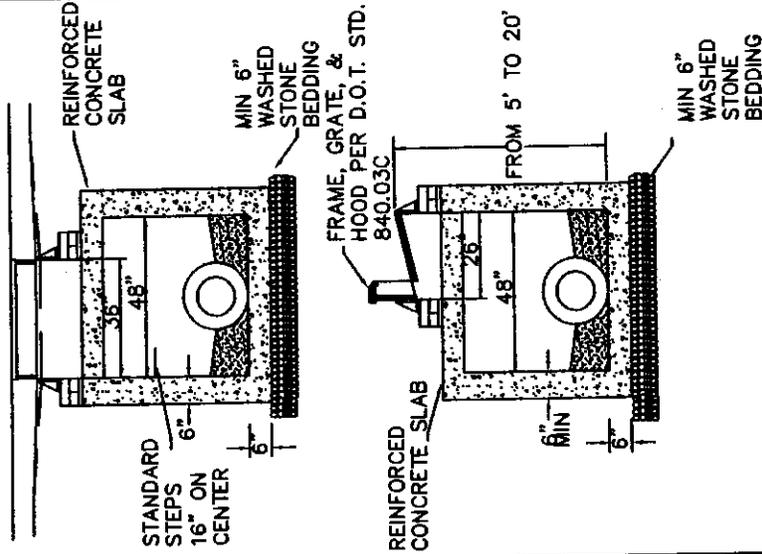


SLAB DETAIL

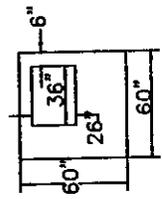


SLAB THICKNESS AND REINFORCEMENT FOR SOIL AND TRAFFIC LOADING BY AN ENGINEER

**INTERMEDIATE TYPE (4'X4')**  
(5 FEET TO 20 FEET IN DEPTH)

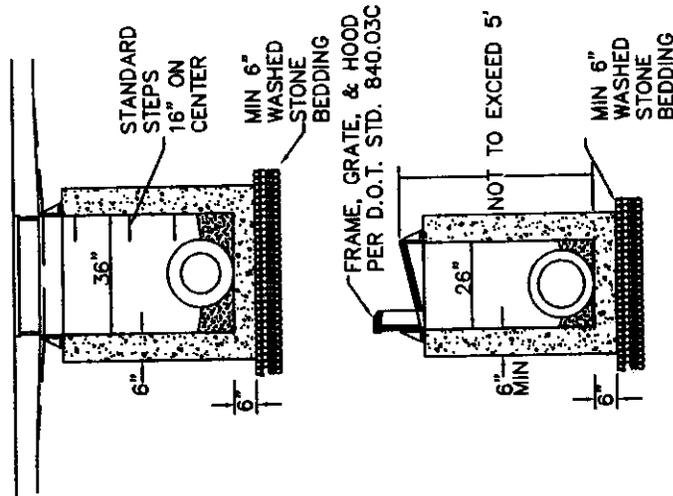


SLAB DETAIL



SLAB THICKNESS AND REINFORCEMENT FOR SOIL AND TRAFFIC LOADING BY AN ENGINEER

**SHALLOW TYPE**  
(5 FEET OR LESS IN DEPTH)

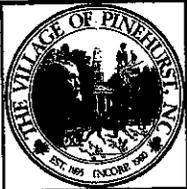


**NOTES:**

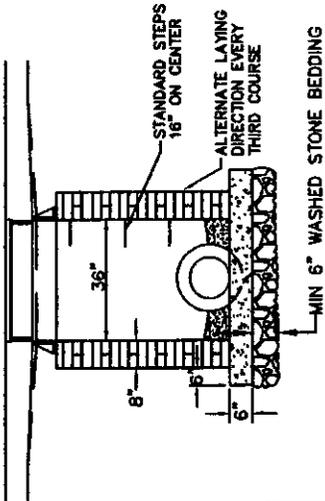
1. CONCRETE SHALL BE 4000 PSI MIN FOR ALL PRECAST CONCRETE CATCH BASINS.
2. PRECAST CONCRETE STRUCTURES MAY ONLY BE INSTALLED TO DEPTHS CERTIFIED AS ACCEPTABLE BY THE MANUFACTURER.
3. "WAFFLE" BOXES ARE ACCEPTABLE FOR SHALLOW TYPE CATCH BASINS.

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 5.03-A	SHEET 1 OF 1

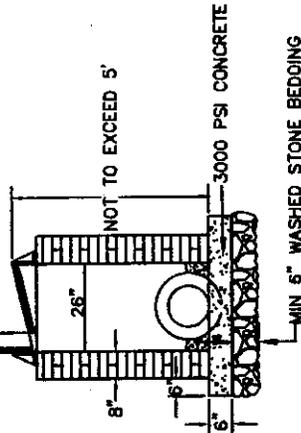
PRECAST  
CONCRETE  
CATCH BASIN



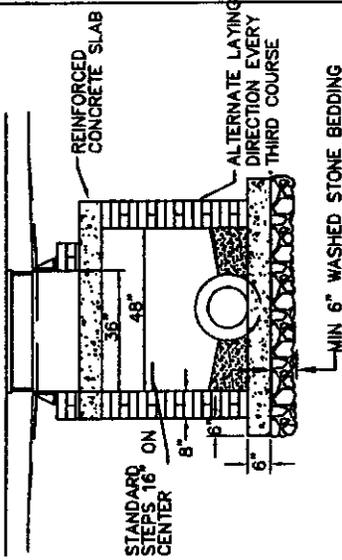
SHALLOW TYPE  
(5 FEET OR LESS IN DEPTH)



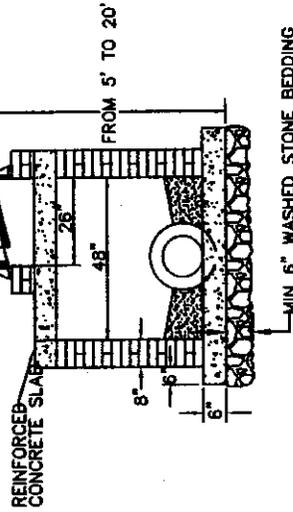
FRAME, GRATE, & HOOD  
PER D.O.T. STD. 840.03C



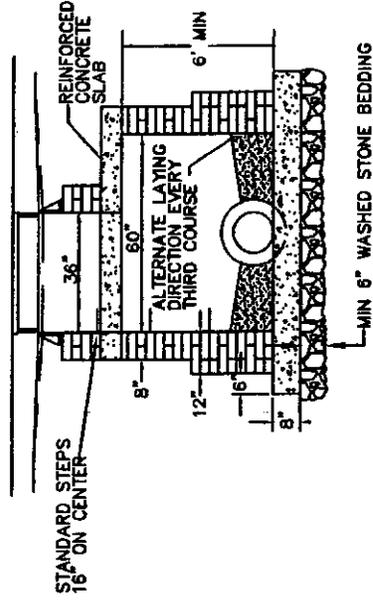
INTERMEDIATE TYPE (4'X4')  
(5 FEET TO 20 FEET IN DEPTH)



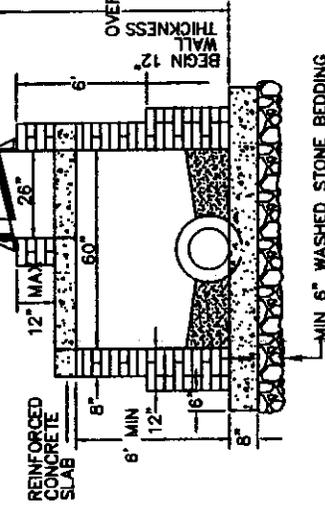
FRAME, GRATE, & HOOD  
PER D.O.T. STD. 840.03C



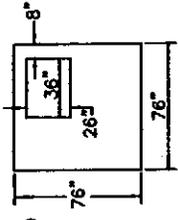
DEEP TYPE (5'X5')  
(OVER 20 FEET IN DEPTH)



FRAME, GRATE, & HOOD  
PER D.O.T. STD. 840.03C

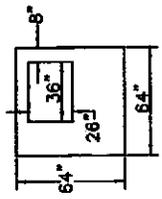


SLAB DETAIL



SLAB THICKNESS AND  
REINFORCEMENT FOR  
SOIL AND TRAFFIC  
LOADING BY AN  
ENGINEER

SLAB DETAIL



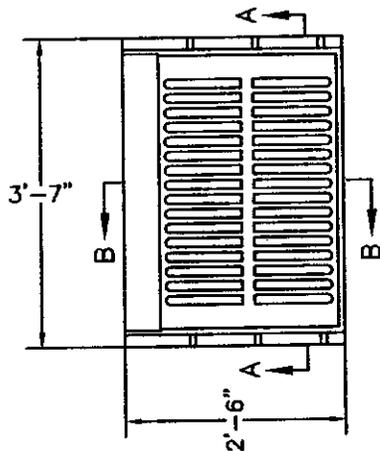
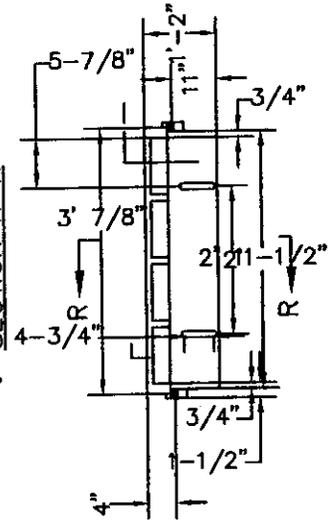
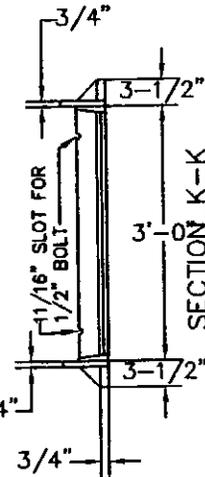
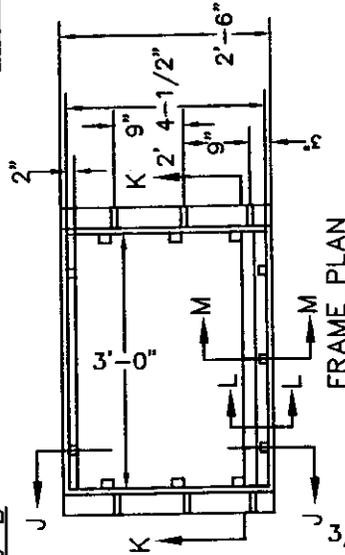
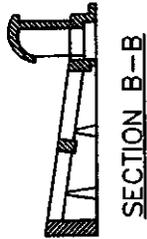
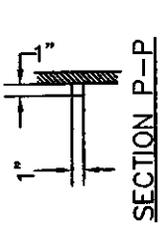
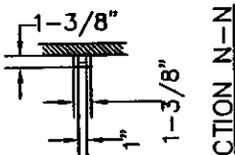
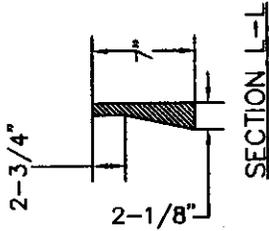
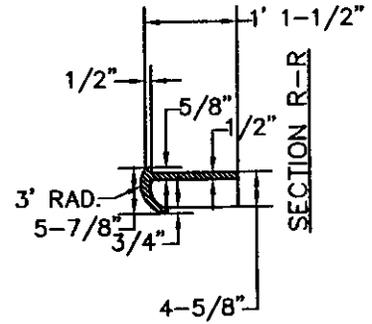
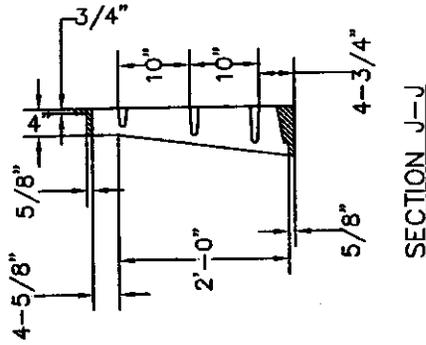
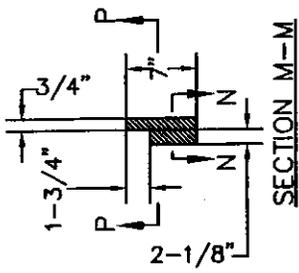
SLAB THICKNESS AND  
REINFORCEMENT FOR  
SOIL AND TRAFFIC  
LOADING BY AN  
ENGINEER

NOTES:  
1. OVER 8' IN DEPTH, 12" WALL THICKNESS TO 6' FROM TOP  
OF WALL AND 8" BOTTOM SLAB SHALL BE USED.

REV	DESCRIPTION	DATE	APPROVED BY
1	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 5.03-B	
			SHEET 1 OF 1

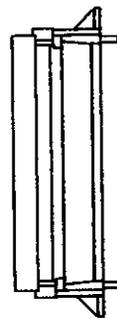
CONCRETE BLOCK  
OR BRICK  
CATCH BASIN





PLAN

FRAME, GRATE, & HOOD ASSEMBLY



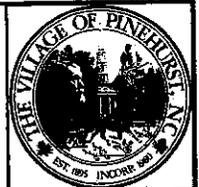
SECTION A-A

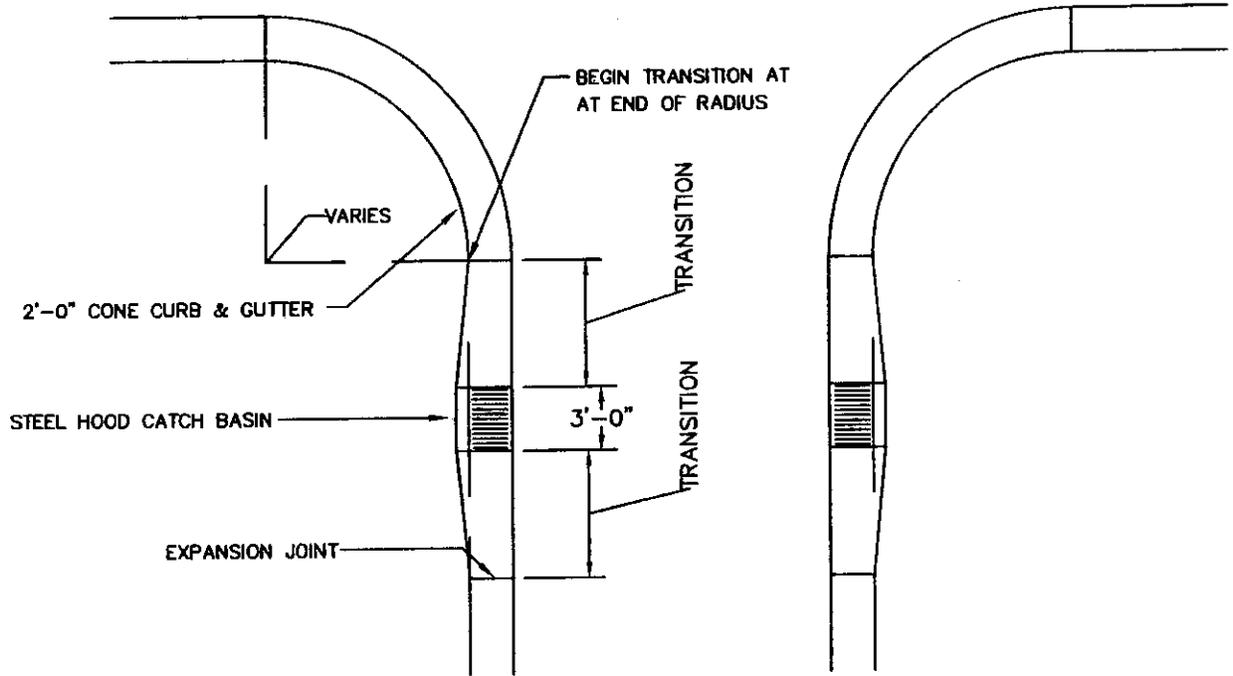
NOTES:

1. USE TYPE "E", "F" AND "G" GRATES AS PER NCDDOT STD. DRAWINGS.

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE	DWG NO. 5.04		SHEET 1 OF 1

FRAME, GRATE AND HOOD FOR CATCH BASIN



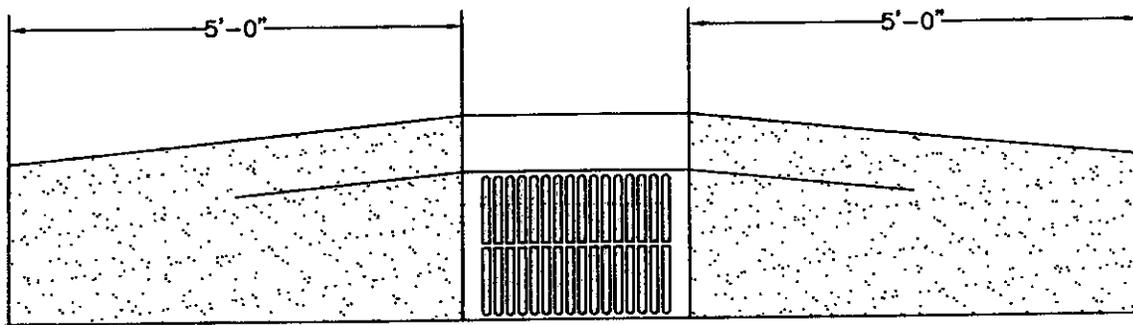


PLAN

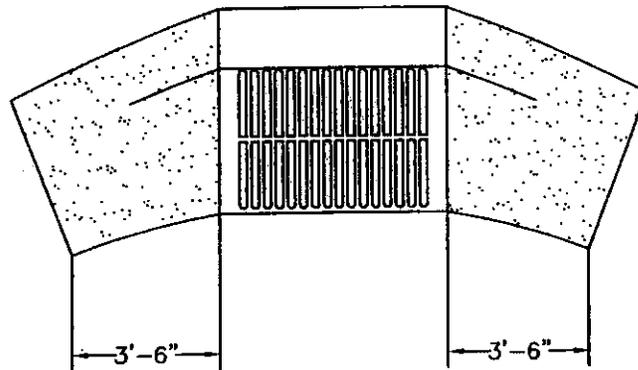
**NOTES:**

1. WHERE 2'-6" CURB AND GUTTER IS USED, CATCH BASINS MAY BE LOCATED AT END OF RADIUS.
2. RADIUS AT INTERSECTION MAY VARY.

REV	DESCRIPTION	DATE	APPROVED BY	CATCH BASIN PLACEMENT AT INTERSECTIONS	
△	ISSUE FOR PUBLICATION	06/04	HJG		
	NOT TO SCALE	DWG NO. 5.05-A	SHEET 1 OF 1		



PLAN FOR TANGENT SECTION

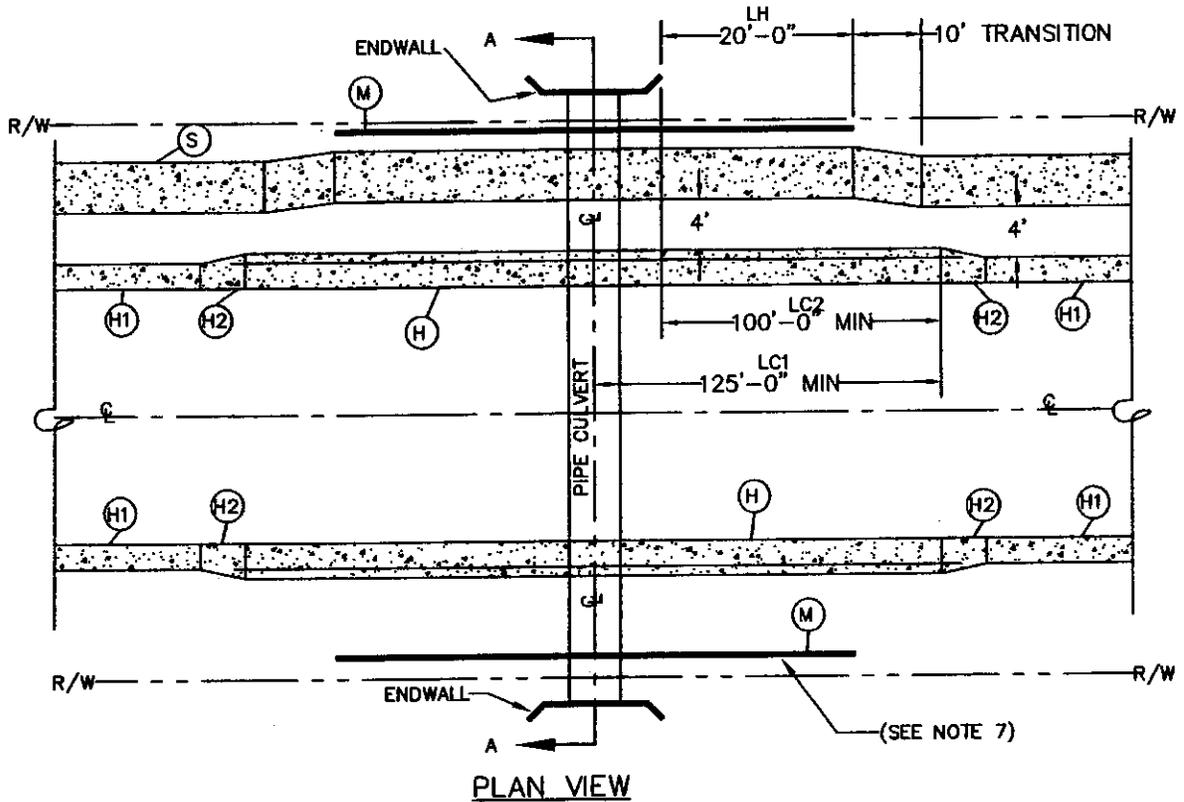
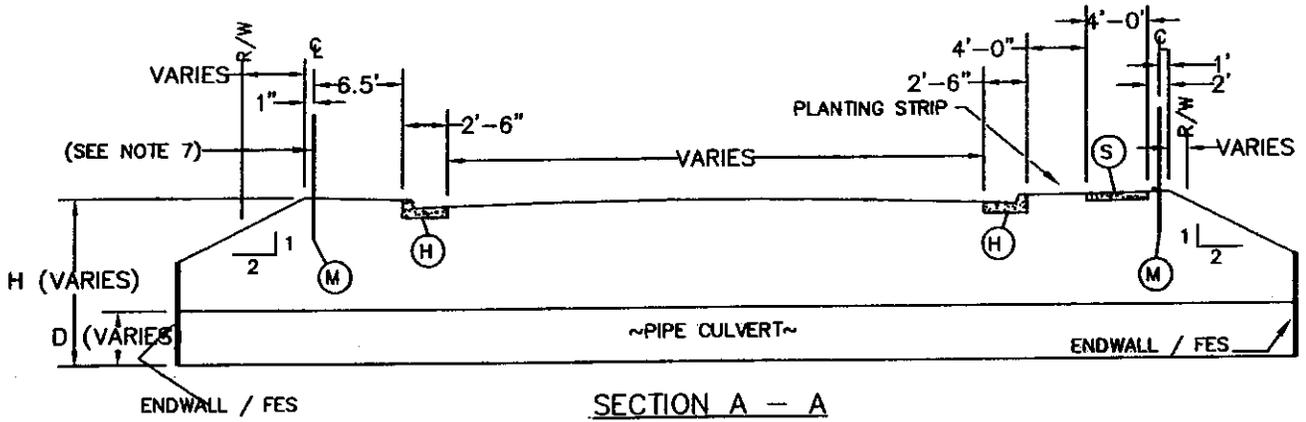


PLAN FOR RESIDENTIAL CUL-DE-SAC

**NOTES:**

1. TRANSITION FROM VALLEY GUTTER TO 2'-6" SECTION TO BE MADE OVER 10' LENGTH.

REV	DESCRIPTION	DATE	APPROVED BY	CATCH BASIN FRAME IN VALLEY CURB	
△	ISSUE FOR PUBLICATION	06/04	HJG		
NOT TO SCALE		DWG NO. 5.05-B		SHEET 1 OF 1	



- (H) 2'-6" CURB AND GUTTER.
- (M) HANDRAIL
- (S) 4'-0" SIDEWALK.
- (H1) 2'-0" VALLEY GUTTER.
- (H2) CURB TRANSITION 2'-6" CURB AND GUTTER TO 2'-0" VALLEY GUTTER.

LH = DISTANCE FROM END OF WINGWALL TO END OF HANDRAIL.

LC1 = DISTANCE FROM C OF CULVERT TO END OF 2'-6" CURB AND GUTTER.

LC2 = DISTANCE FROM END OF WINGWALL TO END OF 2'-6" CURB AND GUTTER.

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 5.06-A	SHEET 1 OF 1

CULVERT CROSSINGS AT  
RESIDENTIAL AND  
COMMERCIAL STREETS



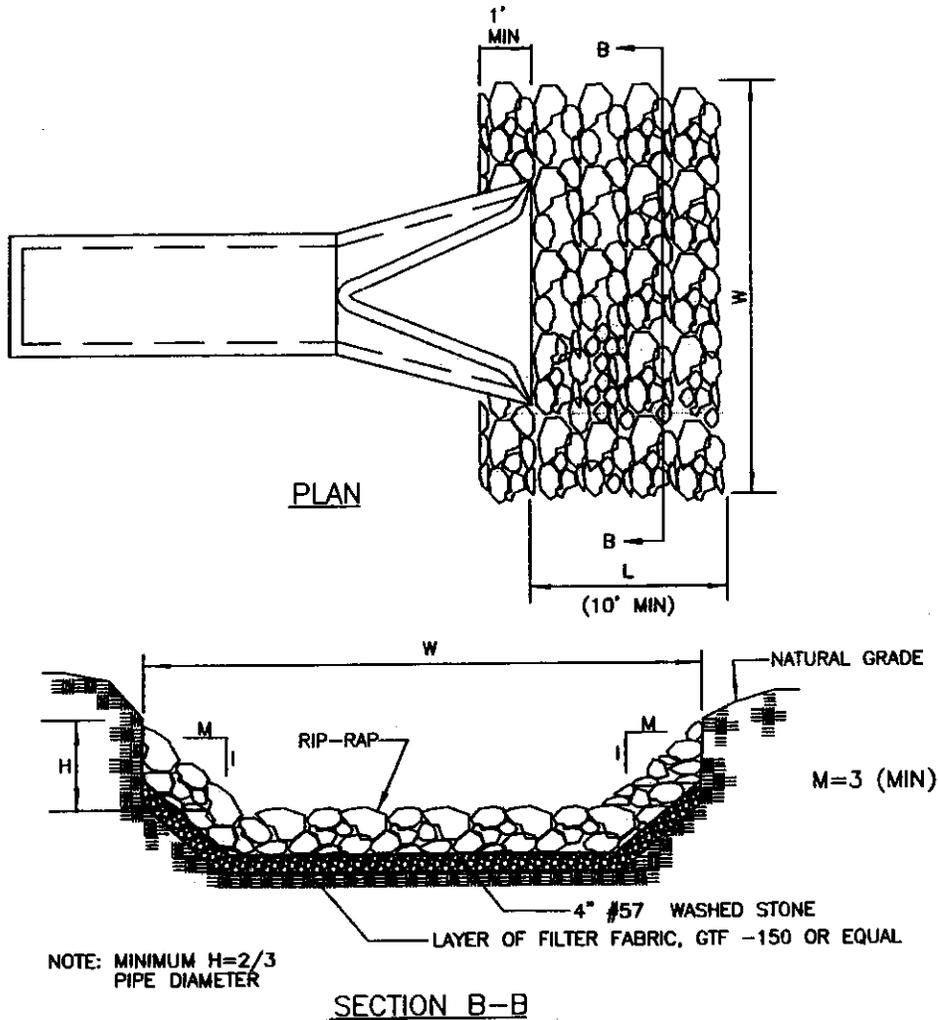
**NOTES:**

1. UNLESS OTHERWISE DETERMINED BY THE VILLAGE ENGINEER, THE MEASURES ILLUSTRATED SHALL BE USED WHEN CULVERT DIAMETER, D, IS GREATER THAN OR EQUAL TO 24 INCHES AND WHEN THE DIFFERENCE IN ELEVATION BETWEEN THE CULVERT INVERT AND THE TOP OF SLOPE, H, IS GREATER THAN OR EQUAL TO 5 FEET.
2. INSTALLATION OF 2'-6" CURB AND GUTTER MAY NOT BE REQUIRED WHEN AN ADEQUATE CLEAR ZONE IS PROVIDED FOR VEHICLES WITH A MAXIMUM OF 6:1 SLOPE (SEE TABLE 1).
3. INSTALLATION OF HANDRAIL MAY NOT BE REQUIRED WHEN A 10-FOOT PEDESTRIAN CLEAR ZONE IS PROVIDED BEHIND THE SIDEWALK WITH A MAXIMUM OF 6:1 SLOPE. WHERE NO SIDEWALK IS REQUIRED, INSTALLATION OF HANDRAIL MAY NOT BE REQUIRED WHEN A 15-FOOT PEDESTRIAN CLEAR ZONE IS PROVIDED BEHIND THE CURB WITH A MAXIMUM OF 6:1 SLOPE.
4. FOR CULVERT CROSSINGS WITHOUT ENDWALLS, LH AND LC2 SHALL BE MEASURED FROM THE OUTSIDE OF THE NEAREST WALL OF THE CULVERT BARREL.
5. FOR MULTIPLE BARREL CULVERT CROSSINGS, LC1 SHALL BE MEASURED FROM THE CENTERLINES OF THE OUTBOARD CULVERT BARRELS.
6. WHEN NECESSARY, AS DETERMINED BY THE CITY ENGINEER, MEASURES ADDITIONAL TO THOSE ILLUSTRATED MAY BE REQUIRED.
7. INSTALLATION OF HANDRAIL IS REQUIRED ON THE SIDEWALK SIDE OF STREET IF SIDEWALK IS ONLY REQUIRED ON ONE SIDE OF STREET. INSTALLATION OF HANDRAIL IS REQUIRED ON BOTH SIDES OF STREET IF SIDEWALK IS REQUIRED ON BOTH SIDES OR IF NO SIDEWALK IS REQUIRED.
8. DESIGN ADT IS CALCULATED ASSUMING A TRIP GENERATION OF 13 DAILY TRIPS PER SINGLE FAMILY DWELLING UNIT.
9. ALL CULVERT CROSSINGS WITHOUT HEATWALLS SHALL HAVE FLARED END SECTIONS.

TABLE 1.  
CLEAR ZONE DISTANCES  
LOCAL, COLLECTOR, AND COMMERCIAL STREETS

DESIGN ADT	CLEAR ZONE FROM EDGE OF PAVEMENT	
	TANGENT SECTION	CURVE (WITHIN 125' OF CULVERT)
UNDER 750	10'	15'
750 - 1500	12'	18'
1501 - 6000	14'	21'
OVER 6000	16'	24'

REV	DESCRIPTION	DATE	APPROVED BY	CULVERT CROSSINGS AT RESIDENTIAL AND COMMERCIAL STREETS	
△	ISSUE FOR PUBLICATION	06/04	HJG		
NOT TO SCALE	DWG NO. 5.06-B	SHEET 2 OF 2			



NOTE: MINIMUM  $H=2/3$   
PIPE DIAMETER

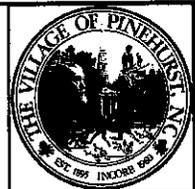
SECTION B-B

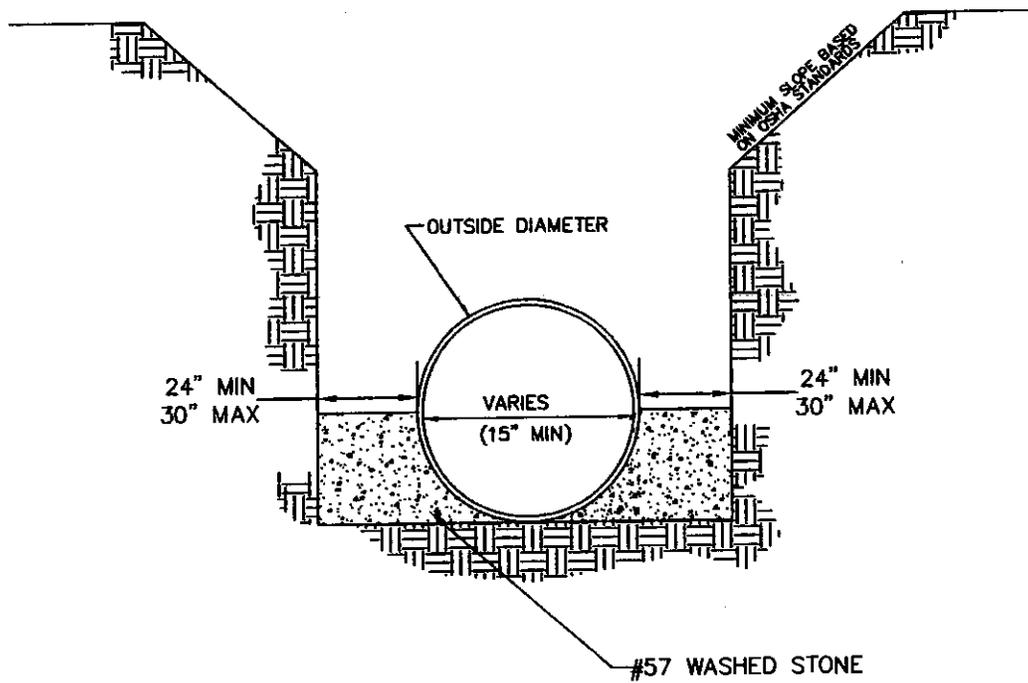
NOTES:

1. CLASS OR MEDIAN SIZE OF RIP-RAP AND LENGTH, WIDTH AND DEPTH OF APRON TO BE DESIGNED BY THE ENGINEER.
2. NO BENDS OR CURVES IN THE HORIZONTAL ALIGNMENT OF THE APRON WILL BE PERMITTED.
3. RIP-RAP SHOULD EXTEND UP BOTH SIDES OF THE APRON AND AROUND THE END OF THE PIPE OR CULVERT AT THE DISCHARGE OUTLET AT A MAXIMUM SLOPE OF 3:1 AND A HEIGHT NOT LESS THAN TWO THIRDS THE PIPE DIAMETER OR CULVERT HEIGHT.
4. THERE SHALL BE NO OVERFLOW FROM THE END OF THE APRON TO THE SURFACE OF THE RECEIVING CHANNEL. THE AREA TO BE PAVED OR RIP-RAPPED SHALL BE UNDERCUT SO THAT THE INVERT OF THE APRON SHALL BE AT THE SAME GRADE (FLUSH) WITH THE SURFACE OF THE RECEIVING CHANNEL. THE APRON SHALL HAVE A CUTOFF OR TOE WALL AT THE DOWNSTREAM END.
5. THE WIDTH OF THE END OF THE APRON SHALL BE EQUAL TO THE BOTTOM WIDTH OF THE RECEIVING CHANNEL. MAXIMUM TAPER TO RECEIVING CHANNEL 5:1.
6. ALL SUBGRADE FOR STRUCTURE TO BE COMPACTED TO 95% OR GREATER.
7. THE PLACING OF FILL, EITHER LOOSE OR COMPACTED IN THE RECEIVING CHANNEL SHALL NOT BE ALLOWED.

REV	DESCRIPTION	DATE	APPROVED BY
①	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE DWG NO. 5.07		SHEET 1 OF 1	

RIP-RAP  
APRON  
AT CULVERTS



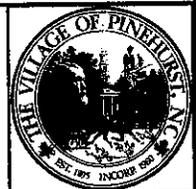


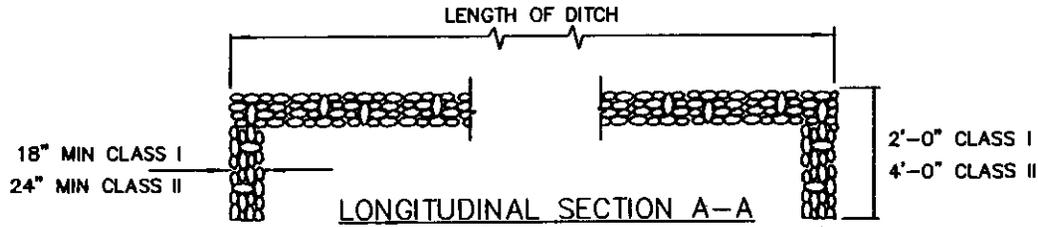
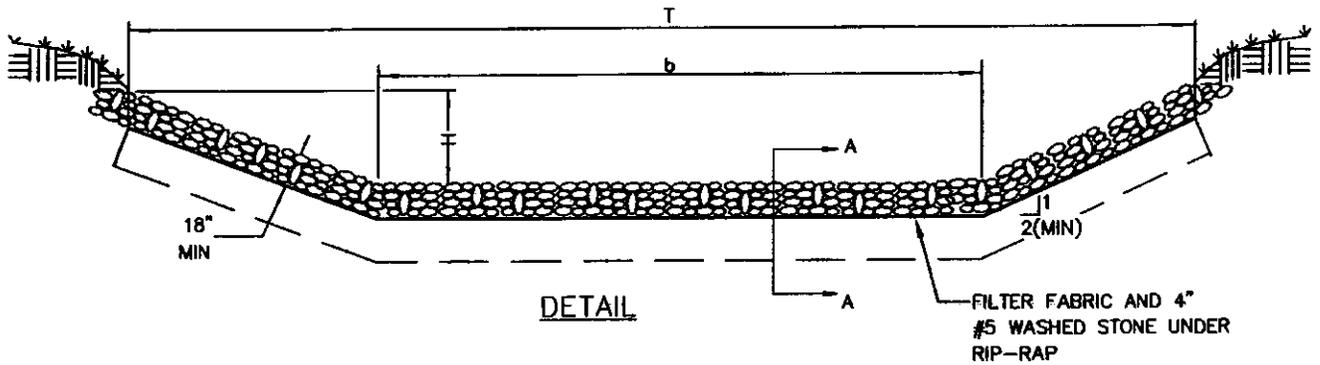
**NOTES:**

1. A MINIMUM OF 24" FROM OUTSIDE DIAMETER OF PIPE TO SIDE OF TRENCH MUST BE ALLOWED FOR COMPACTION OF FILL MATERIAL. BACKFILLING OF TRENCHES SHALL BE ACCOMPLISHED IMMEDIATELY AFTER THE PIPE IS LAID THE FILL AROUND THE PIPE SHALL BE PLACED IN LAYERS NOT TO EXCEED 6". UNDER NO CIRCUMSTANCES SHALL WATER BE PERMITTED TO RISE IN UNBACKFILLED TRENCHES AFTER THE PIPE HAS BEEN PLACED. COMPACTION REQUIREMENTS SHALL BE ATTAINED BY THE USE OF THE MECHANICAL TAMPS ONLY. EACH AND EVERY LAYER OF BACKFILL SHALL BE PLACED LOOSE AND THOROUGHLY COMPACTED INTO PLACE.
2. ALL BACKFILL MATERIAL SHALL HAVE AN IN PLACE COMPACTED DENSITY OF 95% OF STANDARD PROCTOR. THE FINAL 2' BELOW FINISHED GRADE SHALL BE 100%.
3. ALL TRENCHING OPERATIONS SHALL MEET OSHA STANDARDS.
4. BACKFILL MATERIAL BENEATH ROADWAY SHALL BE SELECT BACKFILL MATERIAL.
5. HAUNCHING SHALL BE WITH #57 OR #67 WASHED STONE UNLESS OTHERWISE APPROVED BY THE VILLAGE ENGINEER.

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 5.08	SHEET 1 OF 1

TRENCH DETAIL  
FOR STORM  
DRAIN PIPES



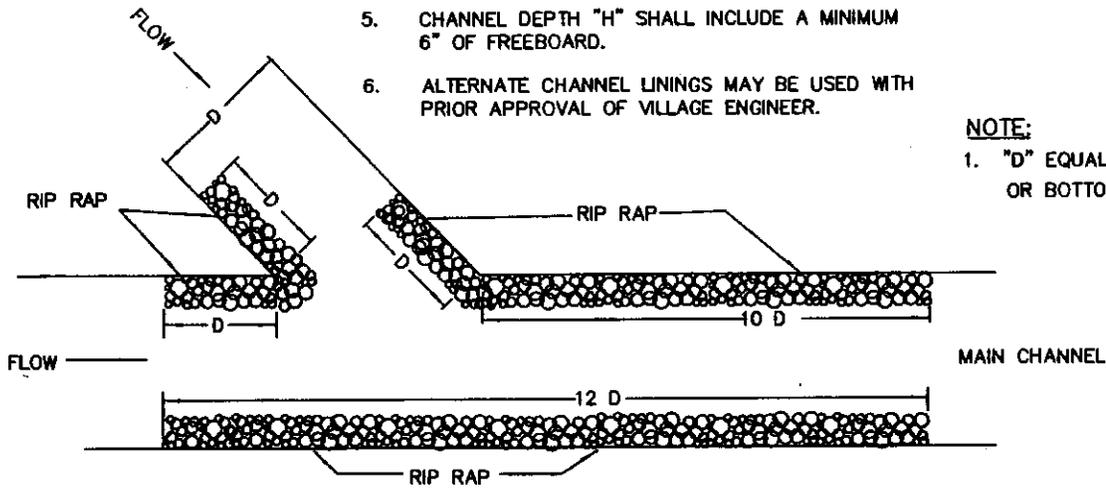


**GENERAL NOTES:**

1. IF BEDROCK IS ENCOUNTERED WITHIN THE LIMITS OF THE TOEWALL, BEGIN TOEWALL ON THE BEDROCK OR AS DIRECTED BY THE ENGINEER.
2. WHERE ONLY ONE SIDE REQUIRES RIP-RAP CLASS I OR II, LIST STATION AND SIDE OF SAME.
3. CHANNEL AND RIP-RAP SIZE TO BE DESIGNED BY THE ENGINEER.
4. DEPENDING ON SOIL CONDITIONS, WASHED STONE AND FILTER FABRIC MAY BE NECESSARY UNDER RIP-RAP.
5. CHANNEL DEPTH "H" SHALL INCLUDE A MINIMUM 6" OF FREEBOARD.
6. ALTERNATE CHANNEL LININGS MAY BE USED WITH PRIOR APPROVAL OF VILLAGE ENGINEER.

**NOTE:**

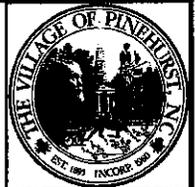
1. "D" EQUALS DIAMETER OF PIPE OR BOTTOM WIDTH OF CHANNEL.



**CHANNEL INTERSECTIONS**

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 5.09	SHEET 1 OF 1

RIP-RAP  
LINED  
DITCHES



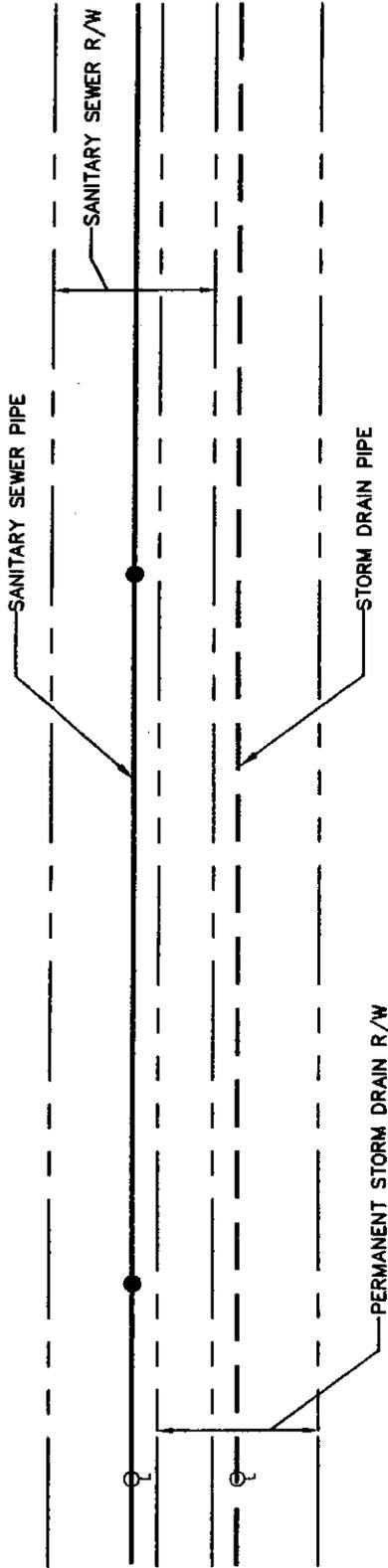
EASEMENT REQUIREMENTS FOR OPEN STORM DRAINAGE CHANNELS	
AREA IN ACREAGE	EASEMENT REQUIREMENT
0-45 AC.	20'
	20'
	20'
45-120 AC.	30'
120-500 AC.	40'
500 AC.+	(SEE NOTE)

EASEMENT REQUIREMENTS FOR STORM DRAIN PIPE	
PIPE SIZE	EASEMENT REQUIREMENT
15"	20'
18"	20'
24"	20'
30"	20'
36"	20'
42"	25'
48"	30'
54"+	30'MIN (VARIES)

**NOTES:**

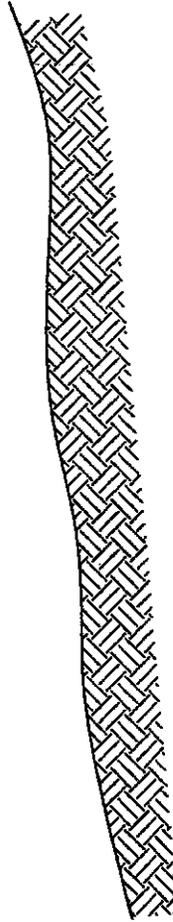
1. FOR STREAMS CARRYING 500 ACRES OR MORE OF SURFACE RUNOFF, THE EASEMENT REQUIREMENT IS TO BE THE WIDTH OF THE STREAM FROM TOP OF BANK TO TOP OF BANK, PLUS (+) 10' ON EACH SIDE OF STREAM. (40' MINIMUM WIDTH )
2. FOR OPEN CHANNELS, THE MINIMUM EASEMENT MUST CONTAIN THE WIDTH OF THE STREAM FROM TOP OF BANK TO TOP BANK.

REV	DESCRIPTION	DATE	APPROVED BY	MINIMUM DRAINAGE EASEMENT REQUIREMENTS FOR STORM DRAIN PIPES AND OPEN CHANNELS	
△	ISSUE FOR PUBLICATION	06/04	HJG		
NOT TO SCALE DWG NO. 5.10		SHEET 1 OF 1			



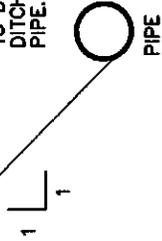
THE SANITARY SEWER AND STORM DRAINAGE RIGHTS OF WAY MAY OVERLAP. HOWEVER, THE PIPE AND ASSOCIATED STRUCTURES MUST NOT BE IN THE OTHER UTILITY'S RIGHT OF WAY. THE SANITARY SEWER RIGHT OF WAY WIDTHS SHALL BE AS OUTLINED IN C.M.U.D.'S DESIGN MANUAL. THIS DETAIL DOES NOT APPLY TO STORM DRAINAGE UTILIZING OPEN CHANNEL FLOW.

PLAN VIEW



THE SANITARY SEWER AND STORM DRAINAGE PIPES MUST BE NO CLOSER TOGETHER HORIZONTALLY THAN THE VERTICAL DISTANCE BETWEEN THE TOP OF THE HIGHER PIPE AND THE BOTTOM OF THE LOWER PIPE. A MAINTENANCE CREW MUST BE ABLE TO DIG DOWN TO THE LOWER PIPE SLOPING THE DITCH ON A 1:1 SLOPE AND NOT EXPOSE THE HIGHER PIPE.

THE VERTICAL SEPARATION GUIDELINE WILL BE USED UP TO THE POINT WHERE THE TWO RIGHTS OF WAY ADJOIN EACH OTHER.

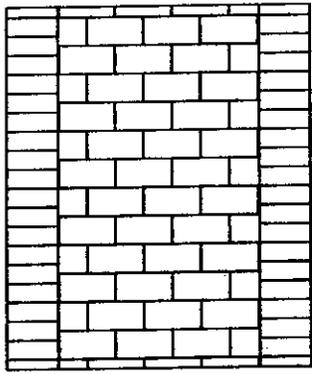


PROFILE VIEW

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 5.11	SHEET 1 OF 1

OVERLAPPING STORM DRAIN/ SANITARY SEWER EASEMENTS





4" x 8" "PINEHALL  
PATHWAY" BRICK PAVER  
OR APPROVED EQUAL

5.00

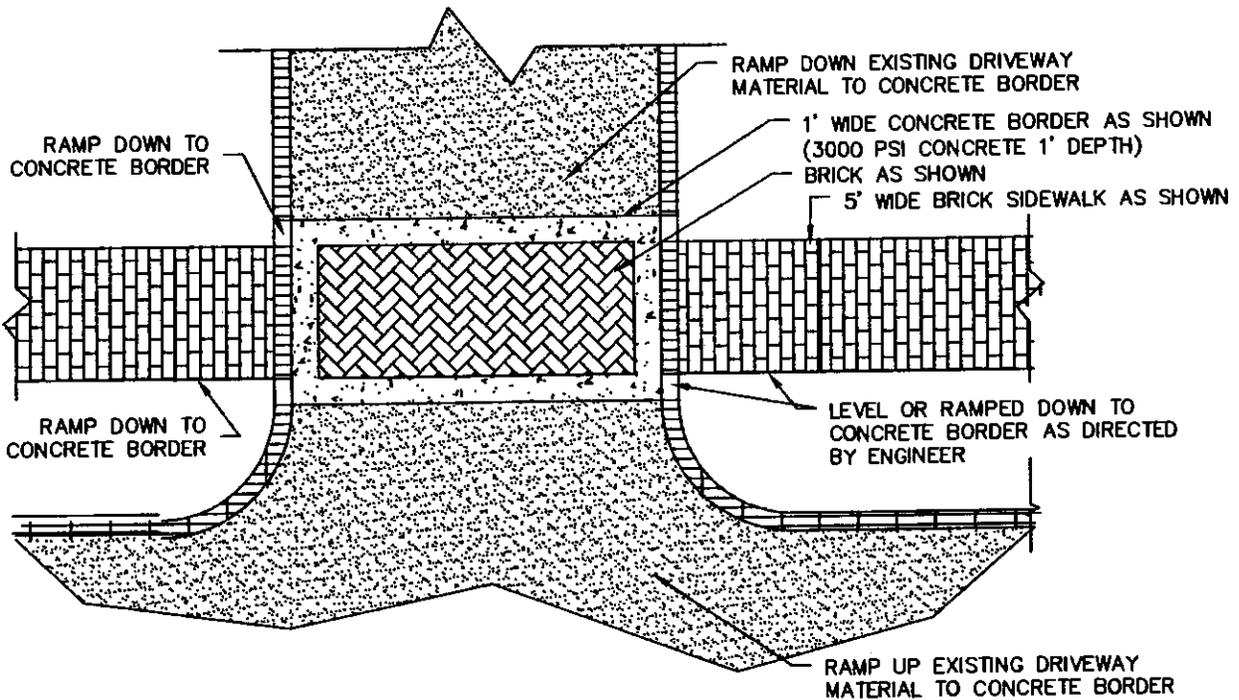
BRUSH SAND INTO JOINTS

"IRON EDGE" STEEL EDGING W/10" SPIKES  
OR APPROVED EQUIVALENT

1" SAND BEDDING WITH GEOTEXTILE  
UNDERLAYMENT

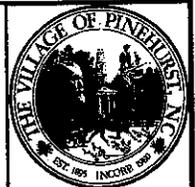
2" SCREENINGS (COMPACTED)

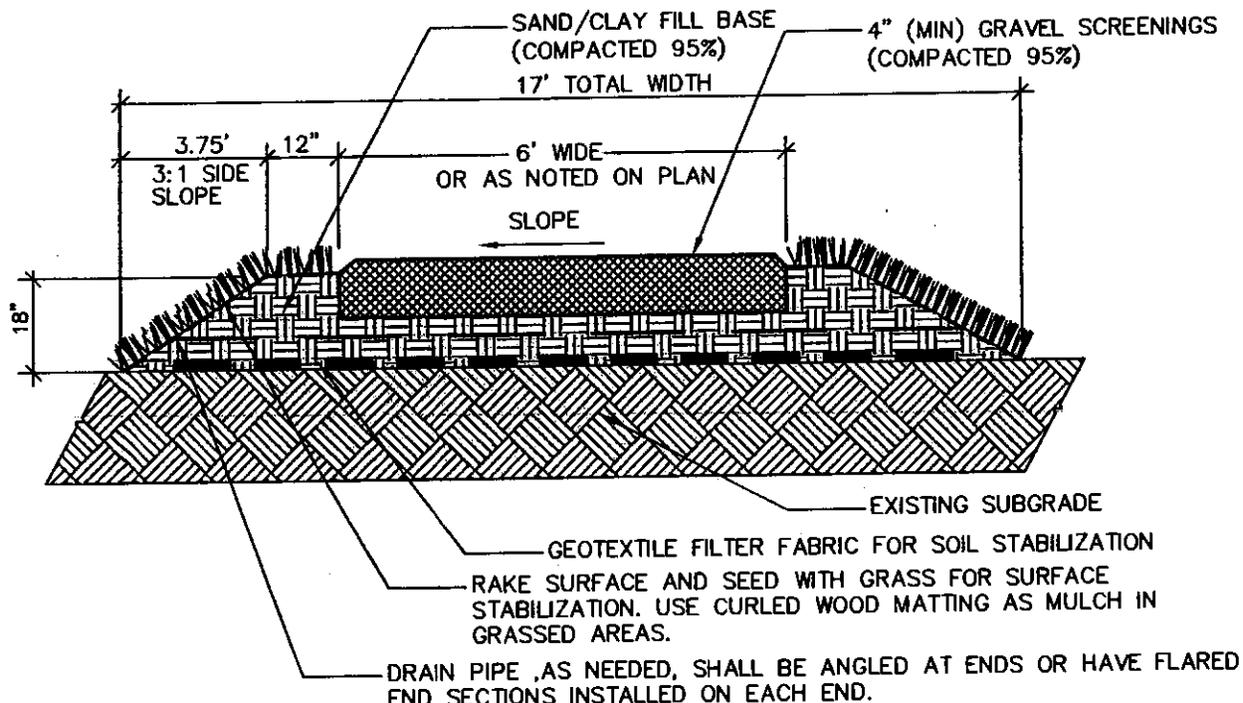
4" ABC COMPACTED TO 95% STD. PROCTOR  
COMPACTED SUBGRADE



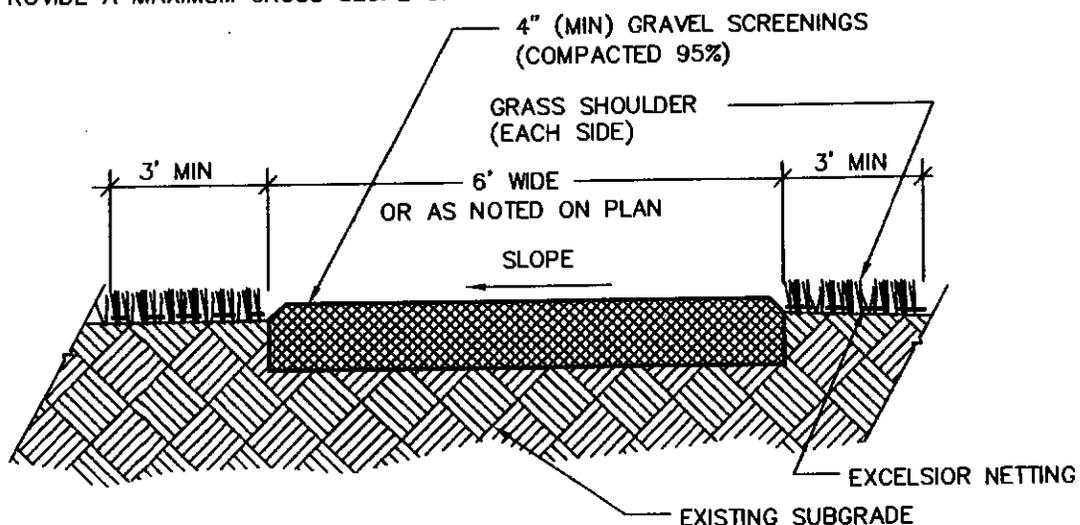
REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE DWG NO. 5.12		SHEET 1 OF 1	

BRICK  
SIDEWALK

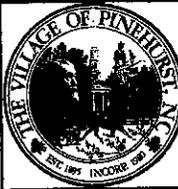


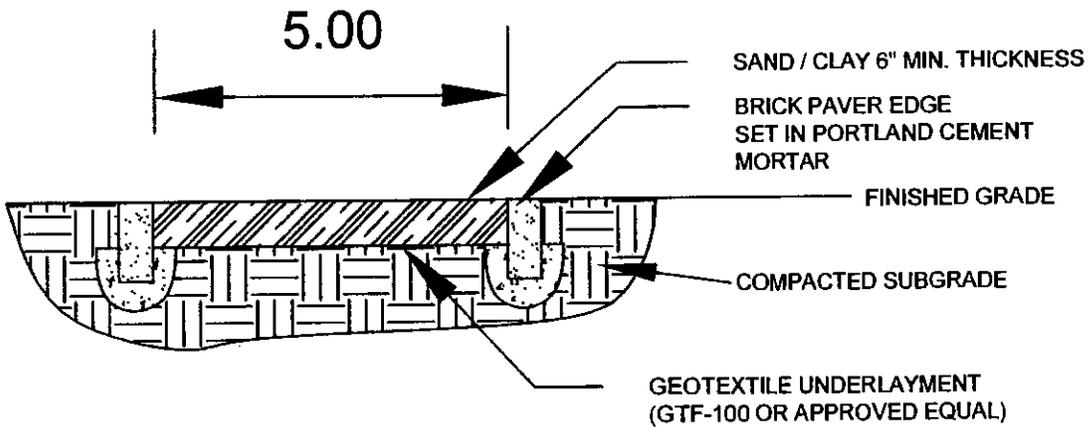
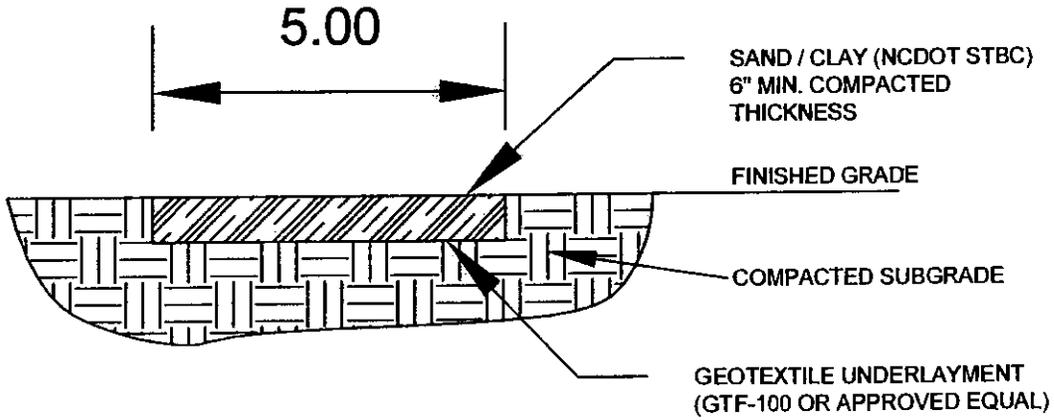


- \* FINISHED TRAIL SURFACE TO BE A MAXIMUM OF 1" ABOVE FINISHED SOIL GRADE.
- \* STONE SCREENINGS SHALL VARY IN SIZE FROM 1/64" TO 1/8" WITH A UNIFORM DISTRIBUTION OF SIZES. A SAMPLE OF SCREENINGS SHALL BE SUBMITTED TO THE OWNER FOR APPROVAL PRIOR TO USE IN CONSTRUCTION.
- \* PROVIDE A MAXIMUM CROSS SLOPE OF 1.5% TO THE LOW SIDE OF TRAIL FOR SURFACE DRAINAGE.



- \* FINISHED TRAIL SURFACE TO BE A MAXIMUM OF 1" ABOVE FINISHED SOIL GRADE.
- \* ROOT PRUNE AREA WHERE TRAIL IS TO BE LOCATED AND COMPACT LOOSENEED SOIL TO 2" MIN BELOW EXISTING GRADE. INSTALL GRAVEL SCREENINGS AND COMPACT TO A MIN DEPTH OF 3" THICK AND 1" ABOVE GRADE.
- \* STONE SCREENINGS SHALL VARY IN SIZE FROM 1/64" TO 1/8" WITH A UNIFORM DISTRIBUTION OF SIZES. A SAMPLE OF SCREENINGS SHALL BE SUBMITTED TO THE OWNER FOR APPROVAL PRIOR TO USE IN CONSTRUCTION.
- \* PROVIDE A MAXIMUM CROSS SLOPE OF 1.5% TO THE LOW SIDE OF TRAIL FOR SURFACE DRAINAGE.

REV	DESCRIPTION	DATE	APPROVED BY	GREENWAY	
△	ISSUE FOR PUBLICATION	06/04	HJG		
NOT TO SCALE DWG NO. 5.13		SHEET 1 OF 1			



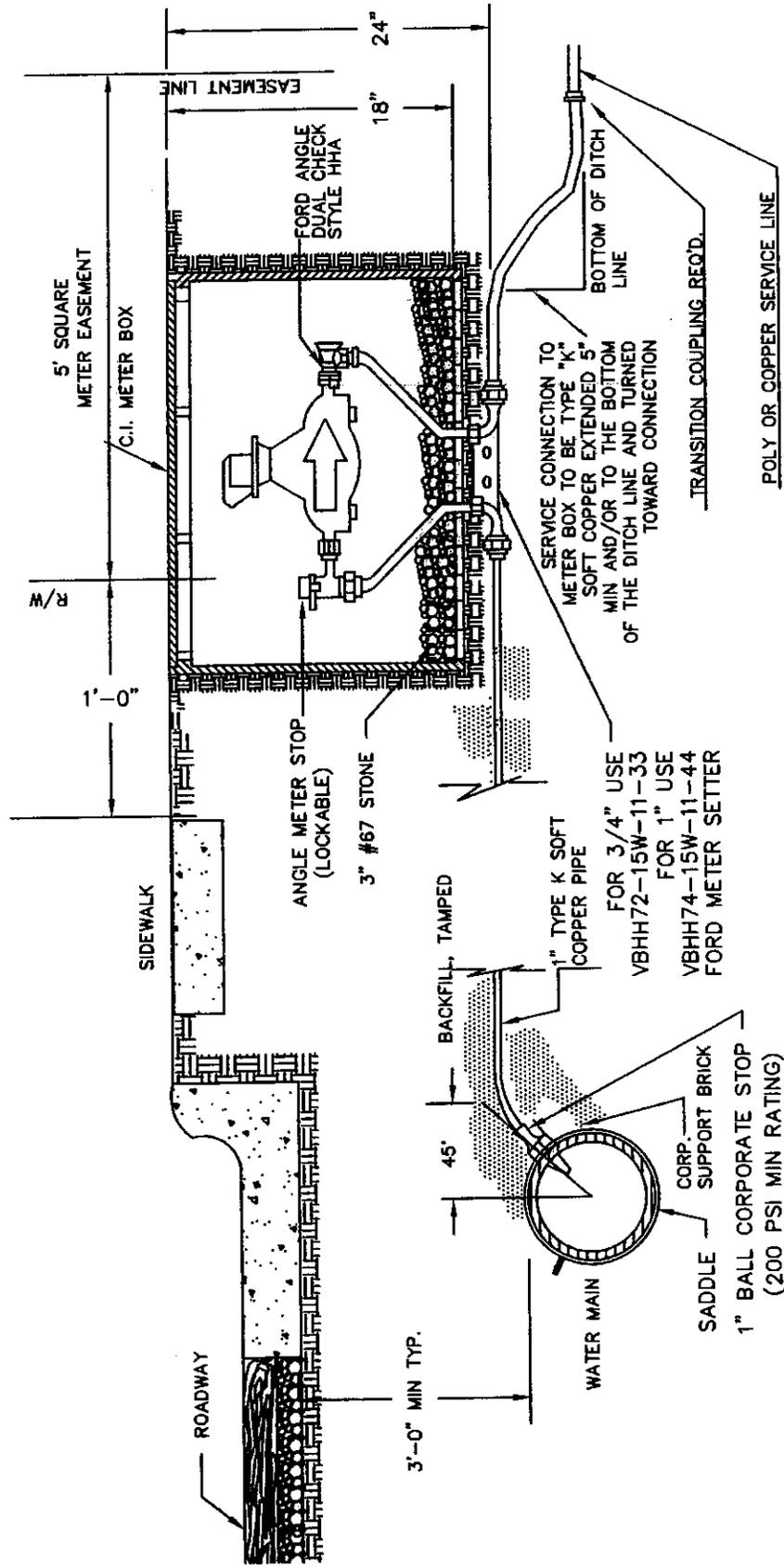
REV	DESCRIPTION	DATE	APPROVED BY
△			
	DWG NO. 5.14		SHEET 1 OF 1

OLD TOWN  
SAND-CLAY  
SIDEWALKS



**NOTE.**

1. TOP OF METER 4" MIN, 6" MAX TO SURFACE.



**METER SETTER**

FORD VHH -70 SERIES, (MIN 15")  
 MUELLER - 14000 SERIES (MIN 15")

**ANGLE DUAL CHECK**

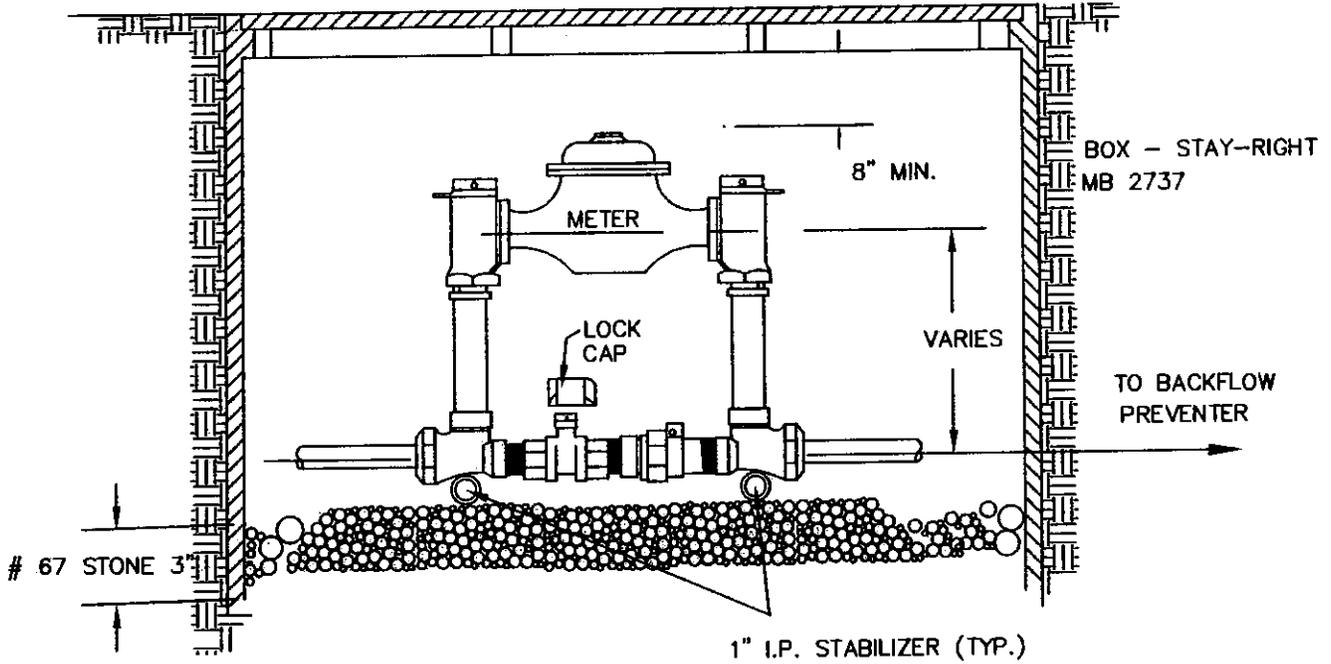
FORD - STYLE HHA  
 MUELLER - #14244

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE	DWG NO. 6.01		SHEET 1 OF 1

**STANDARD 3/4" & 1" METER BOX INSTALLATION**



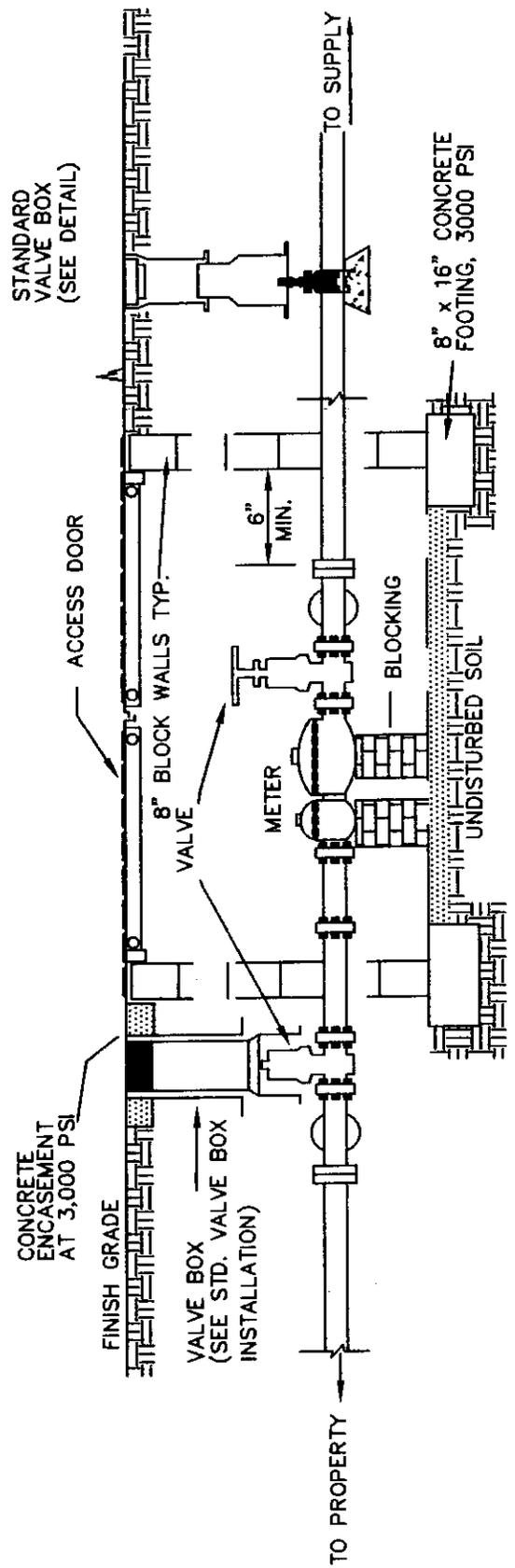
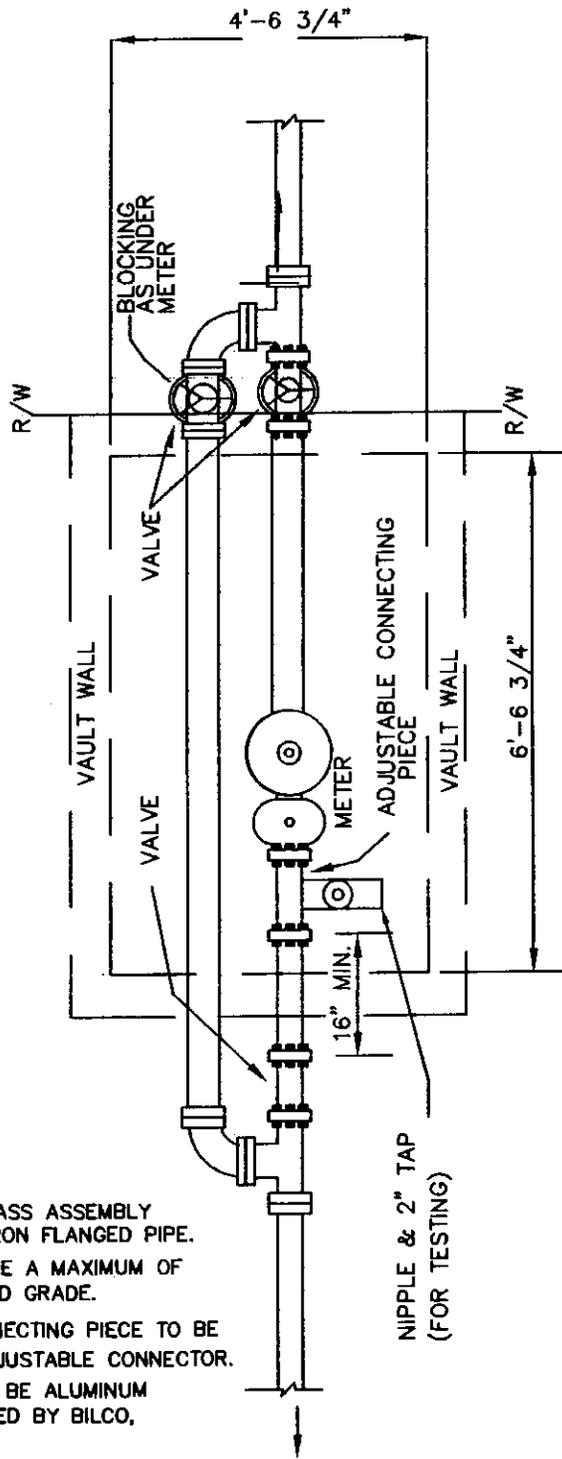
COVER & FRAME DEWEY BROS., BILCO,  
OR APPROVED EQUAL



**NOTES:**

1. METER YOKE - MUELLER OR FORD WITH LOCKABLE BY-PASS AND METER STOPS.

REV	DESCRIPTION	DATE	APPROVED BY	STANDARD 1-1/2" & 2" METER BOX INSTALLATION	
△	ISSUE FOR PUBLICATION	06/04	HJG		
NOT TO SCALE DWG NO. 6.02		SHEET 1 OF 1			



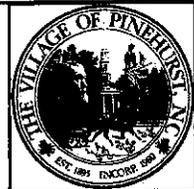
**NOTES:**

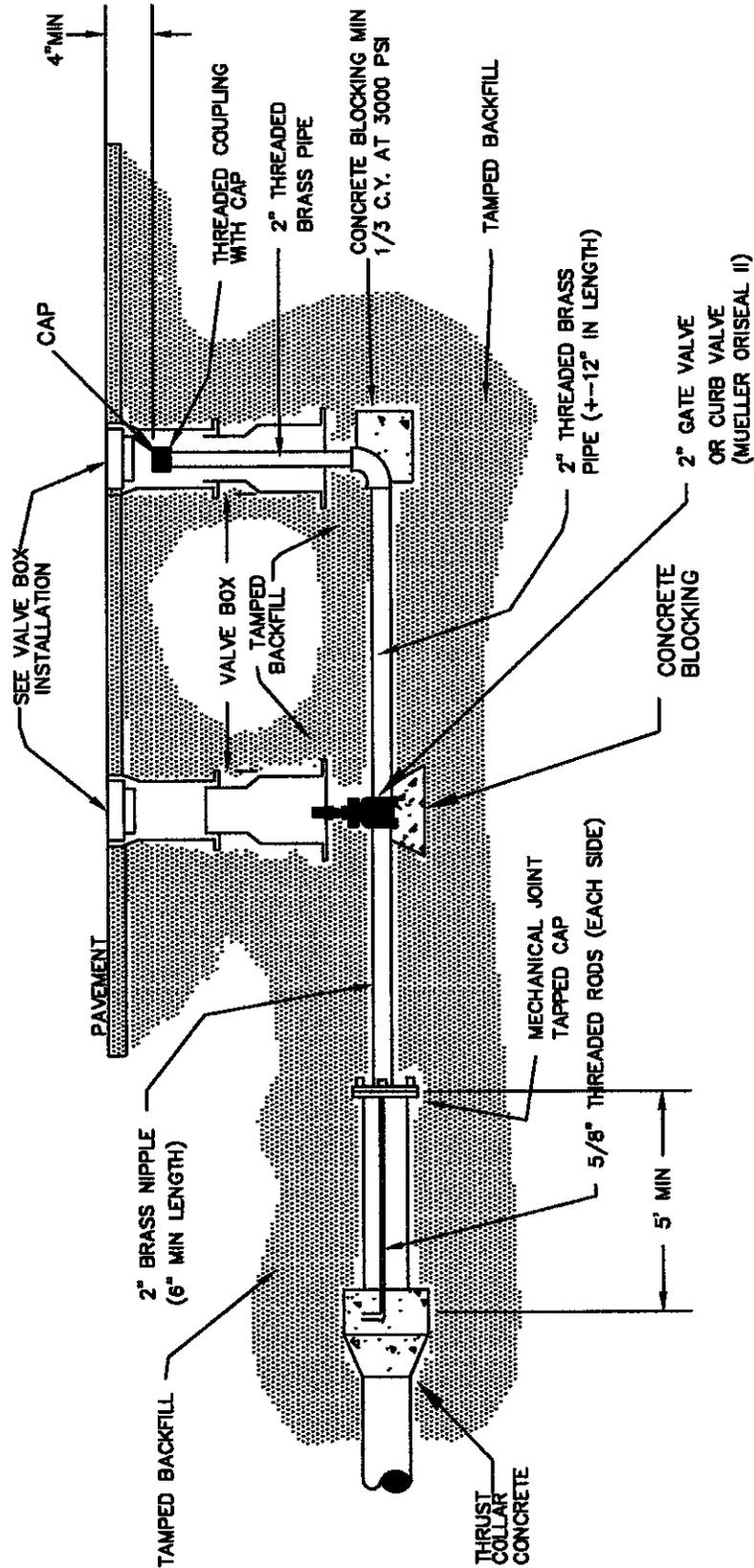
1. METER AND BY-PASS ASSEMBLY TO BE DUCTILE IRON FLANGED PIPE.
2. METER FACE TO BE A MAXIMUM OF 2' BELOW FINISHED GRADE.
3. ADJUSTABLE CONNECTING PIECE TO BE CLOW F-1439 ADJUSTABLE CONNECTOR.
4. ACCESS DOOR TO BE ALUMINUM AS MANUFACTURED BY BILCO, KD-3.
5. VALVES SHALL BE IRON BODY TYPE.
6. EITHER SOLID CONCRETE BRICK, SOLID BLOCK OR PRECAST CONCRETE MAY BE USED.

NIPPLE & 2" TAP  
(FOR TESTING)

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 6.03	SHEET 1 OF 1

**STANDARD 3" & 4" METER INSTALLATION AND VAULT**



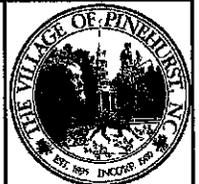


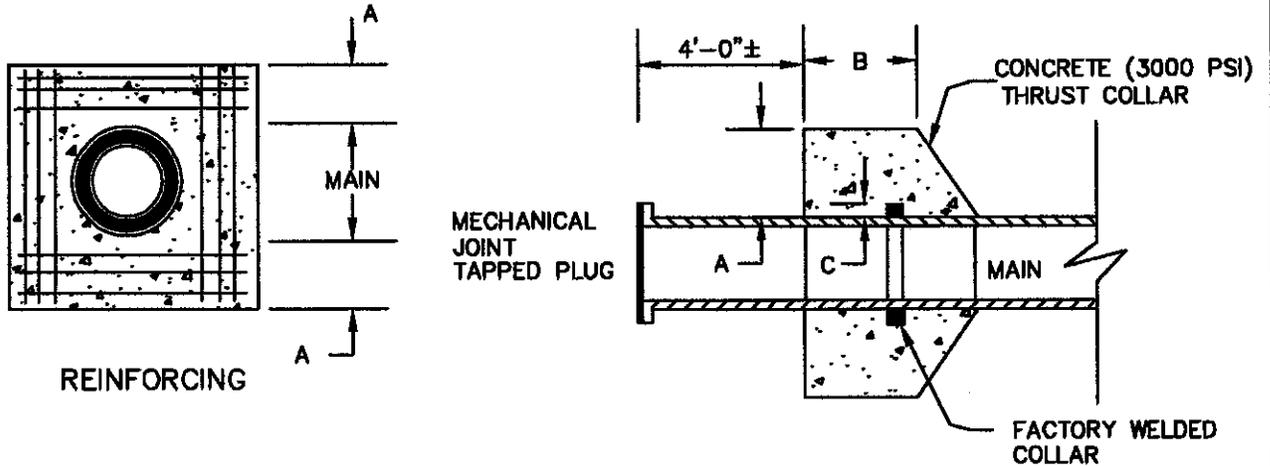
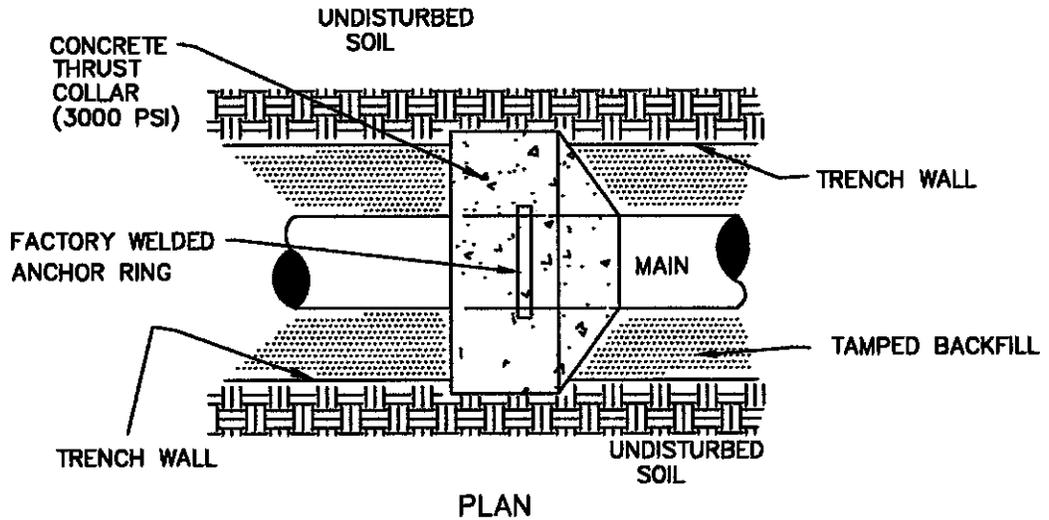
**NOTES:**

1. THE MINIMUM BLOW-OFF SIZE SHALL BE DEPENDENT ON THE MAIN SIZE AS FOLLOWS:
2. MAY SUBSTITUTE APPROVED VILLAGE OF PINEHURST HYDRANT WITH PRIOR APPROVAL OF VILLAGE ENGINEER.
3. SEE DETAIL 6.05 FOR THRUST COLLAR SPECIFICATIONS.

REV	DESCRIPTION	DATE	APPROVED BY
△	ELIMINATE D.I.P. REFERENCE	09/10	MSA
NOT TO SCALE		DWG NO. 6.04	SHEET 1 OF 1

**STANDARD 2"  
BLOWOFF  
ASSEMBLY**





**NOTES:**

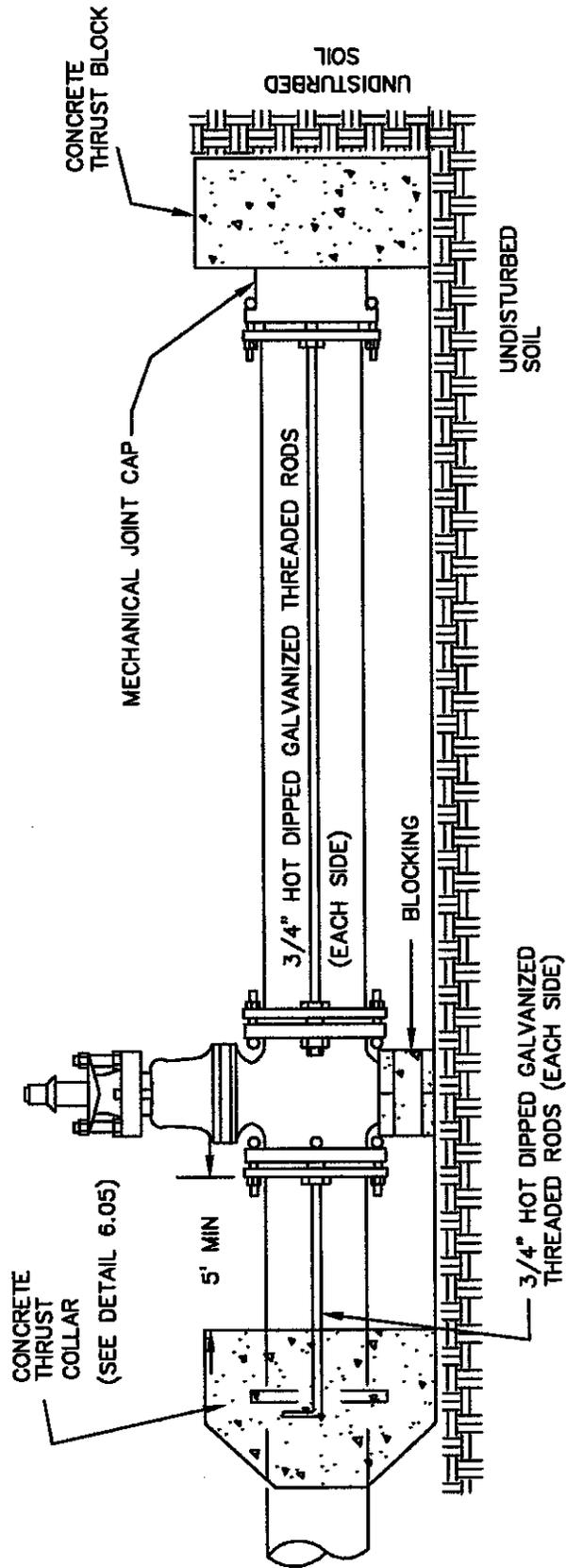
1. 6" TO 16" MAINS=12-NO.7 BARS.
2. 20" TO 36" MAINS=12-NO.8 BARS.
3. BARS PLACED AS SHOWN.

SCHEDULE				
PIPE DIAMETER	CONCRETE THRUST COLLAR		ANCHOR RING	RING REQUIRED
	A	B	C	
6",8",12"	1'-0"	1'-0"	2"	ONE
16"	1'-4"	1'-0"	2"	ONE
20"	1'-4"	1'-0"	3"	ONE
24"	1'-4"	1'-0"	3"	TWO
30"	1'-4"	1'-2"	4"	TWO
36"	1'-4"	1'-4"	4"	TWO

REV	DESCRIPTION	DATE	APPROVED BY
△	ELIMINATE D.I.P. REFERENCE	09/10	MSA
NOT TO SCALE	DWG NO. 6.05		SHEET 1 OF 1

STANDARD  
THRUST COLLAR  
INSTALLATION



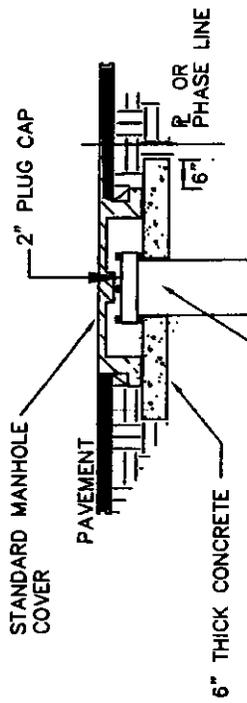


MAIN SIZE    RODS REQUIRED  
 4, 6, 8, 12    =    2    RODS  
 >12", <24"    =    4    RODS

REV	DESCRIPTION	DATE	APPROVED BY
△	ELIMINATE D.I.P. REFERENCE	09/10	MSA
NOT TO SCALE	DWG NO. 6.06		SHEET 1 OF 1

STANDARD  
 CAPPING  
 DETAIL





SIDE VIEW IN PAVED

STD MANHOLE  
FRAME & COVER

6" MIN 2'-0" MAX

R OR  
PHASE LINE

#67 STONE

CONCRETE  
BLOCKING

MAIN SIZE	END PIPE SIZE	ROD SIZE
4" - 12"	SAME DIAMETER AS MAIN	3/4" HOT DIPPED
16"	12"	3/4" HOT DIPPED
24" & GREATER	AS APPROVED BY VILLAGE ENGINEER	3/4" HOT DIPPED

NOTES:  
1. WHEN BLOW-OFF IS EXPOSED TO TRAFFIC,  
THE DETAIL FOR A PAVED AREA SHALL BE  
USED EVEN IF THE BLOW-OFF IS OUTSIDE  
THE PAVEMENT.

19 JOINT MAX

FLANGE CAP

GROUND LINE

CONCRETE

STANDARD VALVE BOX

(SEE TABLE ON DETAIL 6.06  
FOR ROD REQUIREMENTS)

5' TO 10'

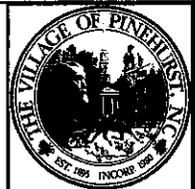
BLOW OFF VALVE

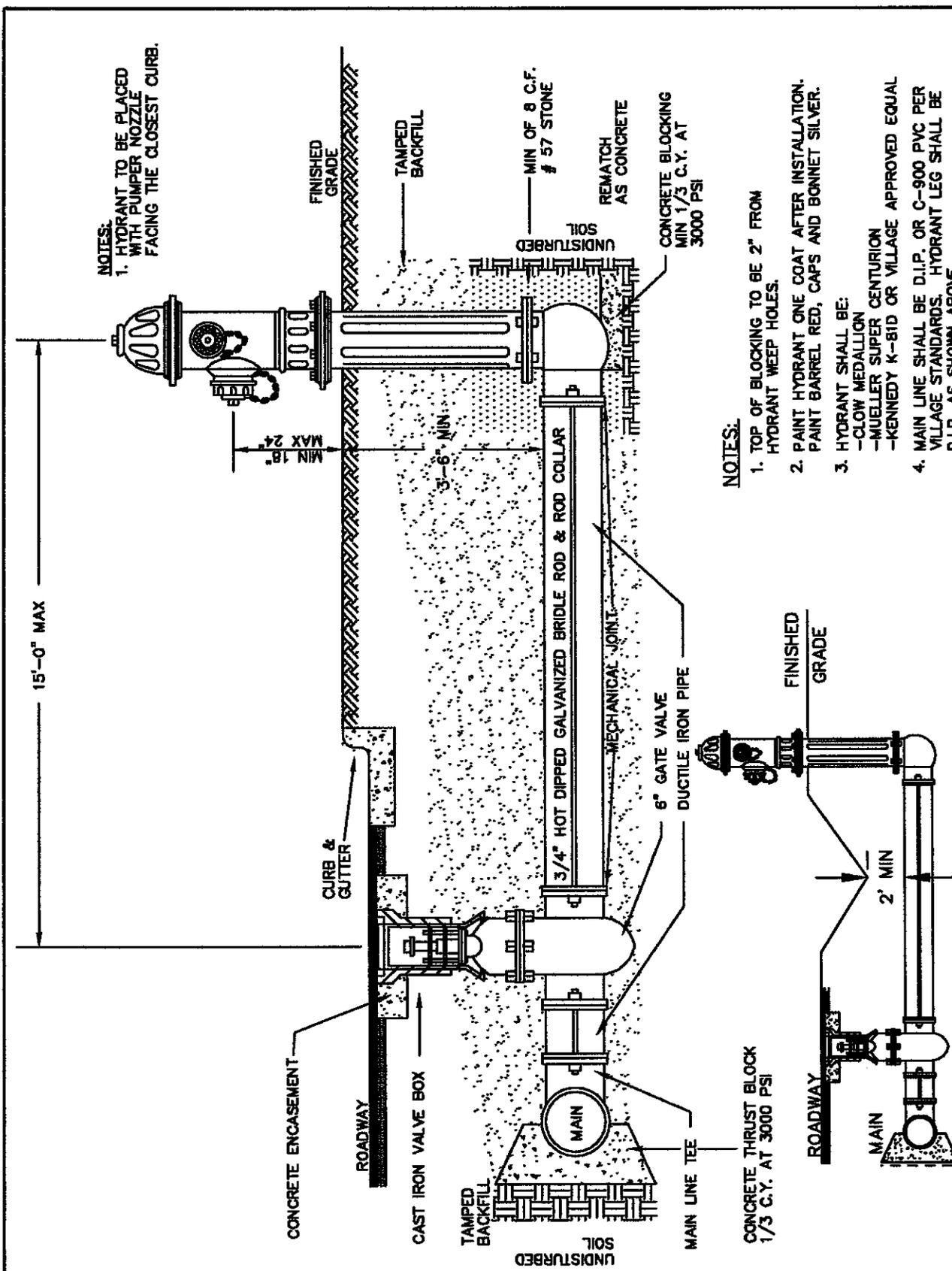
(SEE STANDARD DETAIL 6.10)

SIDE VIEW UNPAVED

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE	DWG NO. 6.07		SHEET 1 OF 1

STANDARD  
BLOWOFF  
ASSEMBLY





NOTES:  
 1. HYDRANT TO BE PLACED WITH PUMPER NOZZLE FACING THE CLOSEST CURB.

NOTES:

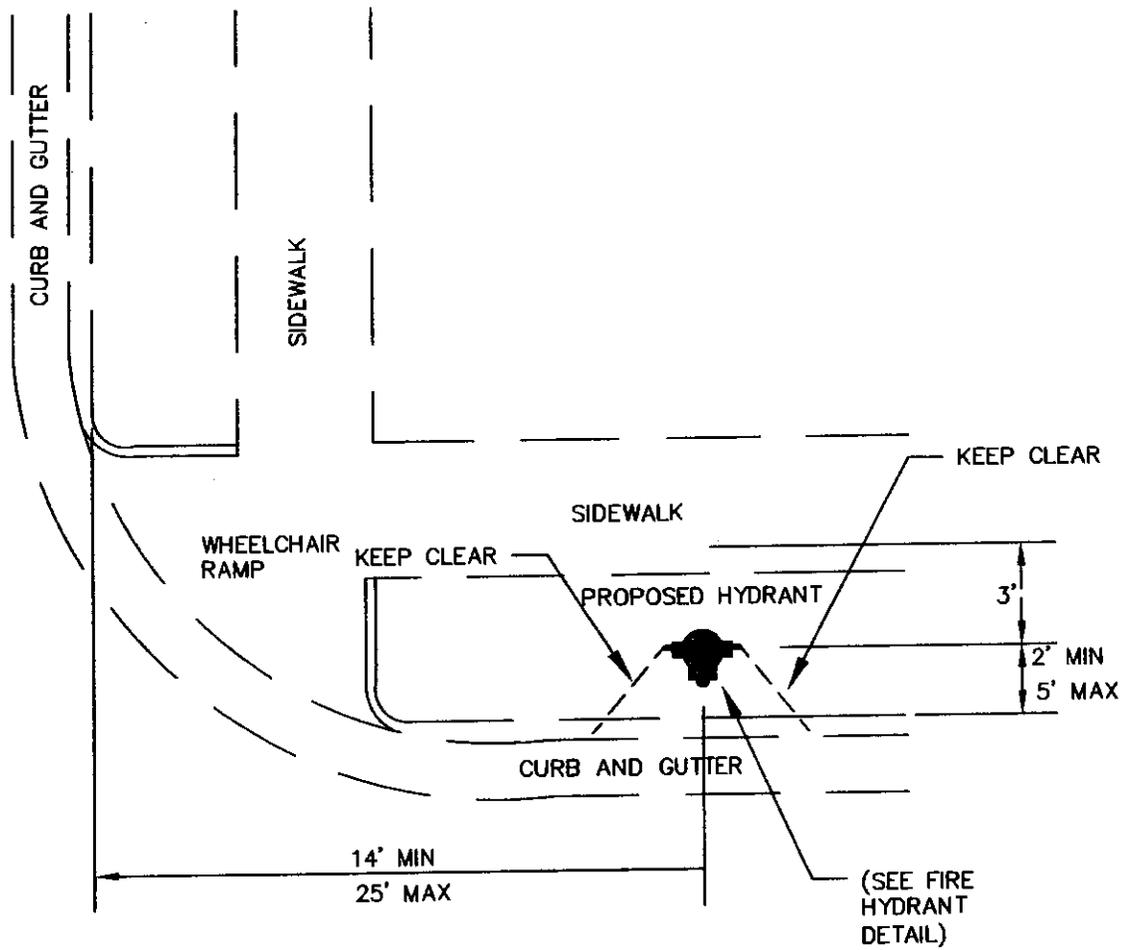
1. TOP OF BLOCKING TO BE 2" FROM HYDRANT WEEP HOLES.
2. PAINT HYDRANT ONE COAT AFTER INSTALLATION. PAINT BARREL RED, CAPS AND BONNET SILVER.
3. HYDRANT SHALL BE:
  - CLOW MEDALLION
  - MUELLER SUPER CENTURION
  - KENNEDY K-81D OR VILLAGE APPROVED EQUAL
4. MAIN LINE SHALL BE D.I.P. OR C-900 PVC PER VILLAGE STANDARDS. HYDRANT LEG SHALL BE D.I.P. AS SHOWN ABOVE.

ROADWAY WITHOUT CURB AND GUTTER SECTION

REV	DESCRIPTION	DATE	APPROVED BY
1	ADD NOTE #4	09/10	MSA
NOT TO SCALE DWG NO. 6.08		SHEET 1 OF 1	

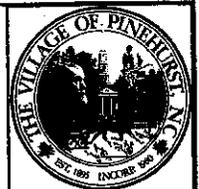
STANDARD  
 HYDRANT  
 INSTALLATION





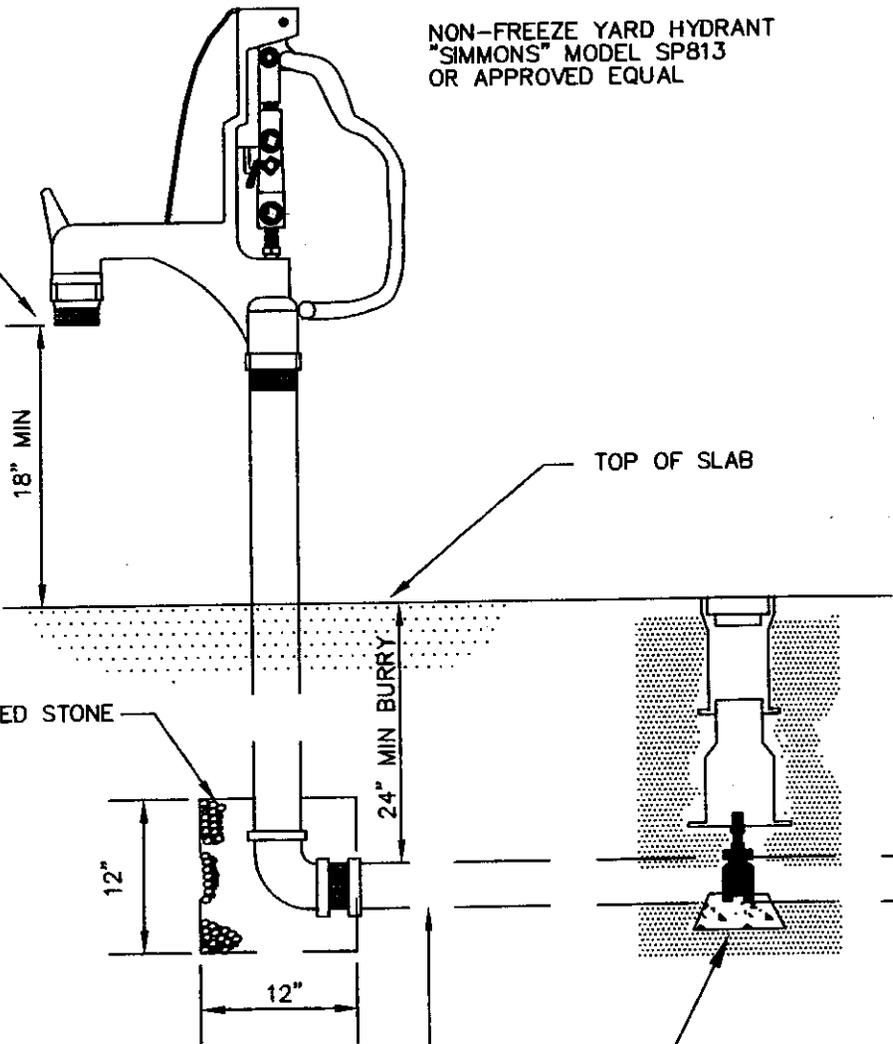
REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE	DWG NO. 6.10		SHEET 1 OF 1

STANDARD  
HYDRANT  
LOCATION



SIPHON BREAK

NON-FREEZE YARD HYDRANT  
 "SIMMONS" MODEL SP813  
 OR APPROVED EQUAL



1 CF #57 WASHED STONE

18" MIN

TOP OF SLAB

24" MIN BURRY

12"

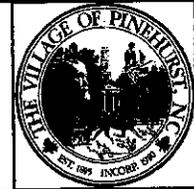
12"

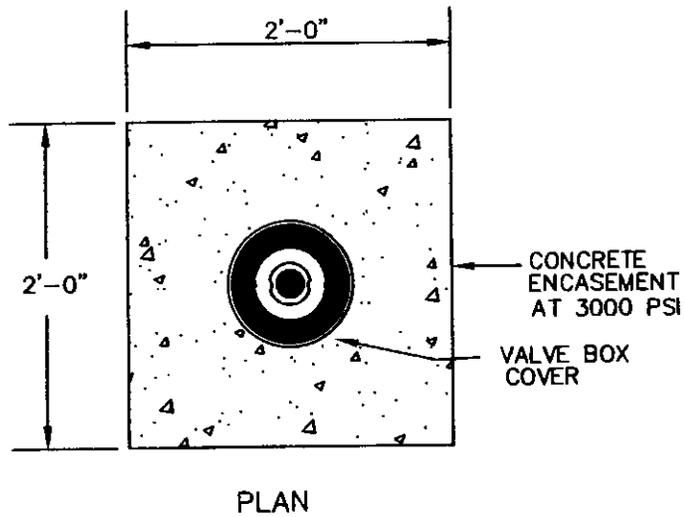
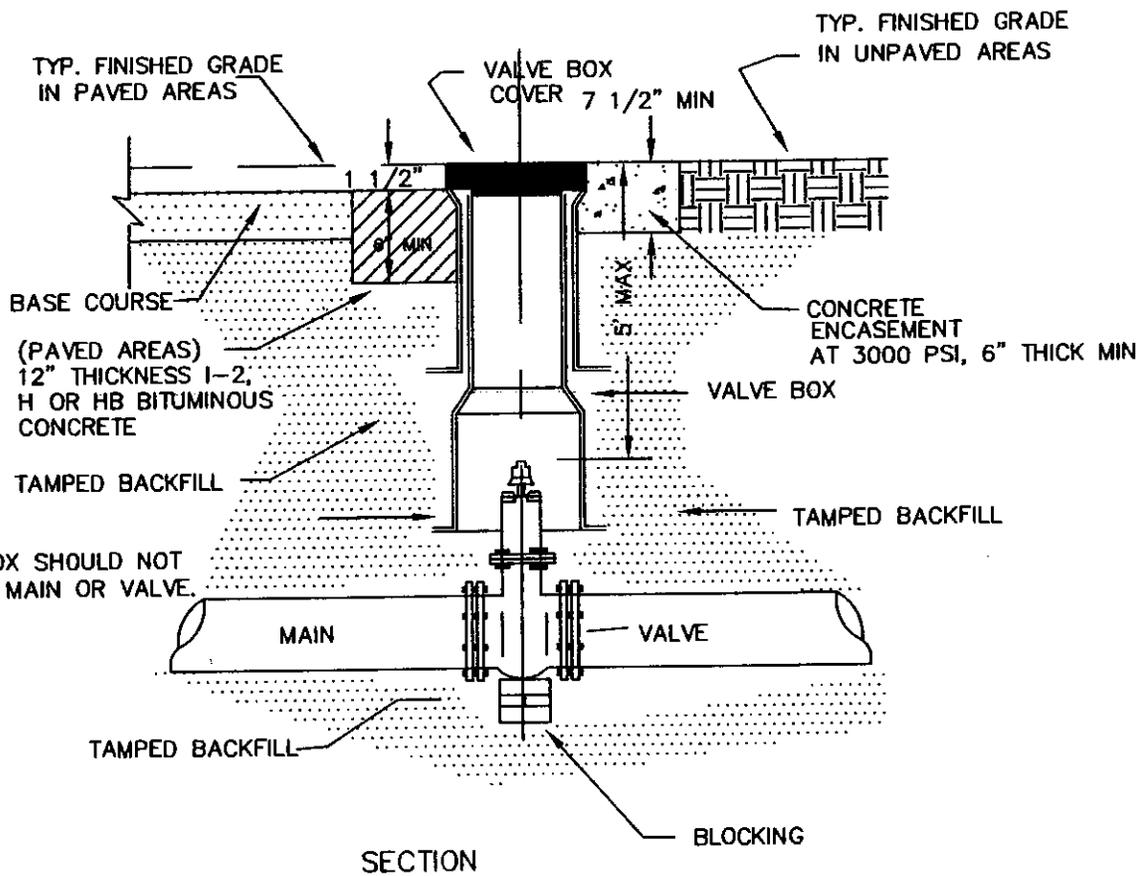
1" CURB STOP  
 IN VAULT

TYPE 'K' 1" DIA. COPPER  
 THREADED TO COMPRESSION  
 FITTING AT HYDRANT

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 6.11	SHEET 1 OF 1

YARD  
 HYDRANT  
 NON-FREEZE

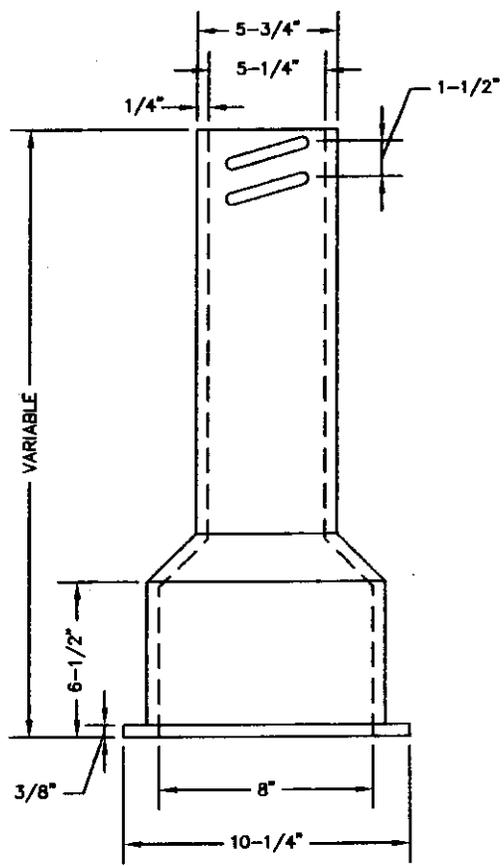




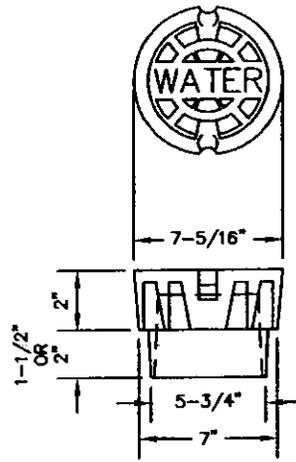
REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE	DWG NO. 6.12-A		SHEET 1 OF 1

VALVE  
BOX  
INSTALLATION

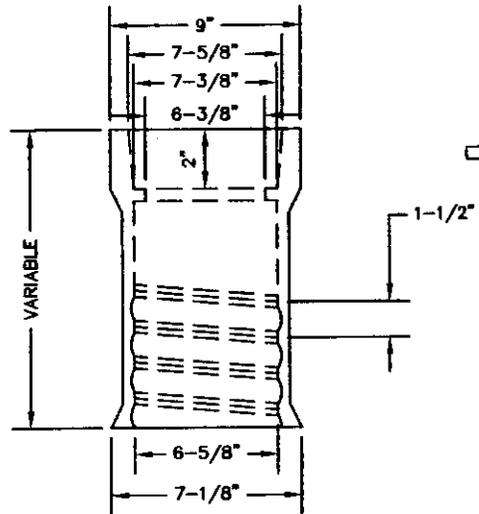




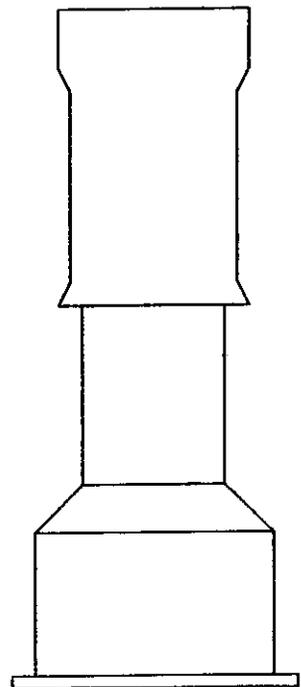
BOTTOM SECTION



LID



TOP SECTION



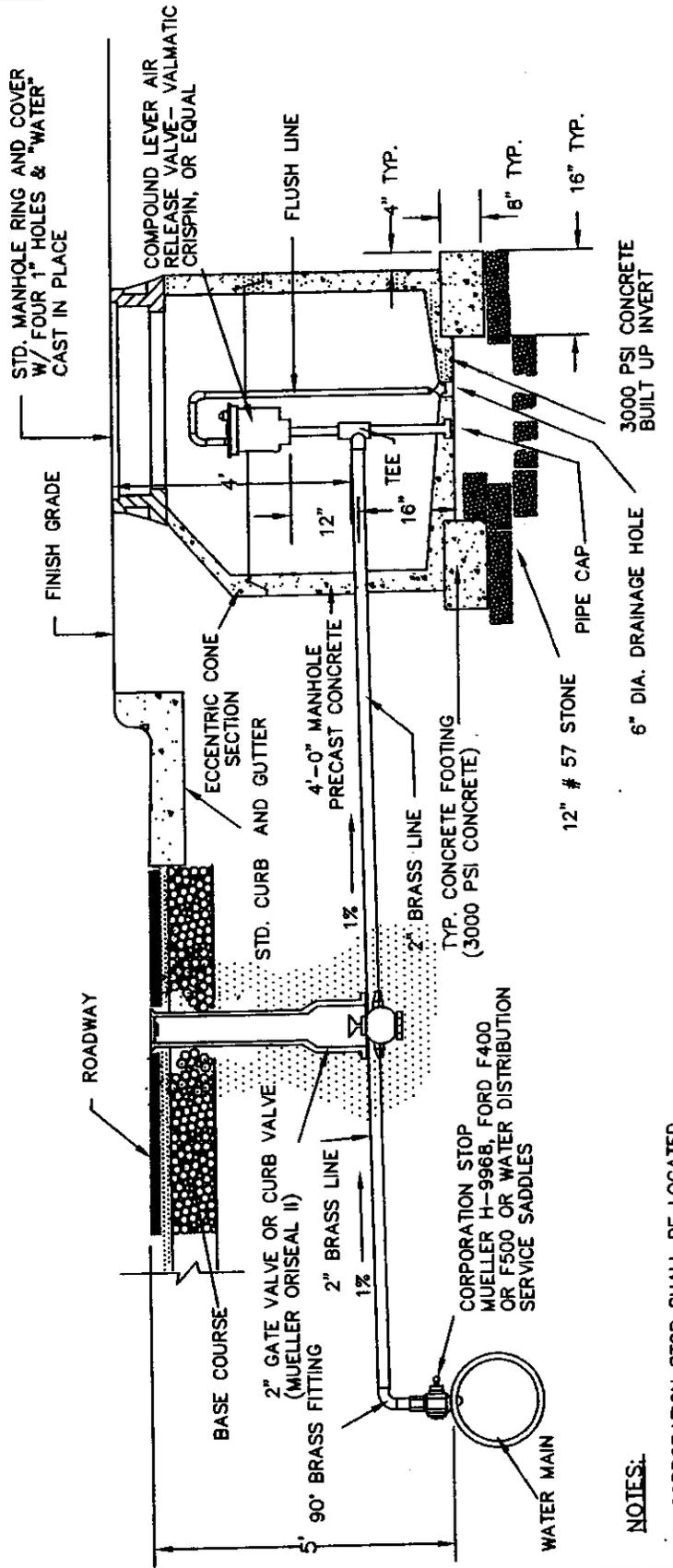
COMPLETE BOX

DIMENSIONS IN INCHES	
LENGTH	
TOP	BOTTOM
10	15
10	24
16	24
16	36
26	36
26	48
26	60

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
	NOT TO SCALE	DWG NO. 6.12-B	SHEET 1 OF 1

STANDARD  
VALVE  
BOX





- NOTES:**
1. CORPORATION STOP SHALL BE LOCATED IN THE TOP OF WATER MAIN.
  2. MANHOLE STEPS SHALL BE PLACED 16" O.C. WHEN DEPTH OF MANHOLE EXCEEDS 5 FEET.
  3. ALL PIPING AND FITTING, IN THE MANHOLE, SHALL BE GALVANIZED IRON.

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE DWG NO. 6.13			SHEET 1 OF 1

**AIR RELEASE VALVE  
WITH MANHOLE FOR  
WATER MAINS**

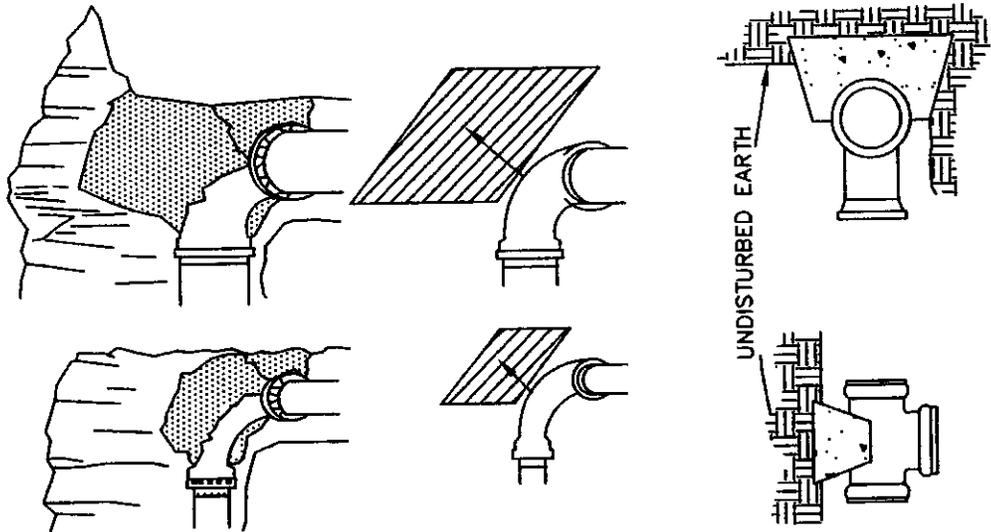


MINIMUM CONCRETE BLOCKING (C.Y.)*					
NOM. PIPE DIA. IN.	TEES & DEAD ENDS	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND
4	0.1	0.1	0.1	0.1	0.1
6	0.2	0.2	0.1	0.1	0.1
8	0.2	0.3	0.2	0.1	0.1
10	0.3	0.5	0.3	0.2	0.2
12	0.4	0.6	0.5	0.3	0.3
14	0.7	0.9	0.6	0.5	0.5
16	0.7	0.9	0.6	0.5	0.5
18	0.9	1.2	0.7	0.6	0.6
20	1.1	1.6	1.1	0.7	0.7
24	1.7	2.3	1.6	0.9	0.9

\*CONCRETE SHALL BE 3000 PSI (MIN) MIX

**NOTES:**

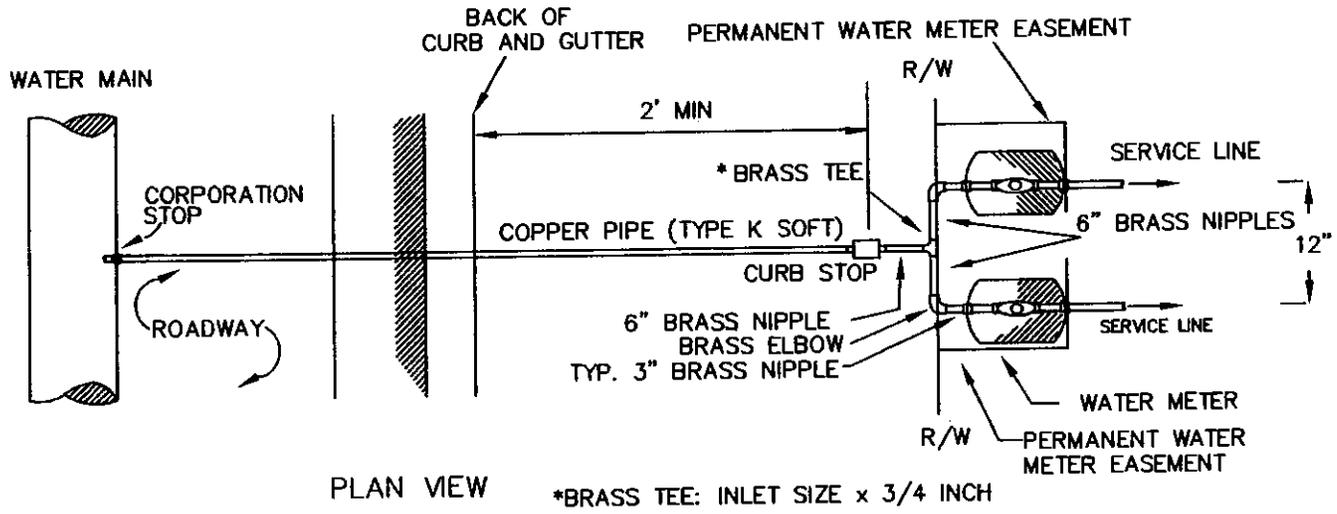
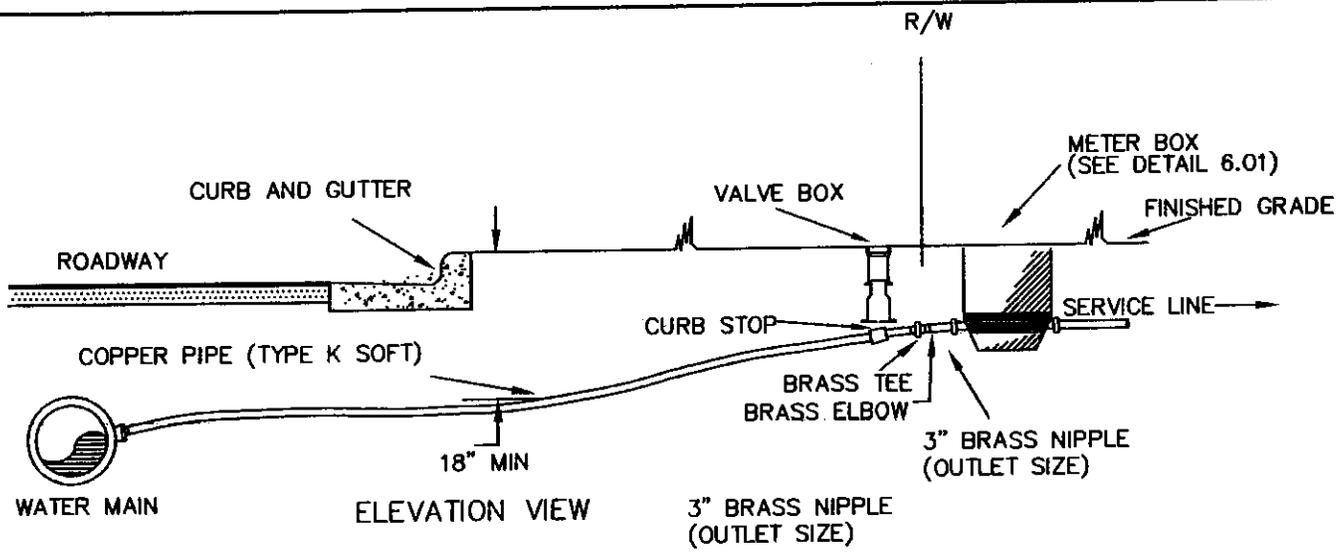
1. WRAP FITTINGS IN 6 MIL PLASTIC BEFORE POURING CONCRETE.



REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 6.14	SHEET 1 OF 1

STANDARD  
REACTION  
BLOCKING





STANDARD MULTIPLE BRANCH SERVICES

NOTES:

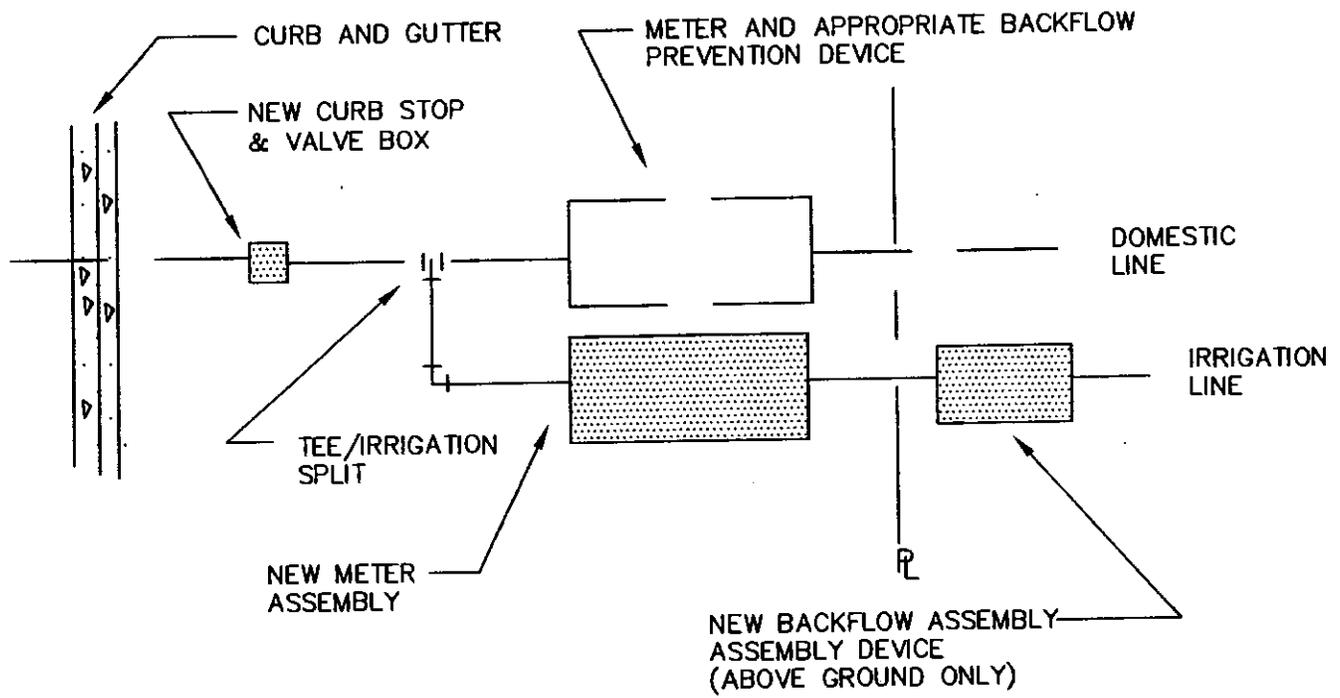
1. THERE SHALL BE NO MULTIPLE CONNECTIONS FOR SERVICES OTHER THAN 3/4" (INCHES).
2. CURB STOPS SHALL BE AS MANUFACTURED BY FORD.
3. METER BOXES SHALL BE AS DESCRIBED IN THE STANDARD SPECIFICATIONS UNDER WATER DISTRIBUTION; HOWEVER, THE INLET SHALL BE IRON PIPE THREADED INLETS.
4. CURB STOP SHALL BE CENTERED ON MULTIPLE BRANCH SERVICE.

APPROVED MULTIPLE CONNECTIONS

SIZE SERVICE INCHES	SIZE INLET INCHES	NUMBER OF BRANCHES
3/4	1	2
3/4	1	3
3/4	1 1/4	4
3/4	1 1/2	5-8

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 6.15	SHEET 1 OF 1

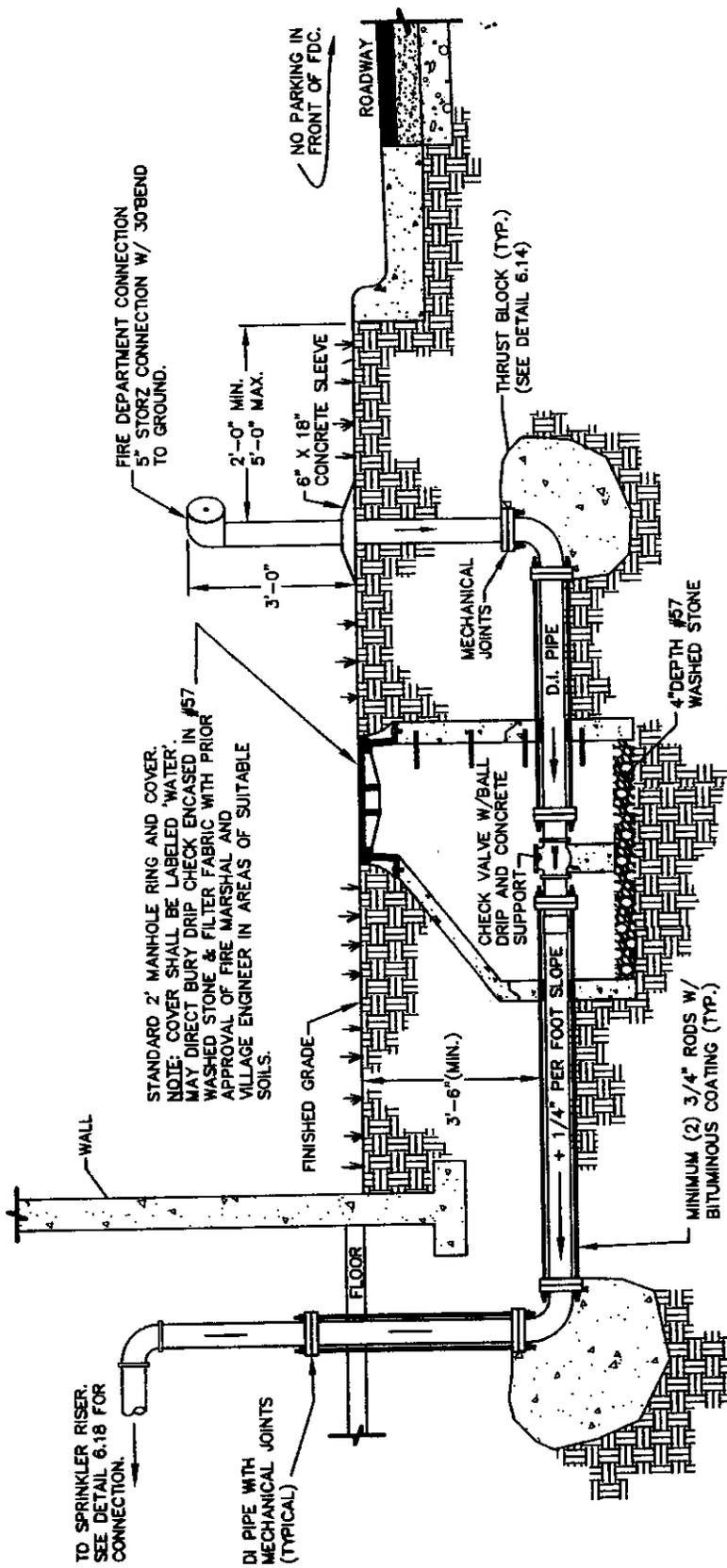
STANDARD  
MULTIPLE BRANCH  
SERVICES



REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE DWG NO. 6.16			SHEET 1 OF 1

IRRIGATION TAP  
ON EXISTING  
SERVICE





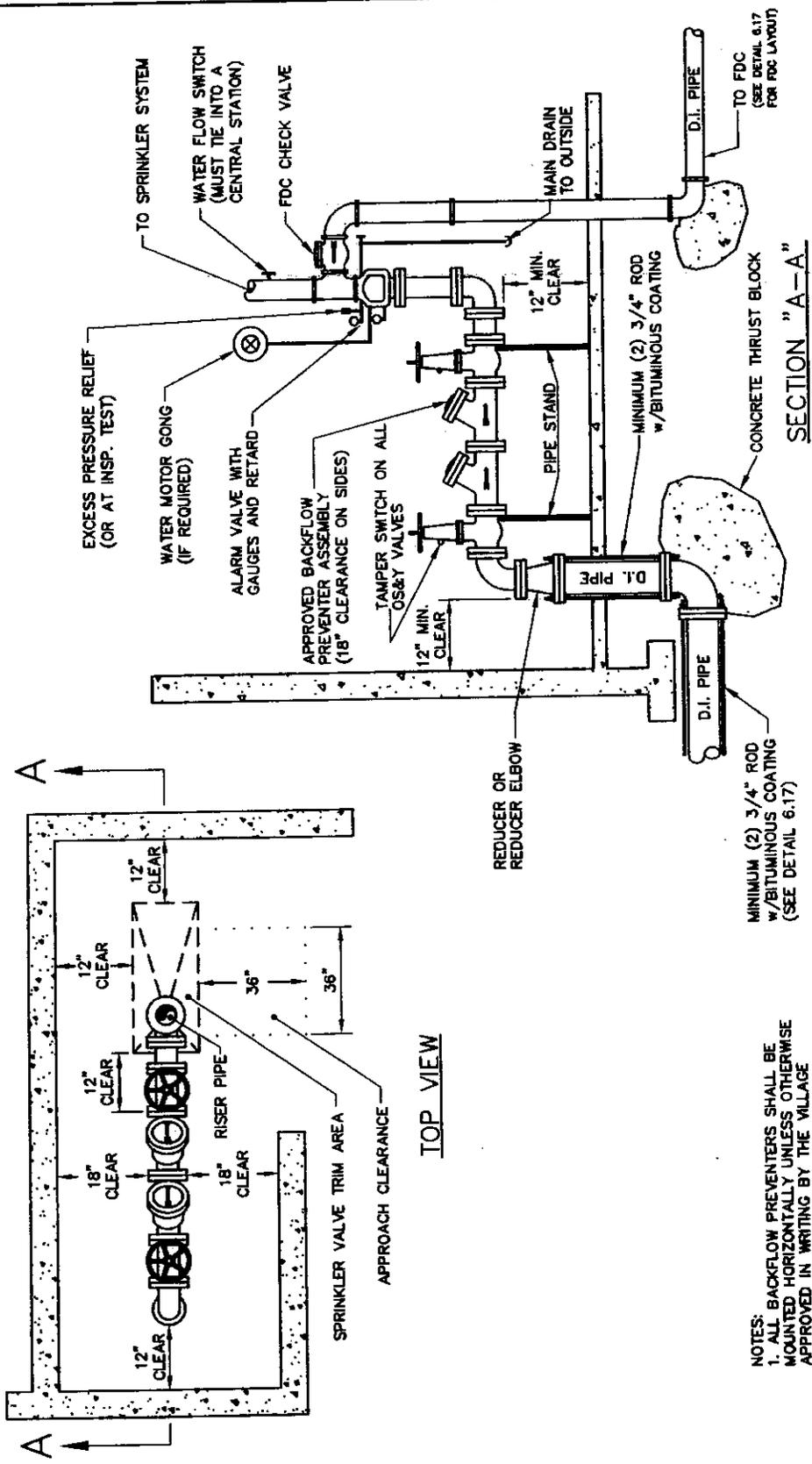
**NOTES:**

- 1) ALL FDC'S SHALL BE WITHIN 50 FEET OF A FIRE HYDRANT.
- 2) ALL FDC'S SHALL BE LOCATED OUTSIDE 'COLLAPSE ZONE' AS REQUIRED BY FIRE MARSHAL.
- 3) ON SHOULDER SECTIONS, FDC SHALL BE 5'(MIN) FROM TOP OF BACKSLOPE.

REV	DESCRIPTION	DATE	APPROVED BY
△		8/01/04	HJG/FAF
	DWG NO.	6.17	SHEET 1 OF 1

**FIRE DEPARTMENT CONNECTION (FDC) LAYOUT DETAIL**



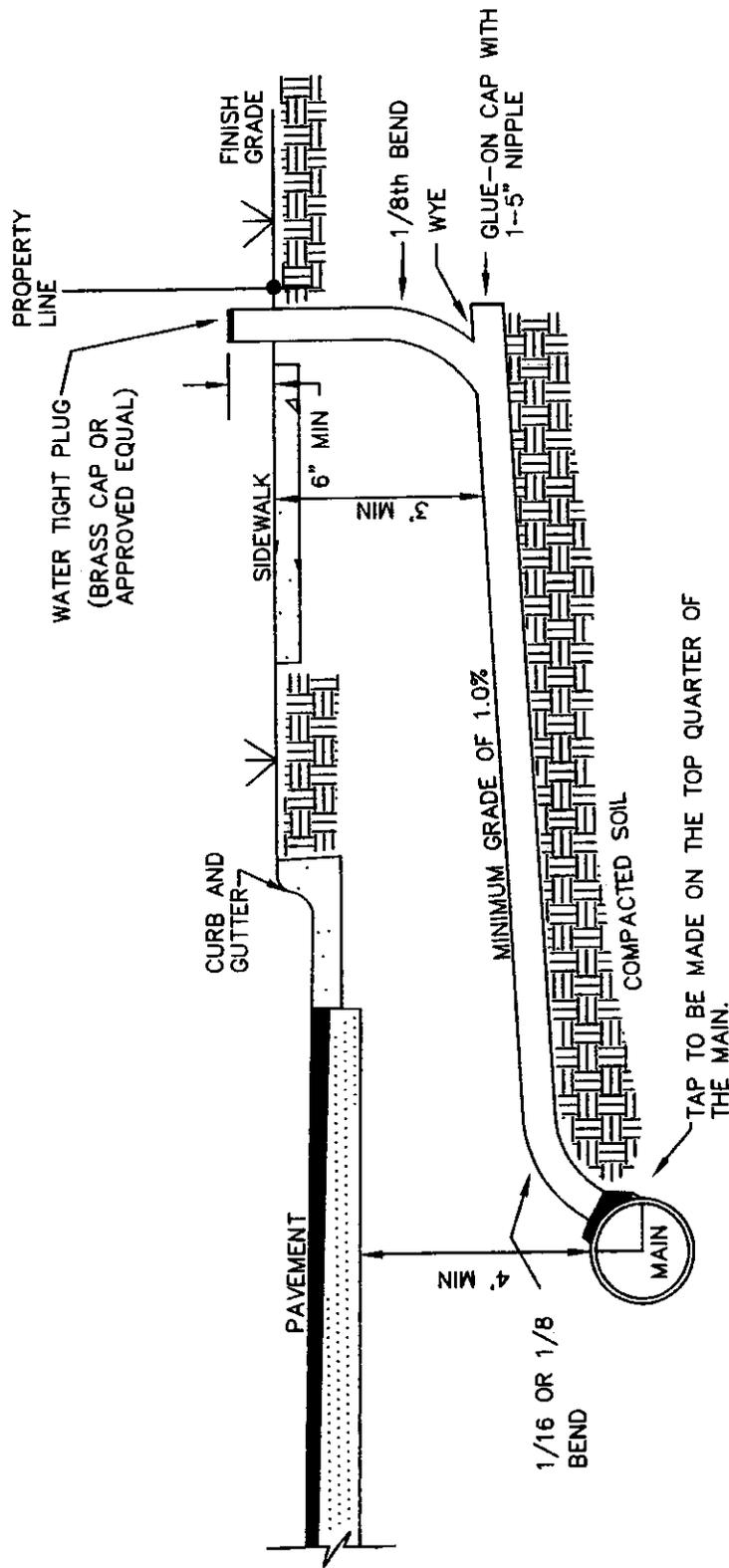


- NOTES:
1. ALL BACKFLOW PREVENTERS SHALL BE MOUNTED HORIZONTALLY UNLESS OTHERWISE APPROVED IN WRITING BY THE VILLAGE ENGINEER.
  2. ALL FITTINGS SHALL BE FULLY WRAPPED WITH 6 MIL(MIN.) PE FILM PRIOR TO PLACEMENT OF CONCRETE BLOCKING.

REV	DESCRIPTION	DATE	APPROVED BY
△		8/01/04	HJG/FAF
	DWG NO.	6.18	SHEET 1 OF 1

# STANDARD SPRINKLER RISER





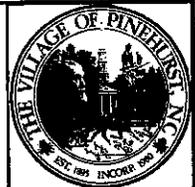
(SEE DETAIL 7.02 FOR SADDLE DETAILS)

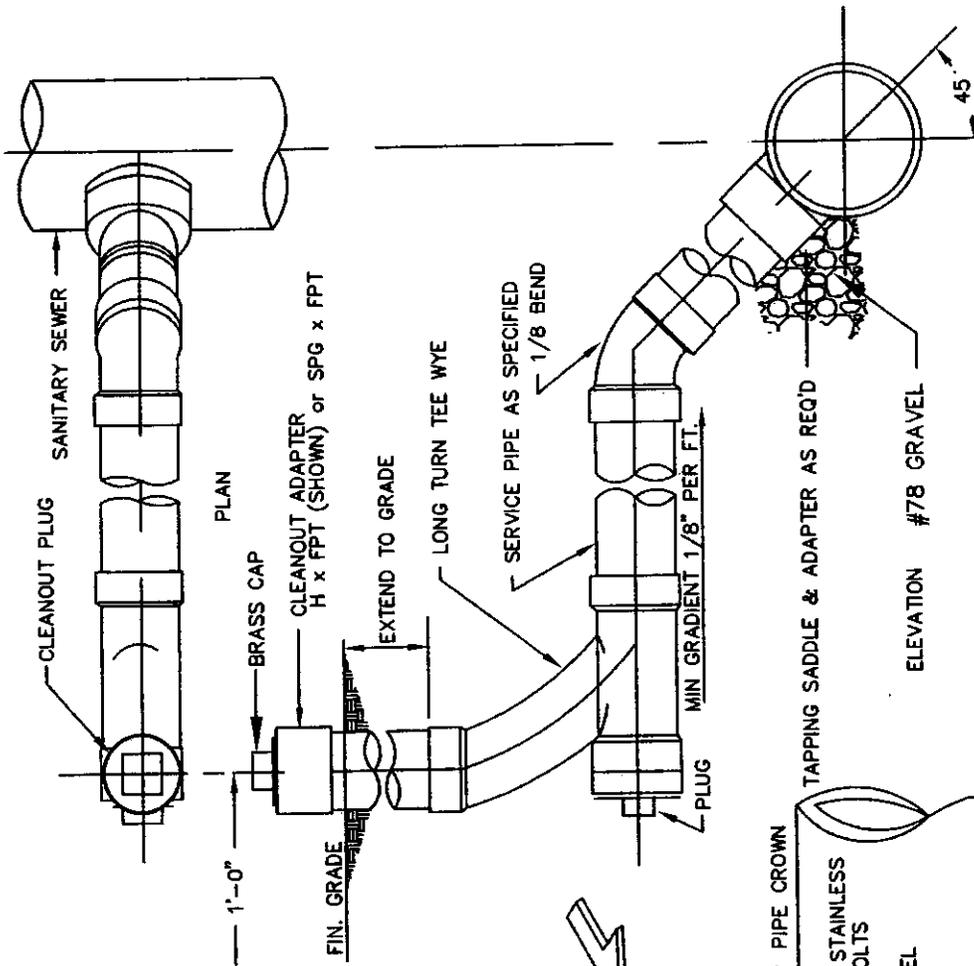
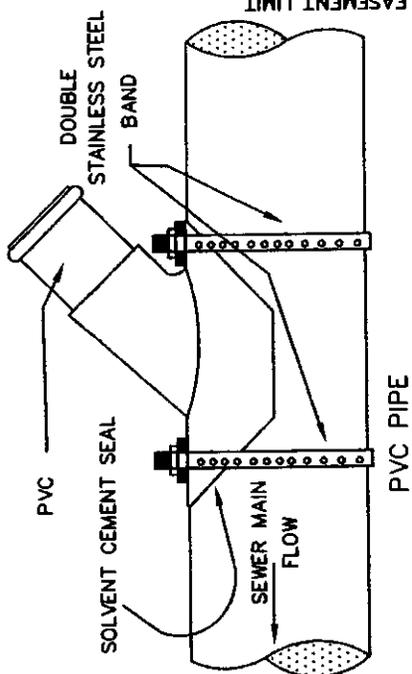
**NOTES:**

1. IN SHOULDER SECTIONS, THE SERVICE SHALL BE A MINIMUM OF 36" BELOW THE FLOW LINE OF THE DITCH.

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 7.01	SHEET 1 OF 1

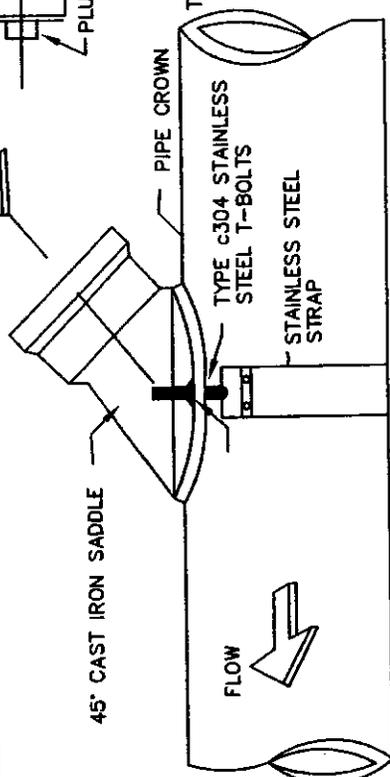
4" DOMESTIC  
SANITARY SEWER  
TAP





**NOTES:**

1. VCP SADDLE SHALL BE BLOCKED AND SEALED WITH CONCRETE.

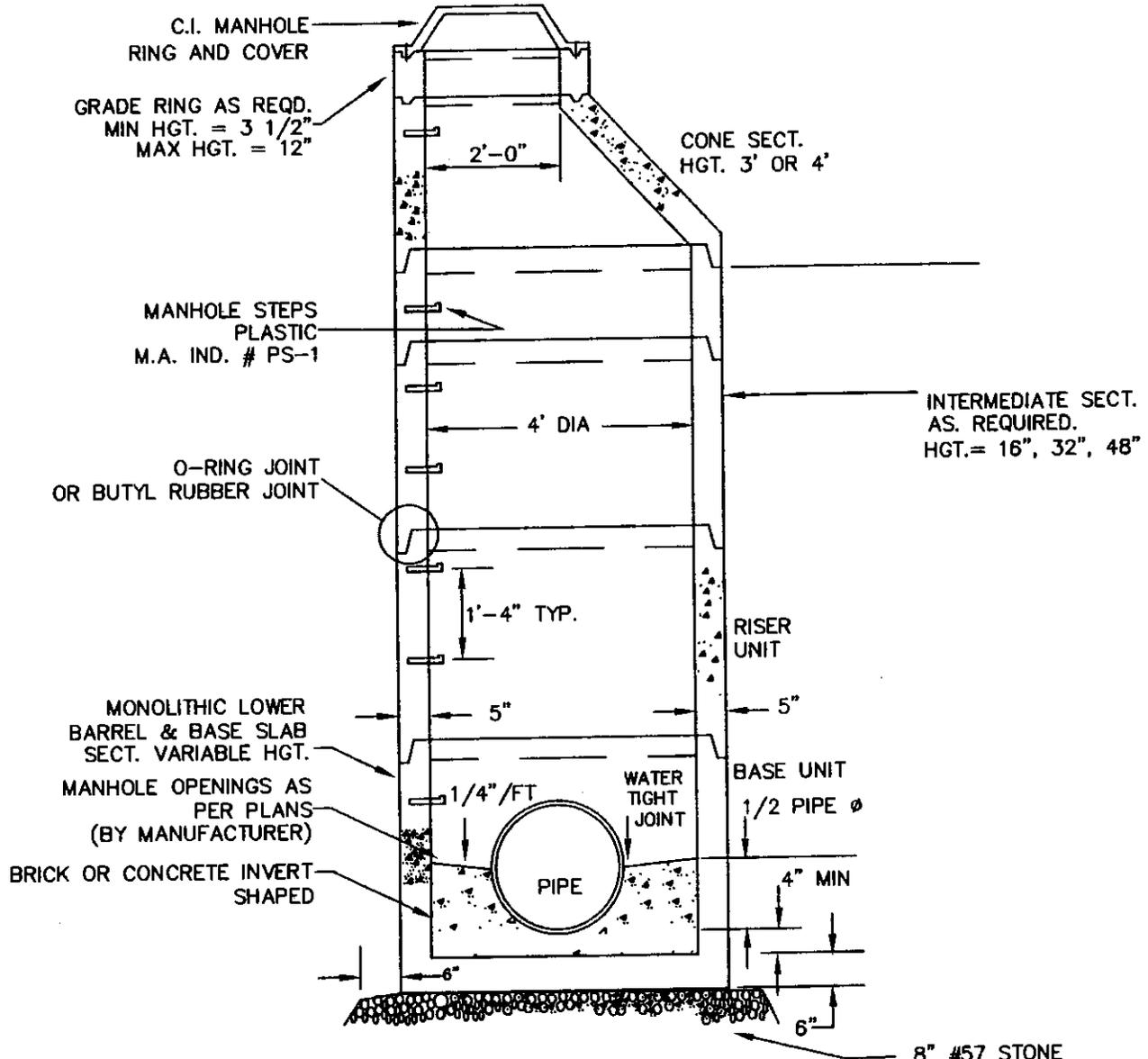


VITRIFIED CLAY PIPE OR D.I. PIPE

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 7.02	SHEET 1 OF 1

4" DOMESTIC  
SANITARY SEWER  
SADDLE TAP





**NOTES:**

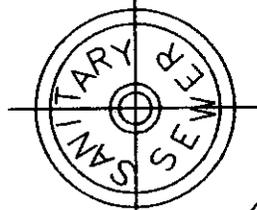
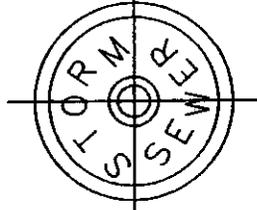
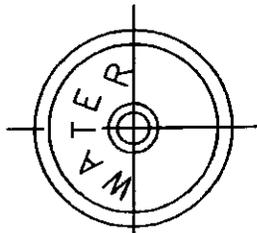
1. 4000 PSI CONCRETE MIN AS = 0.17 SQ. IN/FT. (REINF. NOT SHOWN)
2. FOR DEAD-END MANHOLES THE INVERT THROUGH CONSTRUCTION SHALL BE EXTENDED THROUGH THE MANHOLE.
3. USE AN EXTENDED BASE FOR MANHOLES OVER 10' IN DEPTH.
4. SEE SECTION 7.03-A.
5. IN INSTALLATION AREAS WHERE GROUNDWATER IS ENCOUNTERED, UPLIFT COMPUTATIONS & BALLASTING MAY BE REQUIRED.

8" #57 STONE  
(MIN BEARING CAPACITY OF 3,000 PSF)

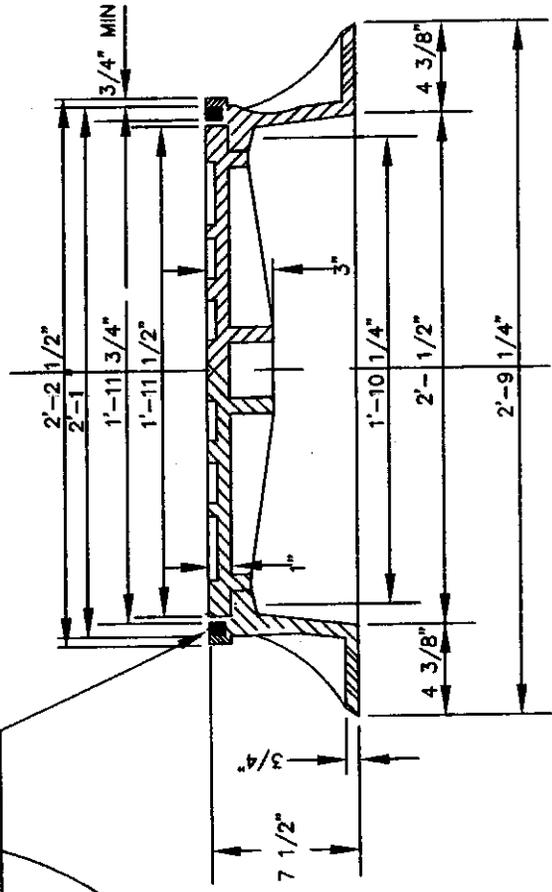
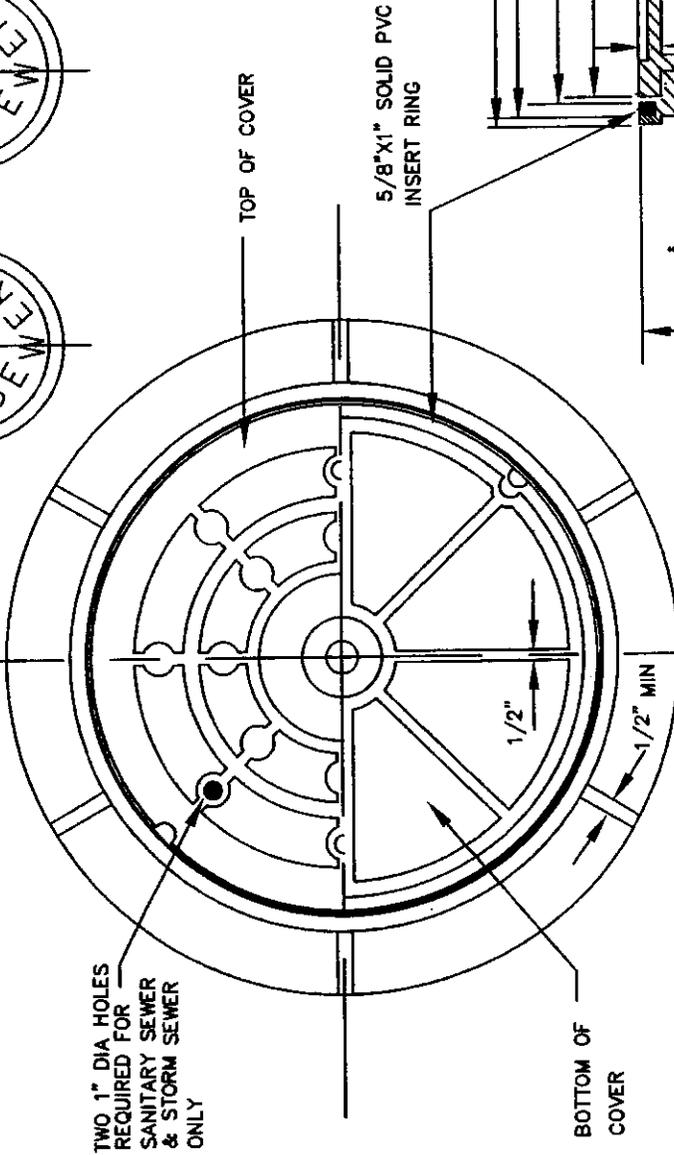
REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 7.03	SHEET 1 OF 1

4' DIAMETER  
PRECAST SANITARY  
SEWER MANHOLE





MINIMUM AVERAGE WEIGHT  
RING 190  
COVER 120  
TOTAL 310



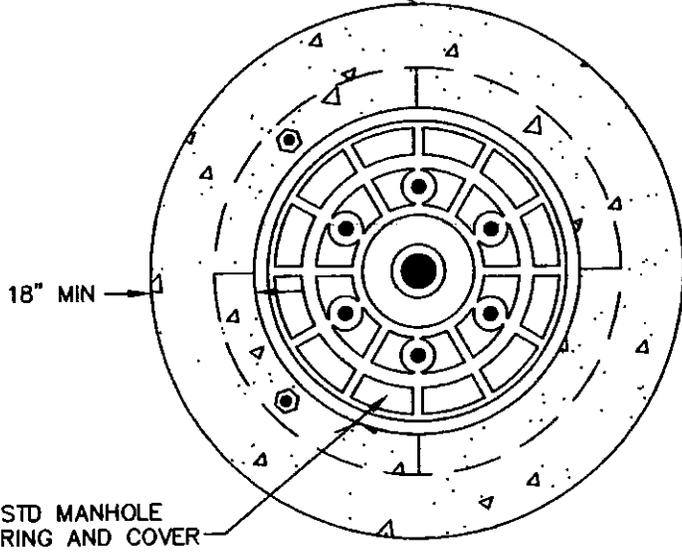
NOTES:  
1. ALL CASTINGS SHALL BE DOMESTIC IN ORIGIN.

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 7.04	SHEET 1 OF 1

STANDARD MANHOLE RING AND COVER



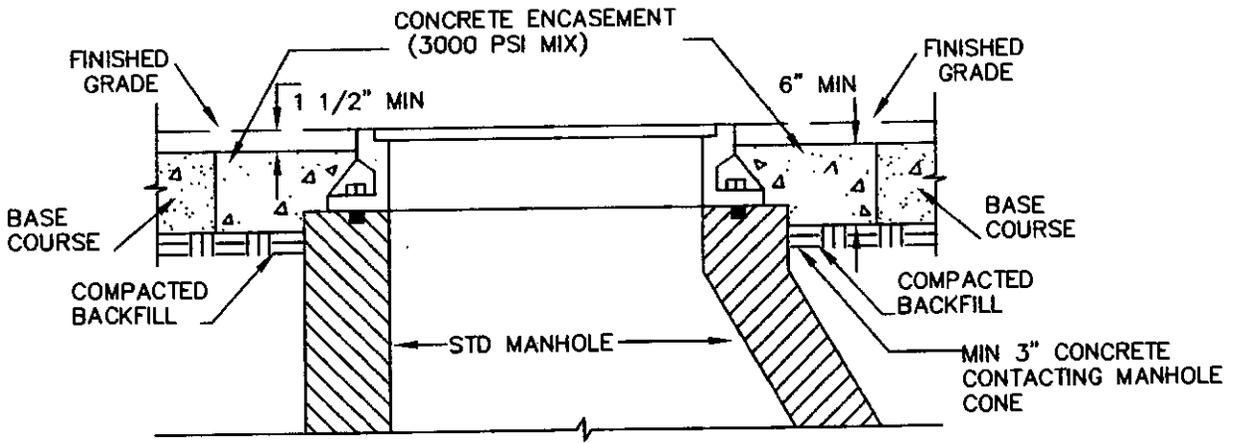
CONCRETE ENCASEMENT  
(3000 PSI MIX)



18" MIN

STD MANHOLE  
RING AND COVER

PLAN

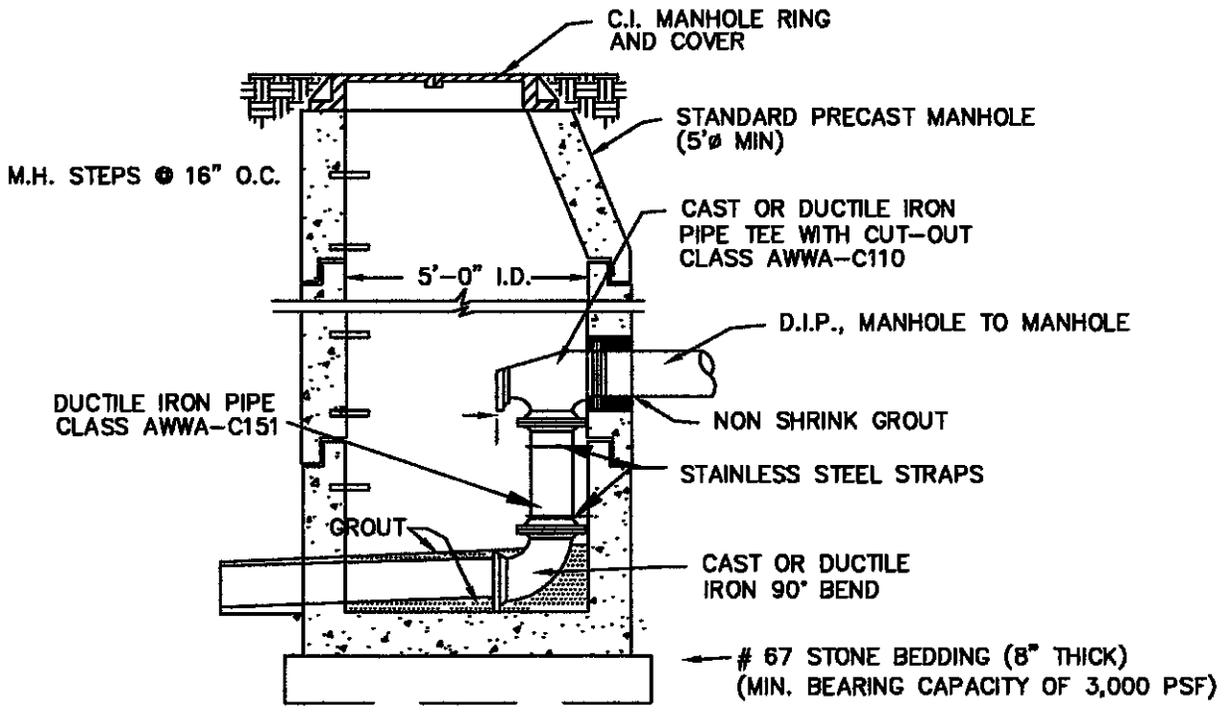


SECTION

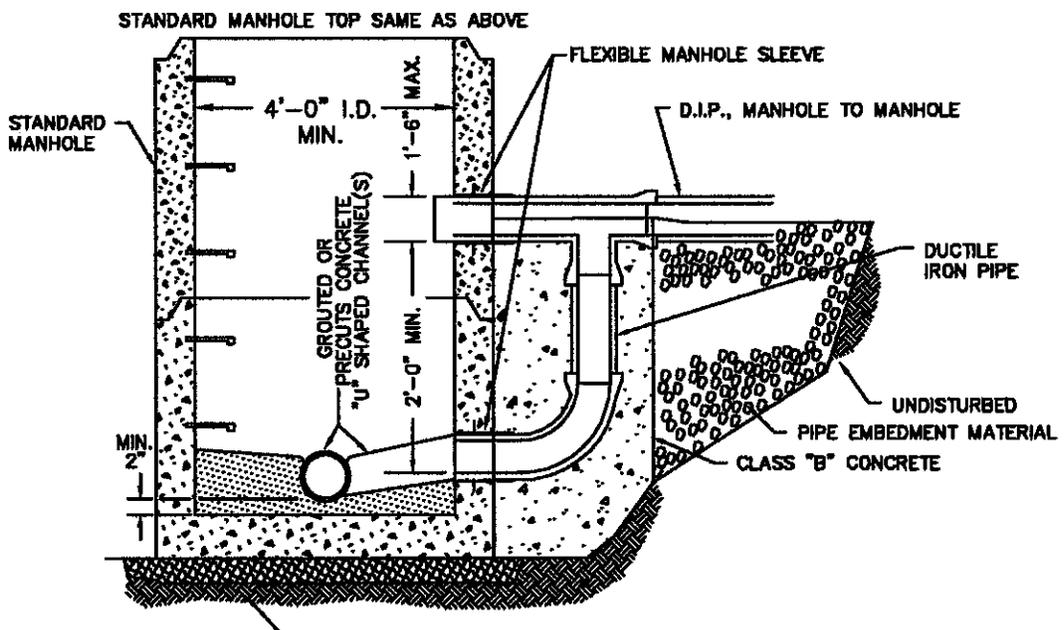
STANDARD MANHOLE RING AND COVER ENCASEMENT  
FOR USE IN PAVED AREAS

REV	DESCRIPTION	DATE	APPROVED BY	STANDARD MANHOLE RING AND COVER ENCASEMENT	
△	ISSUE FOR PUBLICATION	06/04	HJG		
NOT TO SCALE DWG NO. 7.05		SHEET 1 OF 1			





INSIDE DROP

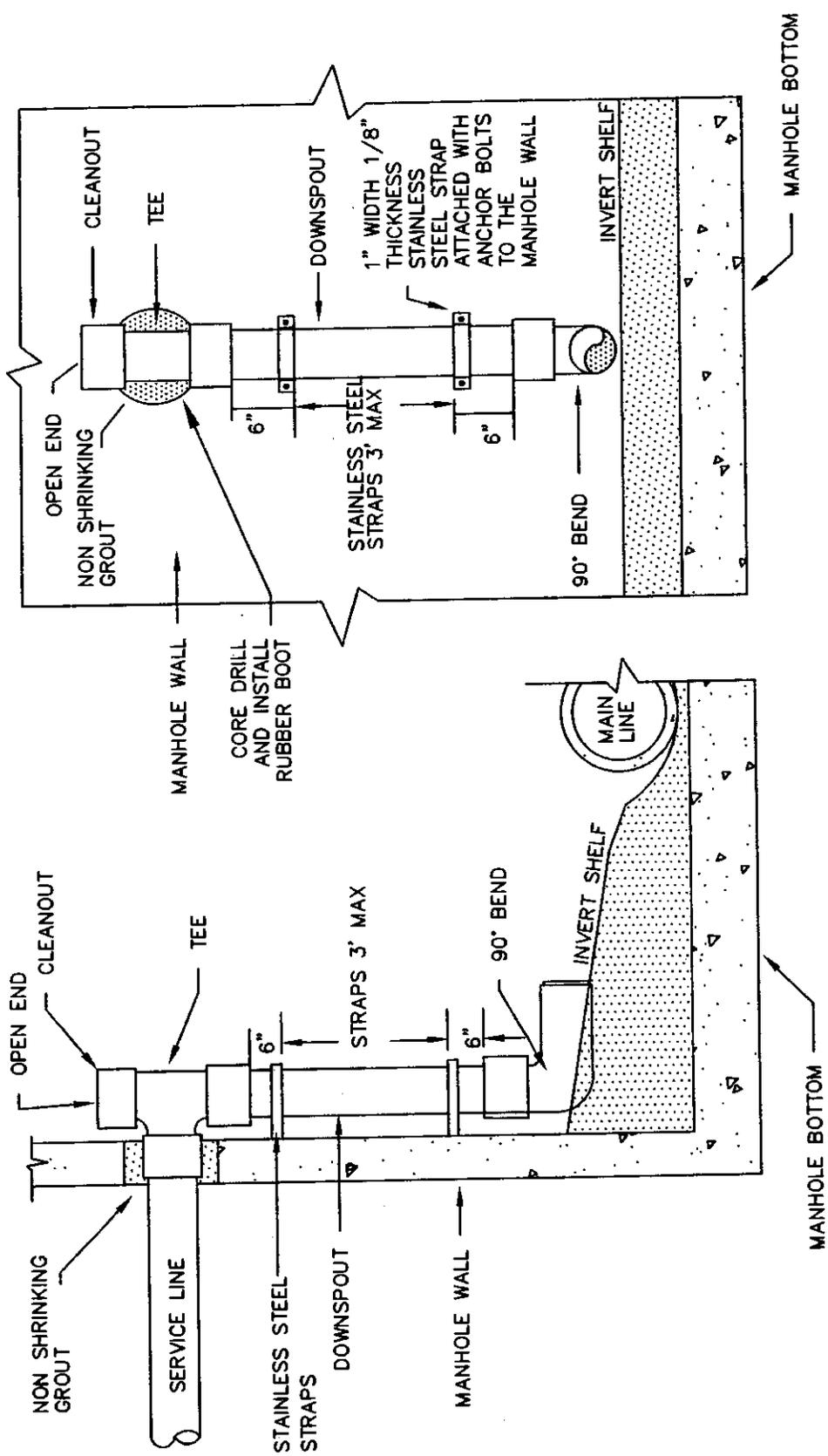


OUTSIDE DROP

**NOTE:**

1. SEE DETAIL 7.03 FOR OTHER APPLICABLE MANHOLE SPECIFICATIONS.

REV	DESCRIPTION	DATE	APPROVED BY	STANDARD DROP MANHOLE	
△	ADD OUTSIDE DROP DETAIL	09/10	MSA		
NOT TO SCALE DWG NO. 7.07		SHEET 1 OF 1			



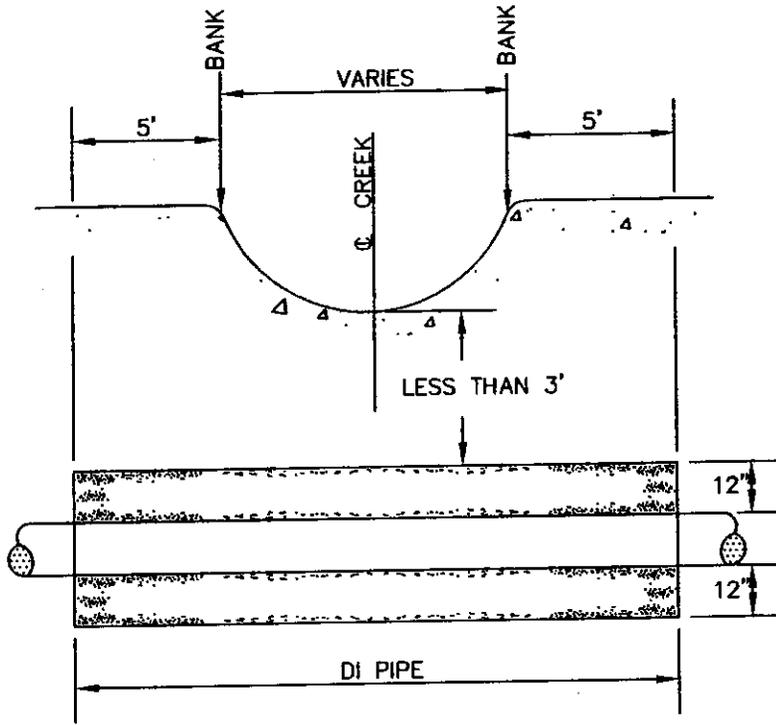
**NOTES:**

1. PIPING CONFIGURATION TO BE USED ON ALL DROPS OVER 30'.
2. DROPS TO BE CONSTRUCTED OF A.B.S., PVC OR DIP PIPE.
3. SERVICE LINE MAY NOT ENTER MANHOLE THROUGH CONE SECTION OR ITS JOINT.
4. THIS DETAIL SHALL NOT BE USED FOR FORCE MAINS.

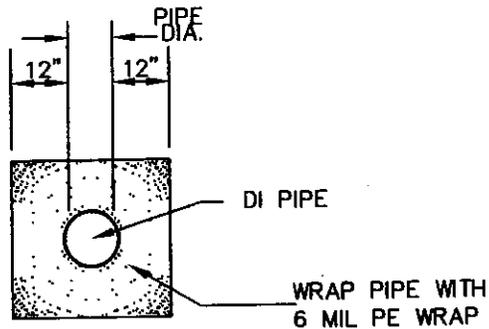
REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE		DWG NO. 7.08	SHEET 1 OF 1

STANDARD INSIDE DROP FOR SANITARY SEWER SERVICE





CROSS SECTION

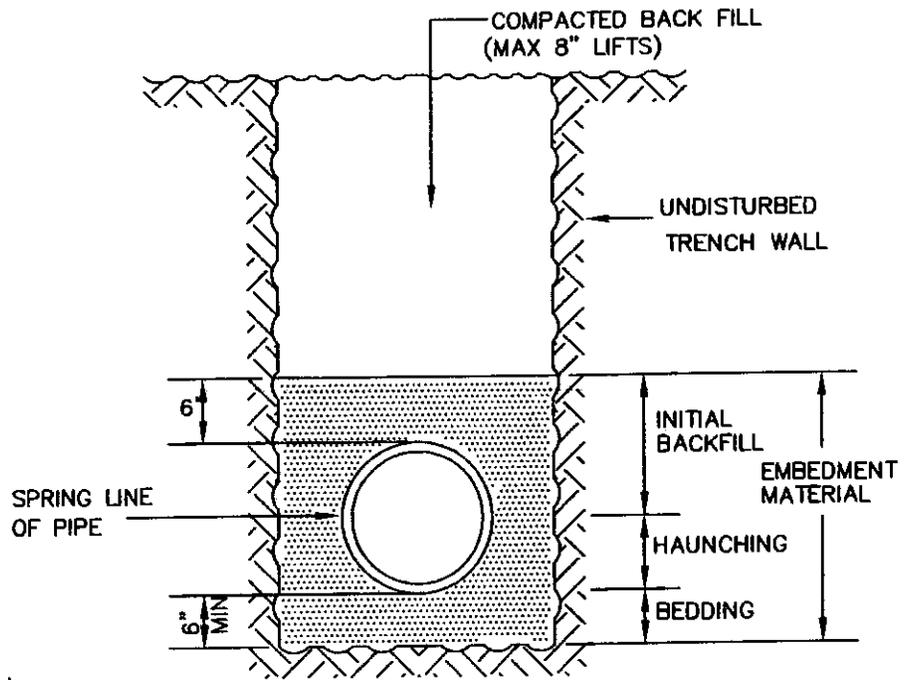


END VIEW

**NOTES:**

1. CONCRETE SHALL BE 3,000 PSI.
2. CONCRETE ENCASEMENT NOT REQUIRED WHEN PIPE IS AT LEAST THREE (3) FEET UNDER C OF CREEK BOTTOM.

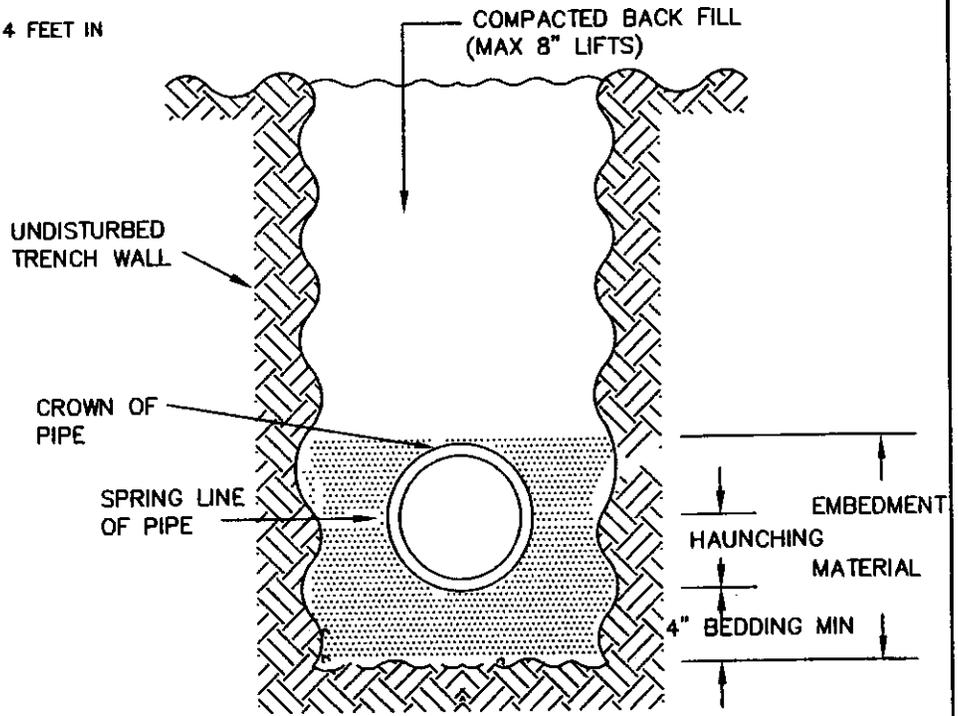
REV	DESCRIPTION	DATE	APPROVED BY	STANDARD CONCRETE ENCASEMENT FOR STREAM CROSSINGS
△	ISSUE FOR PUBLICATION	06/04	HJG	
NOT TO SCALE DWG NO. 7.09		SHEET 1 OF 1		



SPECIAL BEDDING  
FOR 14'-20' DEPTHS

**NOTES:**

1. EMBEDMENT MATERIAL MUST BE CLASS I (# 67 OR # 78M WASHED STONE IS TYPICALLY USED).
2. EMBEDMENT MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY FOR CLASS I MATERIAL.
3. ALL SANITARY SEWER LINES OVER 14 FEET IN DEPTH MUST BE DIP.



STANDARD BEDDING  
FOR 3' TO 14' DEPTHS

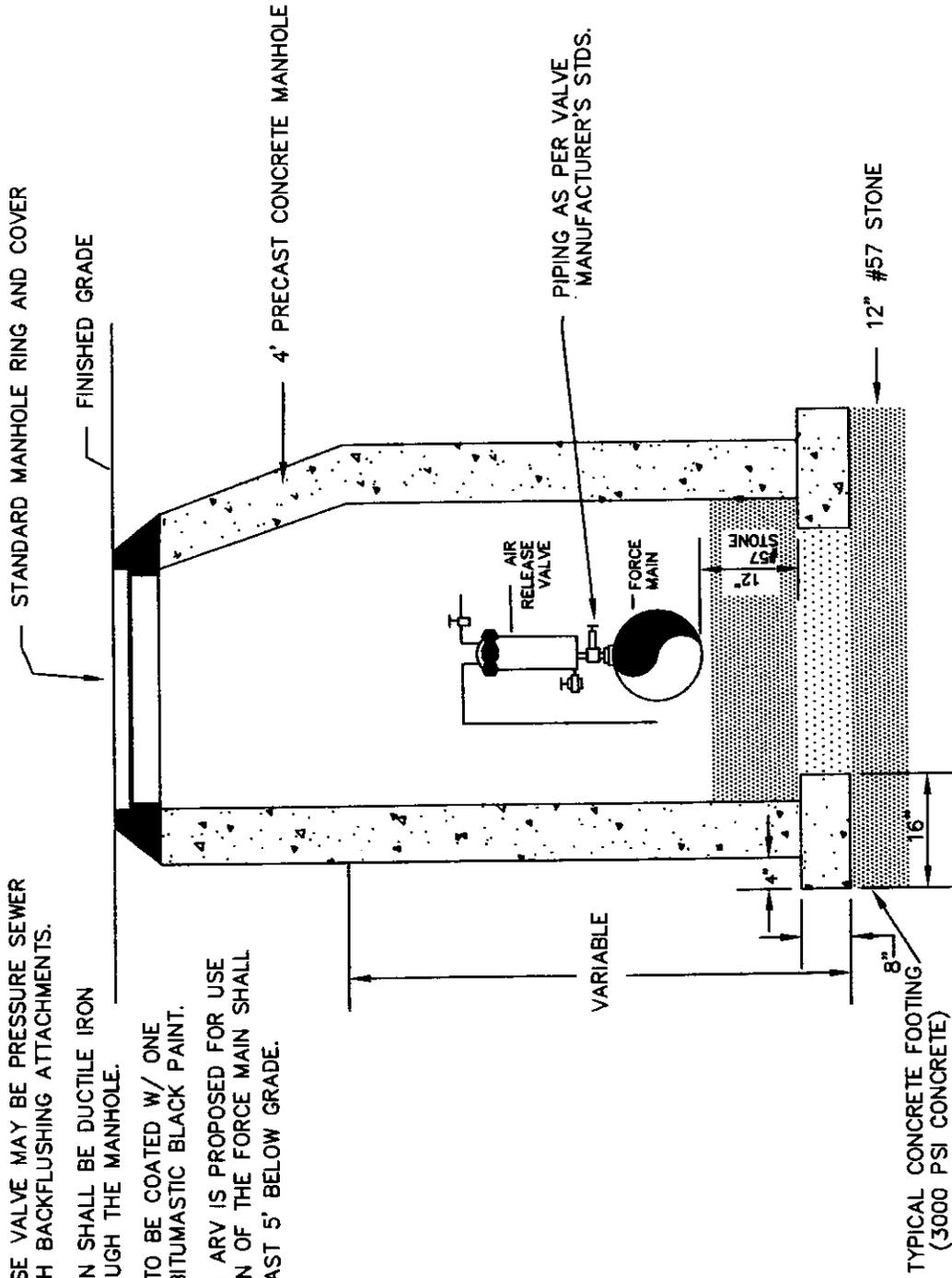
REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE	DWG NO. 7.10		SHEET 1 OF 1

STANDARD TRENCH  
FLEXIBLE AND  
RIGID PIPE



**NOTES:**

1. MANHOLE STEPS SHALL BE PLACED 16" O.C. WHEN DEPTH OF MANHOLE EXCEEDS 5 FEET.
2. AIR RELEASE VALVE MAY BE PRESSURE SEWER VALVE WITH BACKFLUSHING ATTACHMENTS.
3. FORCE MAIN SHALL BE DUCTILE IRON PIPE THROUGH THE MANHOLE.
4. MANHOLE TO BE COATED W/ ONE COAT OF BITUMASTIC BLACK PAINT.
5. WHERE AN ARV IS PROPOSED FOR USE THE CROWN OF THE FORCE MAIN SHALL BE AT LEAST 5' BELOW GRADE.



TYPICAL SECTION

REV	DESCRIPTION	DATE	APPROVED BY
△	ISSUE FOR PUBLICATION	06/04	HJG
NOT TO SCALE	DWG NO. 7.11		SHEET 1 OF 1

STANDARD SANITARY  
SEWER AIR RELEASE  
MANHOLE

