

Town of Boiling Springs
145 South Main St.
PO Box 1014
Boiling Springs, NC 28017

STANDARD SPECIFICATIONS
AND
CONSTRUCTION DETAILS



APRIL, 2005

CERTIFICATE OF THE CONSULTING ENGINEER

I, David W. Odom, P.E., do hereby certify
that the STANDARD SPECIFICATION and
CONSTRUCTION DETAILS were prepared by Odom,
Hollifield & Associates for the Town of Boiling Springs.

David W. Odom, P.E.

Date: _____

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SECTION 1
PRELIMINARY CONSIDERATIONS & INSTRUCTIONS

1.01 General

The Standard Specifications as contained herein are to be utilized as a minimum standard for all subdivision and utility construction projects within the jurisdiction of the Town of Boiling Springs.

The purpose of these Specifications is to present standards for typical conditions encountered. All subdivision roadway construction and utility extension projects 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 does in no way relieve the Professional Engineer of the responsibility to correctly adapt these standards to the actual site conditions encountered on any project. The PROJECT ENGINEER preparing construction drawings for a specific project must 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 engineer may wish to increase pipe strength classification, bedding requirements, reinforcing, etc. In such situations where changes or modifications are proposed, the Town of Boiling Springs 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 deviations from the TOWN'S minimum standards receiving such preliminary approval shall be clearly indicated at one location on the construction drawings, and labeled, **“Exceptions to the Standard Specifications of the Town of Boiling Springs.”**

Each set of plans for subdivision construction and/or utility extension which is submitted to the Town of Boiling Springs 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 Town of Boiling Springs.

I, _____, PE, certify that the Standard Specifications of the Town of Boiling Springs have been thoroughly checked and found to be applicable to this project. All exceptions to the applicable Town Standards have been previously approved by the Town of Boiling Springs and said exceptions are shown on sheet(s) _____ of these drawings.

S E A L

By: _____, PE

Date: _____

The Town of Boiling Springs will periodically update these Specifications. Any purchaser of the Specifications will be eligible to receive the updates as they become available. The TOWN 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 is submitted to the TOWN for initial review.

If construction of the project or phase of the project does not commence within twelve (12) months after the date on which the final construction plans were approved, the approval shall be null and void. If a project approval is deemed null and void, all preliminary submittal procedures shall be repeated, and the resubmittal shall reflect any revisions in the Boiling Springs Standard Specifications and Construction Details in effect on the date of the resubmittal. Upon written request, the TOWN may extend the approval of any project twelve (12) months if the request is made within twelve (12) months of the original approval.

The project contractor shall have at least one (1) complete set of approved plans and specifications (including Town of Boiling Springs Standard Specifications and Construction Details) at the job site at all times that work is being performed.

1.02 Submittal Requirements

Persons desiring to construct subdivisions or other utility extensions within the jurisdiction of the Town of Boiling Springs must submit **final** construction drawings **sealed** by a Professional Engineer licensed to practice in the State of North Carolina. The submittal shall be made to the office of the TOWN Engineer. Submittal of the construction drawings shall be made only after the project has received Site Plan approval from the Planning Board and the TOWN Council.

The submittal process shall be as described below:

a. Initial Submittal:

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

- 1) *Final Construction Plans* - Five (5) sets. Plans should be signed and sealed by a professional engineer registered to practice in North Carolina. Plan size shall be 24 x 36.
- 2) *Storm Drainage Computations* - Five (5) copies of complete storm drainage calculations, maps, and other supporting material shall be submitted, addressing the following special issues as applicable:

* Impact of concentrated run-off from upstream areas released onto the property being developed, and the measures selected to mitigate these impacts, i.e.- either piping of this run-off into the storm water collection system, or the enhancement of existing drainage channels by enlargement, armoring, etc.

* Impact of concentrated run-off from the property being developed onto downstream private property. In such cases, the discharge velocity must be reduced to non-erodible levels. Refer to Section 5.01.

- 3) Wastewater Pump Station & Force Main Computations - (if applicable) Five (5) copies.

b. Second Submittal:

The Town of Boiling Springs staff will review the initial items and will comment on any items needing correction or attention. 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) "Water Distribution Extension Permit Application" - Form provided by the NC Department of Environment and Natural Resources Public Water Supply Section.
- 3) "Gravity Sanitary Sewer Extension Permit Application" – Form provided by the NC Division of Water Quality.
- 4) NC Department of Transportation (NCDOT) - Encroachment Forms, Driveway Permits, etc. - Sufficient copies as required and prepared to conform to the NCDOT requirements.
- 5) Storm Drainage Computations - Two (2) copies of computations, if revised after initial review as per Section 5.05.
- 6) Wastewater Pump Station & Force Main Computations - Two (2) copies of computations, if revised after initial review.
- 7) Grading and Erosion and Sedimentation Plan - Erosion and Sedimentation Control Plan - Two (2) copies of the Erosion and Sedimentation Control Plan and one (1) copy of the "Request for Plan Approval Form" shall be submitted.

The Town of Boiling Springs will review the revised plans and, if they are satisfactory, the submitter will be requested to bring the originals (tracings) to the Plan Reviewer for approval signatures. 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 regulatory agencies.

1.03 Plan Requirements

a. Subdivisions:

All plan submittals for subdivision construction shall include the following elements:

- 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 improvements, sanitary sewers, storm sewers, water mains twelve (12) inches and larger and sanitary sewer force mains. Only plan-view drawings shall be required for water mains eight (8) inches and smaller. All plan/profile drawings shall be prepared at a scale of not less than:
1" = 50' Horizontal and 1" = 5' Vertical.
- 3) Boundary of the tract with all courses and distances indicated. One (1) corner of the tract shall be tied to the NC Plane Coordinate System.
- 4) Vicinity Map, scale of drawings, and north arrow.
- 6) 100-year flood plain, regardless of FEMA mapping.
- 7) Owner and zoning of all properties adjoining the site.
- 8) Tract area and specific data required by the Boiling Springs Subdivision Ordinance or Unified Development Ordinance - number of lots, average and minimum lot size, etc.
- 9) Existing and proposed contour elevations at a maximum interval of two (2) feet. Elevations based on USCGC Datum with benchmark indicated.
- 10) Town Streets
 - Street width.
 - Right-of-way width.
 - Horizontal curve data for each curve (centerline only).
 - Vertical curve alignment.
 - Sight Triangles
 - Entrance Islands with turn radius and turn paths.
 - Distances to existing streets and intersections.
 - Centerline linear footage (intersection to intersection, intersection to radius point in cul-de-sacs).

11) Wastewater Facilities

- Outfall lines drawings - stream location, ability to serve adjoining property.
- Pipe material, size, length, slope, invert elevations at all manholes, distance(s) from other utilities.
- 100-year flood elevations and manhole top elevations, vent elevations.
- Special construction details - piers, boring, encasement, drop manholes, etc.
- Easement widths.
- Pump station and force main calculations.
- Location of service laterals.

12) Water Distribution Facilities

- Pipe material (DIP), size, location and separation from other utilities.
- Valves, fittings, blow-offs, air release valves.
- Fire hydrant locations - conforming to maximum spacing.
- Service lateral locations.
- Special details - boring, etc.
- Easement widths.
- Test pressures and flow rates for any existing line to be tapped into (upon request).

13) Storm Drainage

- Complete storm drainage calculations.
- Invert elevations and top elevations at each structure - catch basin, curb inlet, yard inlet, etc.
- Pipe material, length, slope, etc.
- Exit velocity and details of velocity reduction facilities at each open outlet.
- Complete hydraulic calculations
- Special details - easement widths, open channels, etc.

14) Miscellaneous Data

- OWNER/DEVELOPER: name, address, and telephone number.
- PROJECT ENGINEER: name, address, and telephone number.
- Utility easements as required by the TOWN.

15) Review Certification By Town Of Boiling Springs

The design engineer shall affix the following certificate to each sheet of the construction drawings:

REVIEW CERTIFICATION BY TOWN OF BOILING SPRINGS

This drawing has been reviewed by the Town of Boiling Springs. To the best of my knowledge and belief, it conforms to the requirements established in the Standard Specifications of the Town of Boiling Springs. However, this signature does not constitute a variance from any requirements contained in any federal, state, or local ordinance. The developer/engineer/contractor is still solely responsible for meeting all applicable requirements at all times.

By: _____ Date: _____

b. Site Plans:

All site plans submittals should include, but not limited to, the following elements:

- 1) Plans sealed and signed by an engineer registered to practice in North Carolina, where public utilities, streets and pavement designs are involved, or where otherwise required by North Carolina General Statutes. Plan size shall generally be 24" X 36".
- 2) Boundary of the tract with all courses and distances indicated. One corner of the tract shall be tied to the NC Plane Coordinate System if tract is located within 2000 ft of a USGS or NCGS monument. Total gross area of tract shall be indicated.
- 3) Vicinity map, scale of drawing, and north arrow.
- 4) Existing and proposed contour elevations at a maximum interval of two (2) feet. Elevations based on USCGC Datum with benchmark indicated.
- 5) 100 year flood plain, whether FEMA mapped or not.
- 6) Owner and zoning of all properties adjoining the site.
- 8) Data on Adjoining Streets
 - Street name.
 - Street width and right-of-way dimensions.
 - Existing utilities and storm drainage (size, material type, location).
 - Driveway entrances onto site and adjoining properties.
- 9) Building Site Data

- Number of buildings and dwelling units in each.
- Building "footprint" dimensions and finished ground floor elevation.
- Front, side, and rear yard set backs.

10) Parking Data

- Number of parking spaces provided and required.
- Location and dimensions of parking areas - angle of parking, typical width, length, aisle width, etc.
- Number of handicap spaces provided and required.

11) Storm Drainage

- Pipe material, size, length, slope, etc.
- Drainage areas and run-off for each storm drain pipe.
- Invert elevation, and top elevation for each structure - catch basin, yard inlet. Invert elevations for each flared end section, head wall, etc.
- Exit velocity and details of velocity reduction facilities at each outlet.
- Complete hydraulic calculations.
- Complete Storm Drainage Calculations
- Special details and storm drainage easements widths as required.

12) Utilities

- Waterline location, type of material, and size.
- Water meter location and size; size of service branch.
- Sewer line location, type of material, and size.
- Sewer service lateral - size and location.
- Water and sewer easements and required utility easements.
- Fire hydrant location.
- Valve vault for fire sprinkler line (if applicable).

1.04 Approval of Materials

All materials to be used in the project shall conform to TOWN Specifications. Any variation from the pre-approved materials shall be submitted to the TOWN prior to beginning construction. The list shall include the manufacturer, model number and such other additional information as may be requested by the TOWN to determine compliance with these Specifications.

1.05 Permits

The owner shall be responsible for all applicable permits and associated fees.

1.06 Record Drawings

Record drawings which reflect "AS-BUILT" conditions must be submitted prior to final acceptance of roadways and/or public utilities to be maintained by the Town of Boiling Springs. The record drawings must be labeled "RECORD DRAWINGS" and signed by the Project Engineer of Record. A digital copy of the "RECORD DRAWINGS" must be submitted to the Town. All applicable information listed below shall be included on all "AS-BUILT" drawings:

1. Site Data

- a) Boundary of tract with all courses and distances indicated. One (1) corner of the tract shall be tied to the NC Plane Coordinate System if within 2000 ft. of a USGS or NCGS monument.
- b) Vicinity map, scale of drawings, and north arrow.
- c) All easements identified and dimensioned.
- d) Tract total acreage.
- e) Total number of lots and average size.
- f) Benchmark location and elevation.

2. Public Roadway System

- a) Street widths and right-of-way dimensions.
- b) Horizontal alignment with radii, PCs, and PTs of all curves and curve data.
- c) Vertical alignment with centerline grades, vertical curve lengths, station numbers, and elevation of all PVCs and PVTs, and centerline profile and curve data.
- d) Pavement sections and typical cross sections.
- e) Geotextile fabric locations, type, and manufacturer.

3. Storm Water Drainage System

- a) 100-year flood limits and elevations.
- b) Structure top and invert elevations.
- c) Pipe size and type material.
- d) Pipe grades and distances.
- e) Permanent storm water impoundments with access easements.
- f) Include any applicable maintenance clauses from homeowner covenants.
- g) Storm water easements.

4. Water Distribution System

- a) Pipe size, location, and type material.
- b) Separation from sanitary and storm sewer systems.
- c) Location of valves, fire hydrants, meters, blow-off assemblies, bore and jack casings with distance locations.

- d) Easement locations and widths.
- e) Copy of PROJECT ENGINEER'S certification indicating construction of the water system in accordance with the approved plans and specifications.

5. Sanitary Sewer System

- a) Pipe size, location, and type material.
- b) Manhole top and invert (in & out) elevations.
- c) Pipe grades and manhole to manhole distances.
- d) Clean-out locations with distance references.
- e) Horizontal control (at manholes).
- f) Easement location and widths.
- g) Separation from water distribution and storm water systems.
- h) Pump station test results.
- i) Force main location, size, material type, location of air release valves and check valves, etc.
- j) Pump station and associated appurtenances operation and maintenance manuals per Boiling Springs Specifications.
- k) Copy of the PROJECT ENGINEER'S certification indicating construction in accordance with the approved plans and specifications.

SECTION 2
GENERAL PROVISIONS

2.01 General

All construction shall conform to the requirements and dimensions on the approved construction plans, Town Standard Details, the Code of the Town of Boiling Springs, or as stated in these Specifications. Any conflicting requirements or lack of information shall be brought to the attention of the TOWN prior to construction.

2.02 Abbreviations & Definitions

a. Abbreviations:

AASHTO	-	American Association of State Highway Transportation Officials
ASTM	-	American Society for Testing & Materials
AWWA	-	American Water Works Association
NC DOT	-	North Carolina Department of Transportation
ANSI	-	American National Standard Institute
DPW	-	Public Works Director of the Town of Boiling Springs
OSHA	-	Occupational Safety and Health Administration
NPDES	-	National Pollutant Discharge Elimination System

b. Definitions:

Where the word "ENGINEER" is used in these Specifications, it shall be the Engineer appointed by the Town Manager.

Where the words "DIRECTOR OF PUBLIC WORKS AND UTILITIES" (DPW) or "INSPECTOR" is used in these Specifications, it shall be the Public Works Director of the Town of Boiling Springs.

Where the word "TOWN" is used in these Specifications, it shall be the Town of Boiling Springs, North Carolina or an authorized representative.

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.

Where the words "PROJECT ENGINEER" 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.

2.03 Safety

The CONTRACTOR shall provide for and maintain safety measures necessary for the protection of all persons on the work site and shall fully comply with all laws, 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.

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

The TOWN shall not be responsible for making the CONTRACTOR adhere to the Occupational Safety and Health Administration (OSHA) regulations or standards. However, the TOWN may report suspected violations of unsafe practices to the appropriate enforcement agency.

2.04 Work Within Right-of-Way of State Maintained Roads

a. General:

No construction shall be initiated within the right-of-way of roads that are maintained by the NCDOT without the prior approval of the NCDOT. The NCDOT approval shall be evidenced by an appropriate Encroachment Agreement and/or Driveway Permit, as applicable.

A copy of the approved Encroachment Agreement and/or Driveway Permit shall be in the contractor's possession at the job site at all times that work is being performed.

The Contractor shall notify the NCDOT District Office and shall post any required Indemnity Bond prior to beginning work in the NCDOT right-of-way.

b. Utility Construction:

The installation of public utilities within NCDOT right-of-way shall be accomplished in accordance with the Policies & Procedures for Accommodating Utilities on Highway Rights-of-Way, latest revision, as published by the NCDOT, Division of Highway, or those of the Town, whichever, in the opinion of the ENGINEER is more stringent.

c. Roadway Improvements - Pavement Widening, Curb & Gutter, and Storm Drainage:

All improvements along existing NCDOT roadways, including pavement widening, curb and gutter, and storm drainage improvements, shall be accomplished in strict accordance with the Standard Specifications for Roads and Structures latest edition, as published by the NCDOT. The NCDOT specification shall supersede the construction specifications of the TOWN. The CONTRACTOR shall call for all inspections as required by the NCDOT District Office.

2.05 Maintenance of Traffic

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 TOWN. The Town of Boiling Springs Police Department must also be contacted by the CONTRACTOR a minimum of 24 hours before any streets are fully 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 ENGINEER. The contractor must comply with the Manual of Uniform Traffic Control Devices.

2.06 Concrete

Concrete shall be only plant-mixed, transit-mixed, or mobile-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. Periodic samples may be required at the expense of the owner to determine the strength of the material. 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/or 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 insure proper rate of curing and designed compressive strength.

Concrete shall be air entrained at 5% ($\pm 1\%$). Retarders and accelerators shall be used only upon approval of the ENGINEER.

2.07 Asphalt

Asphalt and tack coat shall be applied only when the surface to be treated is sufficiently dry and the atmospheric temperature in the shade away from artificial heat is 40° degrees F or above for plant mix and 50° degrees F or above for bituminous surface treatment (final lift). Asphalt shall not be applied when the weather is foggy or rainy. The PROJECT ENGINEER is responsible for seeing that these conditions exist prior to the application of tack coat or asphalt.

2.08 Grease Traps/Interceptors

All establishments engaged in the preparation of food shall install a grease trap in accordance with the Town's Sewer Use Ordinance. The grease trap shall be located outside the building and shall intercept all kitchen wastes, floor drains, and car wash drains. Domestic waste from toilets and lavatories shall not be directed to the grease trap. The Town of Boiling Springs shall approve the design and construction of all grease traps as per N.C. State Building Code.

2.09 Dumpsters - Installation Requirements

All dumpsters shall be placed on a reinforced concrete pad conforming to the requirements shown on Standard Drawing No. 2.06 and screened in accordance with the Boiling Springs Planning Department requirements.

2.10 Notification Prior to Beginning Work

The DEVELOPER or responsible contractor shall notify the TOWN not less than 24 hours prior to the commencement of any new construction activity. No new work shall commence without approval of the TOWN.

2.11 Materials

All materials incorporated in work to be accepted by the Town of Boiling Springs 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 ENGINEER, is more stringent or applicable.

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 material not specified may be used provided documentation and samples are furnished to the ENGINEER not less than fourteen (14) days before their delivery to the construction site. The ENGINEER will issue written approval or disapproval of the alternate materials. Current Specifications and/or the latest revisions shall apply in all cases where materials are described.

2.12 Inspections

The presence of a TOWN employee at the work site shall not lessen the CONTRACTOR'S responsibility for conforming to the approved construction plans and/or specifications. Should the ENGINEER or INSPECTOR accept materials, or work that does not conform with the approved plans or specifications, whether from lack of discovery or for any other reason, it shall in no way prevent later rejection or corrections to materials or work when discovered.

The CONTRACTOR shall have no claim for losses suffered due to any necessary removals or repairs resulting from the unsatisfactory work. Any work that has been covered without the INSPECTOR'S approval, shall at the INSPECTOR'S request, be uncovered and be made available for inspection at the CONTRACTOR'S expense. After regular working hours or

weekend work shall comply with the TOWN'S specifications and shall include only such work that does not require continuous observation by an INSPECTOR.

2.13 Utility Easements - Special Provisions

Access for the purpose of construction inspection shall be provided to the Town of Boiling Springs or designated representatives. All off-street water, sewer mains, and power lines, etc. to be operated and maintained by the TOWN shall be located in a public easement.

Private easements for water and sewer service lines are not permitted.

2.14 Water for Construction

The Town of Boiling Springs does not provide free or otherwise unmetered water for use on any construction project. CONTRACTORS or construction personnel shall not take water from hydrants, blow-offs, water meter boxes, etc. CONTRACTORS desiring to use TOWN water for construction purposes shall apply to the TOWN for water service and shall pay for the water service in accordance with the Town of Boiling Springs policies and requirements. Bulk water rates will be billed per load of water obtained. Bulk water rate is the current TOWN Outside Water Rate.

2.15 Street Lights

The DEVELOPER will provide one street light at each intersection and one streetlight near the midpoint of each block or approximately every three hundred (300) feet in a residential area. Additional public street lighting is required only in areas where needed for public safety, such as major intersections, the downtown area, and in cases of clearly defined need as identified by the Public Works Director. For those projects not in the Town, the property owners shall pay the power costs associated with the street lights.

2.16 Guarantee

The DEVELOPER shall provide a guarantee on workmanship and materials for a period of one (1) year after the date of acceptance by the Town of Boiling Springs. Any defects observed within the one (1) year guarantee period shall be repaired and/or replaced to the Town's satisfaction and the cost of such repairs shall be borne by the developer. The guarantee shall apply to street construction, sidewalks, water lines and appurtenances, sanitary sewers, storm sewers (including ditches, drainage channels, and appurtenances, etc.), pumping stations, force mains and appurtenances.

SECTION 3
Earthworks and Erosion & Sedimentation Control

3.01 Erosion & Sedimentation Control and Earthworks

a. General Requirements:

Temporary and permanent erosion control measures shall be provided in accordance with the erosion control plan approved by Land Quality Section of the Division of Environment and Natural Resources in Mooreseville, NC. The approved Erosion Control Plan shall be kept on site by the CONTRACTOR at all times while work is being performed.

All permanent erosion control measures shall be incorporated into the work at the earliest practical time, and in no case shall an area, where work is completed, remain denuded for more than 30 calendar days. Ground cover shall be established in graded slopes and fills within 15 working days or 30 calendar days, whichever is shorter. 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 properties.

b. Construction Sequence and Schedule

The PROJECT ENGINEER will include a construction sequence schedule or work schedule that coordinates the timing of the land-disturbing activities and the installation of erosion and sedimentation control measures.

c. Seeding & Mulching:

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

Temporary Seeding

<i>Date</i>	<i>Type</i>	<i>Planting/Acre</i>
May 15-Aug 15	German Millet	40 lbs
Aug 15 – Dec 15	Rye (grain)	120 lbs
Feb 1 – May 15	Rye (grain)	120
	Korean lespedeza	50 lbs

	Lime	2000 lbs
ALL SEASONS	10-10-10	750
	Straw	4000 lbs

Permanent Seeding (Grass Lined Channels)

<i>Date</i>	<i>Type</i>	<i>Planting/Acre</i>
Mar 1 - June 1	Sericea Lespedeza (scarified) <i>and</i>	50 lbs.
Mar 1 - April 15	ADD Tall Fescue <i>and</i>	120 lbs.
Mar 1 - June 30	ADD Weeping Love grass <i>or</i>	10 lbs.
Mar 1 - June 30	ADD Hulled Common Bermuda Grass	25 lbs.
June 1 - Sep 1	*** Tall Fescue <i>and</i>	120 lbs.
	*** Brown top Millet <i>or</i>	35 lbs.
	*** Sorghum-Sudan Hybrids	30 lbs.
Sep 1 - Mar 1	Sericea Lespedeza (unhulled-unscarified) <i>and</i>	70 lbs.
	Tall Fescue	120 lbs.
Nov 1 - Mar 1	ADD Abruzzi Rye	25 lbs.

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

A Conservation Engineer or Soil Conservation Service shall be consulted for additional information concerning other alternatives for vegetation of denuded areas. The above vegetation rates are those which do well under local conditions; other seeding rate combinations are possible. Any variation from this list shall be pre-approved by the TOWN.

SEEDBED PREPARATION

1. Chisel compacted areas and spread topsoil three (3) inches deep over adverse soil conditions, with stockpiled topsoil. Contractor shall reserve sufficient topsoil for seedbed preparation.
2. Rip the entire area to six (6) inch depth.
3. Remove all loose rock, roots, and other obstructions leaving surface reasonably smooth and

uniform.

4. Apply agricultural lime, fertilizer, and super-phosphate 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 is less than 60% established, the entire area shall be reseeded according to specifications using the original lime, fertilizer and seeding rates.
9. Consult a Conservation Inspector on maintenance treatment and fertilization after permanent cover is established.

*Apply: Agricultural Limestone - 2 tons/acre (3 tons/acre in clay soils)

Fertilizer - 1,000 lb/acre - 10-10-10

Super-phosphate - 500 lb/acre - 20% analysis

Mulch - 2 tons/acre - small grain straw

Anchor - Asphalt Emulsion @ 300 gals/acre

d. Construction Entrances:

When possible, construction vehicles shall be afforded entrances and exits separate from the developed portions of the construction site to preserve the integrity of paving in such areas. Entrances and exits to such developed areas shall exhibit a sign or signs bearing the legend "NO CONSTRUCTION VEHICLES" and directing such traffic to the appropriate entrance.

Gravel construction entrance pads shall be constructed at each point of construction access to the site, including residential lots. The gravel pads shall be maintained in such a manner as to prevent the deposition of mud and debris onto existing public roadways or properties adjacent to the site.

Gravel pads for construction sites other than single family lots shall be 50 feet long. The width shall be 20 feet as a minimum. Surge Stone or Railroad Ballast (nominal size of 2"-3"), shall be placed to a nominal depth of twelve (12) inches for the first fifteen (15) feet and six (6) inches for the remaining 35 feet. Gravel pads for individual single-family lots shall be 25 feet long and twelve (12) feet minimum width. Washed stone shall be six (6) inches thick.

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 TOWN may issue a Notice of Violation, Stop Work Order, and/or assess a penalty which shall remain in effect until such time as the pads are restored and replenished and until any resulting mud and debris has been removed from the adjacent streets by the CONTRACTOR.

3.02 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. Tree Protection:

Tree protection shown on the construction plans approved by the TOWN shall be installed and inspected prior to earthwork within the area shown on the plans for protection. The protection fencing shall also be inspected on a regular basis. In the event that the tree protection fencing is not properly maintained or is in violation, the TOWN may issue a Notice of Violation, Stop Work Order, and/or assess a penalty which shall remain in effect until such time as the fencing is restored and agreements to replace damaged trees and/or vegetation have been resolved.

c. Rock Excavation - by Blasting:

- 1) Permit - Where rock must be removed by blasting, a written permit must first be obtained from the Town of Boiling Springs.
- 2) Hours of Blasting - Blasting for rock removal shall be conducted only Monday through Friday between the hours of 8:00 AM to 5:00 PM.

d. Removal of Unstable Material:

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

e. Placement of Fill:

Fill material for roadway embankments shall be free from stones greater than 4 inches in size, construction debris, frozen, organic and/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 the Standard Proctor Method. The 95% requirement shall apply for that portion of the roadway measured from the back of curb and extending outward on a slope of 1 to 1, measured perpendicular to the centerline. The remaining fill shall be compacted

to a density of not less than 90% of maximum dry density as measured by the Standard Proctor Method.

Attention is called to Section 3 of this document for the inspection and testing requirements.

f. Compaction Tests:

During roadway construction, the TOWN will require the developer to provide compaction tests to demonstrate compliance with the compaction requirements outlined herein. Compaction tests will be completed with every lift.

Backfilling of all trenches within the street right-of-way shall be thoroughly compacted to provide a minimum of 95% of the maximum density as determined by the Standard Proctor Method.

All backfilling of trenches outside the street right-of-way shall be compacted to provide a minimum of 90% of the maximum density as determined by the Standard Proctor Method.

**SECTION 4
STREETS AND CURB
AND GUTTER**

4.01 General

It is the intent of the Town of Boiling Springs to provide the greatest quality of life that is practical for its residents. This entails the enabling of pedestrian activities as well as ensuring adequate provisions are in place for stormwater conveyance.

The Town also understands that the measures required to meet these goals may not be appropriate in all cases. Therefore, the following policy is established:

Curb and gutter shall be installed in any subdivision where any lot is equal to or smaller than 30,000 square feet. A subdivision may be phased in such a way so that an initial phase would not have curb and gutter but a subsequent phase would have curb and gutter (and the associated smaller lots). Once, however, curb and gutter is initiated in a project, it shall be utilized throughout the remainder of a project.

To facilitate pedestrian activities, sidewalks shall be required in all projects where curb and gutter is installed. To ensure consistency, the sidewalks shall be installed with the rest of the infrastructure of the project.

4.02 Design

a. General:

Street design shall conform to the standards set forth in Subdivision Roads Minimum Construction Standards latest edition as published by the NCDOT, Roadway Design Manual latest edition published by the NCDOT, or the Boiling Springs Standard Specifications and Construction Details, whichever, in the opinion of the ENGINEER, is the more stringent.

b. Pavement & Right-of-Way Widths :

Minimum roadway width, measured from back of curb to back of curb, shall not be less than:

Curb and Gutter:

<i>Street Type</i>	<i>Roadway Width</i>	<i>Right-of-Way</i>
Residential Collector Road	35 ft.	60 ft.

Local Residential Road	26 ft.	50 ft
Cul-de-sac Turnaround	37 ft radius	50 ft radius

Shoulder :

<i>Street Type</i>	<i>Roadway Width</i>	<i>Right-of-Way</i>
Residential Collector Road	20 ft.	60 ft.
Local Residential Road	18 ft.	60 ft
Cul-de-sac Turnaround	35 ft radius	50 ft radius

Road type determination is based on the NCDOT definition from the Subdivision Roads Minimum Construction Standards.

c. Grades:

Unless necessitated by exceptional topography (as approved by Town Manager), street grades shall not exceed eight (8) percent, nor be less than one-half of one (1/2) percent, on any street.

Grades approaching intersections shall not exceed five (5) percent for a distance of not less than one hundred (100) feet from the right-of-way of such intersection.

All changes in street grade shall be connected by vertical curves of the value of the constant “k” multiplied by the arithmetic difference of the two grades in percent. Reference Detail 3.06 of these Specifications.

d. Intersections

All intersection locations shall be in accordance with NCDOT requirements.

e. Radii of Curvature:

Where a street centerline deflection of more than five (5) degrees occurs, a curve shall be introduced.

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

Intersection Radius	30 feet
Property Line Radius	25 feet

f. Tangents:

A centerline tangent of not less than one hundred (100) feet shall be provided between reverse curves on all streets. Reverse curves on super-elevated streets shall have a sufficient centerline tangent to accommodate entry and exit run-out, but not less than one hundred (100) feet.

g. Sight Triangle:

A sight triangle easement shall be provided at all intersections. Sight triangle easements shall not be less than ten (10) feet by seventy (70) feet. The ten (10) foot dimension shall be the setback from the right-of-way of the major street, and the seventy (70) foot dimension shall be measured along the

right-of-way of the major street. Sight triangle distances shall be increased if appropriate for traffic conditions and speed limits. Sight triangle easements shall be shown on the final plat for the developed tract.

Plant materials and subdivision signs placed within the sight triangle shall be limited to a mature height of thirty (30) inches.

h. Pavement Design:

All Streets shall have a minimum of 6-inches of compacted stone base with 2-inches of NCDOT “superpave” S9.5B asphalt. The Town reserves the right to require a stronger pavement composition based upon proposed use.

i. Entranceway Islands

Islands shall be limited to such a size as to allow adequate turning room for larger vehicles. The entrance way design shall be in accordance with the Subdivision Roads Minimum Construction Standards latest edition as published by NCDOT.

j. Trench Drains

All entrances with irrigation systems shall require a trench drain directly behind the curb and gutter. The trench shall be a minimum of twelve (12) inches wide and eighteen (18) inches deep. A four (4) inch perforated pipe shall be laid at the bottom of the ditch in the center. The ditch

shall then be backfilled with washed stone wrapped in the appropriate geotextile fabric. The perforated pipe shall drain to a catch basin.

k. Street Signs and Pavement Markings

The CONTRACTOR shall install street signs and pavement markings as required by the Manual of Uniform Traffic Control Devices. The DEVELOPER shall install all street signs in accordance with Cleveland County E-911 requirements.

4.03 Construction Requirements

a. General:

All roadway curb and gutter and sidewalk subgrade shall be inspected and approved by the TOWN prior to placement of base course materials.

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:

Future Development - where planned roadways are to be built (i.e. roads in other phases, or roads by other developers), the rough grading shall be completed in areas where it shall impact homeowners or businesses in the phase currently under construction.

b. Placement of Bituminous Surface Course:

Bituminous mixtures shall not be produced or placed under any of the following conditions:

- During rainy weather or whenever moisture on the surface to be paved would prevent proper bond.
- When the subgrade or base course is frozen.
- When the air temperature, measured in the shade away from artificial heat at the location of the paving operation, is less than 40 degrees F (50 degrees F for final lift).

4.04 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 by using a fully loaded tandem dump truck or a fully loaded water truck. Should any "pumping" or displacement be observed during the proof-rolling, the defective area(s) shall be repaired by replacing defective material w/suitable material,

alternative stabilization methods such as fabric, Geo-Grid, lime, etc., or any combination thereof to the satisfaction of the TOWN and thoroughly compacted. The proof rolling shall be repeated until there is no evidence of "pumping" or displacement.

Recommendations from outside sources such as soils engineers and technicians may be suggested. However, the TOWN shall have authority for approval of additional measures.

b. Compaction Testing - Subgrade:

The Town will require the DEVELOPER/CONTRACTOR to furnish to the TOWN a report from a certified soils testing laboratory or the results of a Proctor analysis demonstrating that the subgrade compaction is acceptable in accordance with standard requirements of NCDOT in all of the significant fill areas. The subgrade shall then be inspected by the ENGINEER, 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.

The cost of laboratory testing of subgrade compaction shall be borne by the DEVELOPER/CONTRACTOR.

c. Base Course & Surface Course Inspection Requirements:

The Town reserves the right to require that quarry tickets be presented to the ENGINEER to enable a check for yield at the specified final thickness. The base material shall then be inspected by the ENGINEER, and upon acceptance and approval, the bituminous surface course may be placed.

Bituminous surface course material shall be placed and compacted in accordance with NCDOT requirements. Copies of delivery tickets shall be furnished to the ENGINEER 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 ENGINEER reserves the right to require the DEVELOPER/CONTRACTOR to provide random core samples by an independent testing laboratory to demonstrate actual thickness of base and surface courses. A certified testing laboratory shall take core samples and the results shall be presented to the ENGINEER. Should the cores 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 ENGINEER. The cost of compaction testing and coring work shall be borne by the DEVELOPER.

4.05 Driveways

Driveway grades shall meet the requirements of the Subdivision Roads Minimum Construction Standards as published by the NCDOT. Driveway culverts shall have a minimum size of 15-inches and shall be of the same material as approved in Section 5- Storm Drainage. Driveways shall have an approach angle of 75-90 degrees. Steeper angles may be approved in extreme

conditions by the DPW. Driveway centerlines shall be located at least 100 feet from the center of all intersections.

4.06 Curb and Gutter and Sidewalks

a. Materials

1. Concrete:

Concrete for curb and gutter or sidewalks shall be portland cement concrete having a 28-day strength of 3000 psi when tested in accordance with ASTM C39. Detailed specifications for concrete shall conform to the specifications contained in Section 2.08 hereof.

2. Joint Fillers:

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

b. Dimensions

The minimum thickness of a sidewalk shall be 4 inches with a minimum width of 4 feet. Sidewalks shall have a uniform slope perpendicular to the curb of not less than 1/4-inch per foot nor greater than 1/2-inch per foot toward the roadway. The utility strip between the sidewalk and the back of curb shall not slope less than 1/2 -inch per foot or greater than 3/4-inch per foot toward the roadway.

All sidewalks for roadways shall be installed as per Standard Details 3.01 and 3.02. Sidewalks shall be installed during roadway construction and/or widening.

All sidewalks and greenways shall meet the current Americans With Disabilities Act (ADA) requirements.

Sidewalks shall be constructed on both sides of the roadway and around cul-de-sacs.

Curb and gutter, where required, shall be standard 24" combination curb and gutter or rolled and valley type gutter. Standard 18" median curb and gutter may be used on entrance islands and medians when deemed appropriate by the Town Engineer.

c. Construction Method

1. Subgrade:

The subgrade shall be excavated to the required depth, and shaped to the proper cross-section. Where tree roots are encountered, they shall be removed to a depth of one (1) foot for the full width of the excavation. The subgrade shall be stable and thoroughly compacted.

2. Forms:

Forms shall be set and maintained true to the required lines, grades, and dimensions. 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 1/2-inch in 10 feet from a true line horizontally or vertically. 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.

3. Grooved Contraction Joints:

Contraction joints shall be cut to a depth equal to at least 1/3 of the total slab thickness. The contraction joint shall be no less than 1/8 inch in width. Contraction joints shall be spaced at five foot intervals for sidewalk and spaced at ten foot intervals for curb and gutter. A 1/2-inch expansion joint filled with joint filler shall be placed between all rigid objects and placed no farther than 50 feet apart for sidewalks and curb and gutter, extending the full depth of the concrete with the top of the filler 1/4 inch below the finished surface. The surface of sidewalks shall be finished to grade and cross-section with a float, troweled smooth and finished with a broom. Refer to Detail 4.06.

d. Inspection

No concrete shall be placed until the forms, and subgrades have been inspected and approved by the INSPECTOR. Where stone is used underneath the driveway and/or over conduits, it shall be compacted ABC stone. Washed stone shall not be permitted.

4.07 Certification

The Town of Boiling Springs shall require the following certification from an engineer registered in the state of North Carolina prior to final acceptance of any TOWN maintained streets:

I _____, PE hereby certify that the construction of <i>(Street Names)</i> in <i>(Phase #)</i> of <i>(Subdivision Name)</i> is/are in accordance with the minimum pavement design standards and layout submitted and approved by the Town of Boiling Springs on <i>(Date of Approval)</i> .	
S E A L	_____ Name
	_____ Date

**SECTION 5
STORM DRAINAGE**

6.01 Design

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

<i>Drainage Structure</i>	<i>Storm Event - Return Frequency</i>
Curb Inlet, Roadside Ditches	2-year storm
Storm Sewer Collector	10-year storm
Cross Street Storm Drainage	25-year storm
Structures in Flood Plain	100-year storm*

*Drainage structures in the flood plain should pass 100-year storm without over-topping the roadway
 -- or in the alternative, the structures may be designed to pass only the 25-year event, in which case, the downstream roadway embankment shall be fully protected from the residual flow which may overtop the roadway during a 100-year event.

Prediction of the peak flow rates shall be calculated using the procedure in the USDA Soil Conservation Service Method, the Rational Method, or other acceptable calculation procedures as determined by the TOWN. The size of storm water conduits shall be determined by utilizing the standard energy equation for inlet control or outlet control and headwater nomographs as published by various federal agencies - US Bureau of Public Roads - H.E.C. #5, Soil Conservation Service, etc. The minimum pipe size to be used shall be 18-inch diameter. (Driveway culverts may be 15-inch diameter)

All storm sewers shall be installed in dedicated street rights-of-way or easements. Minimum widths of storm sewer easements shall be as follows:

<i>Pipe Diameter</i>	<i>Easement</i>
18" -- 36"	20'
42" -- 72"	30'
> 72"	to be determined by the Town of Boiling Springs

Where multiple pipes are installed, the edges of the easement shall be a minimum of 10 feet from the centerline of the outside pipe with a 3-foot clearance between the exterior of the parallel storm sewer pipes. Pipes shall not outfall in the front yard of a lot, but should extend to the rear third of the lot or property line in residential subdivisions.

Erosion and sedimentation control measures shall be so designed to provide control from the calculated peak rates from a 10-year frequency storm. Discharge from the drainage systems shall not be of such a velocity as to cause damage after leaving the pipe. Maximum allowable velocity will be 2.0 feet per second for concrete pipe and 2.5 feet per second for corrugated metal pipe or hdpe pipe. Maximum velocity shall be 10 feet per second within a system. Exiting velocities shall be in conformance with the sedimentation and erosion guidelines and outlet protection used whenever the velocity exceeds the allowable limit. Pipe outlets, flared end sections and head walls shall be provided, with rip-rap aprons designed to reduce velocity and dissipate energy so that downstream damage does not occur. Calculations shall be submitted with plan review.

Drainage basins shall be installed at each deflection of line or grade. No "blind" junction boxes shall be permitted. The maximum distance between access openings shall not exceed 400 feet.

Joints between sections of pipe shall be constructed utilizing a watertight gasket, o-rings, or bitumastic impregnated rope-type joint material for the full circumference of the joint. For pipes 36-inches in diameter or larger, each interior joint shall also be filled with a Portland cement grout and troweled smooth for the circumference of the pipe.

No storm pipe shall enter a precast structure through its corners.

The minimum cover shall be two (2) feet from finish subgrade to the top of pipe under roadways, and one (1) foot under a non-roadway area.

Storm water shall not generally be allowed to flow across the roadway. Any deviation shall require pre-approval by the ENGINEER. Drainage shall be provided to intercept the flow prior to the radius of an intersection, or the design of the roadway 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 roadway exceeds eight-feet for curb and gutter roadways. The inlets may be spaced using a 2-year frequency storm. No catch basin shall be installed in the radius of a curve.

Piped storm water that originates within or passes through the public R.O.W. shall be conveyed through a contiguous public storm drain easement, from the R.O.W. through points downstream, to the point of open discharge. Private storm drainage systems will be permitted, provided that: (1) such systems collect and discharge impounded storm water wholly within the same lot or (2) such systems collect water from one single lot and discharge into the public storm drain system. Private storm drain systems that connect to the public storm drain system shall have the connecting leg of such a system, which crosses into the public R.O.W. or easement, constructed in accordance with

Town Specifications, including but not limited to: the necessary easements, piping, inlets and junction boxes. Piped private storm drainage systems may not cross property lines or convey storm water from one lot to another. Where permitted by topography and site conditions, storm drain systems that serve a single non-residential lot (i.e., parking lots, private streets, vehicular use areas), shall be privately maintained.

6.02 Pipe Materials

a. General:

All storm sewer pipes to be installed in projects within the jurisdictional limits of the Town of Boiling Springs shall be reinforced concrete pipe (RCP) or High Density Polyethylene (HDPE) double wall pipe as approved by the NCDOT. Fully coated Corrugated Steel Pipe (CSP) may be permitted only in very large installations, or in special cases where CSP arch pipe must be used because of limited fill heights. In such special cases, the applicant's plan submittal must contain a formal request to use CSP material and complete background data to justify its use. Approval to use CSP may only be granted by the Public Works Director.

b. Reinforced Concrete Pipe (RCP):

RCP shall be as per ASTM C76 (or the latest revision), Class III or Class IV with a minimum 18-inch diameter as furnished by NC Products or Gray Concrete Pipe Company or an approved equal. Joints shall be wiped with mortar or sealed with a plastic cement putty meeting Federal Specification SS-S-00210 such as "Ram-Nek." Mortar shall be applied to the outside of all pipe joints and to both the inside and outside of joints of pipes 36" or larger. A roughness coefficient of 0.013 ("n" factor) should be used in the design.

c. High Density Polyethylene (HDPE):

Large diameter, corrugated high density polyethylene pipe, meeting the requirements of AASHTO M294 TYPE "S" for diameters ranging from 18 inches through 36 inches. Applications other than subdivision street construction and driveways will require specific approval by the Engineer

d. Corrugated Steel Pipe (CSP) and Pipe Arch:

Fully coated Corrugated steel pipe and pipe arch, where permitted, shall conform to AASHTO M36-78 (or the latest revision) with pipe ends having no less than 2 round corrugations on each end. Coupling bands for pipe connection shall be corrugated, also with a minimum of 2 corrugations for each pipe. Coupling bands shall be used at all joints and shall be of a size specified by the manufacturer in accordance with the pipe design. Bands will be fully asphalt coated on both sides and shall conform to AASHTO designation M36-78 and M190-78. Bands to be of Hugger-type or an approved equal.

6.03 Materials - Storm Drainage Structures

a. General:

All structures shall be constructed of pre-cast concrete.

Curb inlets in streets with curb and gutter shall be DOT type standard frame, grate, and hood. Yard inlets and area drains shall utilize a grate and frame, 2' X 2' size, minimum.

b. Precast Concrete Structures:

Pre-cast concrete structures shall have NCDOT approval.

c. 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.

d. Castings:

- 1) General – Castings shall be manufactured by Neenah Foundry Company or East Jordan Iron Works. Alternate manufacturers shall be permitted upon review by the ENGINEER.

All castings shall meet the requirements of ASTM A48, Grade 35B iron. Country of origin shall be embossed on each casting.

At a minimum, manufacturers shall submit the following to substantiate to the ENGINEER that castings meet the minimum criteria:

- a. Bar tensile test reports from an independent testing laboratory. The results must confirm that the material meets ASTM A48 Class 35B.
- b. Casting proof load test report on the subject casting. Proof load tests shall be

conducted in accordance with AASHTO M306, Section 7.0. During proof load testing, castings shall maintain a 40,000 lb proof load for one minute without experiencing any cracking or detrimental deflection.

c. A written statement of certification by a qualified licensed engineer, employed by the producing foundry, that castings meet these specifications.

2) Curb Inlet - Grates, frames, and hoods shall be in accordance with NCDOT Standard 840.02 and 840.03. Curb inlet hoods shall be embossed with "Dump No Waste! Drains to Waterways".

3) Grates & Frames - Cast iron grates and frames for yard inlets shall be of the size indicated on the approved plans. Grates and frames shall be in compliance with NCDOT Standards for a 2' X 2' masonry opening, or its equivalent with comparable features for other larger size openings as may be required.

Grates and frames shall only be used outside of street rights-of-way.

4) Manhole Rings & Cover - Cast iron manhole rings and covers shall be in compliance with Detail 7.05 and 7.06 of these specifications with the words "STORM SEWER" cast on the cover. Covers shall have two 1-inch holes. Manhole castings shall be machined to provide a continuous bearing around the full periphery of the frame.

e. **Portland Cement Concrete:**

Portland cement concrete used for storm drainage structures, end walls, etc. shall conform to the technical requirements presented in Sub-Section 2.08 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 ENGINEER for all such structures where deemed necessary.

f. **Reinforcing Steel:**

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

6.04 Miscellaneous Materials

a. **Rip Rap:**

Riprap shall be large aggregate of the size and class shown on the approved drawings. Storm water calculations shall be submitted with plan review.

6.05 Storm Water Impoundments Within The Watershed Protection Area

Storm water retention facilities shall be constructed to ensure the post-development runoff rate does not exceed the pre-development runoff rate. Requests to waive this requirement for discharges into well established drainage ways may be made to the Town Manager.

6.06 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 ENGINEER, 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 upgrade and ends fully and closely jointed. Joints of concrete pipe shall be made with cement mortar or with rope-type gasket joint meeting ASTM C 443 and C 361 materials 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 installation, shall be taken up and re-laid.

c. Backfilling:

The storm sewer trench shall be backfilled with selected earth or approved material free from large stones or clods. The material shall be compacted in 6-inch lifts (loose measurement) to the top of the pipe and compacted to 95% of maximum dry density (Standard Proctor). The backfilling shall be done on both sides of the pipe simultaneously to prevent displacement of the pipe. If the pipe is within an area to be paved or where the trench is immediately behind the curb, the backfill material shall be placed on top of the pipe with an initial lift of twelve (12) inches followed by six (6) inch lifts to the top of the trench. If the pipe is outside of the paved area and is not located directly behind the curb, the backfill material shall be placed on top of the pipe in twelve (12) inch lifts to the top of the trench. The backfill materials shall be moistened when necessary in the opinion of the

INSPECTOR to obtain maximum compaction. Water setting or puddling shall not be permitted.

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

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 pertinent ACI (American Concrete Institute) codes and guidelines.

f. Installation of Precast Concrete Structures:

Pre-cast concrete structures shall be installed level and upon a firm, dry foundation, approved by the ENGINEER. 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. All interior joints and pipe penetration shall be grouted water tight. Steps shall be required where the depth of the box exceeds 3 feet. The invert of the structure shall be formed with concrete to ensure smooth continuous flow through the structure.

SECTION 6
WATER DISTRIBUTION

7.01 Preliminary Considerations

Any subdivision which has public water system lines available shall be required to extend the public water system throughout the subdivision to each lot located therein. The term “available” shall mean that there is an existing water line of adequate size and water flow and/or pressure within the distances shown on the Table below of the outside boundary line of the subdivision, or the TOWN indicates its commitment to extend such a water line within the distances shown on the Table below of the property line of the subdivision at no cost to the DEVELOPER and there are no legal or topographic problems which prevent the DEVELOPER from connecting onto and extending the existing system to the subdivision. In the event there are phases to the subdivision or else the subdivision is a part of a larger tract of land owned or under the control of the DEVELOPER, then, and in that event, public water service shall be deemed to be available if an existing or proposed public water system extends or will be extended within the distance shown on the Table below to the larger tract of land.

In any case where a public drinking water system and/or supply system intended to serve more than two lots is proposed to be installed in a subdivision as part of the plan approval process, such system shall be considered to be a “Required Improvement” within the context of this section regardless of whether such a system is an extension of the TOWN system or not and such system shall be required to be installed by the DEVELOPER. This requirement includes both facilities within the subdivision and off-site facilities which are essential to providing service to the property.

In the event the TOWN elects not to extend a water line of sufficient size, flow and/or pressure to the distances shown on the Table below of the subdivision boundary because of topographic features, legal obstacles, or financial reasons, then the DEVELOPER shall not be required to extend water lines to each lot nor provide water service to the subdivision.

The TOWN may, in order to serve future development, require the DEVELOPER to install certain oversized water improvements and/or to increase such improvements to a size and/or extent beyond that indicated herein. In such cases, the TOWN shall enter into an agreement to reimburse the DEVELOPER for the oversizing and/or extension based upon rates as agreed upon by the TOWN.

All public water main extensions shall be designed by a professional engineer registered in the State of North Carolina and shall be approved by the Department of Environmental Health and Natural Resources, Division of Environmental Health. All designs shall comply with the Town of Boiling Springs specifications and “Rules Governing Public Water Systems.”

All water main extensions and distribution facilities which connect to the water distribution

system of the Town of Boiling Springs shall be considered as public facilities up to the metering point. Therefore, all such facilities must be installed in public street right-of-ways or in easements, having a width of not less than 20 feet.

Where water mains "dead end" or are terminated for future extension, at least one 18-foot joint of ductile iron pipe shall be installed with a thrust collar, main line valve, and blow-off assembly. The "dead end" water main shall terminate within a right-of-way or dedicated easement where required by the TOWN.

Ductile iron pipe (DIP CL-350) shall be used for water mains six (6) inches and larger in diameter. C900 PVC pipe shall be used for four (4) inch water mains. SDR 13.5 PVC pipe shall be used for two (2) inch water mains.

Where public water mains are installed within easements crossing private property, the TOWN'S Public Works Department shall have the right to enter upon the easement for purposes of inspecting, repairing or replacing the water mains and appurtenances.

Available Water Distribution System Lines	
Water is available if the subdivision contains the number of lots listed in column one and public lines are within the distance shown in column two.	
LOTS	DISTANCE
2-10	200 feet
11-20	300 feet
21-50	600 feet
51-100	1000 feet
101+	1500 feet

7.02 Design

a. Location:

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

Where a water main and a sanitary sewer cross, and the vertical separation is less than eighteen (18) inches, both the water main and sewer shall be ductile iron pipe, equivalent to water main standards for a distance of ten (10) feet on each side at the point of crossing. The water line pipe section shall be centered at the point of crossing. A water line shall not pass under a sewer line.

b. Cross Connection Control In The Water Distribution System:

No facility may connect to the Boiling Springs water distribution system prior to approval from the TOWN. The installation of an approved reduced pressure zone back-flow preventer and/or double check valve assembly may be required. These devices will be of manufacture and models approved by the State of North Carolina, and the Southern California Foundation for Cross Connection Control and Hydraulic Research and will be approved by the TOWN prior to installation.

All dedicated fire and irrigation lines must be equipped with an approved back-flow prevention device. For projects having any combination of these lines, suitable approved devices must be provided to contain or "isolate" each level through containment.

Approved backflow preventor valve assemblies shall be installed above ground inside a "hot-box". See Standard Detail 6.17.

An approved double check valve must be installed at the meter service on residential service lines. Shut-off valves shall be used on all fire lines and back-flow prevention devices (2-inch and larger) and each back-flow preventer will have approved test cocks.

"Processed water" is water where extra chemicals are added by the user on site to reduce freezing, pipe corrosion, etc. If a fire line or domestic service is connected to any "processed water" source, or booster pump system, back-flow protection shall be provided by using the USC approved Reduced Pressure Zone (RPZ) type device. Fire lines require a reduced pressure detector assembly, with detector meter. This RPZ device shall include gate valves and test cocks, and meet the requirements of AWWA C-506-78. If the RPZ is 2 1/2-inches or larger, then it must be supplied with OS & Y shut-off valves. The unit shall be within an above ground vault or inside of the building.

If the back-flow preventer is located on site for fire lines, it shall be located outside of the structure. All internal or confinement devices (isolation) will have strainers upstream of the device with the exception of devices for fire lines.

c. Back-flow Prevention Devices

Only devices approved of manufacture and models approved by the State of North Carolina, and the Southern California Foundation for Cross Connection Control and Hydraulic Research shall be used.

All devices 3/4" to 2" must have a ball valve that is full port with a blow-off proof stem, resilient seats, and a 400 psi WOG rating (water, oil or gas). All devices 2 1/2" to 10" must have fusion bonded, epoxy coated resilient wedge valves. All test cocks must have approved ball valves of the appropriate size.

Back-flow prevention devices shall be tested and certified when they are installed. In order to have an additional water meter installed, the CONTRACTOR should contact the Public Works Department. All back-flow devices must be tested and re-certified on a yearly basis. Maintenance must be performed for all rubber parts every five (5) years. All testing and maintenance must be performed by certified personnel. All certifications shall be sent to the TOWN.

All back-flow prevention devices must be installed above ground.

d. Fire Flow Requirements:

All water distribution system extensions shall provide water pressures and fire flows at a standard acceptable value for the applicable zoning requirements. Flows shall be estimated for a given structure and/or developed area based on the following formula:

$$F = 18C(A)^{0.5}$$

where:

- F = required flow in gpm
- C = construction type coefficient

- C = 1.5 for wood frame construction
- C = 1.0 for ordinary construction
- C = 0.9 for heavy timber construction
- C = 0.8 for noncombustible construction
- C = 0.6 for fire resistive construction

A = the total floor area (all stories), excluding basements, for the building being considered. For fire resistive buildings, the six largest successive floor areas are used if the vertical openings are unprotected. But where the vertical openings are protected, only the three largest successive floor areas are included.

Regardless of the calculated value, the fire flow shall not exceed 8000 gpm for wood-frame or ordinary construction, or 6000 gpm for noncombustible or fire-resistive buildings, except that for a normal one-story building of any type it may not exceed 6000 gpm. The fire flows shall not be less than 500 gpm. For groupings of single-family dwellings not exceeding two stories in height, the following fire flows may be used:

<i>Distance Between Dwelling Units (ft)</i>	<i>Required Fire Flow ** (gpm)</i>
over 100	500
31 --> 100	750 --> 1000

11 --> 100	1000 --> 1500
10 or less	1500 --> 2000
continuous building	2500

** where wood shingle roofs could contribute to spreading fires add 500 gpm

All other applicable recommendations set forth by the Insurance Services Office (ISO) for the various land use type must be met. The calculated fire flows shall be reviewed by the TOWN resulting in an adjustment of the water main extension size if necessary.

The calculated flows shall be reviewed by the TOWN, flows and water main extension size may be adjusted.

e. Size of Mains:

- 1) Residential Zoning Districts - Water mains shall be 6-inch and 8-inch minimum in residential districts. Maximum lengths of 6-inch line is 1,500 feet. Within residential cul-de-sacs 500 feet and less in length, a 4-inch water main is permissible. Water distribution facilities for Multi-Family Units, Apartments, Condominiums, and Townhouse Developments a 6-inch main is required. In all cases, water mains shall be of such size as to maintain a minimum residual pressure of 20 psi.
- 2) Business, Commercial, and Industrial Zoning Districts - Water mains shall be 8-inch 12-inch minimum. In all cases, water mains shall be of such size as to maintain a minimum residual pressure of 20 psi.

f. Fire Hydrant Location:

- 1) All fire hydrants shall be installed on a minimum six (6) inch water line.
- 2) In all residential districts, there shall be a fire hydrant located at each street intersection. The maximum distance between fire hydrants in these districts, measuring along public street centerlines and/or private travel ways, shall be 500 feet. On group housing projects, all parts of the building shall be within 300 feet of a fire hydrant.
- 3) In all business, commercial, office and institutional, shopping center, multi-family, mobile home and industrial districts there shall be at least one fire hydrant at each street intersection. The maximum distance between fire hydrants in these districts, measuring along public street center lines and/or private travel ways shall be 300 feet.
- 4) All premises, where buildings or portions of the building are located more than 300-feet (commercial) or 500-feet (residential) from a public fire hydrant, shall be provided with approved on-site fire hydrants and water mains capable of supplying the fire flow

required by the Fire Department. The location and number of on-site fire hydrants shall be as designated by the Fire Official, with the minimum arrangement being so as to have a hydrant available for distribution of hose to any portion of any building at distances not exceeding 500-feet of hose length.

- 5) A clear level space of not less than three (3) feet shall be provided and maintained on all sides of a fire hydrant for immediate access. Clearance from the ground surface to the steamer nozzle shall be between eighteen (18) inches and twenty-four (24) inches.

g. Valves:

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

<i>Location</i>	<i>Number of Valves</i>
Cross Intersection	3 valves
Tee Intersection	2 valves
Hydrant Branch	1 valve

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

<i>Main Size</i>	<i>Maximum Spacing</i>
6"	500'
8" and larger	1,000

However, main line valves should coincide with fire hydrants and must be within fifty (50) feet of the nearest hydrant.

Gate valves shall be used for water mains through 12-inch size. For water mains 16-inch and larger, butterfly valves may be used.

Where fire service lines from the public distribution system are required, each fire line shall have an isolation gate valve located within the public R.O.W. or appropriate easement.

h. Services:

- 1) General - Each dwelling unit, whether attached or detached, shall be metered. The only exception to this metering requirement shall be in the case of apartment buildings where

metering of individual dwelling units may be impractical.

Water services shall be extended from the main to a meter box located within the street right-of-way or within an easement. The installation of the tap, service line, and meter box shall be the responsibility of the DEVELOPER or the property owner. Irrigation meters are required for subdivisions.

- 2) Multiple Meters - Multiple meters on branched services are acceptable for multi-family projects, providing they conform with the following table:

<i>Size Of Individual Service (Meter)</i>	<i>Size Of Feeder Service</i>	<i>No. Of Branches</i>
3/4" **	3/4"	2
3/4"	1"	3
3/4"	1 1/4"	4
3/4"	1 1/2"	5-10

**** For individual irrigation system meters only**

All multiple meter installations shall conform to the standard detail drawing and shall contain a curb stop on the feeder line. The curb stop shall be buried and shall be equipped with a curb box. Refer to Detail 6.15.

- 3) Meter installation - The Town of Boiling Springs shall provide and install the water meters subject to the following conditions:
- The TOWN has received a copy of the waterline purity test results and the PROJECT ENGINEER'S certification.
 - The DEVELOPER (or property owner) has paid prescribed meter fee.
 - The DEVELOPER has installed all specified improvements or guaranteed their installation as prescribed in the TOWN Code

i. Looping to Existing Water Mains:

New water mains in cul-de-sacs or dead-end streets shall be extended or "looped" to existing mains in adjacent streets when, in the opinion of the TOWN, it is practical to do so in order to enhance flow and pressure in the affected area.

j. Residual Pressure Requirements for Fire Flow:

Fire service lines to commercial or industrial sites shall be sized so that a minimum residual pressure of 20 psi can be maintained in the Boiling Springs distribution system.

k. Private Irrigation Systems:

No private irrigation system shall be installed within the public right-of-way or any public easement without an encroachment agreement. Yard hydrant locations and quantities are subject to approval of the TOWN. All yard hydrants shall be metered per Boiling Springs standard policy.

Irrigation systems shall be installed utilizing an approved back-flow prevention device for high hazard applications.

Trench drains shall be required around any irrigated median and subdivision or site entrance.

7.03 Materials

a. General Requirements - Water Distribution Mains:

All water mains to be installed within the jurisdictional limits of the Town of Boiling Springs shall be either PVC Pipe or Ductile Iron Pipe.

b. PVC Pipe:

All PVC Pipe shall meet the requirements of AWWA C900. Pipe shall be Class 150, SDR 18, integral bell, iron pipe O.D., 20-foot length, with an elastomeric gasketed compression joint. PVC pipe shall be as furnished by Jones-Manville, Clow, Robin-Tech, or equal as may be approved by the DPW.

c. Ductile Iron Pipe:

All ductile iron pipe shall be designed as per AWWA Standard C150 for a working pressure of 150 psi, 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, and shall be furnished in 18 or 20 foot lengths.

d. Hydrants:

Fire hydrants shall be of the compression type meeting AWWA 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 ½ inch nozzles and one 4 ½ 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 ½ 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.

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 ½ inches (5 ¼” on 8-inch mains and larger).

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 a barrel and a maximum of one stem extension as required by the final field location to provide a nominal minimum bury of three feet, six inches (3'-6"). No more than one extension may be installed on any single fire hydrant (i.e., two six-inch extensions shall be replaced with a single one-foot extension); furthermore, the cost of removal and replacement of extensions shall be borne by the Developer.

Hydrants shall be Mueller “Centurion.”

Special Restraint Systems for Fire Hydrant Installation

In lieu of reaction blocking for fire hydrants, hydrants may be installed with an approved special restraint system. Special restraints shall be Mueller Aqua-Grip or approved equal. Such restraints shall be individually integral to the fire hydrant shoe, the fire hydrant shutoff gate valve, and/or the tapping valve such that the special restraint system, in whole or in part, adequately restrains the entire hydrant service leg back to the water main. Special restraints shall be constructed of ductile iron and provide full circumferential engagement to the ductile iron pipe. Such special restraints shall have a minimum working pressure of 250 psi with a minimum Factor of Safety of 2:1. Restraints shall be supplied with inspection ‘break nuts’ that shear upon the attainment of proper installation torque. Restraints that ‘point load’ around the circumference of the pipe will not be allowed without concrete reaction blocking.

e. Gate Valves:

- 1) 12-inch and smaller - Gate valves 12 inches and smaller shall be designed and manufactured in accordance with AWWA C-500, or of the resilient wedge type conforming to AWWA C-509. They shall be designed for a working pressure of 200 psi and shall be hydrostatically shop tested to 400 psi. They shall be open-left, non-rising stem, cast or ductile iron body, double disc, parallel seat, fully bronze, mounted and equipped with “O-ring” seals and a standard 2-inch square operating nut. Valve ends shall be mechanical joint.
- 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 required by the TOWN.
- 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:

Double Disc/Parallel Seat Gate Valves (AWWA C-500) - shall be Mueller, American or Kennedy.

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

- 5) All gate valves shall be resilient seat gate valves. All gate valves to be furnished by the CONTRACTOR shall be new and must comply with the specification AWWA C509-87 or latest specification. All valves used must be the same make. The end connections of all gate valves furnished shall be mechanical joints conforming to ANSI Specifications A21.11-85 (AWWA C111-85) or latest specification. The valves shall be nut operated, non-rising stem and shall open left. The stuffing box shall be equipped with “O-ring” seals. They will have iron bodies, and be fully bronze mounted.

f. Butterfly Valves:

Butterfly valves may 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 torque's shall comply with Table 1 of AWWA 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.

All butterfly valves shall be installed within a 4' diameter manhole encasement per Detail 6.19 of these specifications.

g. Valve Boxes:

All valve boxes shall be of the screw-adjustable type equal in quality and workmanship to East Jordan Iron Works 4905. Valve boxes shall be cast from close-grained gray iron, in three pieces consisting of a lower base piece, upper part and cover. The lower base piece shall be flanged at the bottom to fit around the valve and shall not rest on the valve bonnet. The upper part 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.

h. Tapping Sleeves:

The tapping sleeves shall be the split type, or stainless steel body, mechanical joint, designed and manufactured for a minimum working pressure of 200 psi, Romac SST III. The tapping sleeve branch shall be flanged and manufactured in such a manner as to assure proper alignment with the flanged inlet end of the tapping valve. The drilling of the branch flange shall correspond to that of the inlet flange of the tapping valve.

Tapping sleeves shall be installed in accordance with the manufacturer's instructions and only on clean, defect free pipe. Tapping sleeves shall be installed no closer than 4 feet from any other fitting along the main to be tapped. Prior to tapping the water main, the sleeve branch shall be pressure tested with 5 PSI of air for a minimum of 5 minutes. Any indication of leakage (loss of air pressure) shall require the sleeve to be removed and inspected for defects. After the sleeve is verified free of defects, the sleeve shall be re-installed and re-tested. The contractor shall provide the Inspector with a torque-wrench for verification of bolt installation within the manufacturer's specified torque range.

Tapping sleeves for PVC and AC pipe shall be the Stainless Steel make and model referenced in these specifications.

i. Tapping Saddles:

Tapping saddles may be used in lieu of tapping sleeves on mains 16 inches and larger. Saddles shall be made of ductile iron providing a factor of safety of 2.5 with a working pressure of 250 psi. Saddles shall be equipped with an AWWA C110 flange connection on the branch. Sealing gaskets shall be “O-ring” type, high quality molded rubber having approximately 70 durometer hardness, placed into a groove on the curbed surface of the saddles. Straps shall be alloy steel. Saddles shall be as manufactured by American.

j. Blow-Off Assemblies:

Blow-off assemblies shall be 2 1/8-inch post type “hydrants”.

k. Iron Fittings

Iron fittings shall be ductile iron, all bell, mechanical joint, conforming to the following specifications:

3" - 16" Size - Standard fittings - AWWA C110, latest revision, or Compact Fittings - AWWA C153, latest revision

18" - 48" Size - Standard fittings - AWWA C110, latest revision

Mechanical Joint - AWWA C111

Inside Lining - Cement mortar with bituminous seal coat - AWWA C104

Fittings through 24" size shall have a minimum pressure rating of 350 psi. Fittings larger than 24" shall have a pressure rating of 250 psi.

l. Water Service Accessories:

- 1) General Requirements - Direct taps without saddles may be permitted to ductile iron pipe in accordance with the following table:

<i>Main Size (DIP)</i>	<i>Maximum Size Of Direct Tap — DIP</i>
8" and larger	2"
6"	1 1/2"
4"	3/4"

Service connections larger than 2" shall be made by means of a tapping sleeve and valve.

All water service tubing shall be copper. Polyethylene or other plastic service tubing will not be permitted.

All new water services shall be equipped with a check valve which shall be located immediately downstream of the meter.

All water meters shall register in gallons.

Multiple meters shall be installed in accordance with the Standard Detail 6.15.

Upon request of the TOWN and prior to beginning work, the CONTRACTOR shall furnish samples of service accessories to the TOWN 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 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 nut on the outlet end for connection to flared copper tubing. The stops shall be fully shop tested for leaks with air pressure under water. The corporation stops shall be Mueller H15000, Ford F600, or approved equal.
- 4) Copper Service Tubing - Copper tubing shall be Type K soft copper tubing conforming to ASTM Standard B88.
- 5) Meter Setters & Accessories for 3/4" & 1" Services - Meter setters shall be copper, 12" high with lockable angle meter stop and angle duel check valve.
The meter setters and accessories shall be as follows:
 - Ford VHH-70 Series with HHA angle duel check valve. Meter stop shall be equipped with padlock wings.
 - Mueller #14000 Series with #14244 angle duel check valve. Meter stop shall be equipped with padlock wings.
 - AY McDonald 20-212WDDD33 Series or 20-412WDDD44 Series with 12-3HE43 angle duel check valve. Meter stop shall be equipped with padlock wings.

- 6) Meter Setters & Accessories for Services larger than 1" - shall be as shown on Standard Detail 6.04 or 6.05, as applicable.
- 7) Meter Boxes for 3/4" and 1" Services - shall be cast iron. Bud Badger Model #25 meter box to be installed to allow radio read transmitter.
- 8) Meter Boxes for Services larger than 1-inch - shall be as shown on the Standard Detail 6.04 or 6.05, as applicable.
- 9) Meters - 5/8" X 3/4" through 1" - for residential and small commercial service shall be supplied by the TOWN.

7.04 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 three (3) feet. 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 and a maximum of 24 inches plus the outside diameter of the pipe, unless approval for deviation from this requirement is granted by the 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 or No.57 stone or other material approved by the ENGINEER. Rock excavation requirements for water mains shall conform to requirements outlined hereinafter in Section 7.05(c).

In trenches where water is present or where dewatering is required, the trench bottom shall be stabilized with No. 67 or No. 57 stone. When material of poor supporting value (i.e. "muck") is encountered in the trench, it shall be removed and replaced with No.67 or No.57 stone or other material approved by the 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.

c. Pipe Installation:

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 and TOWN Specifications. Care shall be taken during pipe installation so as not to exceed the maximum joint deflection as prescribed below for ductile iron pipe.

<i>Maximum Joint Deflection In Inches — DIP</i>		
<i>Pipe Size</i>	<i>MJ</i>	<i>Push-On-Joint</i>
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 ENGINEER may require that the bell ends face upgrade.

d. Pipe Bedding:

The barrel of the pipe shall bear uniformly upon the supporting trench bottom at all times. The foundations of ductile iron pipe shall conform to the minimum requirements described below.

Ductile Iron 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. Refer to Standard Detail 6.01.

e. Backfilling:

All water mains shall be backfilled in accordance with the Standard Details 6.01 as applicable and compacted so that the pipe is properly supported in accordance with the pipe manufacturer's recommendations and TOWN Specifications.

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 traffic areas, the final backfill shall be placed and compacted in 6-inch layers. Backfill shall be of such density as to ensure no settlement of the trench. An INSPECTOR may require compaction test in traffic areas at the CONTRACTOR'S expense.

Should any water line trench exhibit settlement, the CONTRACTOR shall correct the deficiency to the complete satisfaction of the ENGINEER. Where a water line is in or crosses existing State roads or other public roads, the backfill shall be compacted to at least 95% standard density as measured by AASHTO Method T-99. Where deemed necessary, the ENGINEER may require compaction tests to be performed (at the CONTRACTOR'S expense) on backfill placed in trenches across such roads.

For permitted open-cut water main extensions and/or tie-ins, the ENGINEER may require that "flowable fill" be used for backfill material. If required, one (1) foot of approved natural backfill material shall be compacted over the water main per Boiling Springs Specifications, the remaining excavated trench shall be backfilled with "flowable fill". Within seven (7) days after the excavation has been filled, the open-cut area shall be repaired per Detail 3.06.

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 pavement is existing, the box shall be adjusted to finished street grade. When valves are located in street right-of-way, but out of pavement, the boxes shall be adjusted to finish grade and a concrete collar 2-foot square and 6-inches thick shall be poured around the box ½-inch from the top of the casting, in lieu of the poured in place concrete a pre-cast concrete collar may be used such as manufactured by Brooks, Inc. or Buckhorn Products.

When valves are located outside of street right-of-way, the boxes shall be adjusted 6 inches above the finished grade, and a concrete collar 2-foot square and 6-inches thick shall be poured around the casting.

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 Detail 6.14 of these Specifications. All blocking shall be placed so that the pipe and fitting joints will be accessible for repairs.

All dead end lines shall be plugged and anchored by using ductile iron pipe, thrust collars and blocking as indicated in Detail 6.11 of these specifications.

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.

7.05 Installation of Steel Casing Pipes by Boring & Jacking

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

7.06 Cutting & Replacement of Existing Pavements

The open cutting of existing pavements may be permitted for water line installations across designated Town streets and State maintained roadways. The cutting and replacement of such pavements shall conform to the specifications presented in Section 3.03 of these Specifications.

Requested permission must be in writing to the TOWN and approved, prior to cutting Town maintained roadways.

7.07 Water Service Connections

Water services shall be installed using only the materials as specified herein under Section 6.03.

Taps shall be made only on lines under pressure and after the main has been tested and chlorinated. No taps on dry lines shall be allowed, unless specific authorization is obtained from the TOWN.

Taps shall be installed at an angle of 45 degrees to the vertical axis of the water main. Direct taps shall only be made in accordance with the provisions of Section 6.03(k) (1) hereof.

Water service lines from the main line to the metering point shall be a continuous run with no intermediate connections and/or joints.

Services larger than 2-inches shall be made by using a tapping sleeve and valve. Each service shall be flushed and disinfected after installation, all to the complete satisfaction of the ENGINEER. The CONTRACTOR shall have the same responsibility for disinfection of service laterals as required for mains.

7.08 Water Meter Installations

Water meter installations shall conform to Details 6.03 through 6.05 for meter sizes through 4-inch.

Installations larger than 4-inch shall require a special detail and are subject to the review and approval of the TOWN 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.

7.09 Hydrostatic Testing

No valve in the existing Town of Boiling Springs Water System shall be operated without giving a minimum 4 hours notice to the Public Works Department.

A section of line 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 2 hours. The pressure gauge used in the hydrostatic test shall indicate in increments of 50 psi or less and shall have been calibrated within the last 12 months. 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:

<i>Pipe Size</i>	<i>Allowable Leakage Per 1000 ft. (gallons)</i>
4"	0.85
6"	1.28
8"	1.70
12"	2.56
16"	3.40
20"	4.24
24"	5.10

All visible leaks are to be repaired regardless of the amount of leakage.

7.10 Disinfection

All additions or replacements to the Boiling Springs water system shall be chlorinated before being placed into service. Such chlorination must take place under the supervision of an 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.

<i>Pipe Size</i>	<i>Pounds Of High Test Hypochlorite (70%) Per 1000 ft. Of Line — To Produce 50 ppm</i>
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. Extreme care will be exercised at all times to prevent the HTH solution from entering existing mains.

7.11 Bacteriological Sampling

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

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.

Within 24 hours after flushing is complete, the CONTRACTOR shall collect samples for bacteriological analysis, under direct observation of an INSPECTOR. The CONTRACTOR is responsible for the delivery of the sample(s) to a testing laboratory certified by the NC Department of Human Resources, Division of Health Services. The CONTRACTOR shall furnish the ENGINEER with a copy of the results prior to tapping any services.

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

SECTION 7
SANITARY SEWERS

8.01 Preliminary Considerations

Any subdivision which has public sewer system lines available shall be required to extend the public sewer system throughout the subdivision to each lot located therein. The term “available” shall mean that there is an existing sewer line of adequate size and sewer flow and/or pressure within the distances shown on the Table below of the outside boundary line of the subdivision, or the TOWN indicates its commitment to extend such a sewer line within the distances shown on the Table below of the property line of the subdivision at no cost to the DEVELOPER and there are no legal or topographic problems which prevent the DEVELOPER from connecting onto and extending the existing system to the subdivision. In the event there are phases to the subdivision or else the subdivision is a part of a larger tract of land owned or under the control of the DEVELOPER, then, and in that event, public sewer service shall be deemed to be available if an existing or proposed public sewer system extends or will be extended within the distance shown on the Table below to the larger tract of land.

In any case where a public drinking sewer system and/or supply system intended to serve more than two lots is proposed to be installed in a subdivision as part of the plan approval process, such system shall be considered to be a “Required Improvement” within the context of this section regardless of whether such a system is an extension of the TOWN system or not and such system shall be required to be installed by the DEVELOPER. This requirement includes both facilities within the subdivision and off-site facilities which are essential to providing service to the property.

In the event the TOWN elects not to extend a sewer line of sufficient size, flow and/or pressure to the distances shown on the Table below of the subdivision boundary because of topographic features, legal obstacles, or financial reasons, then the DEVELOPER shall not be required to extend sewer lines to each lot nor provide sewer service to the subdivision.

The TOWN may, in order to serve future development, require the DEVELOPER to install certain oversized sewer improvements and/or to increase such improvements to a size and/or extent beyond that indicated herein. In such cases, the TOWN shall enter into an agreement to reimburse the DEVELOPER for the oversizing and/or extension based upon rates as agreed upon by the TOWN.

All public sewer main extensions shall be designed by a professional engineer registered in the state of North Carolina and shall be approved by the Department of Environmental Health and Natural Resources, Division of Environmental Health. All designs shall comply with the Town of Boiling Springs specifications and “Rules Governing Public Water Systems.”

Available Sewer System Lines	
Sewer is available if the subdivision contains the number of lots listed in column one and public lines are within the distance shown in column two.	
LOTS	DISTANCE
2-10	200 feet
11-20	300 feet
21-50	600 feet
51-100	1000 feet
101+	1500 feet

a. 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 in the center of the pavement or right-of-way, where practical, or the south or west side of the pavement.

In natural drainage ways, sewers shall be extended to the property line to readily enable future connection to adjoining property.

Sanitary sewers shall not be installed under any part of an existing impoundment or beneath any area to be impounded. Sanitary sewers shall not be installed through, above, or below any retained earth structure.

A one-hundred (100) foot minimum separation must be maintained from any private or public water supply source, including. A fifty (50) foot minimum separation from waters classified WS-II, WS-III, B, SA, OR, HQW, or SB, and twenty (20) feet from any other stream, lake, or impoundment.

If a deviation from these separations is proposed and approved by the DPW, DIP sewer main with joints equivalent to water main standards must be used. But in no case shall minimum separations be less than fifty (50) feet from a private well or fifty (50) feet from a public water supply.

Sanitary sewers shall be laid at least 10-feet laterally from the 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 public sanitary sewer mains are installed within easements crossing private property, the Town's Public Works Department shall have the right to enter upon the easement for purposes of inspecting, repairing, or replacing the sewer main and appurtenances.

b. Easements:

Sewer easements shall be Twenty (20) feet wide.

Where sewer mains are installed at a depth in excess of 10 feet nominal, the easement widths shall be increased in accordance with the following table:

<i>Sewer Main Depth</i>	<i>Easement Width Increase</i>
10' up to 12'	5 FT
12' up to 14'	10 FT
14' +	Determined by Engineer

Where sewer mains are installed in easements having cross slopes in excess of 5 percent, the easement widths shall be increased in accordance with the following table:

<i>Cross Slope Range</i>	<i>Easement Width Increase</i>
0 --> 10%	0 FT
10 --> 20%	10 FT
> 20%	20 FT

In the alternative, the developer may provide a 20-foot wide terrace or "bench" centered over the sewer pipe. The terrace shall be sloped (2% maximum) from the high side to promote drainage across the easement. The cut and fill slopes on the sides of the easement should not exceed 2 (horizontal) to 1 (vertical). The minimum easement widths may be used when the 20 ft. +/- terrace is provided.

Sewer mains shall be centered in the easement. Under special conditions, temporary construction easements may be required upon approval of the ENGINEER.

The minimum permanent combination easement width for sanitary sewer and storm sewer is 30-feet. There must be a separation of ten (10) feet between outside diameters of pipes and ten (10) feet from the centerline of the sanitary sewer to the easement line.

All off-site easements shall be acquired by the developer. These off-site shall be recorded by and by deed of easement prior to construction approval. These easements shall be dedicated to the Town of Boiling Springs and labeled 'Town of Boiling Springs Sanitary Sewer Easement'.

No person shall place any part of a structure, any permanent equipment, or impoundment of sanitary

sewer easements or mains. Prohibited structures include, but are not limited to: buildings, houses, air conditioning units, heat pump units, decks, garages, storage/tool sheds, swimming pools, walls, retaining wall mechanisms/appurtenances, and fences. Upon prior written approval by the Public Works Department, fences may be permitted across easements; provided that an access gate is installed for the full width of the easement.

No person shall plant trees, shrubs, or other plants within a sewer easement without prior written approval from the Public Works Department. Any such plantings approved by the Public Works Department shall be done so at the risk of the property owner having to replace the plantings due to removal by the Town during maintenance activities.

c. Depth of Cover:

All sanitary sewer mains in non-traffic areas shall be installed with a minimum cover of three (3) feet measured from the finish grade to the top of the pipe. In traffic areas, the minimum depth of cover shall be four (4) feet measured from finish subgrade to the top of the pipe. DIP shall be used when the minimum three feet of cover in a non-traffic area or the minimum four feet of cover in a traffic area cannot be maintained in accordance with NCAC 2H .0219(i)(2)(H).

The depth of sewer mains shall be great enough to serve adjoining property, allowing for sufficient grade on the service line. Lateral connections are to be into manholes or into the top quarter of sewer mains.

Proposed sewers paralleling a creek shall be designed to a proper depth to allow lateral connections, such that all creek crossings will be below the stream bottom elevation. The top of the sewer pipe should be at least one (1) foot below the streambed elevation. The centerline of a main paralleling a creek shall be a minimum of 25-feet from the top of the closest creek bank.

All waterway crossings shall be encased in 3000 psi concrete, a minimum of one (1) foot around the diameter of the pipe. No bells or connections shall be within the waterway crossing area.

For sewer mains excavated between 14 and 20-feet, special bedding details will be required. The sewer shall be set on six (6) inches of No.57 or 67 stone and covered with six (6) inches of No.57 or 67 stone.

Where a sanitary sewer and a water main cross, and the vertical separation is less than eighteen (18) inches or the water line passes under the sewer, both the sewer and the water main shall be ductile iron pipe for a distance of ten (10) feet on each side at the point of crossing. The water line pipe section shall be centered at the point of crossing. Also, the sewer line shall be encased in 3000 psi concrete, a minimum of one foot around the diameter of the pipe.

Transition of sewer main materials shall only occur at manholes.

Sanitary sewers shall have the top of pipe at least twelve (12) inches below the bottom of storm

sewer pipe when the horizontal separation is three (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 twelve (12) inches, the sanitary sewer shall be ductile iron pipe equivalent to water main standards for a distance of ten (10) feet on each side at the point of crossing. The sanitary sewer pipe section shall be centered at the point of crossing.

d. Construction Drawing:

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 Section 1.03 of these Specifications and to the guidelines established by the NC Department of Environmental Health and Natural Resources.

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.

e. Size:

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.

Sewers shall be designed so as to carry the total peak tributary flow at one-half of full depth (50% capacity).

For residential zoning districts, sewer size shall be based on an average daily flow of 100-gpcd and a peak/average ratio of 2.5, which includes an allowance for infiltration. Minimum flow per dwelling unit shall not be less than 300-gpcd. Where average daily flows are less than 10,000 gpd, the peak/average ratio shall be increased to 3.0. For non-residential development, sewer size shall be based on a reasonable population equivalent applied to the same 100-gpcd unit flow and peaking factors utilized for residential flow. In all cases involving non-residential flow, the PROJECT ENGINEER shall furnish complete calculations to establish the basis for pipe sizing.

<i>Sewer Size</i>	<i>Minimum Slope (ft/100ft)</i>
8"	0.500
10"	0.300
12"	0.250

The minimum gradient for sanitary sewer shall not be less than the above. The maximum gradient

for sanitary sewers (and any required anchors) shall be in accordance with NCDENR requirements.

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 in the invert of 0.2 feet. Drop manholes shall be required where the difference in pipe inverts exceeds 2.0 feet in elevation.

g. Service Laterals:

Service laterals shall be tapped a manhole where possible. All businesses shall tap into a manhole. Connections 6-inch and larger shall be made into manholes. All individually owned structures shall require at least one sewer tap. Clean-outs for sewer services shall be located as required by building and plumbing codes.

A clean-out (or manhole) shall be installed of each serviced lot's right-of-way or easement for the Town's use, and shall extend a minimum of six (6)-inches above the finish grade. Minimum grade for service laterals shall be 1/4 inch per foot for four (4)-inch and six (6)-inch.

All service laterals between thirteen (13) and twenty (20) feet deep shall be embedded on six (6) inches of No.57 or 67 stone, covered with six (6) inches of No.57 or 67 stone, and shall be constructed of Schedule 40 PVC or D.I.P. material. Any sewer service lateral deeper than twenty (20) feet shall be pre-approved by the ENGINEER.

Service laterals to be maintained by the TOWN shall not be located beneath a driveway; nor shall a clean out be located in a sidewalk area without prior written permission of the ENGINEER. In the event that a service lateral is located beneath a driveway or other concrete area, every effort shall be made to relocate the service lateral. The ENGINEER will review and specify appropriate measures for only those cases where it is physically impossible to relocate the service lateral; furthermore, financial burden and time constraints shall not be considered as justification for not relocating service laterals. Relocated service laterals shall be constructed perpendicular to the main line or as approved by the ENGINEER, and the clean-out shall be positioned at the edge of the street or easement right-of-way line.

8.02 Pipe Materials For Gravity Sewers

a. General:

Sanitary sewer collection lines, trunk sewers and interceptors shall be constructed using Ductile Iron Pipe (CL350) or SDR-21 (ADTM D 3034) PVC Pipe.

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 may be Class 350 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 seal coat in accordance with ANSI A21.4. The seal coat shall be the coat tar epoxy lining and shall be Indurall coating, Inc. "Ruff-Stuff," Kopper's Company, Inc. "Bitumastic No. 300-M," or equal. Joints for ductile iron pipe shall be mechanical or of the "push-on" type conforming to the requirements of ANSI A21.11.

c. PVC Sewer Pipe – SDR-21:

- 1) PVC sewer pipe for gravity flow installations shall be manufactured in accordance with all requirements of ASTM Standard D-2241 for SDR-21, "Type PSM Polyvinyl Chloride Sewer Pipe and Fittings."
- 2) Pipe Joints - Pipe joints for PVC Sewer Pipe shall be of the bell and spigot type with rubber gasket conforming to ASTM F-477.
- 3) Manufacturer's Certification - The manufacturer of non-pressure PVC Sewer Pipe shall furnish a notarized affidavit certifying as to compliance with the foregoing ASTM Specifications and with the PVC cell classification as specified.

8.03 Manholes & Accessory Materials

a. General Requirements:

All new manholes shall be of precast concrete construction. Brick or block masonry units may only be used for the lower portion of manholes where required for tie-ins to existing sewers. The following minimum diameter manholes shall be utilized dependent upon the size of the mains and depth of installation.

<i>Manhole Diameter</i>	<i>Pipe Size</i>	<i>OR</i>	<i>Depth</i>
4'-0"	8" -- 10"		0' --> 12'
5'-0"	>10"		12' --> 18'

** Or as directed by the Town

Variance from this specification must be approved by the ENGINEER prior to construction. Each manhole shall be of consistent diameter throughout its entire height. Inside drop manholes shall be a

minimum five (5) foot diameter. If more than one (1) inside drop occurs within the same manhole, a six (6) foot diameter manhole is required.

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 five (5) inches thick and the base slab shall have a minimum thickness of six (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 penetration six (6)-inches and larger.

- 2) Joints - Manhole sections shall have a standard tongue and groove joint with a rubber "O"-ring, conforming to ASTM Standard C-443 or butyl rope sealant such as Ram-Nek. A heat shrinkable wrap such as WrapidSeal, shall be installed around the outside of all manhole joints.
- 3) Cone Sections - The upper precast cone sections shall be of the eccentric type with a minimum height of 24 inches. Concentric cones and/or flat top slabs may be used where required for shallow manholes.

c. Manhole Steps:

Manhole steps shall be constructed of a slip resistant reinforced molded polypropylene plastic shell. Reinforcing shall be of a single 3/8" steel bar, ASTM 615 grade 60. The steps shall be equal in all respects to step PS-1 as manufactured by M.A. Industries, Inc. or equivalent product by Oliver Tire & Rubber.

d. Manhole Ring and Cover:

Manhole ring and cover shall meet the requirements of Section 5.03 e of these Specifications for Gray Iron Castings. Minimum weight for the ring and cover shall be 190 lbs. and 120 lbs. respectively. The cover shall be perforated with 2 - 1" diameter holes unless otherwise noted on plans. Manholes shall have rings and covers made by East Jordan Iron Works, Neenah Foundry Company, or equal and should facilitate raising of manhole for future paving. Where deemed necessary in low areas of streets, solid manhole covers may be required by the ENGINEER to prevent surface water inflow into the sewer.

Manholes located along outfalls within the 100-year flood plain per Section 7.14c of these Specifications or where deemed appropriate by the ENGINEER, shall utilize a locking ring and

cover per Detail 7.05.

e. 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 Specification C- 150, Type I. Sand used for mortar shall meet the requirements of ASTM Specification 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.

f. 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. 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.

g. Stone for Stabilization of Trench Foundation:

Stone used for pipe bedding and trench stabilization shall meet the gradation requirements of Table 1005-1 for standard aggregate size No.57 or 67 as contained in Section 1005 of the Standard Specifications for Roads and Structures as published by the NCDOT – July, 1995 edition.

8.04 Service Lateral Materials

a. General Requirements:

All sewer service laterals shall be constructed of either of the two types of materials indicated herein. Prior to beginning work, the CONTRACTOR shall furnish samples of service material fittings to the DPW for approval. Samples shall include saddles, wyes, clean out, 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 PVC and NSF approved. Laying lengths may be 10 or 20 feet. Joints shall be of the solvent weld type.

c. Saddles for PVC Sewer Pipe:

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.

8.05 Trench Excavation and 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 bell, plus eight (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 bell, plus twelve (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 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 OSHA 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 DPW, 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.

In trenches where water is present or where dewatering is required, the trench bottom shall be undercut and stabilized with No.57 or No.67 stone, having a minimum depth of 8-inches.

c. Rock Excavation:

Where 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.57 or No.67 stone. For ductile iron sewer pipe, the bedding may be other native granular soil as may be approved by the 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 2.04c of these Specifications have been met. The CONTRACTOR is also reminded of the work hour limitations for blasting, as also established in Section 2.04c.

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, including the use of an approved blasting mat where there exists the danger of throwing rock or overburden. The CONTRACTOR shall keep explosive materials that 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 materials 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 ENGINEER upon request and shall be kept in an orderly manner. Compliance by the CONTRACTOR with these specifications does in no way relieve him/her of legal liabilities relative to blasting operations.

The 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 as to make blasting hazardous.

8.06 Soils Classifications - for Bedding and Backfill

Soils for pipe bedding and backfill are described in the ASTM D2487 Figure 1 soils classification chart and for purposes of these specifications are grouped in (5) categories as follows, according to their suitability for this application:

a. Class I Soil:

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

b. Class II Soil:

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

c. Class III Soil:

Includes fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil types GM, OC, 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:

Include the organic soils - types OL, OH, and PT, as well as soils containing frozen earth, debris, rocks larger than 1 1/2-inch 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 shall 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 (Standard Proctor Method) 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 four (4) inches below the pipe bell and filled to pipe grade with No.57 or No.67 stone in such a manner that the pipe will be bedded in stone to a vertical 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.57 or 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 (Standard Proctor Method). 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.57 or 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.

8.08 Pipe Bedding Requirements - Ductile Iron Pipe,

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

8.09 Pipe Bedding Requirements - PVC Sewer Pipe, SDR-21

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

8.10 Pipe Bedding Requirements - Schedule 40 PVC Service Pipe

The trench bedding for Schedule 40 PVC Service Pipe shall be Class "C", as defined under Section 7.07b hereof.

8.11 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.

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.

8.12 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 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.

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

The downstream side of the last manhole(s) of a sanitary sewer line extension under construction shall be plugged with a non-pneumatic plug and secured with a stainless steel chain or wire rope to prevent the passage of ground water, runoff and sediment into the sanitary sewer system. All water upstream of the plug shall be pumped out of the sanitary sewer line and all sediment and solids shall be removed and properly disposed of by the Contractor. The plug shall not be removed until the line has been inspected, in accordance with Section 7.18 hereof, by the Town to insure that all possible points of inflow or infiltration have been eliminated. The Director of Public Works shall reserve the right to assess the Contractor or Developer a fine, to cover any remediation costs borne by the Town, for the Contractor's failure to adhere with the requirements of this paragraph.

Where a sewer line crosses an existing or proposed water line or water service line, the sewer shall always be installed beneath the water line, with a minimum separation of 18-inches. The CONTRACTOR shall locate the conflicting water main or service sufficiently far in advance to ensure that the sewer can be laid at the proper gradient and meet the eighteen-inch separation requirement. If this separation cannot be attained, then both the water line and the sewer line shall be constructed in accordance with Section 7.01c hereof.

8.13 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:

The material shall be compacted in 6-inch lifts (loose measurement) to the top of the pipe and compacted to 95% of maximum dry density (Standard Proctor). The backfilling shall be done on both sides of the pipe simultaneously to prevent displacement of the pipe. If the pipe is within an area to be paved or where the trench is immediately behind the curb, the backfill material shall be placed on top of the pipe with an initial lift of twelve (12) inches followed by six (6) inch lifts to the top of the trench. If the pipe is outside of the paved area and is not located directly behind the curb, the backfill material shall be placed on top of the pipe in twelve (12) inch lifts to the top of the trench. The backfill materials shall be moistened when necessary in the opinion of the INSPECTOR to obtain maximum compaction. Water setting or puddling shall not be permitted. See last paragraph of this section for the final backfill requirements.

c. Backfilling - PVC Sewer Pipe – SDR-21:

The material shall be compacted in 6-inch lifts (loose measurement) to the top of the pipe and compacted to 95% of maximum dry density (Standard Proctor). The backfilling shall be done on both sides of the pipe simultaneously to prevent displacement of the pipe. If the pipe is within an area to be paved or where the trench is immediately behind the curb, the backfill material shall be placed on top of the pipe with an initial lift of twelve (12) inches followed by six (6) inch lifts to the top of the trench. If the pipe is outside of the paved area and is not located directly behind the curb, the backfill material shall be placed on top of the pipe in twelve (12) inch lifts to the top of the trench. The backfill materials shall be moistened when necessary in the opinion of the INSPECTOR to obtain maximum compaction. Water setting or puddling shall not be permitted. If there is a question as to soils classification, the CONTRACTOR shall have representative 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. See last paragraph of this section for final backfill requirements.

d. Backfilling - Schedule 40 PVC Service Pipe:

The initial backfill for this pipe material shall be Class I, Class II, Class III or Type ML and Cl soils in the Class IV grouping, placed in six (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 twelve (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 placed and compacted in layers not to exceed six (6) inches. No rocks, boulders, stones, or debris shall be included in the backfill material for at least two (2) feet above the top of the pipe. In traffic areas the final backfill shall be placed and compacted in six (6) inch layers. Backfill shall be of such density

as to ensure no settlement of the trench. Should any sewer trench exhibit settlement, the CONTRACTOR shall correct the deficiency to the complete satisfaction of the ENGINEER. Where the sewer pipe is placed in public roads the backfill shall be compacted to at least 95% standard density as measured by AASHTO Method T-99. Where deemed necessary, the ENGINEER may require compaction tests on backfill placed under State roads or other public roads. The cost for such tests shall be borne by the CONTRACTOR or DEVELOPER.

8.14 Manhole Construction

a. General:

Precast concrete manholes shall be set true to the alignment and elevations indicated on the plans. The monolithic base section shall be set on an eight-inch thick, No.57 or 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.

Backfill around manholes shall be placed uniformly in shallow layers and 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 other approved masonry construction. The inverts shall be shaped to form a smooth and regular surface free from sharp and jagged edges. The benches shall be sloped so as to prevent sedimentation. The inverts from intercepted cross 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 substantially higher elevation than that of the downstream invert, the connecting line shall extend into the manhole a sufficient distance to enable the flow to spill into 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 ENGINEER. Any rings and covers not conforming to the correct grade shall be adjusted by the CONTRACTOR as required. 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.

b. Special Provisions - Drop Manholes:

Where drop manholes are noted on the Drawings, they shall be constructed in accordance with the Standard Detail 7.07. Drop pipe and fittings shall be ductile iron. The sewer pipe entering the drop tee shall consist of one joint of ductile iron pipe.

c. Special Provisions – Manholes Within the 100-Year Flood Plain:

Manholes located within the 100-year flood plain or in areas of high ground water shall be waterproofed by wrapping the individual joints with Conwrap, Conseal, or approved equal. Waterproofing measures shall be approved by the INSPECTOR prior to backfill. Manholes showing signs of infiltration shall be excavated and repaired, to the satisfaction of the ENGINEER, prior to acceptance by the Town.

Manholes located within the 100-year flood plain shall be installed with rim elevations not less than two feet above the flood plain at that location. All manholes located within the 100-year flood plain shall be equipped with a locking ring and cover per Detail 7.05 and shall be vented in accordance with Detail 7.14.

8.15 Construction of Sewer Service Laterals - Additional Provisions

Connection to the sewer main 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 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 lateral shall terminate with a combination wye and 1/8 bend. A vertical riser shall extend and project slightly above grade (6 inches nominal). The riser shall terminate with a female pipe adapter and threaded cap.

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 1/8 inch per foot. Minimum gradient for 6-inch pipe shall be 0.6 percent.

Where service laterals connect to a manhole, an invert shall be constructed wherever possible to provide a smooth flow line. Where the drop is 30 inches or greater, a service drop connection with clean out shall be provided in accordance with the standard detail.

8.16 Installation of Steel Casing Pipes by Boring & Jacking

Steel casing pipe to be installed by simultaneous boring and jacking shall be constructed to the required standards of the NCDOT. 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.

8.17 Cutting & Replacement of Existing Pavements

Open-cut of existing bituminous pavement may be permitted on TOWN streets and/or designated State maintained roads. Where bituminous pavements are open-cut, the pavement shall be restored with pavement replacement conforming to the detail shown on the approved drawings. Prior to open-cutting of the roadway, approval by DPW and/or NCDOT must be obtained in writing.

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.

The pavement shall be cut to true neat lines, with cutting equipment as may be approved by the DPW, 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 the excavated material which would be used for backfill. The edge of the pavement cut shall be at least twelve-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 six (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 or the hole may be filled with full depth asphalt, binder, or flowable material the same day.

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 a strict accordance with the requirement of the NCDOT - Standard Specifications for Roads & Structures latest edition.

NOTE: Black base - type HB shall be used in lieu of ABC, if required by the NCDOT or the TOWN.

8.18 Inspection & Testing of Gravity Sewers

a. Visual Inspection of Pipeline Interior:

Upon completion of any designated portion of the sewer lines, the ENGINEER in the presence of the CONTRACTOR shall conduct a visual inspection of the pipeline interior. 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 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 ENGINEER. The 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.

b. Low Pressure Air Tests:

Portions of the sewer lines, which do not exhibit a ground water problem during 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 ENGINEER. 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 5 psi and allowed to stabilize for a period of two (2) minutes.

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.

<i>Normal Pipe Size (inches)</i>	<i>Time (t) (Minutes/100 ft.)</i>
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
27	4.2
30	4.8
33	5.4
36	6.0
42	7.3

If the pressure stays at 5 psi for the required test time length as noted above, the pipe is acceptable.

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

The CONTRACTOR shall furnish all plugs, compressors, hose, gauges, etc., as required to conduct the low-pressure air test.

c. Infiltration Tests:

Portions of the sewer lines, which exhibit a higher ground water table during construction, shall be tested for infiltration. The portions of the line to be infiltration tested shall be determined by the ENGINEER.

The portion of the sewer line designated by the ENGINEER shall be tested for infiltration by installing a V-notch measuring 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 (infiltration) shall be measured. The rate thus measured shall not exceed 100 gallons per 24 hours per inch of sewer pipe diameter per mile of pipe. The CONTRACTOR shall furnish weirs and other equipment required for infiltration tests and the tests shall be performed in the presence of the ENGINEER.

Should the infiltration tests reveal leakage in excess of the allowable, the leaking joints shall be re-laid 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-21):

If PVC Sewer Pipe (SDR-21) is used for gravity sewer, 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 pipes.

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.

The outside diameter of the 9-arm mandrel shall be as shown below for eight (8)-inch PVC Pipe. The mandrel diameter shall have a tolerance of +/- 0.01". Contact length shall not be less than two (2) inches.

<i>Mandrel Dimensions</i>	
<i>Main Size</i>	<i>PVC Sewer</i>
8"	7.42
10"	9.24
12"	10.96

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 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 ENGINEER. Upon completion of all work, the ENGINEER may require such final deflection testing as may be deemed necessary to ensure that the long-term deflection has not exceeded the maximum allowed deflection.

An INSPECTOR shall approve the mandrel. The CONTRACTOR shall furnish drawings of the mandrel with complete dimensions to the ENGINEER upon request.

SECTION 8
WASTEWATER PUMPING STATIONS & FORCE MAINS

9.01 General

In situations where gravity flow is not feasible, the TOWN 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 Town of Boiling Springs. The factors include:

1. The wastewater flow that would be generated by the total natural drainage basin based upon the existing zoning.
2. An evaluation of the capacity of the receiving sewer main at the point of discharge and downstream to determine that the line could handle the transferred sewer flow.
3. A cost analysis of the pumping versus gravity alternative to demonstrate that gravity service is not feasible.

The above information shall be furnished to the DPW for consideration. The DPW, in collaboration with the Town Manager shall determine whether a pumping station will be permitted.

9.02 Design

a. General Requirements:

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.

Pump stations may be either of the following types:

1. Submersible Non-Clog Pumping Station
2. Submersible Grinder Pump Station

All stations shall have a minimum of two (2) pumps of equal capacity, and shall be capable of handling flows in excess of the expected peak flow. Where three or more pumps are required, they should be of such capacity that with any one unit out of service, the remaining units will have capacity to handle peak sewage flows. Pumps shall be sized to provide a minimum velocity in the force main of 2.5 fps.

Wastewater pumping stations, structure, controls, etc. shall be protected from physical damage by the 100-year flood. Stations shall remain fully operational and accessible during the 100-year flood.

The 100-year flood elevation shall be shown on all site plans.

b. Standby Power:

All wastewater-pumping stations shall be equipped with an automatic alternative power source. Alternative power sources include on-site standby power generator or dual power feed from a separate electric substation.

c. Site Work:

The site work shall be generally graded level to remove runoff from site in a non-erosive manner.

Drainage swales and site sloping shall be provided to direct drainage away from the pump station.

The site shall be stabilized by concrete slab or pavement, crushed stone, low maintenance vegetative ground cover or other suitable materials.

The site area shall be secured by a 6-foot high chain link fence topped with three (3) strands of barb wire. Fence products shall be only new materials using hot dipped galvanized iron or steel components and aluminum coated fabric after fabrication. Gates shall permit 180-degree opening and located so as to provide vehicle accessibility to lift the pumping units. There shall be a minimum gate opening of twelve (12) feet to facilitate truck access.

An all-weather (stone base) access road shall be provided to the pumping station site. The road shall be constructed of Aggregate Base Course, compacted to eight-inch minimum thickness, and shall be a minimum of ten-feet in width, with shoulders and side ditches, as applicable. The maximum roadway grade shall be ten-percent. The site shall feature adequate turn around areas for service vehicles.

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 circuit breaker in the main control panel; or if a timber pole is used, a pole mounted disconnect switch shall be installed. Mounting height shall be 20-feet (minimum) above finished grade.

d. Odor Control:

An adequate odor control facility may be required at a proposed wastewater pump station where deemed necessary by the DPW. This type of facility will be required when lengthy detention times are anticipated thus creating anaerobic conditions resulting in the release of hydrogen sulfide gas. Detention time, length of the force main, slow build out of design capacity, etc., will factor in this determination.

e. Piping & Valves:

Suction and discharge piping shall be ductile iron flanged pipe designed and manufactured per AWWA Specifications C150 and C151.

A check valve and a plug valve shall be provided for the discharge line of each pump. Valves shall be rated for 175 psi (minimum) working pressure. Plug valves shall have full port openings equal to 100% of the adjacent pipe area and shall be capable of passing a 3-inch solid. Check valves and plug valves shall be mounted in the horizontal position. Upon approval of the DPW, gate valves may be used in lieu of plug valves for discharge sizes 6" and smaller.

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.

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

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 double leaf or single leaf (as required) aluminum diamond pattern floor hatch of 1/4-inch (minimum) thickness capable of withstanding 150 psf 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 building to house valves and electrical controls shall be required for submersible pump stations. An isolation valve is required on all force mains outside of the building.

Wet well structures may be cast in place of reinforced concrete or precast concrete construction. If precast manhole units are utilized, they shall conform to the requirements of ASTM C478, with watertight joints per ASTM C443 with durable mastic sealing compound and WrapidSeal on the outside joints. Special requirements of wet wells for submersible pumping stations are noted in Section 8.03 hereof.

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. Vents shall be of ductile iron flanged elbows with an insect screen at the exposed end of the vent. The insect screen shall be of bronze or aluminum mesh.
- 2) Ladders - Each wet well shall be equipped with standard manhole steps as specified to enable access. The PROJECT ENGINEER shall designate the location on the plans during

the review process.

- 3) Waterproofing - Precast structures shall have a coal tar epoxy material applied to the outside of all tongue and groove joints. Prior to backfilling the wet well structure, the entire surface shall receive one (1) coat of coal tar epoxy. The coal tar epoxy material used for exterior coating shall meet the requirements of Corps of Engineers Specification C-200 and shall be Bitumastic No. 300M as manufactured by Koppers or equal as approved by the ENGINEER. The coal tar exterior coating shall be applied as to achieve a dry film thickness of not less than 10.0 mils. The exterior surface shall be clean and dry prior to application of the coating.
- 4) Interior Corrosion Protection - The interior surface of the wet well shall be thoroughly cleaned of all oils, latence, dirt, loose concrete, etc. All voids or surface blemishes shall be filled or repaired using portland cement grout. The joints of pre-cast units shall receive three (3) coats of portland cement grout so as to achieve a smooth surface at each joint. After the interior patching has thoroughly dried, the entire surface of the wet well interior shall receive two (2) successive coats of coal tar epoxy material meeting requirements of Corps of Engineers Specification C-200. The coal tar epoxy coating shall have a minimum dry film thickness of 10 mils per coat - 20 mils total. Coal tar epoxy material used for interior coating shall be equal to Bitumastic No. 300M as manufactured by Kopper's, or equal as approved by the ENGINEER. If material other than Koppers is proposed, it shall be approved by the DPW prior to use.

All bolted connections (including pipe flanges) inside the wet well shall be made using stainless steel bolts, nuts and washers.

- 5) Handrail Around Hatch Opening - Submersible Pumping Stations - An aluminum handrail shall be provided around the wet well opening of all submersible pumping stations or submersible grinder type pumping stations. The handrail shall be closed on three sides, with the fourth side closed by a latching chain. The handrail shall be permanently attached to the concrete cover slab. The chained side of handrail shall face the chain link fence gates for access and pump maintenance.

h. Electrical Controls:

Power service to wastewater pumping stations shall be three phase where pump motors are three horsepower (3 HP) or greater.

- 1) Control Sequence - On rising liquid level in the wet well, a float level control system shall initiate operation of the lead pump at the elevation indicated on the drawings. Should the liquid level continue to rise, a second setting 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 setting 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 above the "Lag Pump On" level, a fourth setting would activate the alarm circuit.

2) Control Panel - The duplex pump control panel shall be furnished by the pump manufacturer, completely pre-wired, factory assembled, tested and ready for service. Where possible, pump controls shall be housed in a single panel.

For outside installations at submersible stations, the panel shall be a NEMA 3R door-in-door enclosure, fully gasketed with drip cap. The panel shall be suitable for mounting on the panel board as indicated on the drawings.

The panel shall contain the following elements:

- Separate Manual Disconnect for each pump with 2-pole adjustable overload protection for each phase
- Magnetic starter for each pump motor with all leg quick trip ambient compensated overload protection for each motor. Overloads are to have an auxiliary contact for automatic dialer.
- Hand-Off-Auto selector switch for each pump
- Automatic Electric Alternator with ability to designate either Pump 1 or Pump 2 as lead
- Circuit Breaker for Control Circuit
- Motor Thermal protection - Motor control circuit is to shut down if high temperature occurs. Manual resets to be provided.
- A float control system for the duplex pumps and alarms.
- Control Disconnect
- Seal failure light for each pump and contact closure for automatic dialer (submersible installations only)
- High temperature light for each pump and contact closure for automatic dialer (submersible installations only)
- Running light for each pump
- Non-resettable, elapsed time meter for each pump, reading in tenths of hours. Capacity 100,000 hours.

- High-level alarm light with Red Globe and contact closure for automatic dialer. (Remote mounting for “package” pumps station where panel is inside pump compartment)
 - All necessary internal wiring, relays, etc. to provide the operation as described.
- 3) Protection from Weather - All external electrical control apparatus shall be protected from the weather by means of a weather shield fabricated of aluminum sheet, 3/16" thickness. The weather shield shall be of adequate size to accommodate all electrical control apparatus, including meter base, service entrance disconnect switch, automatic transfer switch, alarm dialer, and pump control panel (submersible pump stations only). The weather shield shall have a clear height of 7'-0", and a minimum overhang of 4'-0". The width shall not be less than 8'-0". The weather shield structure shall consist of structural steel or galvanized pipe supports with horizontal members as required for individual support of each equipment item and the weather shield. If bare structural steel is used for the weather shield structure, the steel shall be hand tool cleaned, primed and painted with a high-build epoxy polyamide coating system, Tnemec Series 66 or equal. A suitable barrier of neoprene or similar material shall be placed between the steel support members and the aluminum sheet to prevent galvanic corrosion.

i. Alarm Dialer:

On all wastewater pumping station installation, an automatic alarm dialer shall be furnished and installed. The dialer unit shall conform to the specifications presented herein under Section 9.05.

j. Water Service Lines:

Each pumping station shall have a metered potable water supply service line consisting of a 1" service line to the pump station site with a freeze-proof yard hydrant. An RPZ backflow preventor shall be installed on the service line.

9.03 Submersible Non-Clog Pump Stations

a. General:

Submersible pumping stations shall be furnished with the following principal features:

- 1) Duplex, Non-Clog Pumps - capable of passing a 3-inch sphere.
- 2) Guide Rail System - including a quick-connect, base discharge elbow mounted to the wet well floor. Guide rails shall be stainless steel pipe, 2-inch minimum diameter, Schedule 40.
- 3) Submersible Pump Motors - shall meet UL requirements for Class I, Division I, Group D for hazardous locations. Dual seals shall be provided and all leads shall be epoxy sealed. Pumps

shall be fitted with seal moisture sensor and thermal sensor, both wired to the control panel and alarm system. Motors shall be furnished with a minimum of 30 feet of waterproof, multi-conductor power and control cable for direct feed to control panel without splicing.

4) Precast Concrete Wet Well

- Minimum size: 6' 0" (inside diameter)
- Base Slab: cast in place, reinforced concrete having a minimum 28-day compressive strength of 4,000 psi. No precast base sections may be used.
- Riser Sections: precast concrete sections conforming to ASTM C-478 with watertight joints per ASTM C-443.
- Top Slab: Cast-in-place, reinforced concrete having a minimum 28-day compressive strength of 4,000 psi.

5) Valve and Electrical Building

6) Site Work Improvements - as required per Section 9.02 (c) hereof.

7) Control Panel

8) Alarm Dialer System

9) Water Supply Line - as required per Section 9.02 (j) hereof.

b. Manufacturer:

Submersible pumps, motors and accessory equipment shall be as manufactured by Fairbanks Morse or Myers as approved by the Public Works Director.

c. Shop Drawing:

Prior to purchase of submersible pumping equipment, the CONTRACTOR shall submit not less than four (4) sets of data to the 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) bound complete O & M Manuals shall be furnished to the DPW 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 Town of Boiling Springs, certain spare parts, including a spare pump, shall be furnished, consisting of any items, which may be recommended by the equipment manufacturer and listed, in the O & M Manual. For submersible pumps, a replica of the nameplate with serial number, model number, manufacturer, operating conditions, etc. shall be provided.

f. **Warranty:**

The manufacturers of the pumping equipment, control panel, and dialer shall warrant to the Town of Boiling Springs that the equipment which 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 TOWN. The warranty shall name the TOWN as warrantee and shall be delivered to the ENGINEER at the time of final acceptance.

9.04 Submersible Grinder Pump Stations

a. **General:**

Submersible pumping stations shall be furnished with the following principal features:

- 1) Duplex, Grinder Pumps – with a single rotating grinder impeller and a single stationary shredding ring.
- 2) Guide Rail System - including a quick-connect, base discharge elbow mounted to the wet well floor. Guide rails shall be stainless steel pipe, 2-inch minimum diameter, Schedule 40.
- 3) Submersible Pump Motors - shall meet UL requirements for Class I, Division I, Group D for hazardous locations. Dual seals shall be provided and all leads shall be epoxy sealed. Pumps shall be fitted with seal moisture sensor and thermal sensor, both wired to the control panel and alarm system. Motors shall be furnished with a minimum of 30 feet of waterproof, multi-conductor power and control cable for direct feed to control panel without splicing.
- 4) Precast Concrete Wet Well
 - Minimum size: 5' 0" (inside diameter)
 - Base Slab: cast in place, reinforced concrete having a minimum 28-day compressive strength of 4,000 psi. No precast base sections may be used.
 - Riser Sections: precast concrete sections conforming to ASTM C-478 with watertight joints per ASTM C-443.

- Top Slab: Cast-in-place, reinforced concrete having a minimum 28-day compressive strength of 4,000 psi.

- 5) Valve and Electrical Building
- 6) Site Work Improvements - as required per Section 9.02 (c) hereof.
- 7) Control Panel
- 8) Alarm Dialer System
- 9) Water Supply Line - as required per Section 9.02 (j) hereof.

b. Manufacturer:

Submersible pumps, motors and accessory equipment shall be as manufactured by Fairbanks Morse or Myers as approved by the Public Works Director.

c. Shop Drawing:

Prior to purchase of submersible pumping equipment, the CONTRACTOR shall submit not less than four (4) sets of data to the 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) bound complete O & M Manuals shall be furnished to the DPW 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 Town of Boiling Springs, certain spare parts, including a spare pump, shall be furnished, consisting of any items, which may be recommended by the equipment manufacturer and listed, in the O & M Manual. For submersible pumps, a replica of the nameplate with serial number, model number, manufacturer, operating conditions, etc. shall be provided.

f. Warranty:

The manufacturers of the pumping equipment, control panel, and dialer shall warrant to the Town of Boiling Springs that the equipment which 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 TOWN. The warranty shall name the TOWN as warrantee and shall be delivered to the ENGINEER at the time of final acceptance.

9.05 Alarm Dialer System

a. General:

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

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 and installations of the required phone jack.

b. Functional Description:

The Alarm Dialer System shall be completely self-contained and fully automatic. The system shall monitor a minimum of four (4) independent alarm conditions plus power failure. (Common alarm conditions shall be wired in series 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.

The system shall be connected into the telephone line network through a self contained FCC approved coupler and shall plug into a standard jack supplied with the telephone line. A regular telephone line shall be used with the system or latest technology of communication.

Upon operation of any alarm contact, the system shall address the telephone line, wait for a dial tone, and begin dialing the first four (4) field programmed telephone numbers consisting of from two (2) to sixteen (16) digits. A keyboard shall remain in operation during reprogramming of telephone numbers.

The voice message shall be electronically synthesized and programmed prior to installation in sufficiently clear language to advise operator of the alarm status. Dialer units using motors, tapes, pick-up heads, etc., are not acceptable.

After dialing the first priority number, the system shall indicate the pump station name and alarm message. The message shall be repeated up to sixteen (16) times with time between to allow party to acknowledge by pressing a "touch-tone" key or calling in. After acknowledgment the system shall vocalize a sign-off and hang up. After a 30-minute delay to allow for corrective action, the system shall begin the re-dial sequence at one (1) minute intervals if corrective action has not been taken. Should other alarm conditions occur during the delay, the system shall redial the numbers in order of

priority until a party is reached. The system shall be capable of being called to check the alarm status at the station.

If the first priority party is not reached, the system shall hang up, wait 60 seconds, and dial the second priority number. If no party is reached after dialing all four (4) numbers in order of priority, the system shall return to the first priority number and repeat the sequence indefinitely.

The system shall operate from a 120 VAC source with continuously float charged batteries capable of 24 hours standby operation during power outages. The operating temperature range shall be -20 degrees C to +50 degrees C.

Alarm contacts to the system shall be provided through standard AC wire from various locations in the pump station. Contacts shall be rated 120 VAC, 1 AMP resistive.

For outside installations, the alarm dialer enclosure shall be equipped with a thermostatically controlled strip heater.

c. Alarm Conditions:

The following alarm conditions shall be monitored at the pump station. The fault conditions shall be grouped to provide six (6) alarm groups to the dialer:

	Submersible Stations	Flooded Suction
Fault I	Wet Well High Level	Wet Well High Level
Fault II	Pump #1 Failure (Over temp/ Overload/Seal Moisture)	Pump #1 Failure (Over temp/ Overload)
Fault III	Pump #2 Failure (Over temp/ Overload/Seal Moisture)	Pump #2 Failure (Over temp/ Overload)
Fault IV	Generator Running (Report)	Generator Running (Report)
Fault V	Generator Failure	Generator Failure
Fault VI	Power Failure	Power Failure

d. Manufacturer:

The automatic alarm dialer system shall be the Sensaphone Express manufactured by Phonetics, Inc., or equal, as may be approved by the Public Works Director.

e. Installation:

- 1) For Submersible Pump Installations - The system shall be housed in a heavy gauge, UL listed steel cabinet painted with epoxy or baked-on enamel paint, NEMA 4. The unit shall be mounted adjacent to the control panel beneath the rain shield.
- 2) For Package Pump Stations - The system shall be housed in a NEMA 1 enclosure and housed in the pump compartment. The unit shall be furnished and installed by the pump station manufacturer.

9.06 Standby Power Generator System

a. General:

All pump stations shall have an automatic standby power generation system conforming to these specifications. The system shall consist of a natural gas (if available) or propane (with a buried tank) fueled standby generator in a weatherproof enclosure complete with all equipment and accessories required to automatically supply power to the pump station during a utility power failure. The engine generator set shall start the two-wastewater pumps in sequence and will run both simultaneously under full load. Simultaneous starting is not required.

b. Engine:

The engine shall have the following features:

- 1) Engine shall be propane fueled, 4-cycle. Engine shall be 1800 rpm, unless the TOWN waives this requirement.
- 2) Engine shall be liquid cooled and shall have a radiator, coolant pump, thermostat and fan. Air-cooled engines may be approved by the Town for installation of less than 10 kW.
- 3) Fuel system shall be for gaseous propane.
- 4) Governor shall be mechanical flyweight type with a speed regulation of 5 percent maximum.
- 5) Lubrication shall be by a positive displacement lube oil pump with positive pressure lubrication to all bearings. Full flow lube oil filter shall be provided.
- 6) Starting system shall be 12 volt, positive shift gear engaging starter.
- 7) Battery charging alternator shall be belt driven, 12 volts, 35 amps with solid state voltage regulator. A battery float charger shall be provided.
- 8) An engine block heater shall be provided with control thermostat. The unit shall be 120 volt.

c. Alternator:

The alternator shall have the following features:

- 1) Alternator shall be revolving field, broad range, brushless type designed for minimum resistance, low voltage, waveform distortion, and maximum efficiency. Rotor shall be dynamically balanced permanently aligned to engine by flexible disc coupling. Maximum allowable voltage dip shall be 30%.
- 2) Exciter shall be 3 phase, full-wave rectified with silicon diodes mounted on a common motor shaft, sized for maximum motor starting.
- 3) Voltage regulator shall be solid state with silicon-controlled rectifiers with phase controlled sensing circuits.
- 4) Temperature rise at rated load shall be within limits for class F insulation in accordance with NEMA MG 1-22.40.
- 5) Insulation system shall be Class F in accordance with NEMA MG1-1.65. Rotor shall be vacuum impregnated with 100% solid epoxy resin for complete environmental protection. Stator shall be impregnated twice with varnish conforming to MIL-I-24092, Type M, Class 155.
- 6) Output circuit breaker shall be 3-pole, rated at 145% of alternator full load current.

d. Unit Performance:

Frequency regulation of the generator unit shall be 3 hertz maximum, no load to rated load. Voltage regulation shall be plus or minus 2 percent, no load to rated load. Voltage drop during motor starting shall not prevent the successful starting of the pump motors in the pump station.

e. Control Panel:

A unit mounted control console shall be furnished with the following items, completely wired and installed:

- 1) Engine start/stop controls
- 2) Run/Stop/Remote switch
- 3) Remote start/stop terminals for 2-wire starting from automatic transfer switch
- 4) Oil pressure gauge

- 5) Coolant temperature gauge
- 6) Charge rate ammeter
- 7) Overcrank protection and alarm light
- 8) Low Pressure shutdown and alarm light
- 9) High coolant temperature shutdown and alarm light
- 10) Overspeed shutdown and alarm light
- 11) AC Voltmeter and selector switch
- 12) AC ammeter and selector switch
- 13) Voltage adjusting rheostat
- 14) Running time meter
- 15) Exciter circuit breaker, manual reset
- 16) Alarm contact for automatic dialer (generator fail signal)
- 17) Frequency Meter

f. Accessories:

All accessories needed for the proper operation of the generating set shall be furnished and installed. These shall include, but are not limited to, the following:

- 1) Muffler with residential silencing
- 2) Flexible exhaust connection
- 3) Exhaust pipe
- 4) Starting batteries
- 5) Battery cables
- 6) Battery rack (inside weatherproof enclosure)

- 7) Battery float charger
- 8) Propane tanks, pressure regulator, air and fuel filters, valves and piping
- 9) Flexible fuel line connections to the engine

g. Weatherproof Enclosure:

The generator control panel, batteries and battery charger shall be installed in a weatherproof enclosure.

The weatherproof enclosure shall be welded reinforced sheet steel, 14 gauge, prime coated and finished painted, and shall have hinged or lift-off doors for access to the generator set and all other equipment inside.

h. Gaseous Fuel System:

All equipment and piping for the propane fuel system shall be furnished and installed. The fuel system shall conform to NFPA 58.

- 1) Fuel Tank - above ground tank sized to ensure starting and running of the generator set under full load for a period of not less than twenty four (24) hours, or longer if required by State regulatory authorities, at an ambient temperature of 20 degrees F. Design pressure rating shall not be less than 250 psig.
- 2) Fuel Piping - shall comply with NFPA 58 for a design working pressure of 250 psig. Pipe size shall be per manufacturer's recommendations, but not less than ½-inch.
- 3) Vapor Withdrawal System - shall include a manual shut-off valve at the tank(s), a vaporizer, dry full filter, line service regulator, solenoid fuel shut-off valve to open when engine runs, flexible pipe connection at the engine, and a gas flow regulator.

i. Fuel, Antifreeze, Oil:

An 80% charge of propane in the propane storage tank shall be provided at the time of final acceptance by the TOWN. Complete charges of antifreeze and oil shall be provided.

j. Tests:

After installation of the engine generator set is complete, and prior to its acceptance by the TOWN, the supplier shall demonstrate the capability of the system to perform in accordance with these specifications to the satisfaction of the TOWN.

A 4-hour load bank test shall be performed to load the generator set to the alternator kW rating at 1.0 power factor. The TOWN shall witness the test.

Any defects that become evident during this test shall be corrected.

Safety shutdown features shall be tested by simulating the primary device contact closure.

k. Manufacturer:

The standby power generator set shall be ONAN, KOHLER, CATERPILLAR, GENERAC or equal as determined by the Public Works Director.

1. Parts & Service:

The generator set, controls, and transfer switch shall be furnished by a single supplier.

The engine-generator set 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 radius of the location of the installed generator set.

m. Automatic Transfer Switch:

The transfer switch, supplied as part of the standby power supply, shall be capable of switching all classes of load and shall be rated for continuous duty when installed in a non-ventilated enclosure constructed in accordance with Underwriter's Laboratories, Inc., Standard UL-508.

The transfer switch shall be housed in a NEMA 3R enclosure. Switch size/rating shall be as indicated on the approved Drawings.

The transfer switch shall be double throw, actuated by a single electrical operator momentarily energized, and connected to the transfer mechanism by a simple overcenter type linkage with a total transfer time not to exceed ½ second from line-to-neutral and from neutral-to-line. The transfer switch shall be capable of transferring successfully in either direction with 70% of rated voltage applied to the switch terminals.

An adjustable time delay in the neutral position (0.5 sec.) between the opening of the closed contacts and the closing of the open contacts shall be provided to allow the loads to be demagnetized before transfer. This type transfer switch shall allow the motor and transfer loads to be re-energized after transfer with normal inrush current.

The normal and standby contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing.

Main contacts shall be mechanically locked in position in both the normal and standby positions without the use of hooks, latches, magnets, or springs, and shall be silver tungsten alloy protected by

arching contacts, with magnetic blow-outs on each pole. Interlocked molded case circuit breakers are not acceptable.

The transfer switch shall be equipped with a manual operator that is designed to prevent injury to the operating personnel if the electrical operator should suddenly become energized during manual transfer. The manual operator shall provide the same contact-to-contact transfer speed as the electrical operator to prevent a flash over from switching the main contacts slowly.

In addition to the above, the transfer switch must have a short circuit with capability in excess of the UL minimum requirements as follows:

100 - 150 amperes	16,000 RMS amperes symmetrical
225 amperes	20,000 RMS amperes symmetrical
400 - 800 amperes	40,000 RMS amperes symmetrical
1000 - 1600 amperes	50,000 RMS amperes symmetrical
2000 - 3000 amperes	73,000 RMS amperes symmetrical

Engine starting contacts shall be provided to start the generating plant if any phase of the normal source drops below 80% of rated voltage, after an adjustable time delay period of 3 seconds to allow for momentary dips. The transfer switch shall transfer to standby as soon as the voltage and frequency have reached 90% of rated voltage. After restoration of normal power on all phases to 90% of rated voltage, an adjustable time-delay period of 0-30 minutes shall delay retransfer to normal power until it has had time to stabilize. If the standby power source should fail during the time delay period, the time delay shall be bypassed, and the switch shall return immediately to the normal source. After the switch has retransferred to normal, the engine generator shall be allowed to operate at no load for an adjustable period of time (0-15 minutes) to allow it to cool before shutdown. The transfer switch shall include a test switch to simulate normal power failure, pilot lights on the cabinet door to indicate the switch closed on normal or standby, and two (2) auxiliary contacts on the main shaft; one (1) closed on normal, the other closed on emergency. In addition, one (1) set of relay contacts shall be provided to open on loss of the normal power supply. All relays, timers, control wiring and accessories shall be front accessible. Contacts shall be provided to the alarm dialer for generator "RUN" and generator "FAIL." In addition, contacts interlocked to the pump control shall be provided to open when the switch is in the EMERGENCY position to lockout the "LAG" pump.

As a pre-condition for approval, all transfer switches, complete with timers, relays and accessories shall be listed by Underwriter's Laboratories, Inc. in the Electrical Construction Materials Catalogue under Standard UL-1008 (Automatic transfer switches) and approved for use on Emergency Systems.

A programmable exerciser shall be provided which will allow the operator to schedule the starting and transfer time based on the TOWN'S standard exercising schedule. The exerciser program shall allow the operator to monitor run time.

n. Submittal Data:

The CONTRACTOR shall furnish to the DPW six (6) copies of complete data and shop drawings for the generator set to be furnished.

o. 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.

p. Warranty:

The complete standby power generating system shall be warranted for one year after the acceptance of the generating system by the TOWN. 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 DPW.

9.07 Force Main Materials

a. General:

Force mains shall be constructed of ductile iron pipe as specified herein. PVC pipe may be utilized on force mains 3-inches and smaller.

Force mains from pumping stations shall be sized to maintain a minimum flushing velocity of 2 feet per second. Grinder pumps shall be utilized on force mains smaller than 4-inches.

b. Ductile Iron Pipe:

All ductile iron pipe shall be designed as per AWWA Standard C150 for a working pressure of 150 psi, 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 18-foot or 20-foot lengths.

c. PVC Pipe - 3-Inch & Smaller:

Unless otherwise shown on the approved plans, small diameter PVC pipe shall be Class 200, SDR 21, conforming to ASTM Designation D-2241. Joints for pressure rated PVC pipe may be of the rubber ring, bell joint type, where the bell is an integral and homogenous part of the pipe barrel. The basic pipe material shall meet the requirements for Type 1, Grade 1, for PVC 1120 of the ASTM Resin Specification D-1784.

Pressure-rated PVC pipe, Class 200, shall be as manufactured by Johns-Manville, Clow, Robin-Tech or approved equal.

d. Fittings:

Fittings for ductile iron or PVC pipe force mains, four (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(j) of these Specifications. Fittings for PVC force mains, three (3) - inch diameters and smaller, may be Schedule 40 PVC fittings with solvent weld socket joints. PVC fittings shall be manufactured by the same company manufacturing the PVC pipe, so as to assure compatibility.

9.08 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.

The engineering drawings for all force mains shall include a profile drawing for the entire length of the main.

Force mains shall be installed in dedicated public rights-of-way or in dedicated utility easements conforming to Section 7.01b.

b. Sewer Air Valves:

Sewer air valves and/or air and vacuum valves shall be installed at all high points on the force main. The sewer air valves shall be installed in a precast concrete manhole per Standard No.7.09. The manhole interior surface shall receive a coal tar epoxy coating (one coat).

c. Receiving Manholes - Special Requirements:

The interior surface of the receiving manhole at the discharge end of the force main shall also receive a single coat of a coal tar epoxy coating. Coal tar epoxy coatings shall conform to Corps of Engineers Specification C-200 and shall be Koppers Bitumastic No. 300M, or approved equal. The coating shall have a dry film thickness of 10 mils, and all nicks and scratches shall be touched up prior to acceptance.

Force mains shall discharge at the invert of the receiving manhole and at an angle which is as close as possible to 180-degrees of the outlet pipe.

d. Force Main Identification:

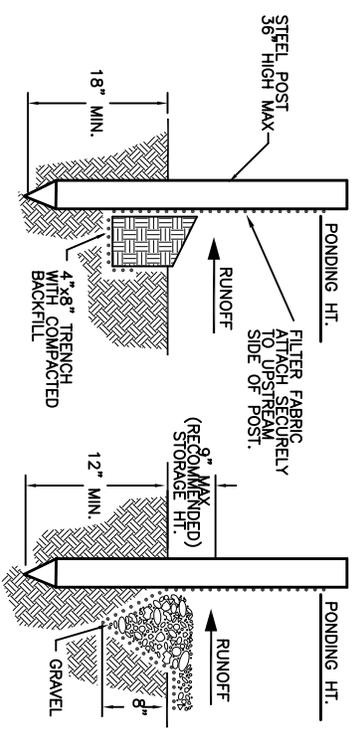
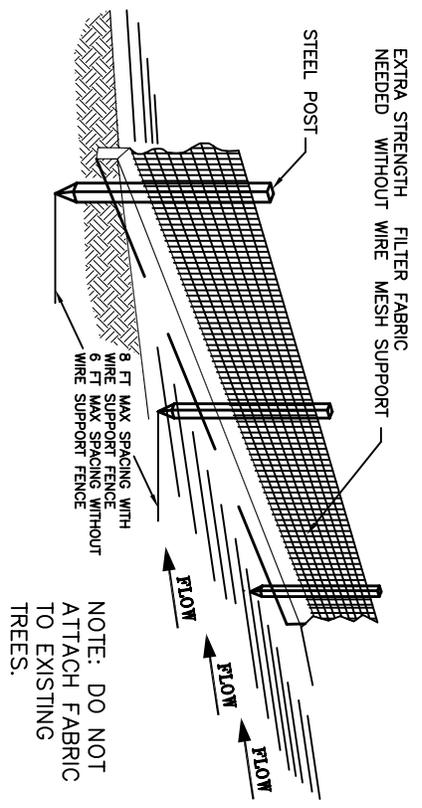
All force mains shall be appropriately identified upon installation so that the pipe will not be confused with potable water distribution mains. The force main pipe shall be marked on top of the pipe with the word "sewer."

In addition, where force mains are of PVC pipe, a color-coded metallic detector tape shall be installed in the force main trench approximately 12" below ground surface. The tape shall be as previously specified for PVC water mains, except the tape shall be marked with standard underground marking - "CAUTION - BURIED FORCE MAIN BELOW." The tape shall meet the APWA color code requirement for sewer force mains.

e. Testing of Force Mains:

All force mains shall be subjected to a hydrostatic test according to the provisions of Section 6.09 of these Specifications.

*** * * END OF STANDARD SPECIFICATIONS * * ***



NOTE:

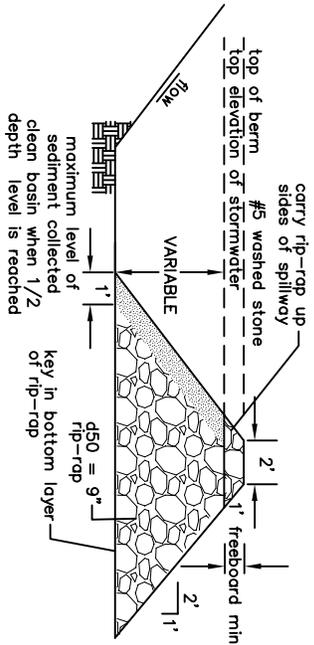
1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.
2. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.

DATE	REVISIONS DESCRIPTION

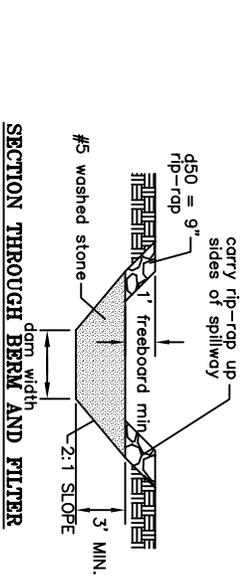
TOWN OF BOILING SPRINGS STANDARDS

STANDARD TEMPORARY SILT FENCE DETAIL

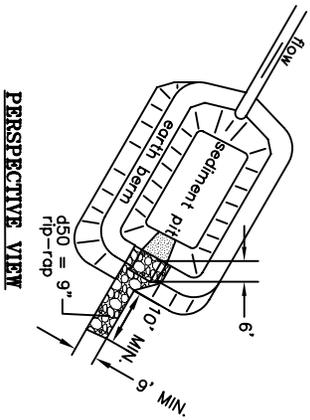
STD. NO.
2.01



SECTION THROUGH BASIN AND FILTER



SECTION THROUGH BERM AND FILTER



PERSPECTIVE VIEW

CONSTRUCTION SPECIFICATIONS

1. Clear, grub, and strip area of all vegetation and root material. Remove all objectionable material.
2. Ensure fill material is free of objectionable material. Place fill in 6" lifts and machine compact.
3. Protect connection between riprap and soil by using filter fabric. Extend fabric across spillway foundation and sides to top of dam.
4. Clear pond area below dam for sediment cleanout.
5. All cut and fill slopes should be 2:1 or flatter.
6. Ensure stone section has min. bottom width of 3' with max side slopes of 2:1.
7. Ensure weir is level and constructed to grade.
8. Material used in stone section should be well-graded mixture of stone with d50 size of 9" and max size of 14".
9. Ensure spillway extends past toe of embankment until stable conditions are reached. Keep edges of stone outlet flush with surrounding ground and shape center to confine outlet stream.
10. Direct emergency bypass to natural, stable areas.
11. Stabilize embankment and all disturbed areas immediately after construction, including embankment, emergency spillway, above the sediment pool and downstream.
12. Mark cleanout level in field.

REVISIONS	
DATE	DESCRIPTION

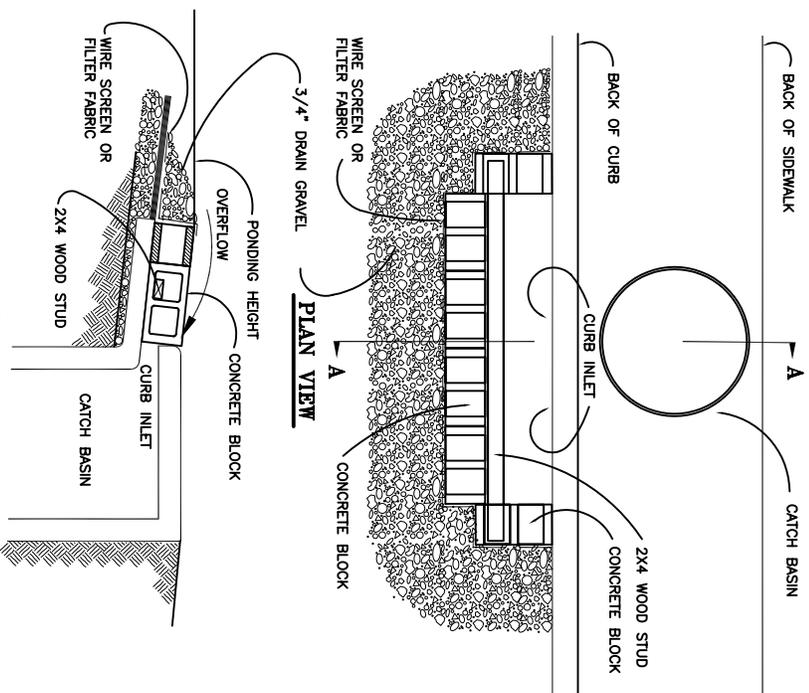
**TOWN OF BOILING SPRINGS
STANDARDS**

STANDARD TEMPORARY SEDIMENT TRAP

STD. NO.

2.02

1. Place two concrete blocks on their sides perpendicular to the curb at either end of the inlet opening. These will serve as space blocks.
2. Place concrete blocks on their sides across the front of the inlet and abutting the spacer blocks. The openings in the blocks should face outward, not upward.
3. Cut a 2- by 4-inch stud the length of the curb inlet plus the width of the two spacer blocks. Place the stud through the outer hole of each spacer block to help keep the front blocks in place.
4. Place wire mesh over the outside vertical face (open ends) of the concrete blocks to prevent stone from being washed through the blocks. Use chicken wire, hardware cloth with 1/2 inch openings, or filter fabric.
5. Place 3/4 inch to 1-1/3 inch gravel against the wire to the top of the barrier.



- NOTES:
1. USE BLOCK AND GRAVEL TYPE SEDIMENT BARRIER WHEN CURB INLET IS LOCATED IN GENTLY SLOPING STREET SEGMENT, WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
 2. BARRIER SHALL ALLOW FOR OVERFLOW FROM SEVERE STORM EVENT.
 3. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.

REVISIONS

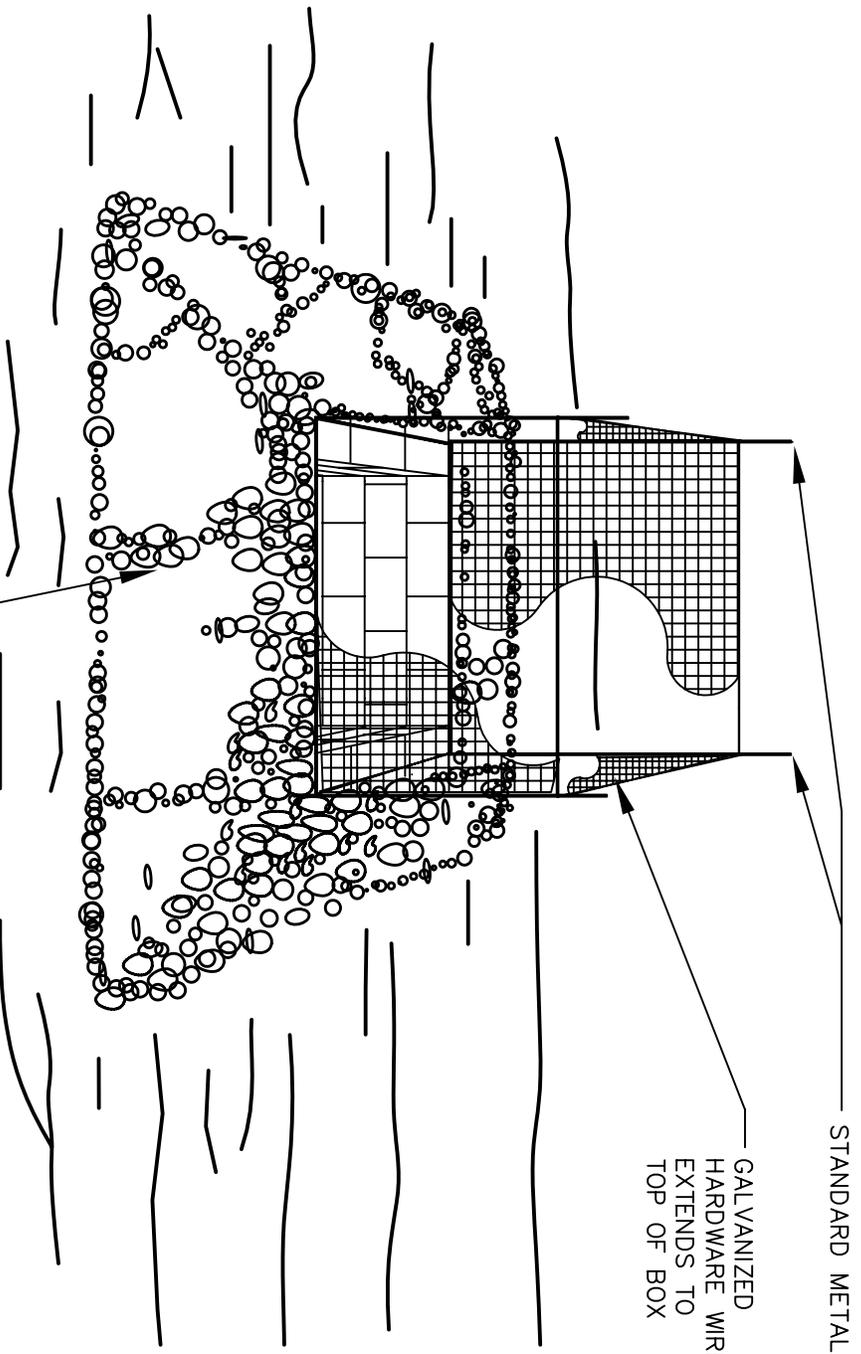
DATE	DESCRIPTION

TOWN OF BOILING SPRINGS
STANDARDS

CURB INLET SEDIMENT FILTER

STD. NO.

2.03



57 WASHED STONE PLACED TO A HEIGHT OF 12"-18" MIN. ABOVE TOP OF BOX

REVISIONS	
DATE	DESCRIPTION

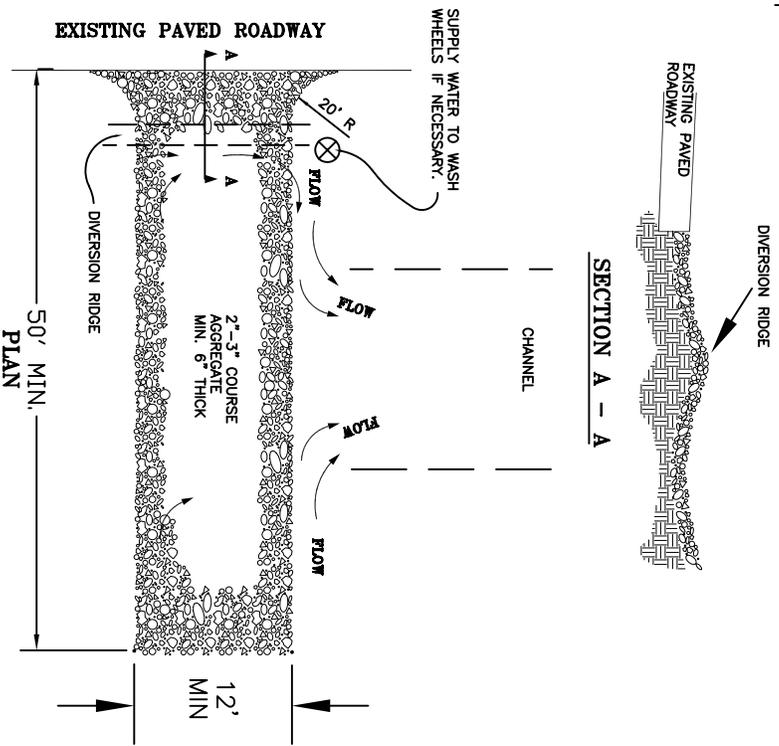
**TOWN OF BOILING SPRINGS
STANDARDS**

YARD INLET SEDIMENT FILTER

STD. NO.	2.04
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CONSTRUCTION SPECIFICATIONS

1. Clear the entrance and exit area of all vegetation, roots, and other objectionable material and properly grade it.
2. Place the gravel to the specific grade and dimensions shown on the plans, and smooth it.
3. Provide drainage to carry water to the sediment trap.



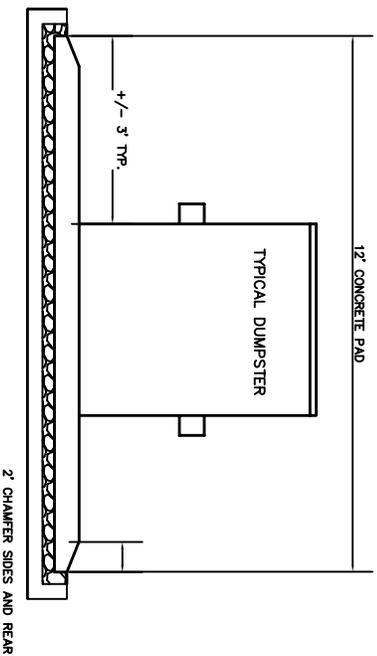
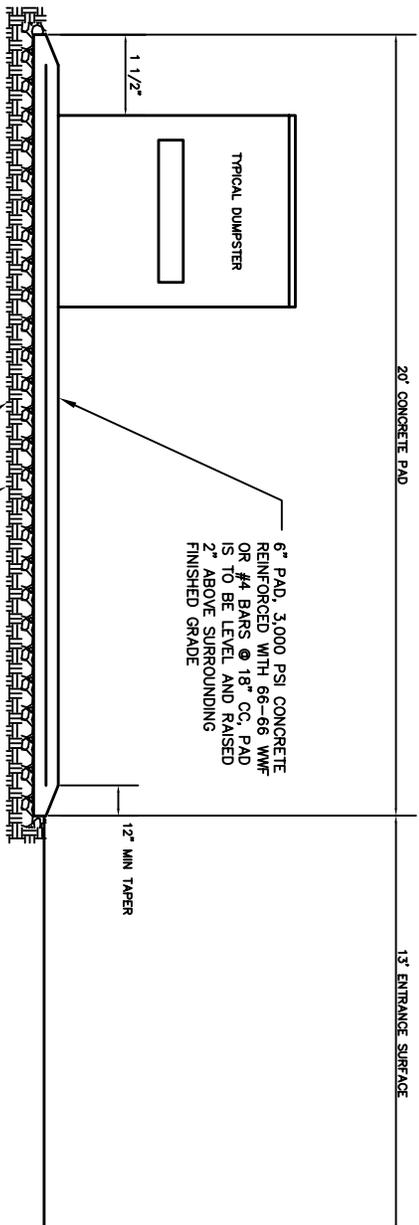
- NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
 2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
 3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

TEMPORARY CONSTRUCTION ENTRANCE

STD. NO.
2.05



- GENERAL NOTES:
1. NO OBSTRUCTIONS SHALL BE PERMITTED WITHIN 23' ABOVE DUMPSTER PAD OR ENTRANCE.
 2. FENCING MUST BE PLACED OUTSIDE OF PAD. GATES SHALL HAVE 12' CLEAR OPENING

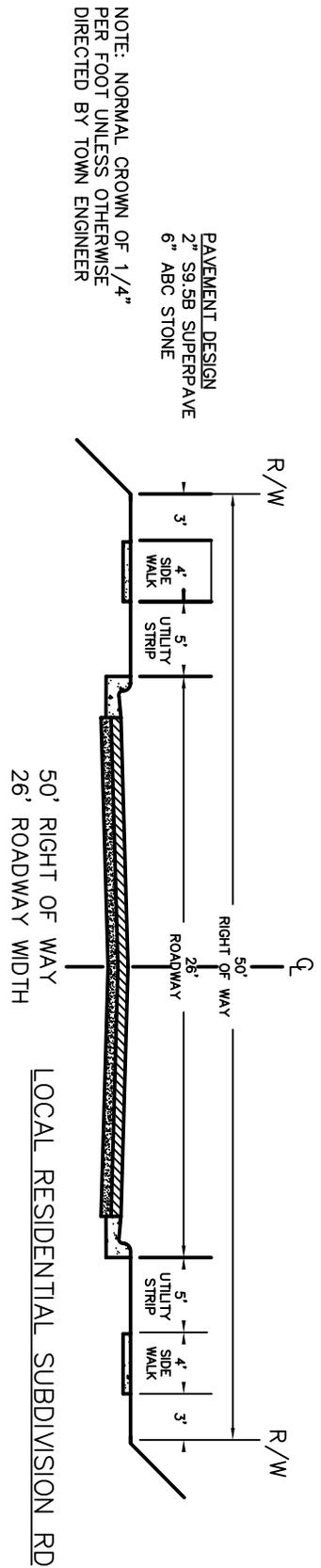
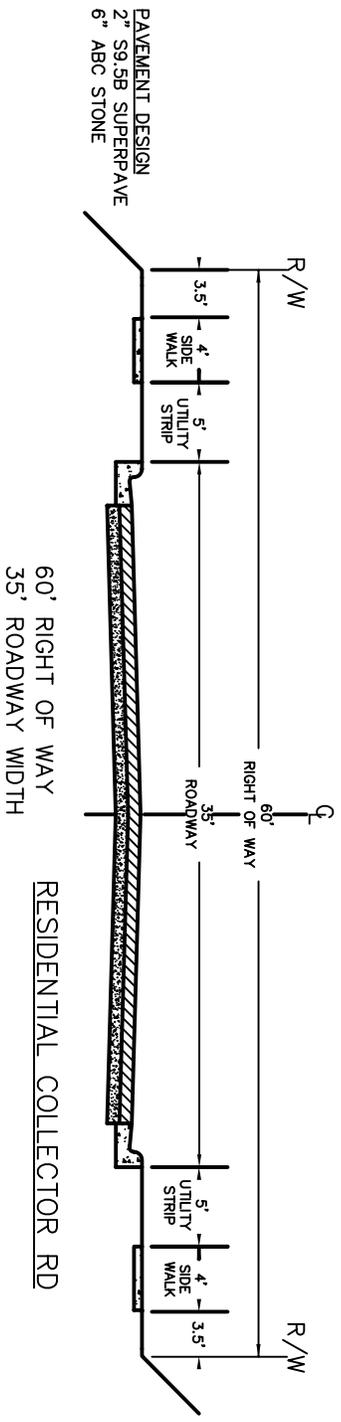
REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

DUMPSTER PAD DETAIL

STD. NO.

2.06



NOTE: NORMAL CROWN OF 1/4" PER FOOT UNLESS OTHERWISE DIRECTED BY TOWN ENGINEER

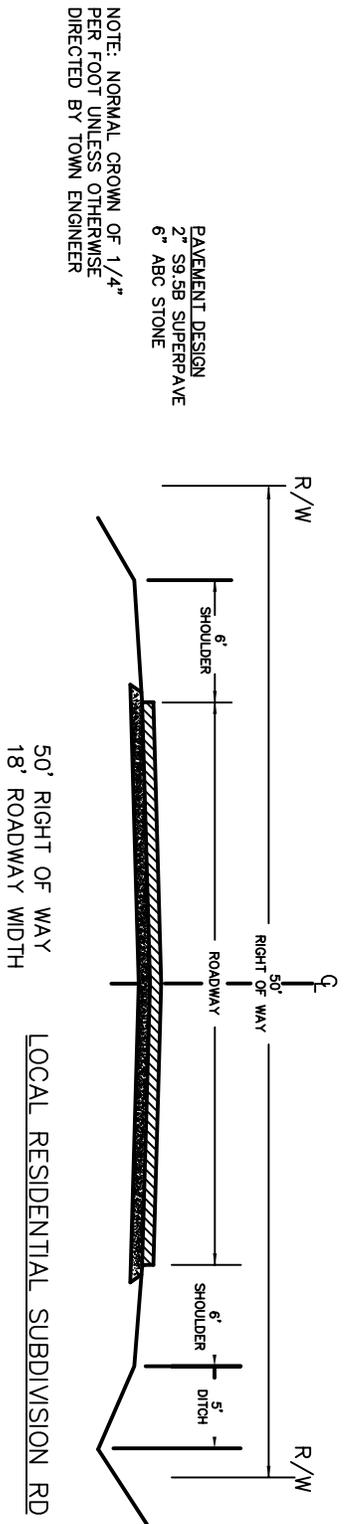
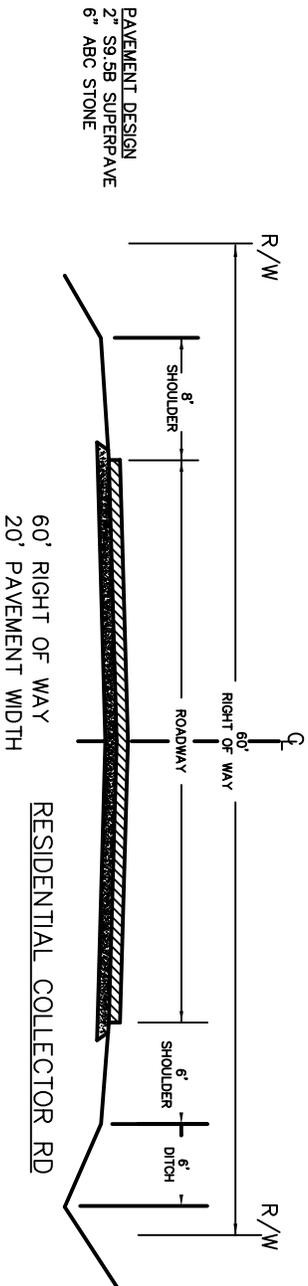
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	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

STANDARD STREET SECTION

STD. NO.

3.01a

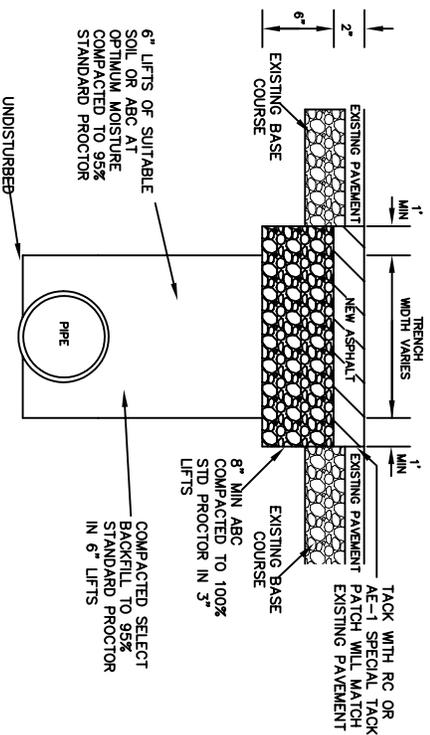
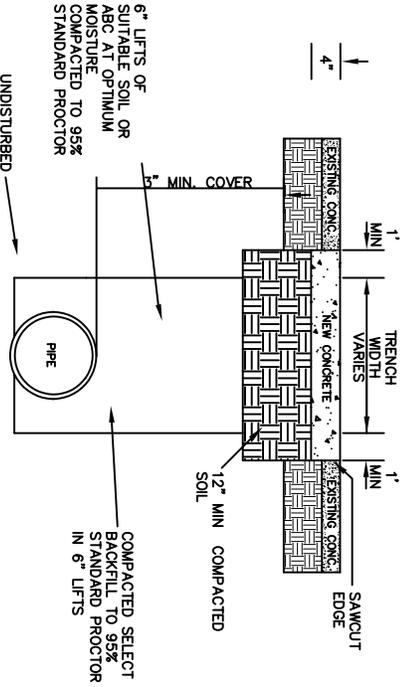


REVISIONS
DATE
DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

STANDARD STREET SECTION

STD. NO.
3.01b



ALL PAVEMENT CUTS SHALL BE REPAIRED WITHIN A MINIMUM OF SEVEN (7) DAYS FROM THE DATE THE CUT IS MADE. IF CONDITIONS DO NOT PERMIT A PERMANENT REPAIR WITHIN THE GIVEN TIME LIMIT, PERMISSION TO MAKE A TEMPORARY REPAIR MUST BE OBTAINED FROM THE TOWN ENGINEER

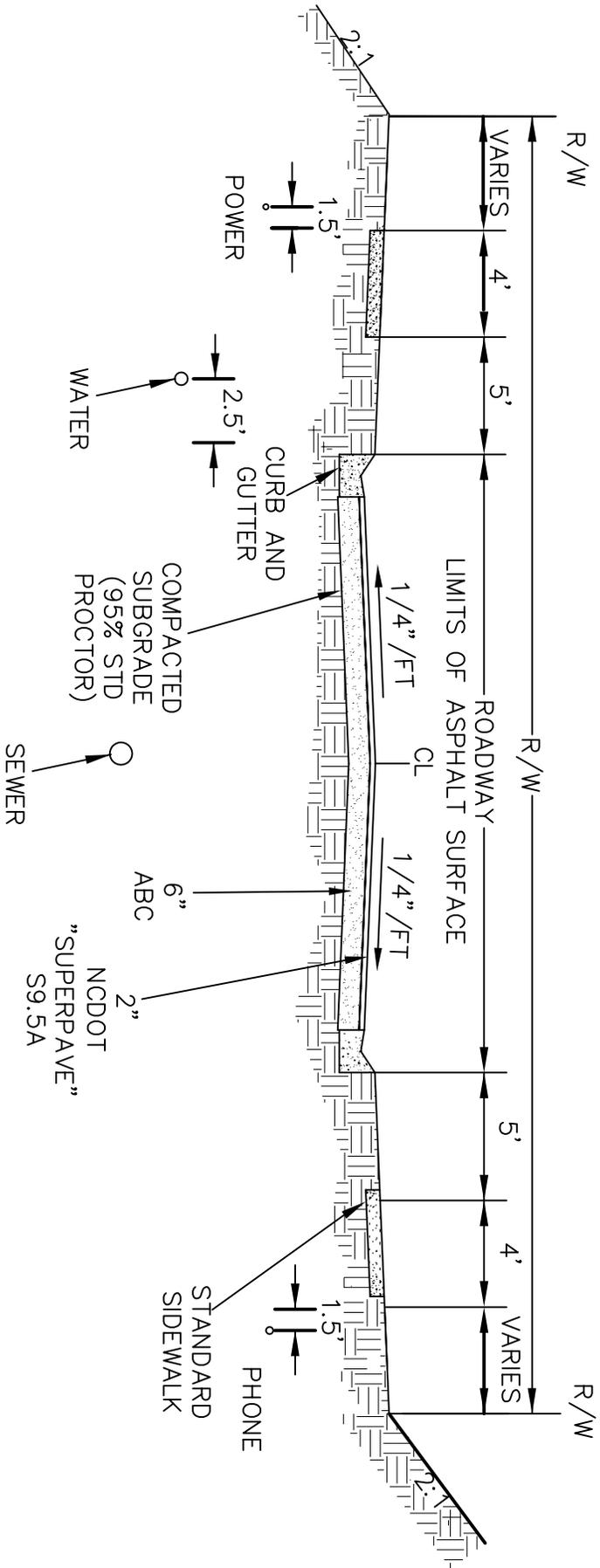
REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

**STANDARD TRENCH AND PAVEMENT
REPAIR SECTIONS**

STD. NO.
3.03

NOTE: ONLY GRASS TO BE PLANTED
IN UTILITY STRIP

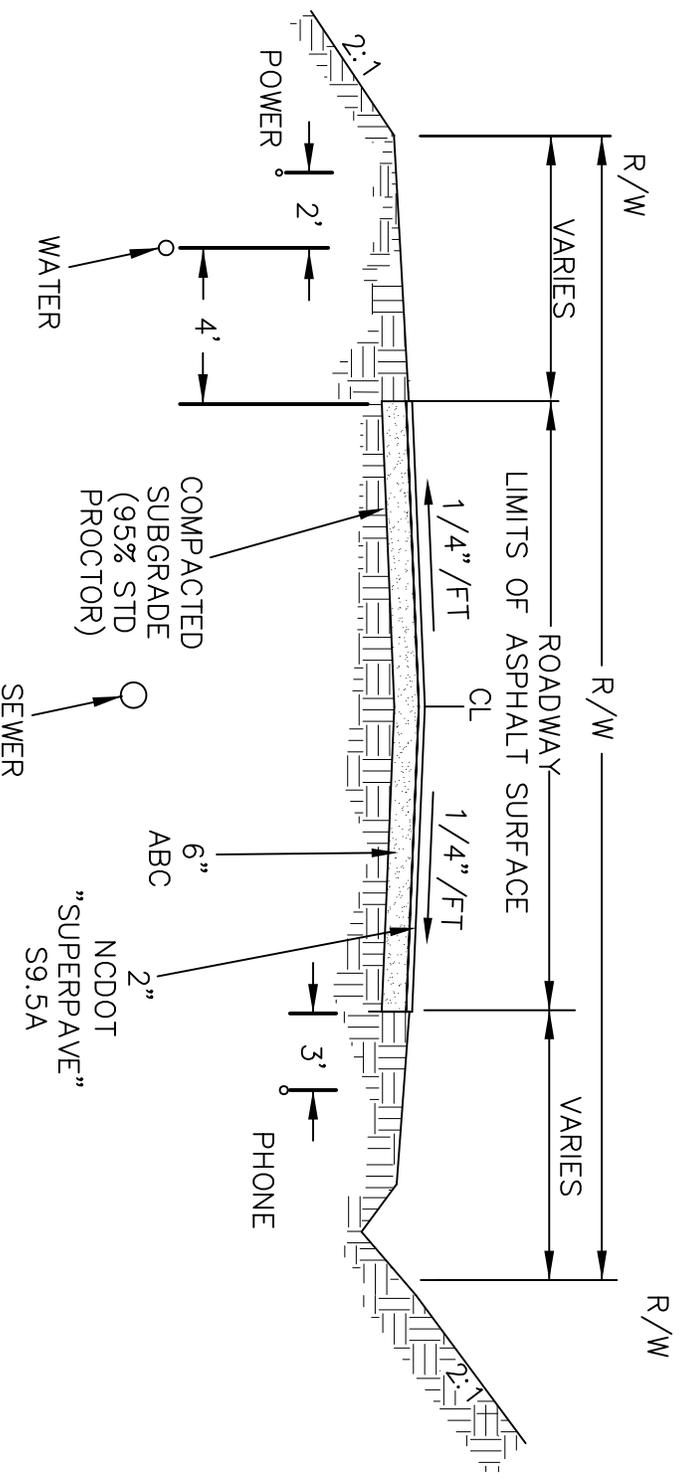


REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

STANDARD UTILITY CORRIDOR

STD. NO.
3.04c



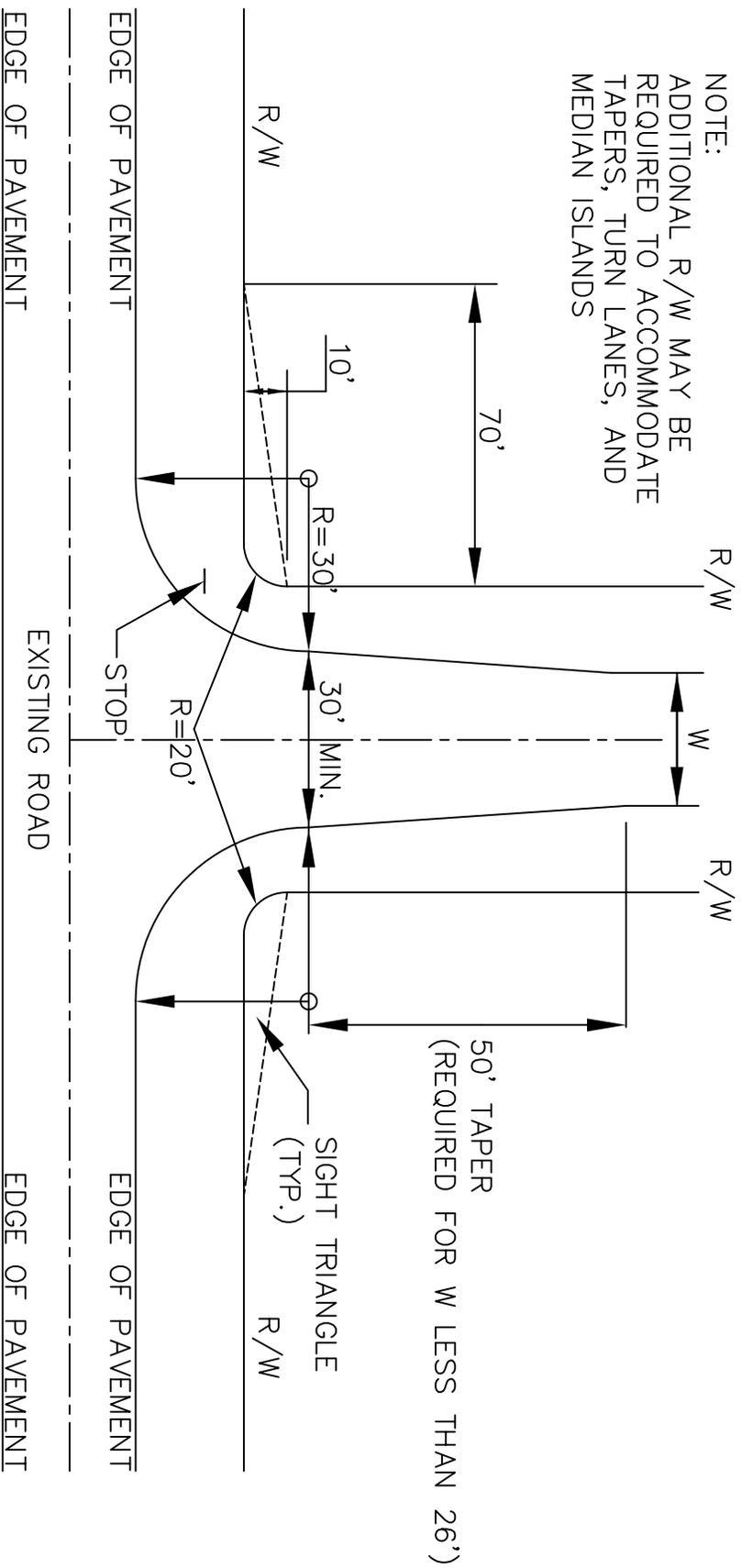
REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

STANDARD UTILITY CORRIDOR

STD. NO.
3.04b

NOTE:
 ADDITIONAL R/W MAY BE
 REQUIRED TO ACCOMMODATE
 TAPERS, TURN LANES, AND
 MEDIAN ISLANDS



**NOTE: PERMANENT DRAINAGE EASEMENTS MAY BE REQUIRED TO ACCOMMODATE DRAINAGE BEYOND THE RIGHT-OF-WAY

REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
 STANDARDS**

**STREET INTERSECTION
 TURN**

STD. NO.
 3.05

Classification	Min. Design Speed (MPH)	Horizontal Curve Controls			Vertical Curve "K" VALUE	
		Max. Super Elevation (ft./ft.)	Minimum Radius (ft.)	Maximum Grade (%)	Length Crest (ft.)	Length Sag (ft.)
RESIDENTIAL COLLECTOR RD	35	NC	310'	8	45	45
LOCAL RESIDENTIAL SUBDIVISION RD	30	NC	230'	8	30	30

NOTES:

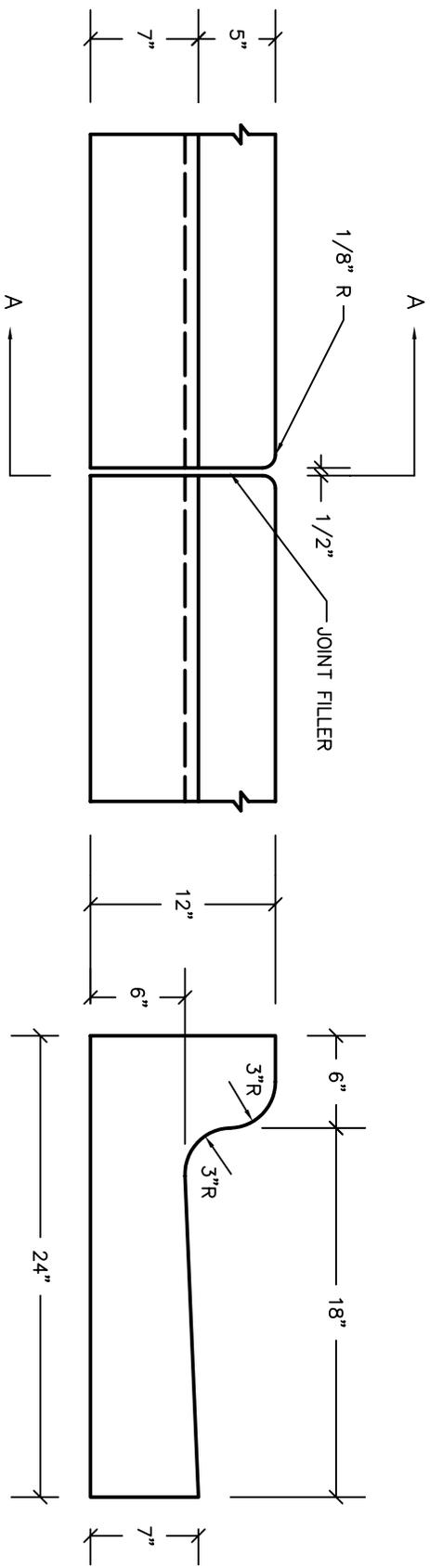
DESIGN SPEED SHALL NOT BE LESS THAN 5 MPH GREATER THAN THE POSTED SPEED.

NC = NORMAL CROWN, A PARABOLIC CROWN WITH AN AVERAGE CROSS SLOPE OF 1/4" PER FOOT MEASURED OUTWARD FROM THE CENTERLINE.

THIS TABLE OUTLINES MINIMUMS FOR ROADWAY DESIGN. SOUND ENGINEERING JUDGMENT SHOULD BE EXERCISED WHEN USING MINIMUM DESIGN STANDARDS FOR ROADS. ALTERNATE DESIGNS SHALL BE IN ACCORDANCE WITH THE NCDOT ROADWAY DESIGN MANUAL OR A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS, LATEST EDITION PUBLISHED BY AASHTO.

REVISIONS	
DATE	DESCRIPTION

TOWN OF BOILING SPRINGS STANDARDS	PUBLIC STREET GEOMETRIC STANDARDS	STD. NO.
		3.06



FRONT ELEVATION
TRANVERSE EXPANSION JOINT

SECTION A--A
SIDE ELEVATION

COMBINATION CURB & GUTTER

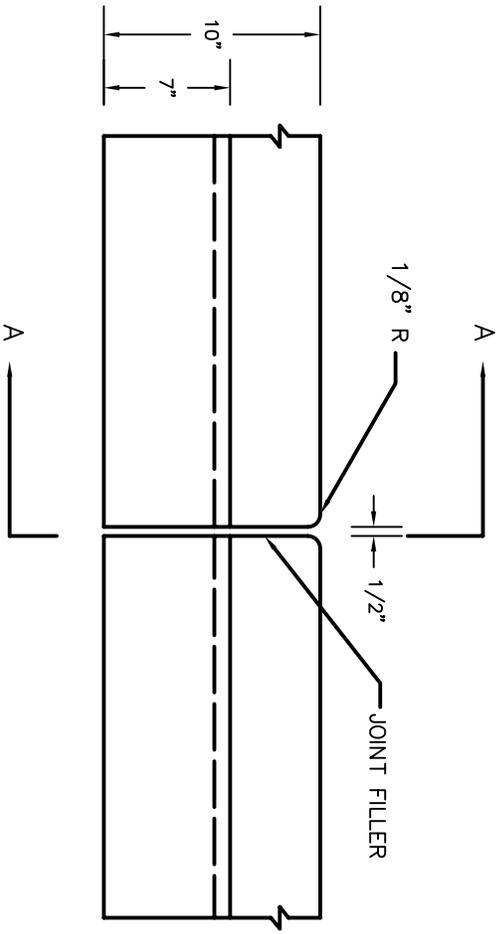
- NOTE:
1. CONCRETE SHALL BE 3000 PSI.
 2. FOR HAND POURED CURBING, CONTRACTION JOINTS SHALL BE SPACED AT 10' INTERVALS & EXPANSION JOINTS SHALL BE PLACED AT 50' INTERVALS.
 3. FOR EXTRUDED CURBING, CONTRACTION JOINTS SHALL BE SPACED AT 15' INTERVALS & EXPANSION JOINTS SHALL BE PLACED AT 90' INTERVALS.
 4. FINISH ALL CONCRETE WITH CURING COMPOUND.
 5. FOLLOW ALL APPLICABLE ACI REQUIREMENTS.

DATE	REVISIONS DESCRIPTION

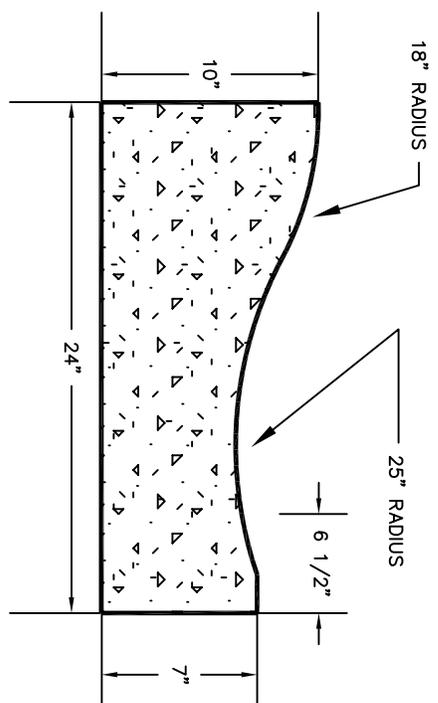
**TOWN OF BOLLING SPRINGS
STANDARDS**

STANDARD CONCRETE CURB AND GUTTER

STD. NO.
4.01



FRONT ELEVATION
 TRANSVERSE EXPANSION JOINT



SECTION A-A
 SIDE ELEVATION

COMBINATION CURB & GUTTER

- NOTE:
1. CONCRETE SHALL BE 3000 PSI.
 2. FOR HAND POURED CURBING, CONTRACTION JOINTS SHALL BE SPACED AT 10' INTERVALS & EXPANSION JOINTS SHALL BE PLACED AT 50' INTERVALS.
 3. FOR EXTRUDED CURBING, CONTRACTION JOINTS SHALL BE SPACED AT 15' INTERVALS & EXPANSION JOINTS SHALL BE PLACED AT 90' INTERVALS.
 4. FINISH ALL CONCRETE WITH CURING COMPOUND.
 5. FOLLOW ALL APPLICABLE ACI REQUIREMENTS.

DATE	REVISIONS DESCRIPTION

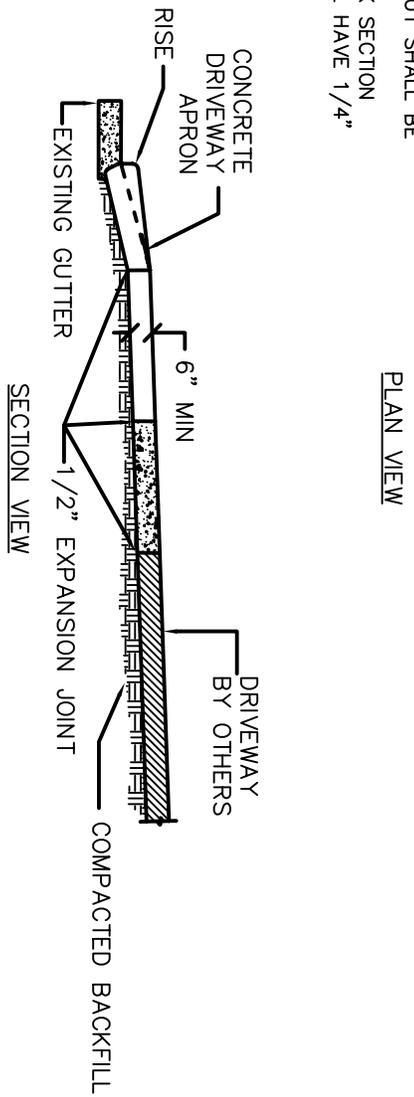
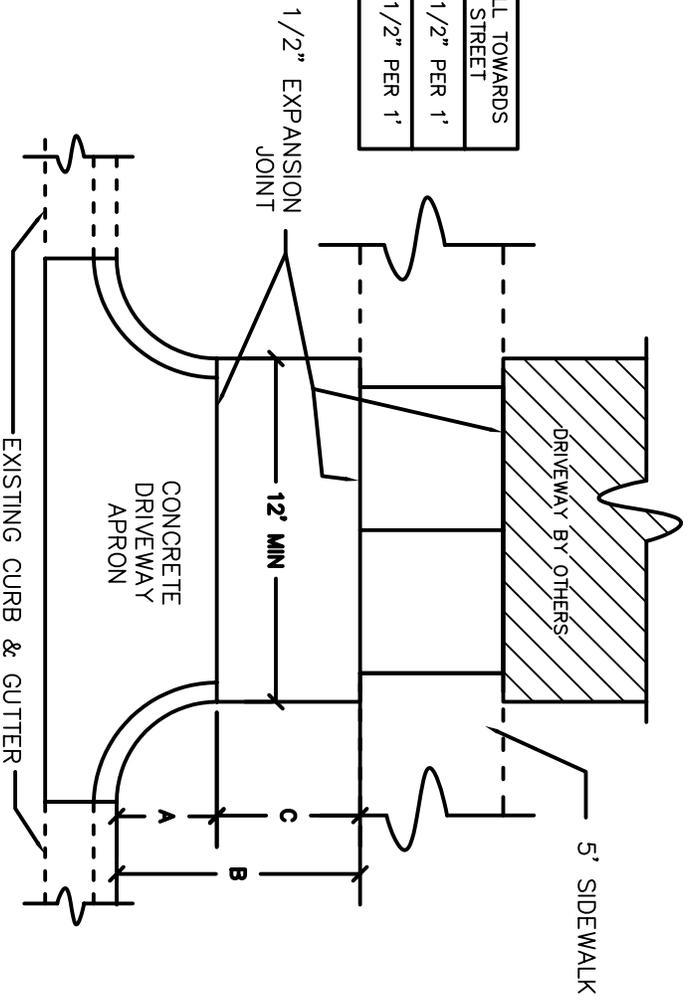
**TOWN OF BOILING SPRINGS
 STANDARDS**

MOUNTABLE OR VALLEY CURB AND GUTTER

STD. NO.
 4.02

STREET WIDTH	A	B	C	FALL TOWARDS STREET
32' B-B	3'	6'	3'	1/2" PER 1'
28' B-B	3'	6'	3'	1/2" PER 1'

- NOTES TO CONTRACTOR:
1. RESIDENTIAL DRIVEWAYS TO BE 12' TO 18' IN WIDTH.
 2. ALL CONCRETE SHALL BE 3000 PSI.
 3. IF CURB CUT IS WITHIN 5' FROM A JOINT, THEN THE CUT SHALL BE MADE AT THAT JOINT.
 4. ALL DRIVEWAYS SHALL BE INSTALLED WITH A SIDEWALK SECTION AND UTILITY STRIP AS SHOWN. SIDEWALK SECTIONS SHALL HAVE 1/4" PER FOOT FALL TOWARDS THE STREET.

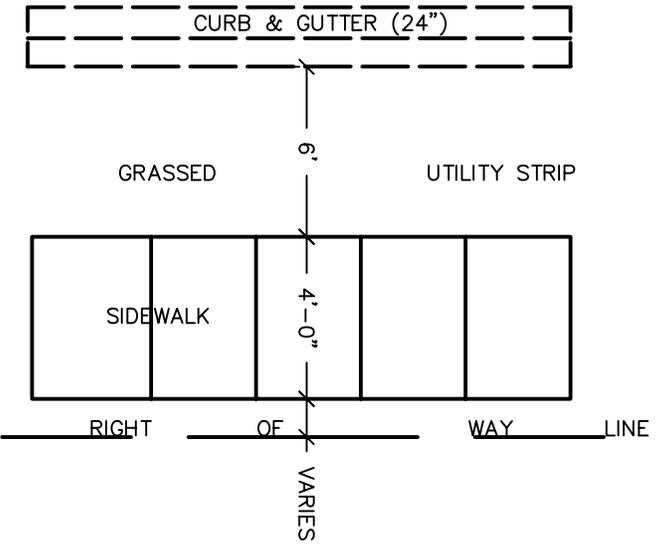


**TOWN OF BOILING SPRINGS
STANDARDS**

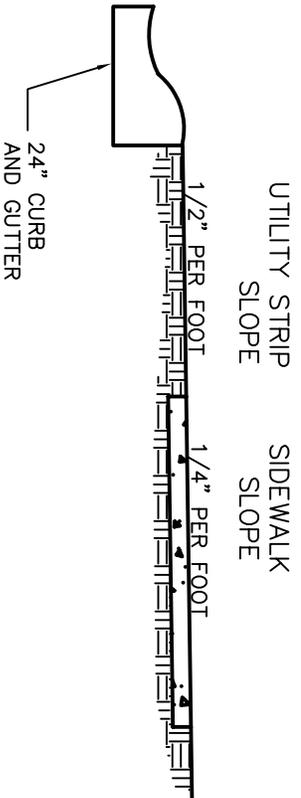
STANDARD RESIDENTIAL DRIVEWAY APRON

STD. NO.
4.04

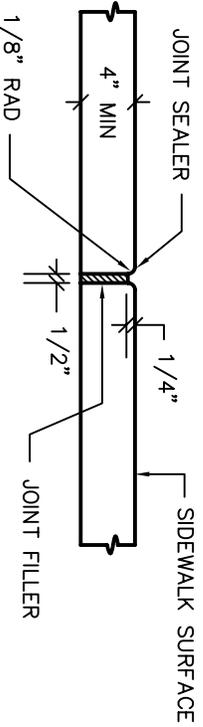
DATE	REVISIONS DESCRIPTION



- NOTES:**
1. TRANSVERSE EXPANSION JOINTS TO BE A MAXIMUM OF 50'.
 2. ALL CONCRETE TO BE FINISHED WITH CURING COMPOUND.
 3. ALL CONCRETE SHALL CONFORM TO ALL APPLICABLE REQUIREMENTS OF THE ACI.



TYPICAL SECTION



TRANSVERSE EXPANSION JOINT

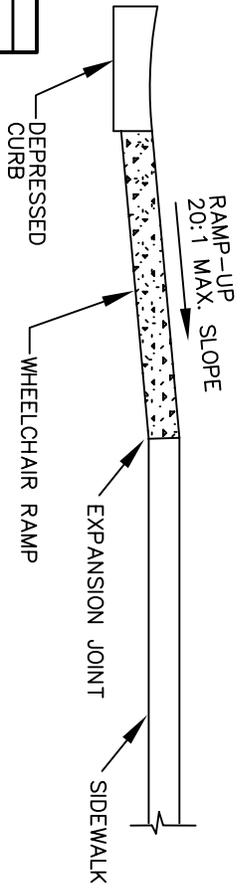
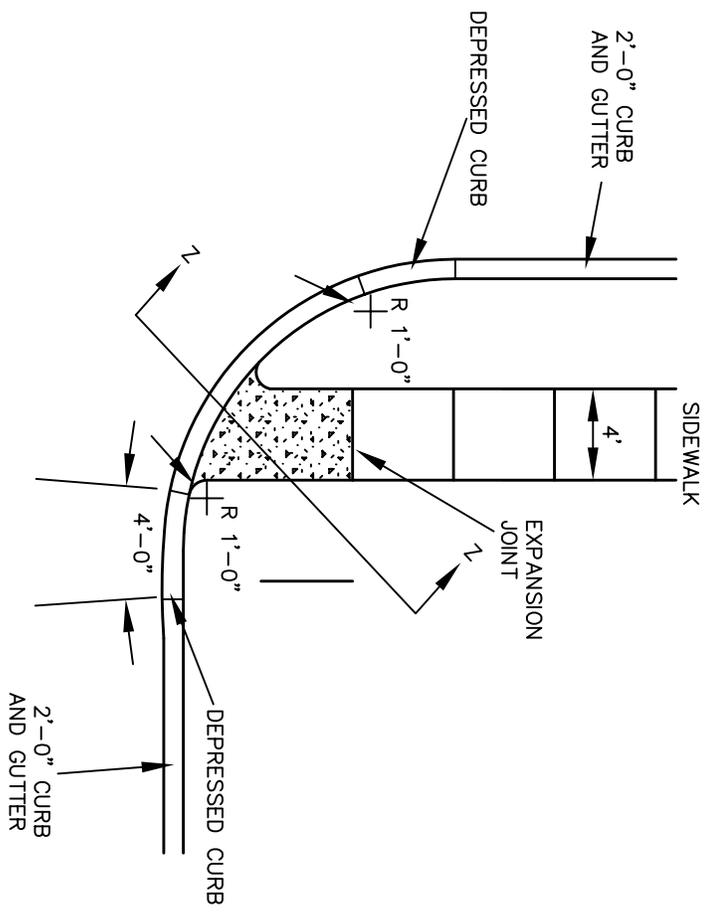
**TOWN OF BOILING SPRINGS
STANDARDS**

STANDARD CONCRETE SIDEWALK

STD. NO.

4.05

DATE	REVISIONS DESCRIPTION

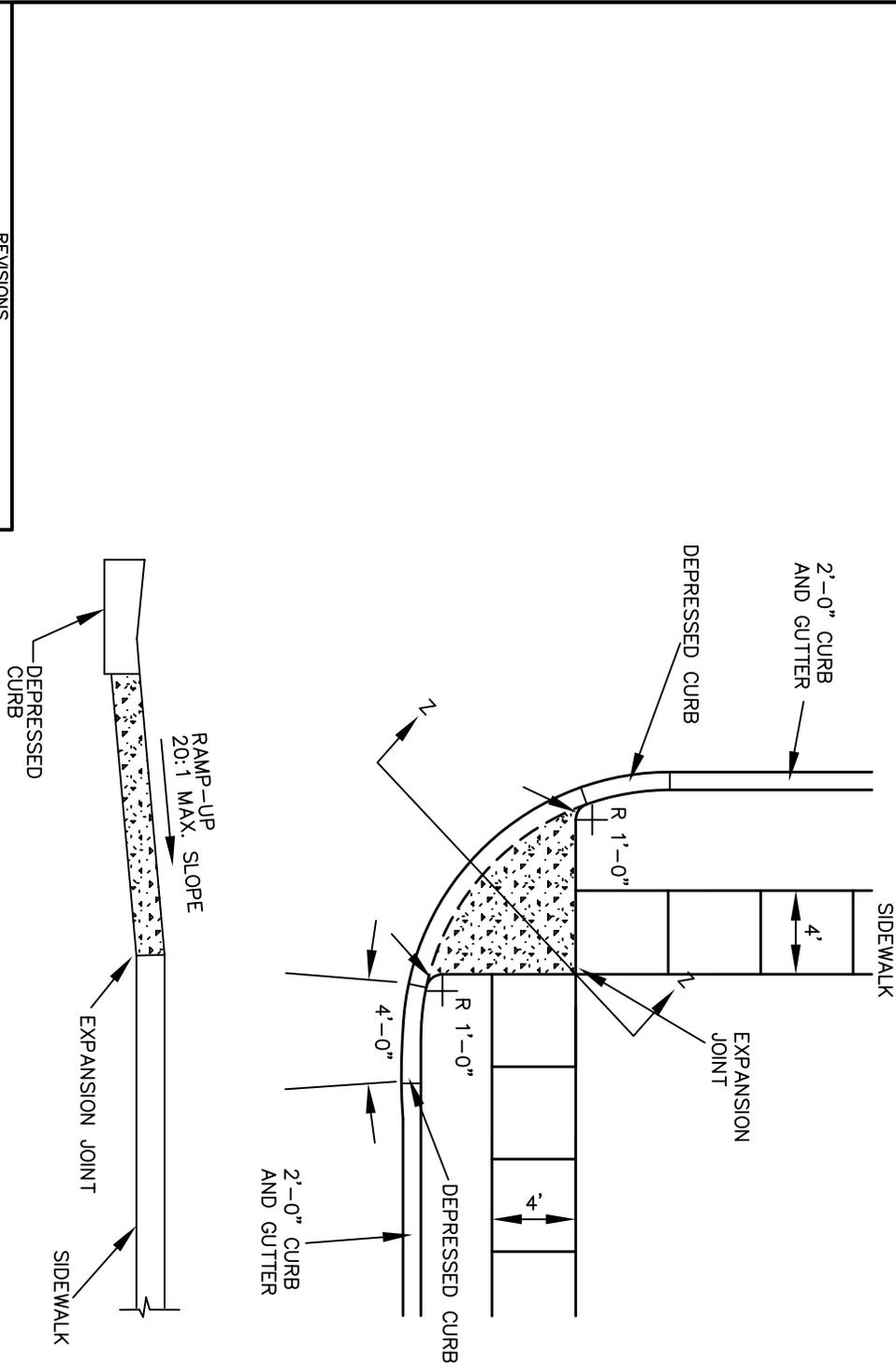


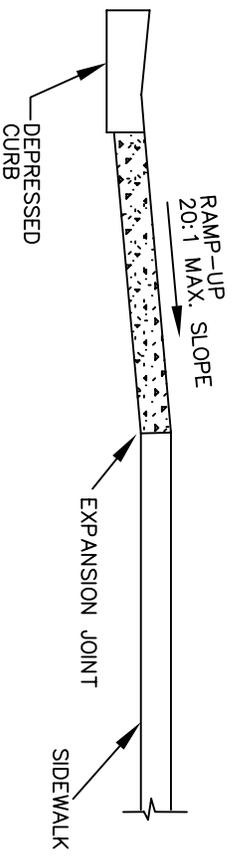
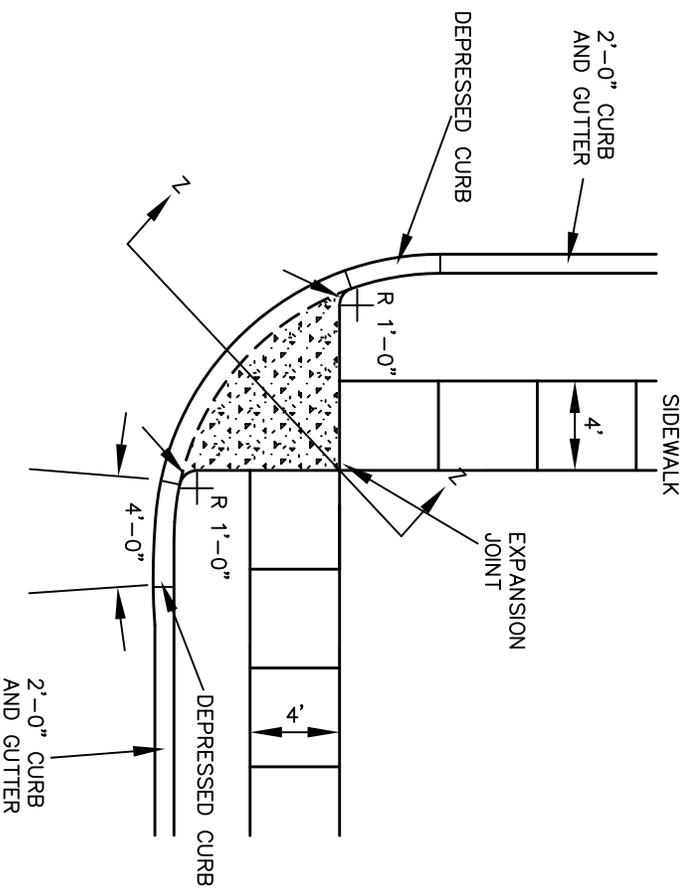
REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

**STANDARD WHEELCHAIR RAMP
SINGLE TYPE**

STD. NO.
4.06





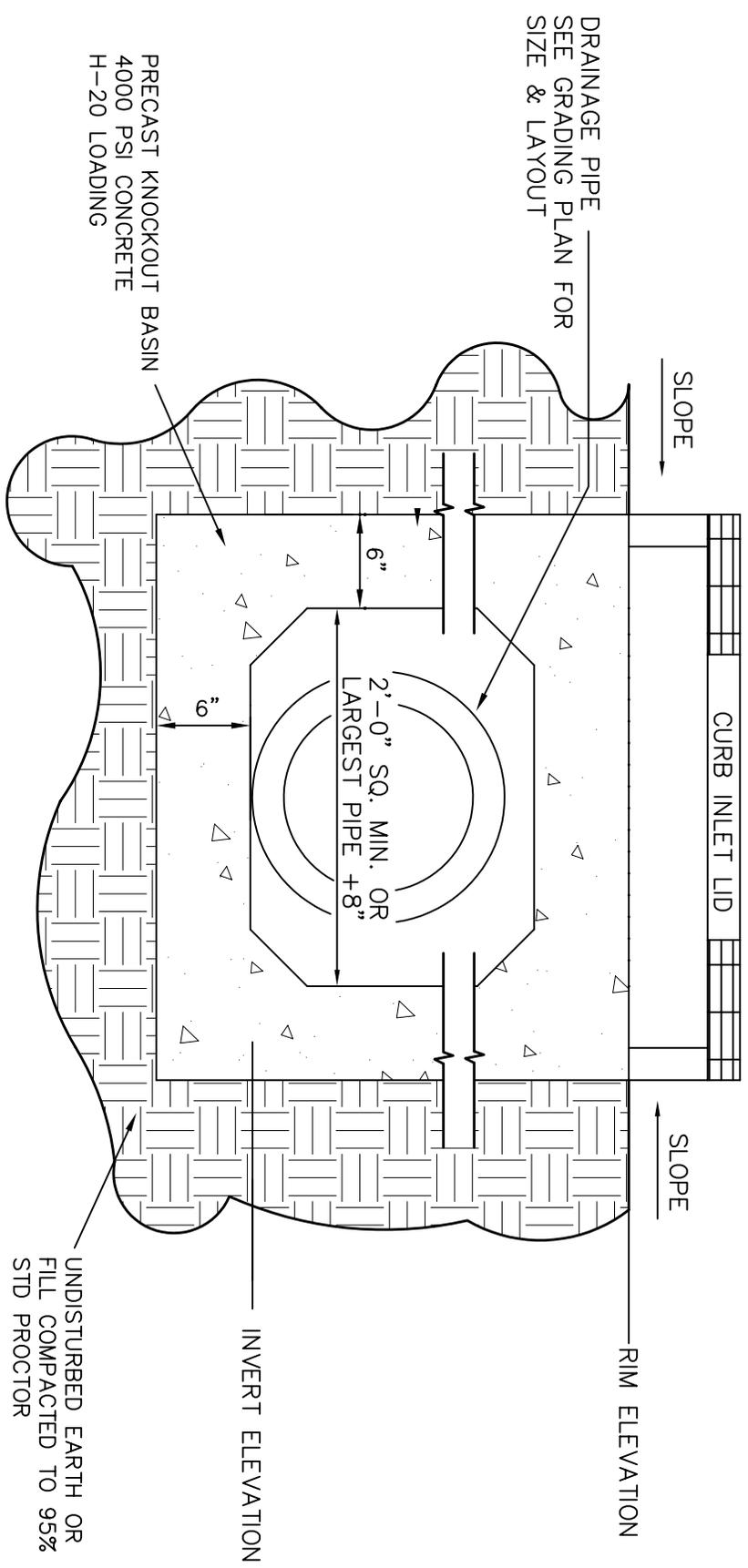
REVISIONS
DATE
DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

**STANDARD WHEELCHAIR RAMP
DOUBLE TYPE**

STD. NO.

4.08



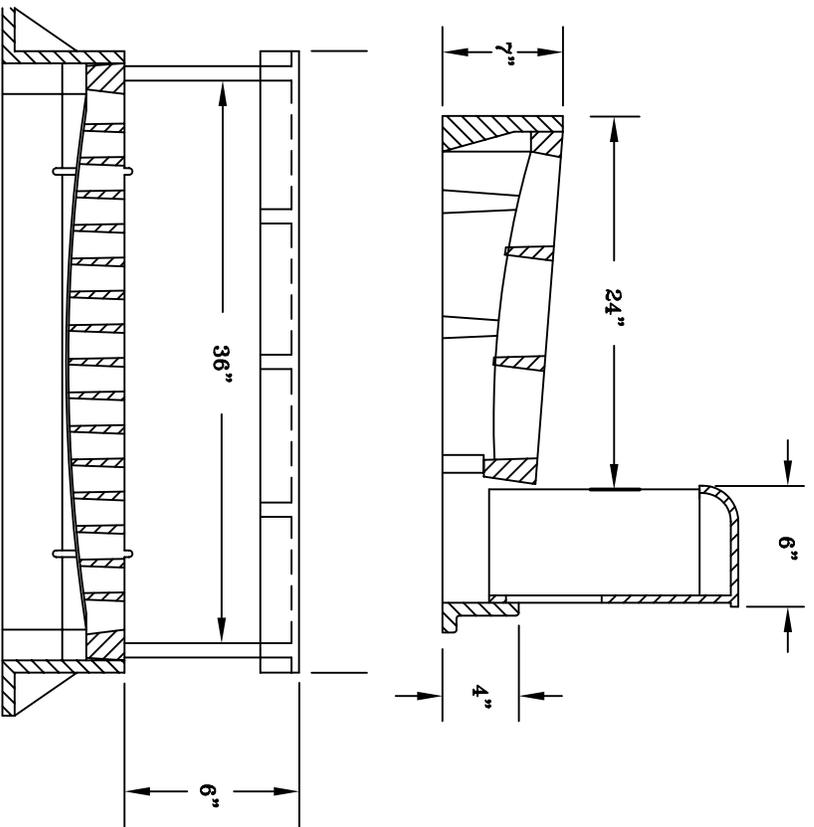
INSTALL & MAINTAIN INLET PROTECTION AROUND ALL STORM DRAIN INLETS DURING CONSTRUCTION.

REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

BASIN DETAIL

STD. NO.
5.01



1. GRATES, FRAMES, AND HOODS SHALL BE IN ACCORDANCE WITH NCDOT STANDARD 840.02 AND 840.03
2. EMBOSS WITH "DUMP NO WASTE ! DRAINS TO WATERWAYS."

REVISIONS
DESCRIPTION

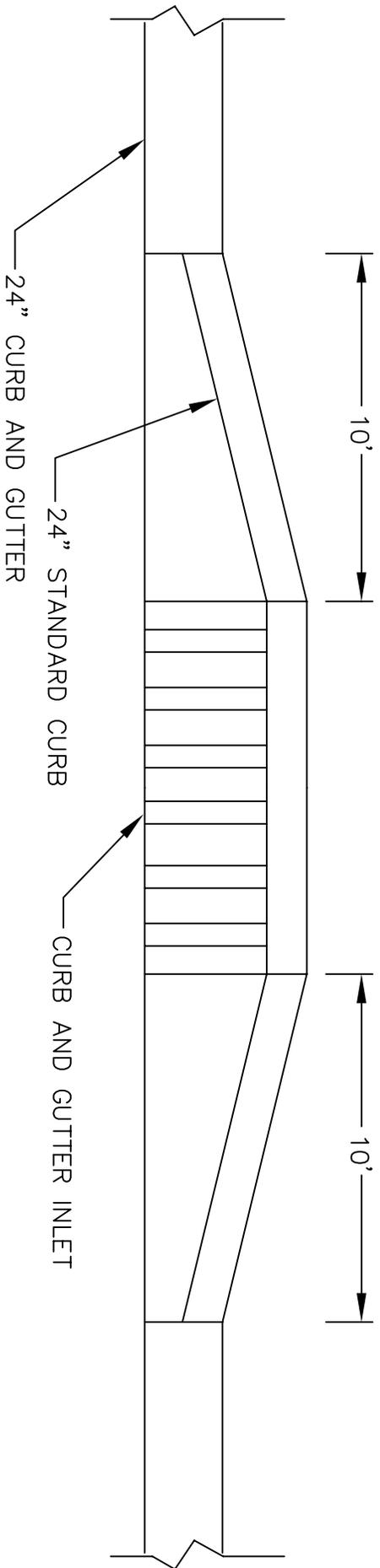
DATE

**TOWN OF BOILING SPRINGS
STANDARDS**

CURB INLET DETAIL

STD. NO.

5.02

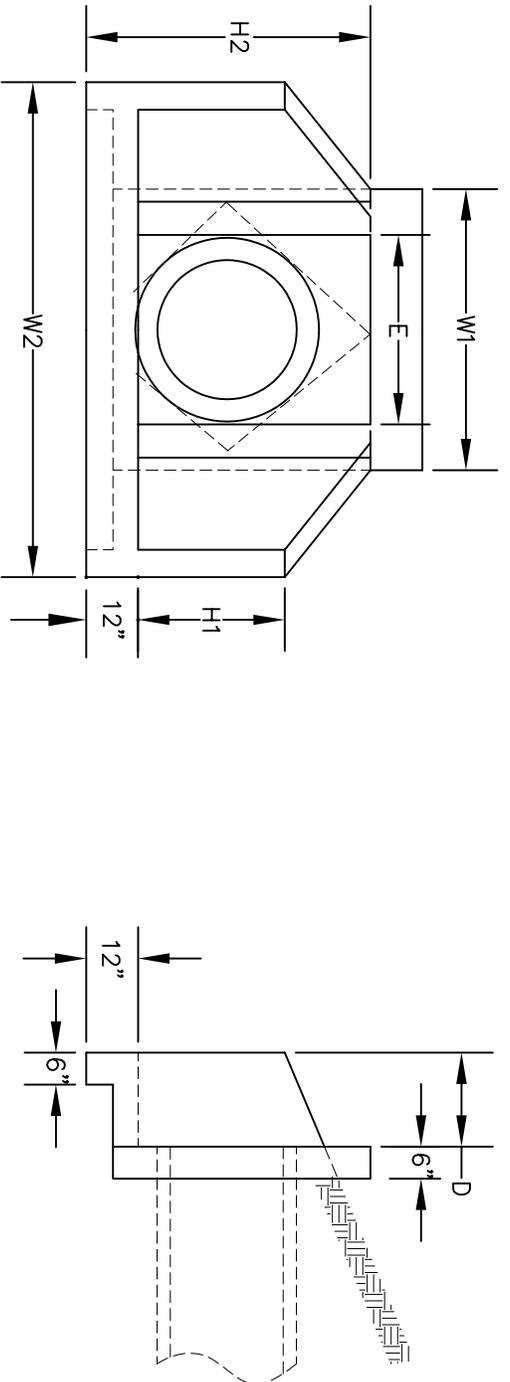


REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

CURB AND GUTTER TRANSITION

STD. NO.
5.03



- NOTES:
1. ALL CONCRETE SHALL BE 4000 PSI MINIMUM.
 2. REINFORCEMENT STEEL SHALL MEET ASTM-A615 GRADE 60 WITH 2" MINIMUM CLEARANCE.

INSIDE PIPE DIAMETER	REINF.	LBS.	W1	W2	H1	H2	D	E
12", 15", 18"	NO. 4	2060	44"	64"	23"	42 1/2"	18 1/2"	27"
21", 24"	NO. 4	3100	50"	85"	31"	56"	24"	33"
27", 30", 36"	NO. 4	5940	64"	108"	41"	72"	36"	49"
42", 48"	NO. 4	8040	79"	150"	52"	79"	40"	64"
54", 60", 72"	NO. 4, NO. 5	16000	105"	161"	60"	90"	48"	90"

REINFORCED CONCRETE HEADWALL

REVISIONS
DESCRIPTION

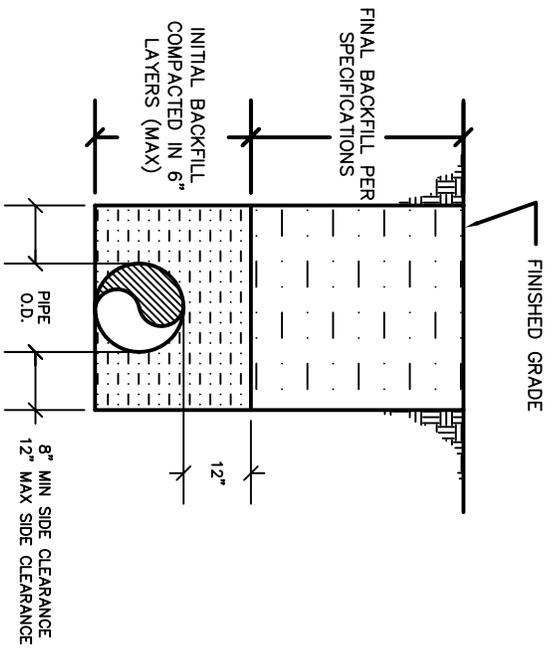
DATE

TOWN OF BOILING SPRINGS
STANDARDS

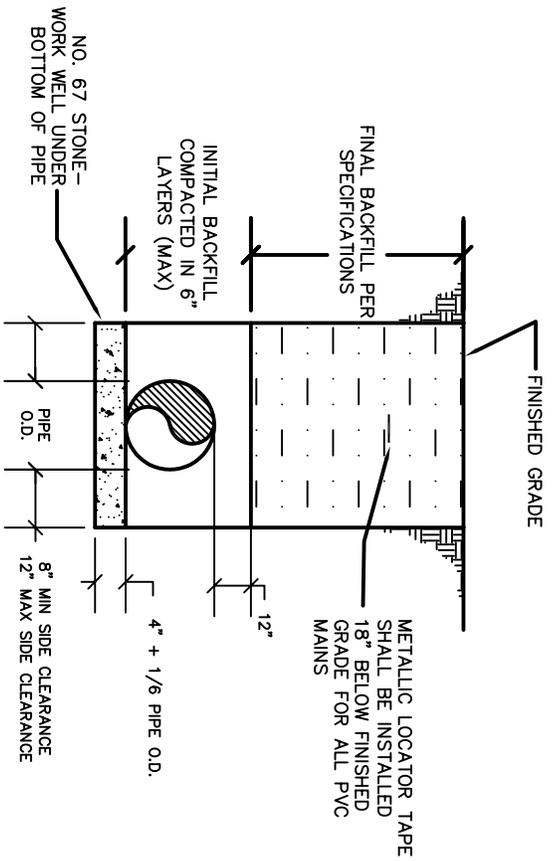
STANDARD REINFORCED CONCRETE
HEADWALL WITH WING WALLS

STD. NO.

5.04



CLASS 'D' BEDDING
REQUIRED FOR DUCTILE IRON PIPES



CLASS 'C' BEDDING
REQUIRED FOR C-900 PVC PIPE

NOTE:
FOR TRENCHES REQUIRING SHORING & BRACING, DIMENSIONS SHALL BE TAKEN FROM THE INSIDE FACE OF THE SHORING & BRACING.

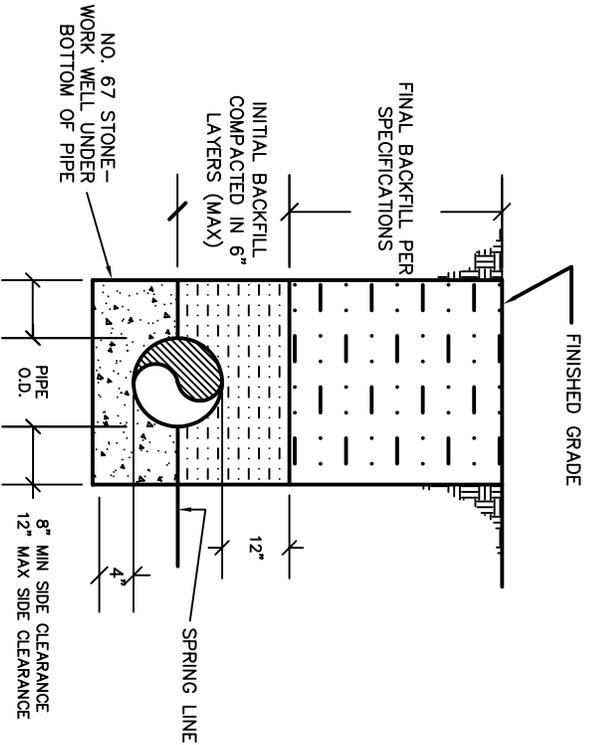
DATE	REVISIONS
	DESCRIPTION

TOWN OF BOILING SPRINGS
STANDARDS

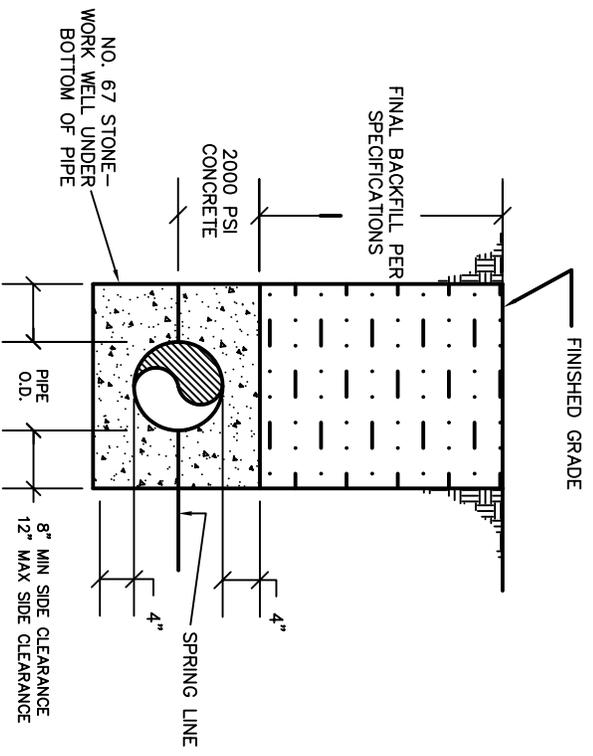
**PIPE BEDDING AND BACKFILLING/
CLASS D&C**

STD. NO.

6.01



CLASS 'B' BEDDING
 REQUIRED FOR FOR PVC SEWER
 PIPE, SDR-35



CLASS 'A' BEDDING

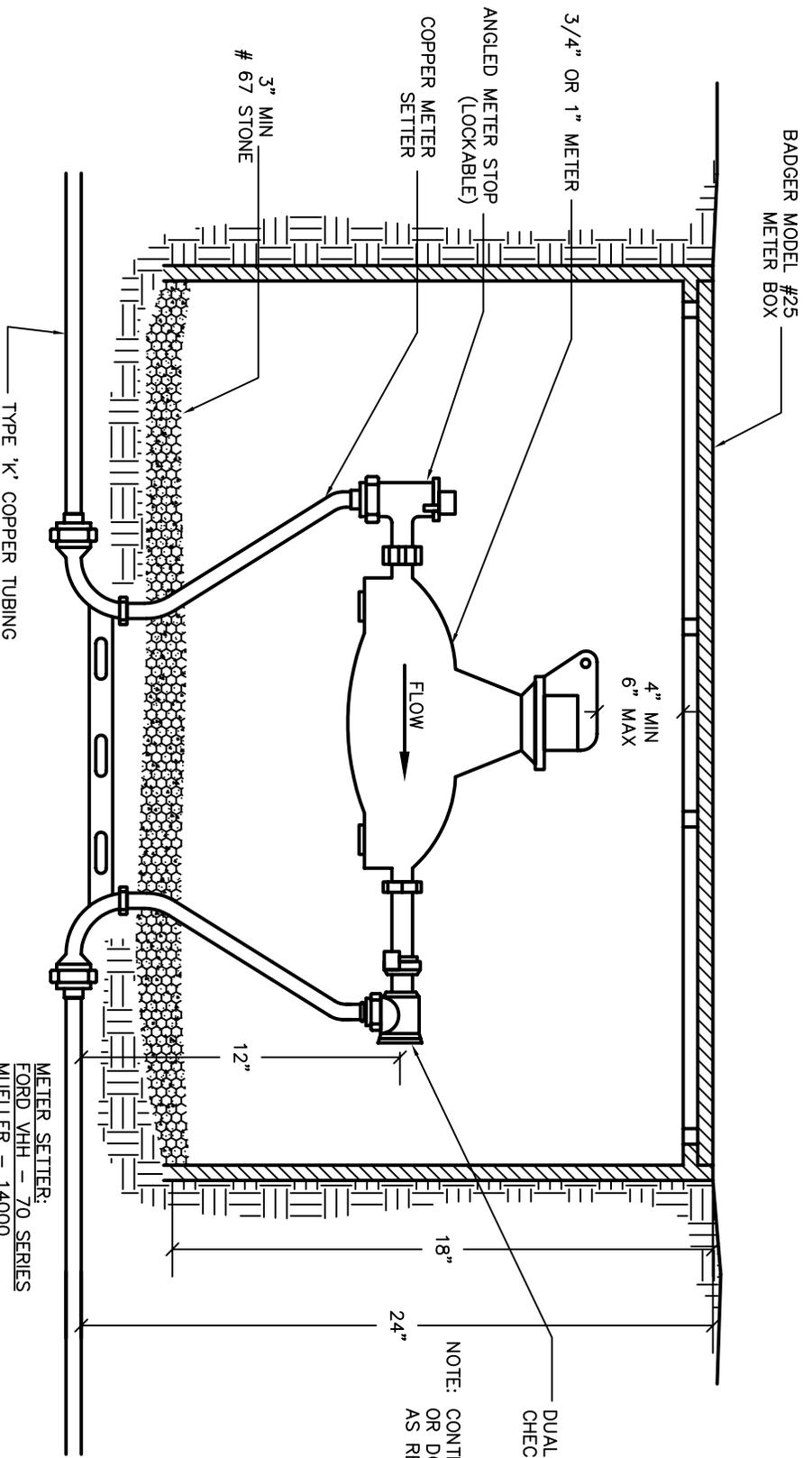
NOTE:
 FOR TRENCHES REQUIRING SHORING & BRACING, DIMENSIONS
 SHALL BE TAKEN FROM THE INSIDE FACE OF THE SHORING &
 BRACING.

DATE	REVISIONS
	DESCRIPTION

TOWN OF BOILING SPRINGS
STANDARDS

**PIPE BEDDING AND BACKFILLING/
 CLASS B&A**

STD. NO.
 6.02



NOTE: CONTRACTOR TO INSTALL SETTER

- METER SETTER:
 FORD VHH - 70 SERIES
 MUELLER - 14000 SERIES
 McDONALD - SERIES 20
 ANGLE DUAL CHECK:
 FORD - STYLE HHA
 MUELLER - #14244
 McDONALD - SERIES 12

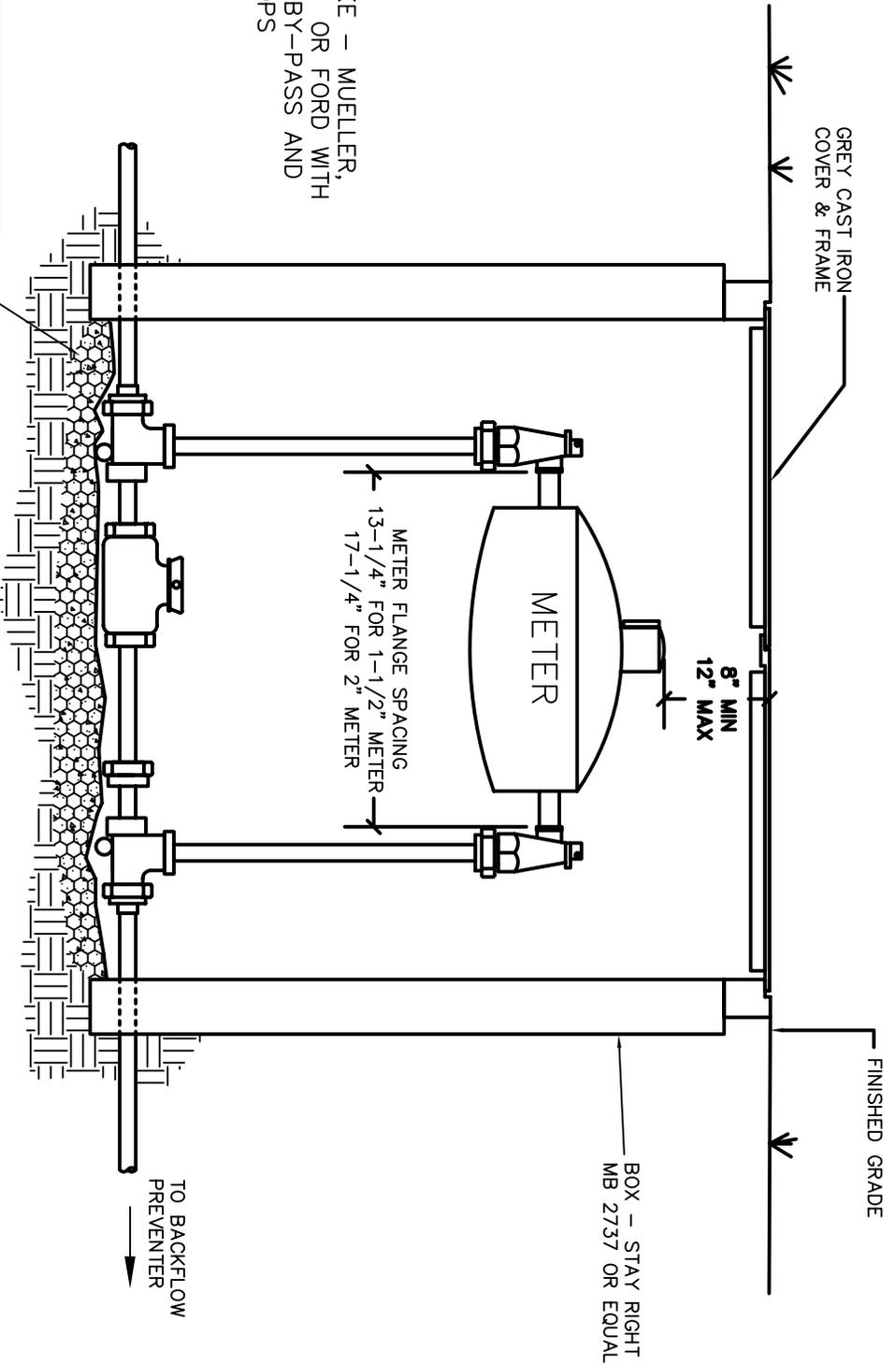
NOTE: CONTRACTOR MUST USE RPZ OR DCCV BACKFLOW PREVENTER AS REQUIRED

DATE	REVISIONS
	DESCRIPTION

TOWN OF BOILING SPRINGS
 STANDARDS

STANDARD 3/4" AND 1" BACKFLOW/
 METER ASSEMBLY

STD. NO.
 6.03



NOTE:
 METER YOKE - MUELLER,
 McDONALD OR FORD WITH
 LOCKABLE BY-PASS AND
 METER STOPS

67 WASHED STONE
 TO 3" DEPTH

TOWN OF BOILING SPRINGS
 STANDARDS

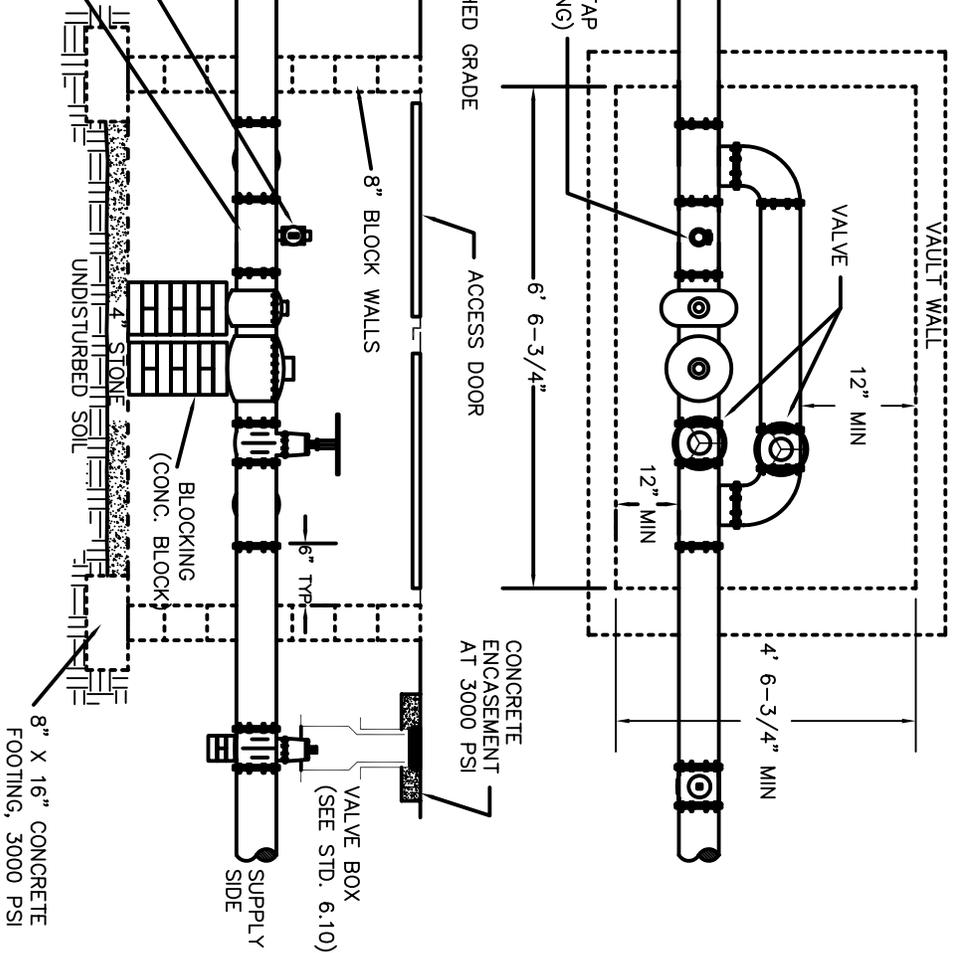
STANDARD 1 1/2" AND 2" METER
 INSTALLATION AND VAULT

DATE	REVISIONS
	DESCRIPTION

STD. NO.
 6.04

GENERAL NOTES:
 METER AND BY-PASS ASSEMBLY TO BE DUCTILE IRON FLANGED TYPE.
 METER FACE TO BE MAXIMUM OF 2' BELOW FINISHED GRADE.
 ACCESS DOOR TO BE BILCO KD-3 OR EQUAL.
 VALVES SHALL BE IRON BODY TYPE.
 ONLY SOLID BLOCK OR PRECAST CONCRETE MAY BE USED. CAST IN PLACE DESIGNS BY SUBMISSION ONLY.

BRONZE CORPORATION STOP WITH 2" MALE PIPE THREAD BY AWWA THREADS FOR FLARE FITTING CONNECTION.
 PRE-FABRICATED FLANGED STEEL SPOOL WITH WELDED 2" FEMALE PIPE THREAD TAP.



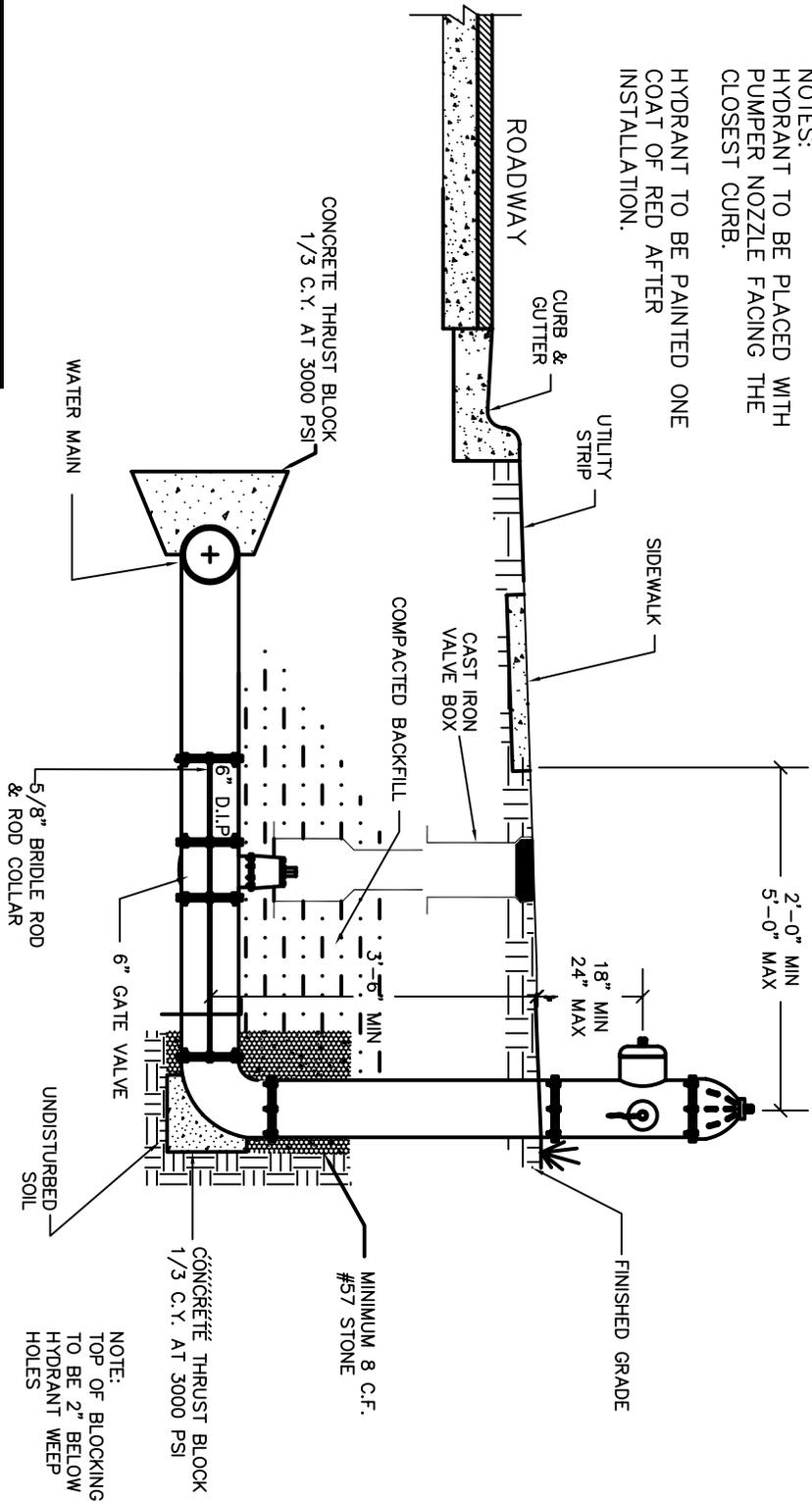
DATE	REVISIONS
	DESCRIPTION

TOWN OF BOILING SPRINGS STANDARDS

STANDARD 3" AND 4" METER INSTALLATION AND VAULT

STD. NO.
6.05

NOTES:
 HYDRANT TO BE PLACED WITH
 PUMPER NOZZLE FACING THE
 CLOSEST CURB.
 HYDRANT TO BE PAINTED ONE
 COAT OF RED AFTER
 INSTALLATION.

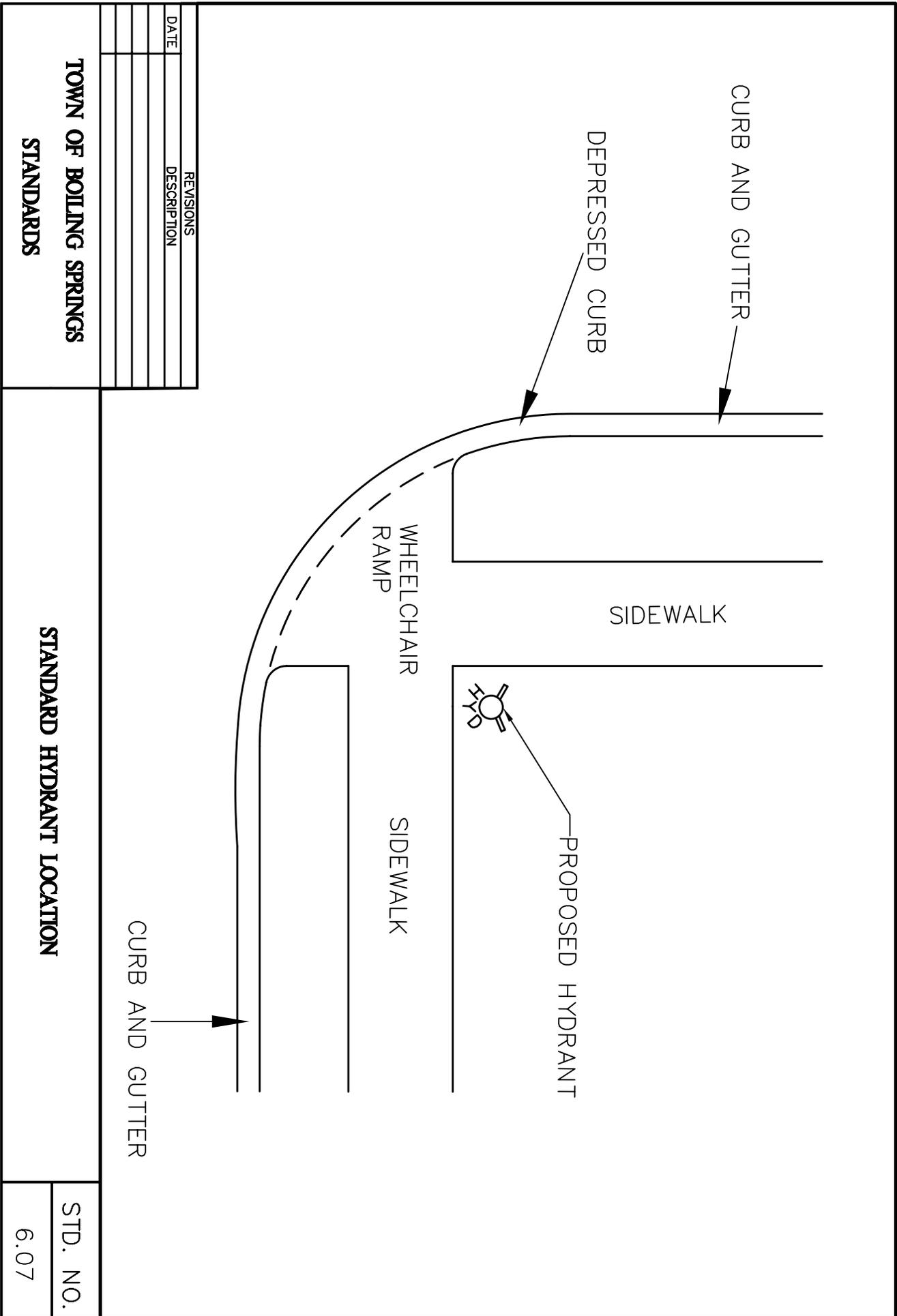


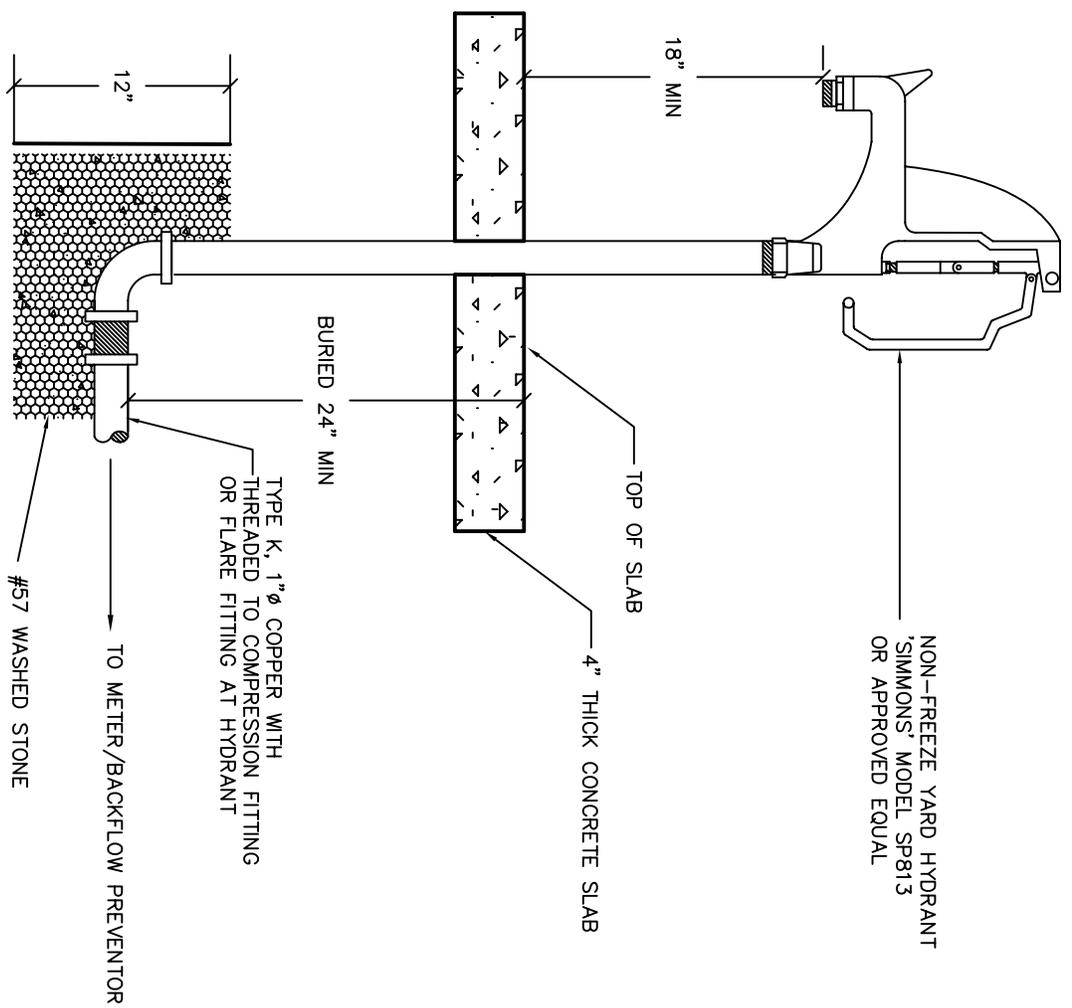
DATE	REVISIONS
	DESCRIPTION

TOWN OF BOILING SPRINGS
STANDARDS

STANDARD HYDRANT INSTALLATION

STD. NO.
 6.06





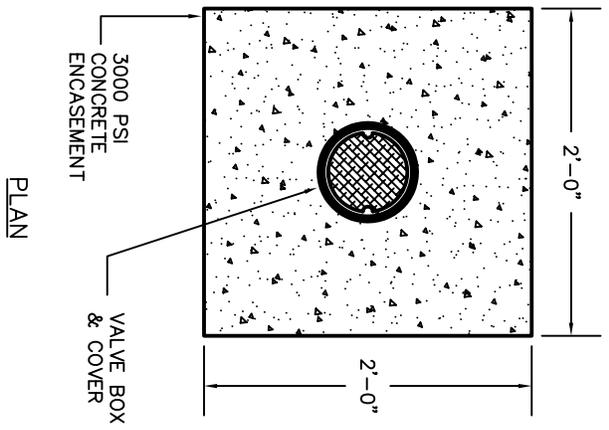
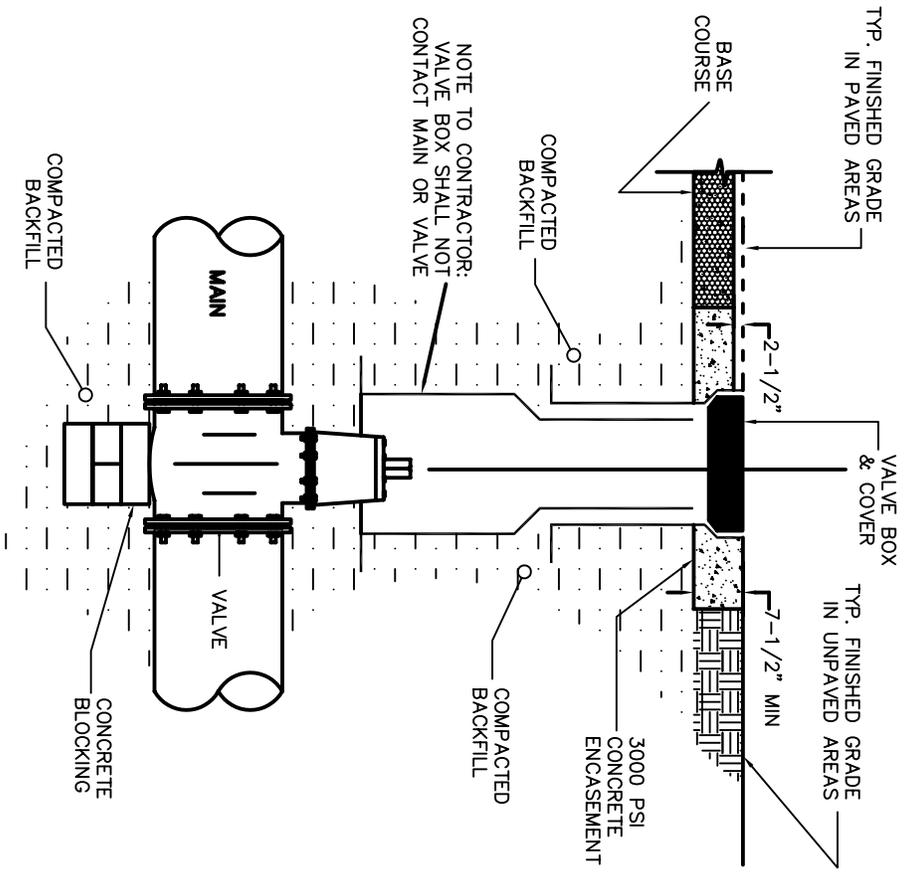
REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

**YARD HYDRANT
(NO-FREEZE)**

STD. NO.

6.08



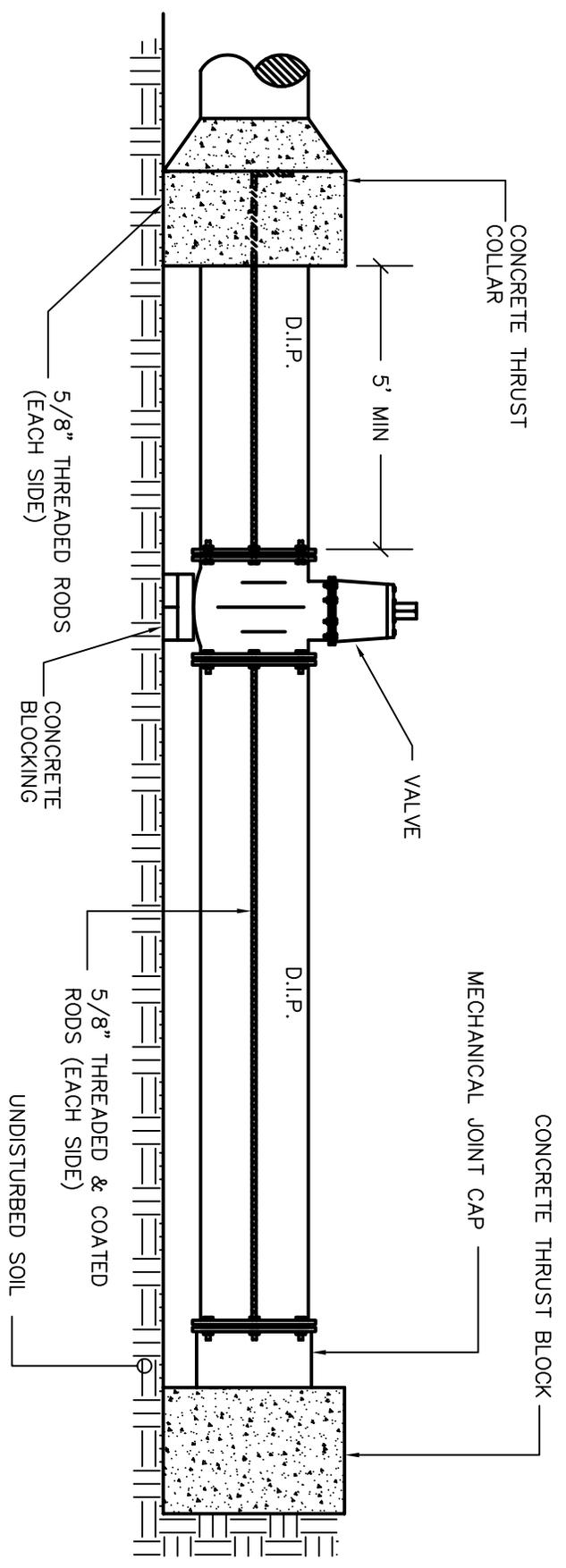
PLAN

REVISIONS	DESCRIPTION	DATE

**TOWN OF BOILING SPRINGS
STANDARDS**

STANDARD VALVE BALVE BOX INSTALLATION

STD. NO.
6.09

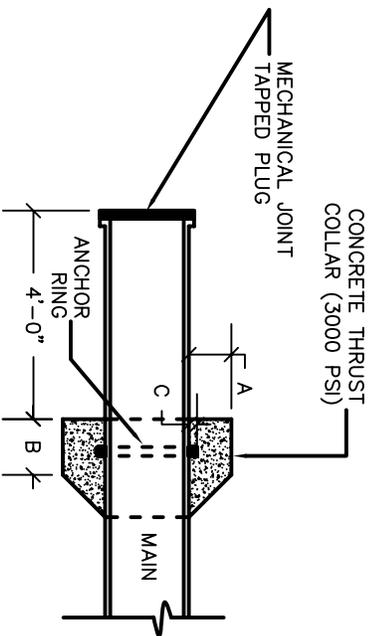
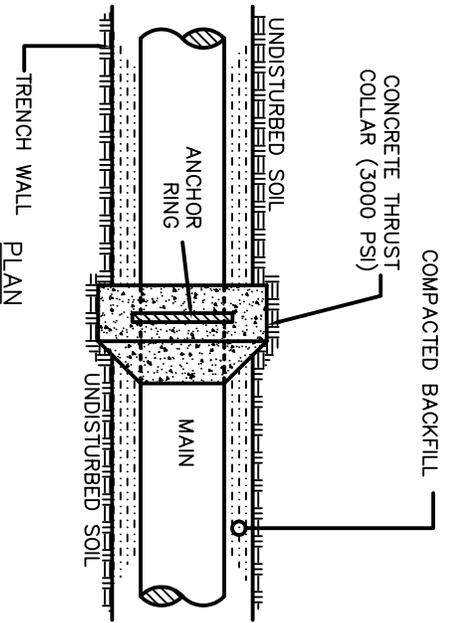


REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

STANDARD CAPPING DETAIL

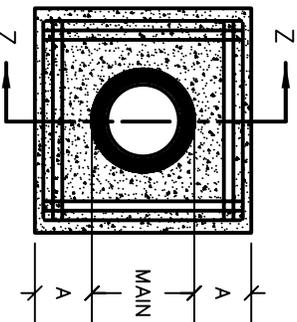
STD. NO.
6.10



SECTION Z-Z

SCHEDULE

PIPE DIAMETER	CONCRETE THRUST COLLAR		ANCHOR RING	RINGS REQUIRED
	A	B		
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



NOTE:
 6" TO 16" MAINS--12-NO. 7 BARS
 20" TO 36" MAINS--12-NO. 8 BARS
 * BARS PLACED AS SHOWN

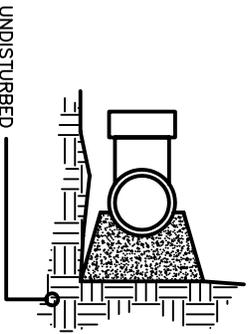
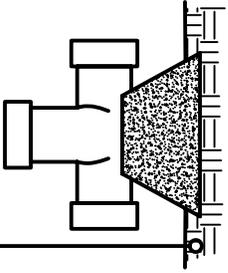
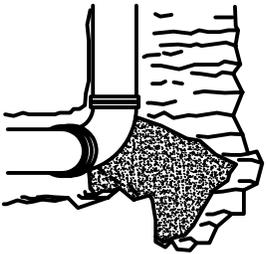
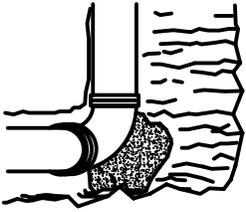
DATE	REVISIONS
	DESCRIPTION

TOWN OF BOILING SPRINGS
 STANDARDS

STANDARD THRUST COLLAR INSTALLATION

STD. NO.

6.11



MINIMUM CONCRETE BLOCKING (C.Y.)*						
NOM. PIPE DIA. INCHES	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

NOTE: WRAP FITTINGS IN 6 MIL PLASTIC BEFORE POURING CONCRETE

REVISIONS	DESCRIPTION
DATE	

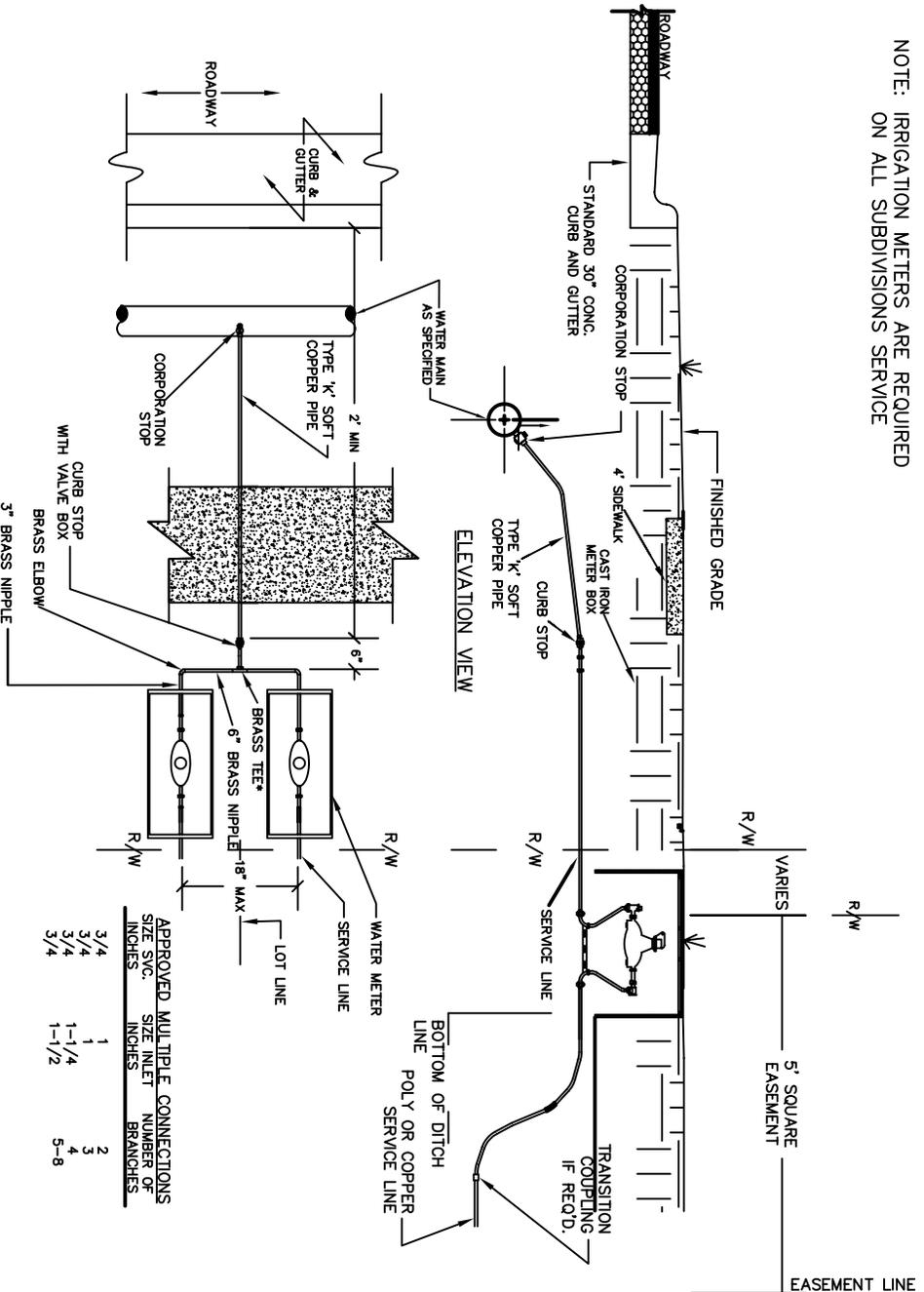
**TOWN OF BOILING SPRINGS
STANDARDS**

STANDARD REACTION BLOCKING

STD. NO.

6.13

NOTE: IRRIGATION METERS ARE REQUIRED ON ALL SUBDIVISIONS SERVICE



APPROVED MULTIPLE CONNECTIONS SIZE SVC. INCHES	APPROVED MULTIPLE CONNECTIONS SIZE INLET INCHES	NUMBER OF BRANCHES
3/4	1	2
3/4	1-1/4	4
3/4	1-1/2	5-8

* BRASS TEE: INLET SIZE X 3/4" PLAN VIEW

FOR MULTI-FAMILY PROJECTS ONLY

TOWN OF BOILING SPRINGS STANDARDS

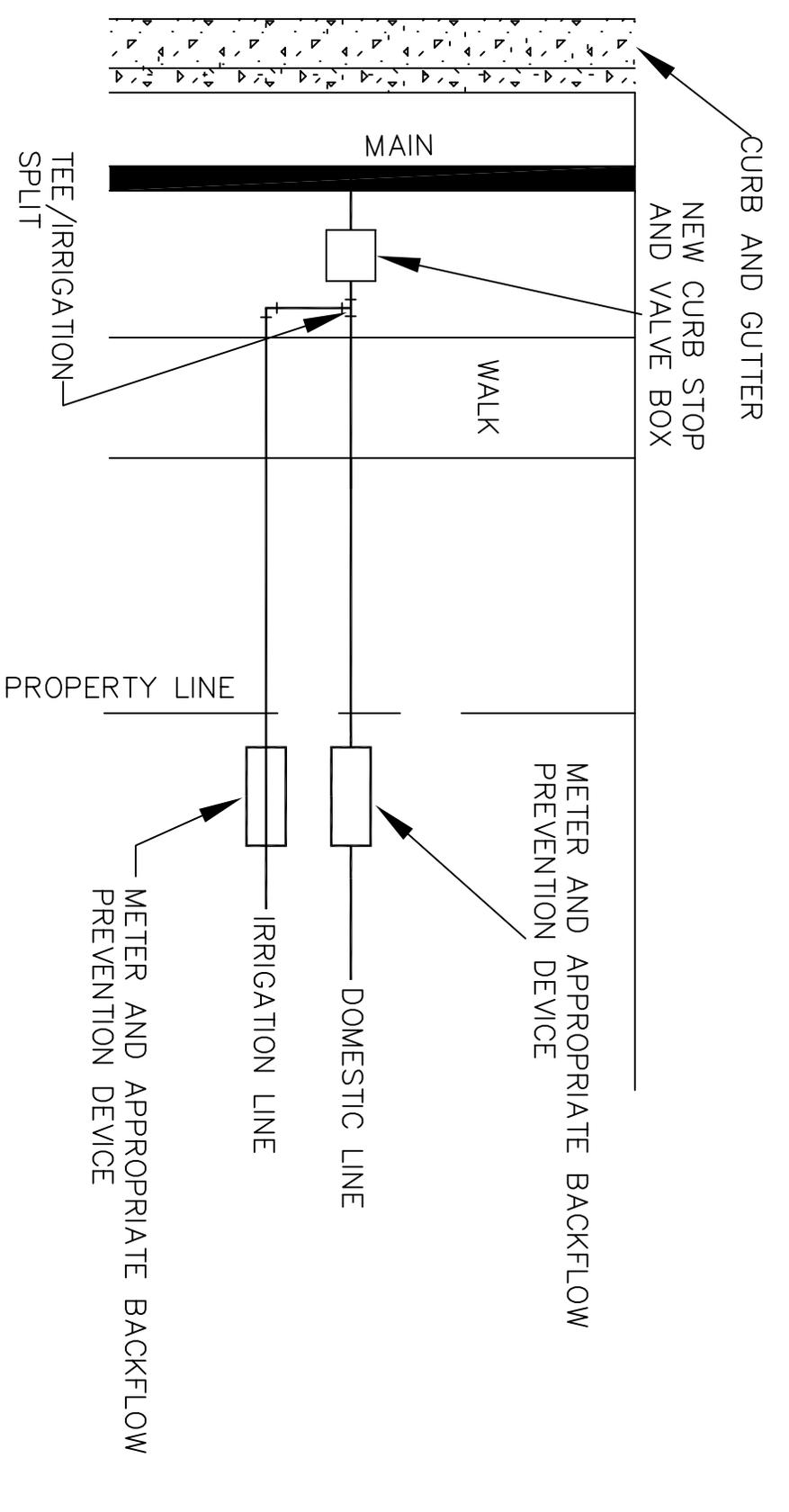
STANDARD MULTIPLE BRANCH SERVICE

STD. NO.

6.14

NOTES:
 THERE SHALL BE NO MULTIPLE CONNECTIONS FOR SERVICES OTHER THAN 3/4".
 CURB STOPS SHALL BE AS MANUFACTURED BY FORD OR APPROVED EQUAL.
 METER BOXES SHALL BE AS DESCRIBED IN THE STANDARD SPECIFICATIONS UNDER WATER DISTRIBUTION; HOWEVER, THE INLET SHALL BE IRON PIPE THREADED INLETS.
 CURB STOPS SHALL BE CENTERED ON MULTIPLE BRANCH SERVICE AND CONTAINED WITHIN A VALVE BOX.

REVISIONS	DESCRIPTION	DATE

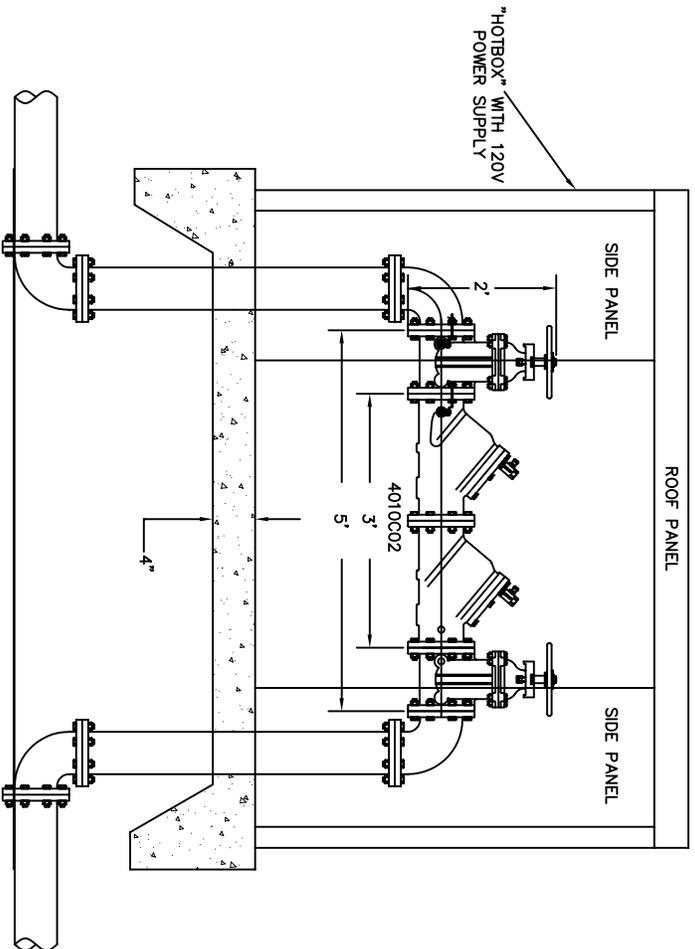


REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

**IRRIGATION TAP ON
EXISTING SERVICE**

STD. NO.
6.15



- NOTES:
- 1) ALL PIPE IS TO BE DIP CL350.
 - 2) THE DOUBLE CHECK VALVE SHALL BE 12" MINIMUM TO 30" MAXIMUM ABOVE THE CONCRETE PAD.
 - 3) DOUBLE CHECK VALVE SHALL BE CONBRACO MODEL 40-10C-02 OR ENGINEER APPROVED EQUIVALENT.
 - 4) ENCLOSURE SHALL BE A WATER SAFE @ 2 DOOR ACCESS ENCLOSURE OR ENGINEER APPROVED EQUIVALENT.

REVISIONS
DESCRIPTION

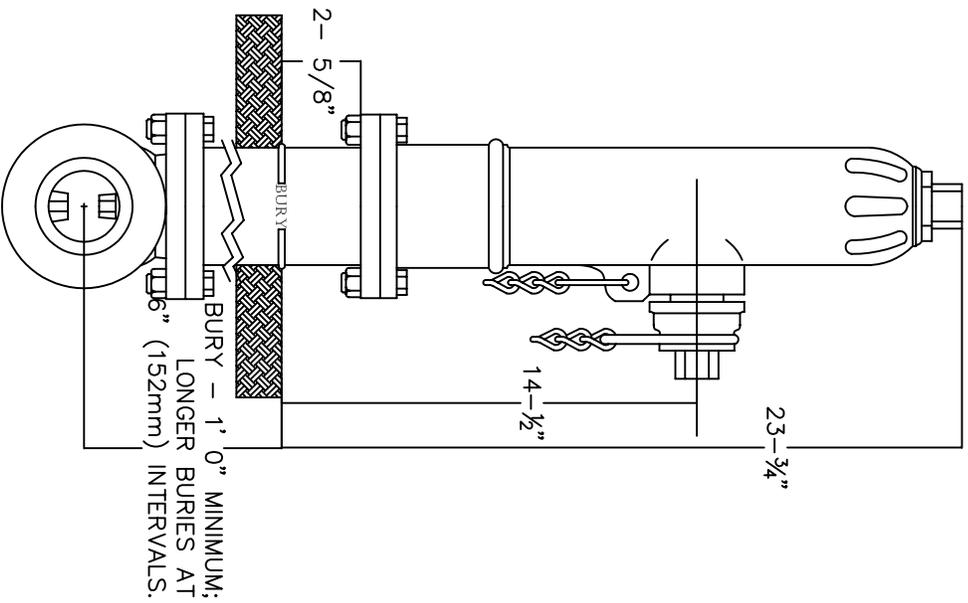
DATE

TOWN OF BOILING SPRINGS
STANDARDS

BACKFLOW PREVENTER
IN HOT BOX

STD. NO.

6.16



REVISIONS
DESCRIPTION

DATE

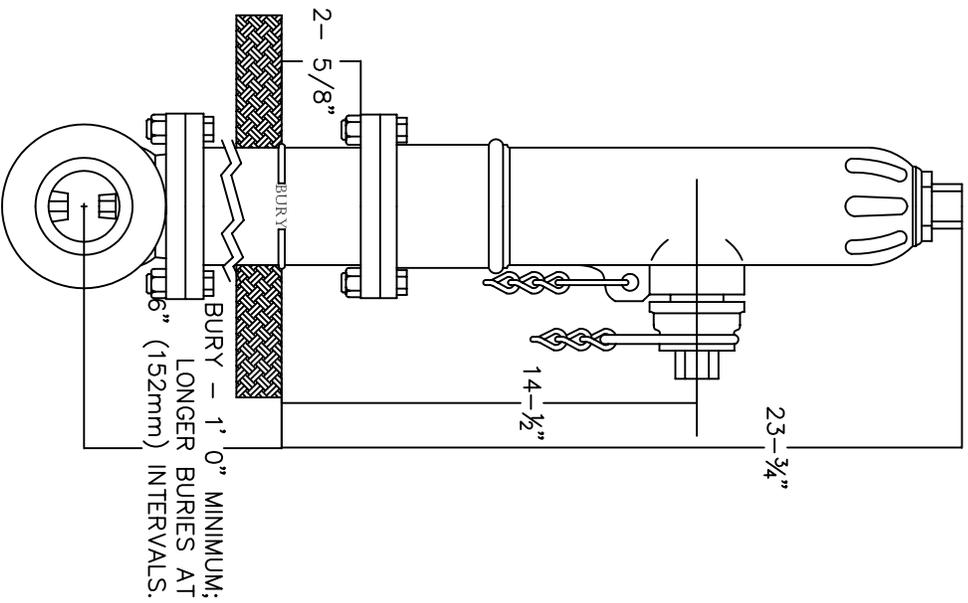
TOWN OF BOILING SPRINGS

STANDARDS

POST TYPE $2\frac{1}{8}$ " HYDRANT FOR USE AT END OF MAIN

STD. NO.

6.17



**TOWN OF BOILING SPRINGS
STANDARDS**

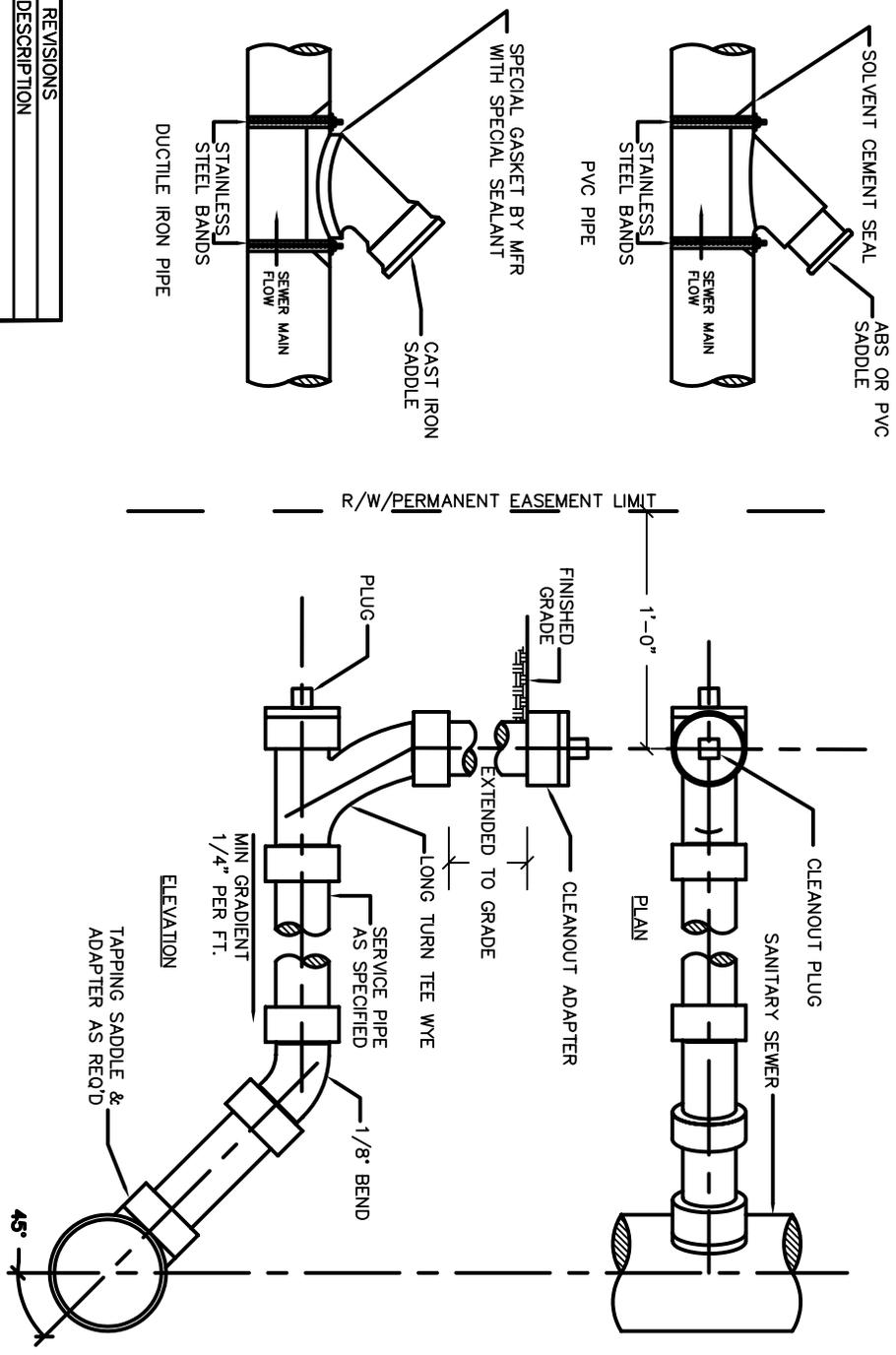
**POST TYPE 2 1/8" HYDRANT FOR USE
AT END OF MAIN**

STD. NO.

6.18

REVISIONS	DESCRIPTION
DATE	

NOTE: CONNECTIONS TO MAIN MUST BE APPROVED BY THE TOWN.



REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

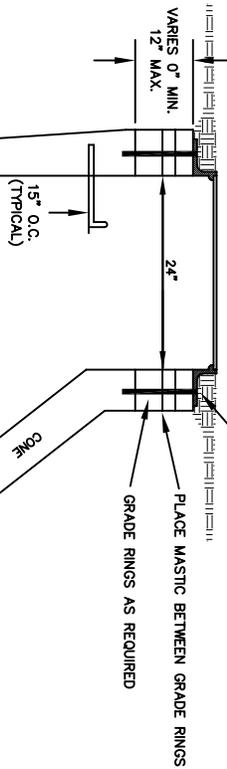
**SANITARY SEWER
SERVICE CONNECTIONS**

STD. NO.
7.02

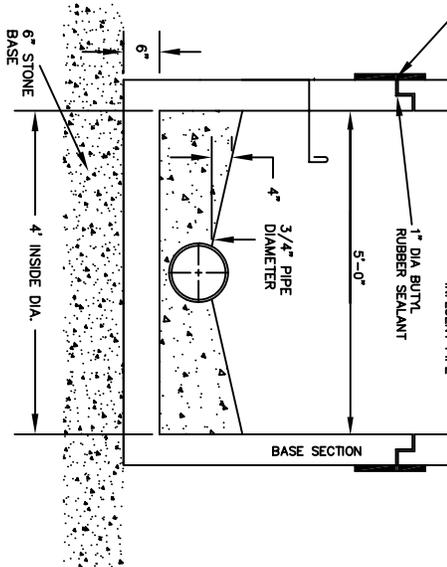
STANDARD MH RINGS AND COVERS: VULCAN FOUNDARY, INC.; "V-B1364", NEENAH "R-1550", U.S. FOUNDARY "USF-669 VENTED" OR EQUAL. WATERIGHT MH RINGS AND COVERS: VULCAN FOUNDARY, INC.; "V-2328", NEENAH "R-1915H", U.S. FOUNDARY "USF-669 BWT", OR EQUAL.

BOLTS ON MH FRAME AND COVER PROVIDE BOLTS ONLY WHERE SPECIFIED

GRADE RINGS AS REQUIRED

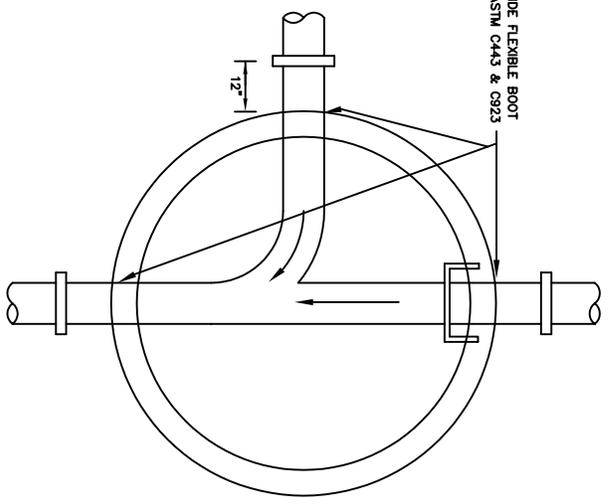


NOTE: WRAP ALL MANHOLE JOINTS WITH A HEAT SHRINKABLE SHEET SIMILAR TO WRAPDEAL



- NOTES:
1. MANHOLE RISERS AND CONE SECTIONS SHALL CONFORM TO ASTM C-478, LATEST REVISION.
 2. TRANSITION RINGS SHALL HAVE A MINIMUM CLEARANCE OF 2'-0" ABOVE THE EFFLUENT OVERT ELEVATION.
 3. FLEXIBLE WATERIGHT, SYNTHETIC RUBBER SLEEVES WITH STAINLESS STEEL CLAMP, DRAW BOLT AND NUT, OR CAST-IN SLEEVE OR "A" LOCK CONNECTION SHALL BE FURNISHED FOR EACH PIPE TO MANHOLE CONNECTION.

PROVIDE FLEXIBLE BOOT PER ASTM C443 & C923



REVISIONS
DATE
DESCRIPTION

TOWN OF BOILING SPRINGS STANDARDS

4' DIAMETER PRECAST MANHOLE

STD. NO.

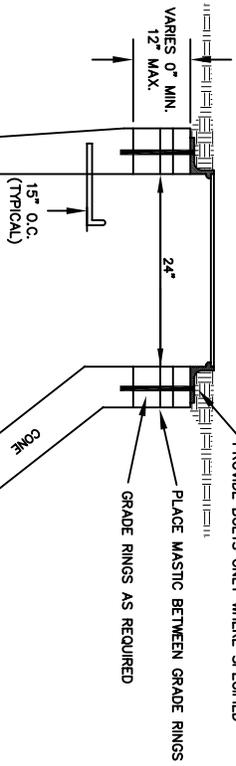
7.03

STANDARD MH RINGS AND COVERS: VULCAN
 FOUNDARY, INC., "V-61584" NENAH "R-1950", U.S.
 FOUNDARY "USF-669 VENTED", OR EQUAL.
 WATERLOO MH RINGS AND COVERS: VULCAN
 FOUNDARY, INC., "V-2328" NENAH "R-1915H", U.S.
 FOUNDARY "USF-669 BWT", OR EQUAL.

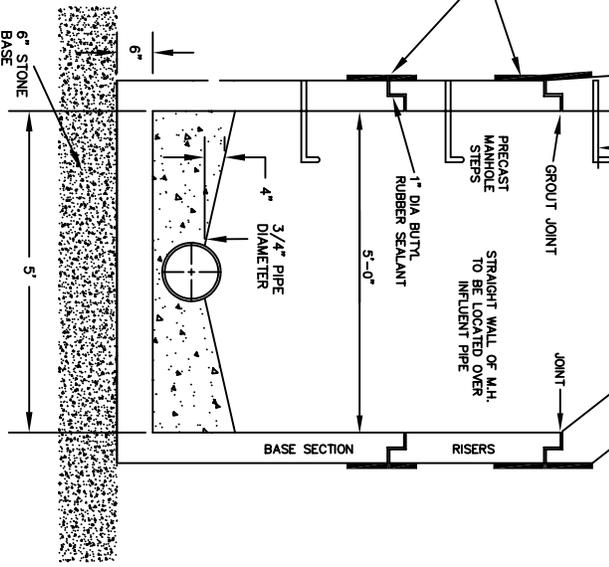
BOLTS ON MH FRAME AND COVER
 PROVIDE BOLTS ONLY WHERE SPECIFIED

PLACE MASTIC BETWEEN GRADE RINGS
 GRADE RINGS AS REQUIRED

CONE

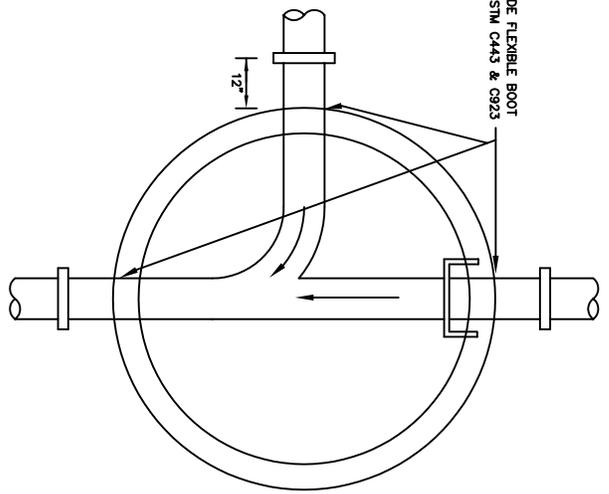


NOTE: WRAP ALL MANHOLE JOINTS
 WITH A HEAT SHRINKABLE SHEET
 SIMILAR TO WRAPDISEAL



- NOTES:
1. MANHOLE RISERS AND CONE SECTIONS SHALL CONFORM TO ASTM C-478, LATEST REVISION.
 2. TRANSITION RINGS SHALL HAVE A MINIMUM CLEARANCE OF 2'-0" ABOVE THE EFFLUENT OVERT ELEVATION.
 3. FLEXIBLE WATERTIGHT, SYNTHETIC RUBBER SLEEVES, WITH STAINLESS STEEL CLAMP, DRAW BOLT AND NUT, OR CAST-IN SLEEVE, OR "A" LOCK CONNECTION SHALL BE FURNISHED FOR EACH PIPE TO MANHOLE CONNECTION.

PROVIDE FLEXIBLE BOOT
 PER ASTM C443 & C923



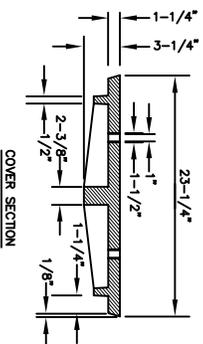
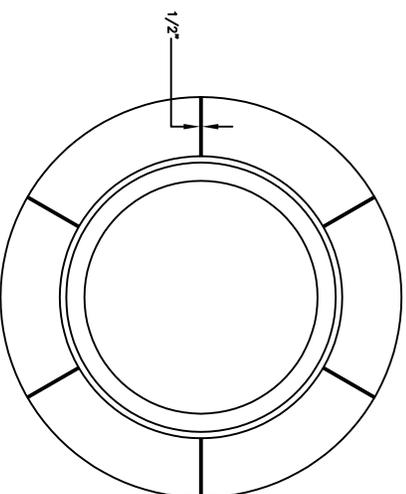
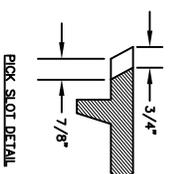
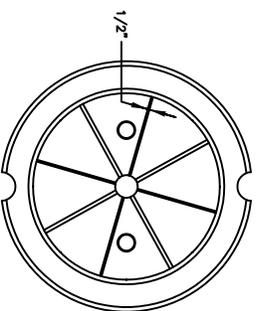
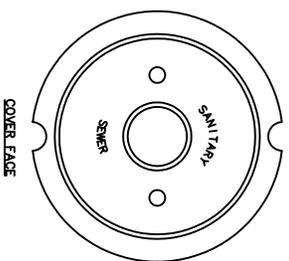
REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
 STANDARDS**

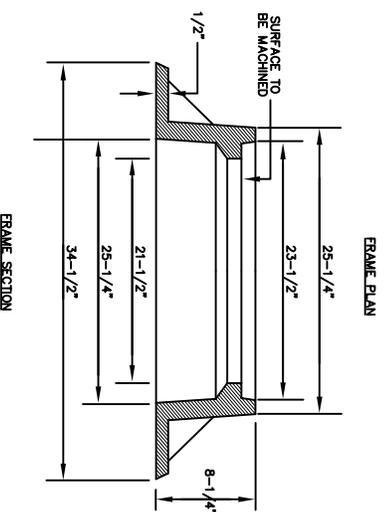
5 DIAMETER PRECAST MANHOLE

STD. NO.
 7.04

NOTE: MANHOLE COVERS IN
ROADS TO BE SOLID



ESTIMATED WEIGHT	
VULCAN TYPE V-1364	U.S. FOUNDRY 689 RING & KI COVER
LOAD RATING - HEAVY DUTY	LOAD RATING - HEAVY DUTY
FRAME 240 LBS.	FRAME 190 LBS.
COVER 145 LBS.	COVER 125 LBS.
TOTAL 385 LBS.	TOTAL 315 LBS.



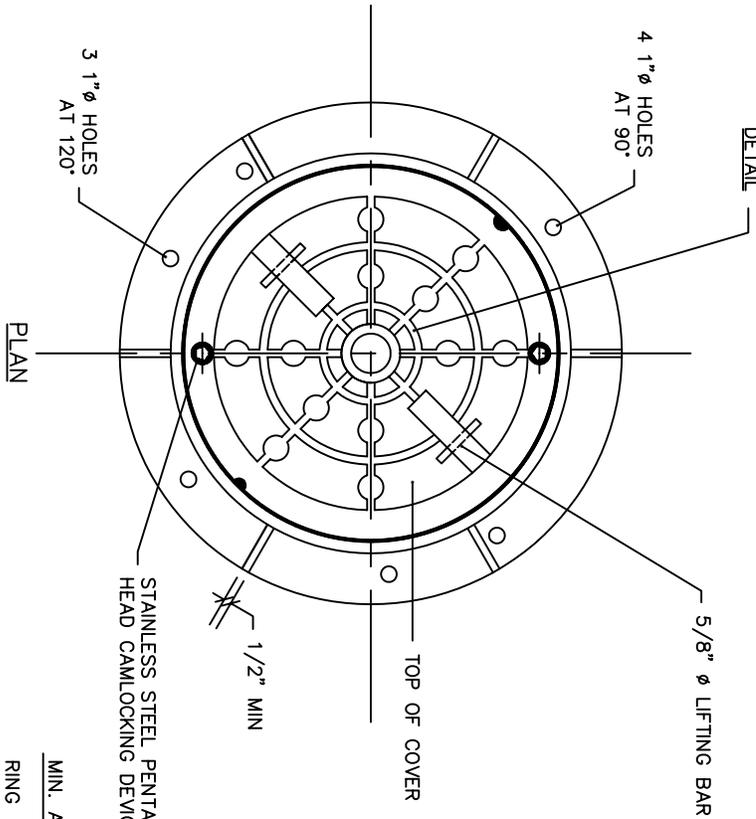
TOWN OF BOILING SPRINGS
STANDARDS

STANDARD MANHOLE RINGS AND COVER
FOR MANHOLES IN PAVED AREAS

STD. NO.

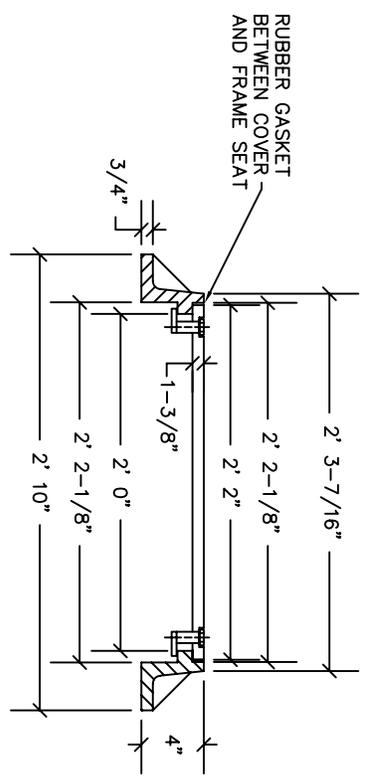
7.05

REVISIONS	DESCRIPTION
DATE	



MIN. AVG. WT. _____
RING 160 LBS

SECTION



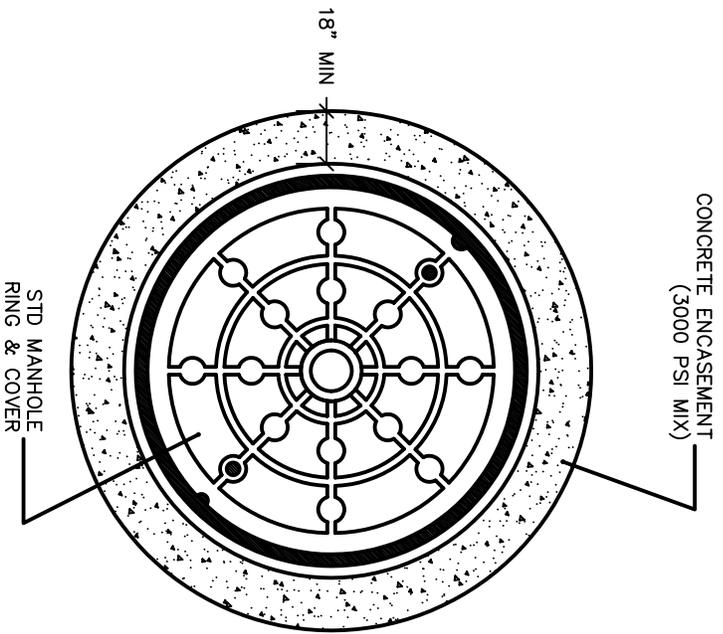
NOTE: MANHOLE COVERS IN ROADS TO BE SOLID
ALL MANHOLE COVERS LOCATED OUTSIDE OF THE PAVEMENT SHALL BE BOLTED AND GROUTED TO THE MANHOLE CONE PER STD 7.06

DATE	REVISIONS
	DESCRIPTION

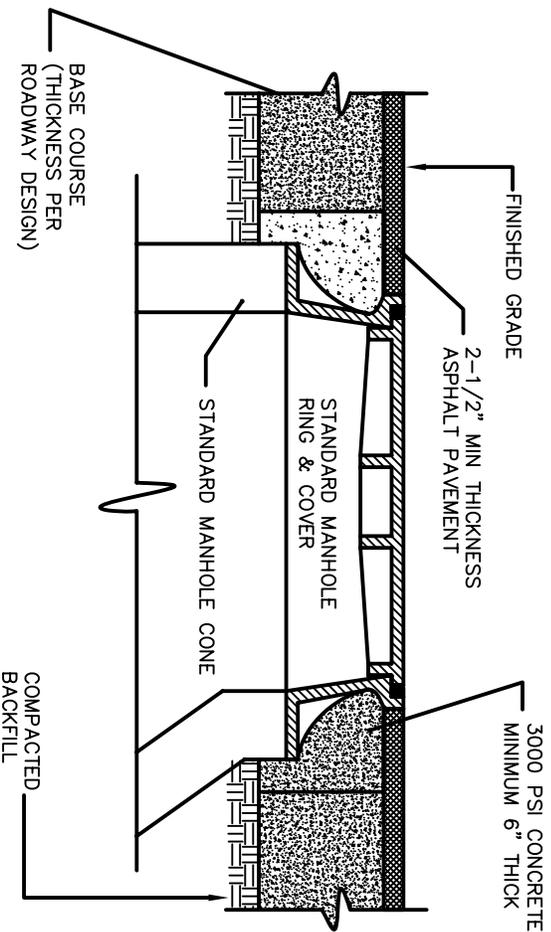
TOWN OF BOILING SPRINGS STANDARDS

STANDARD MANHOLE RING AND COVER FOR WATERTIGHT MANHOLES

STD. NO. 7.05a



PLAN



SECTION

REVISIONS	
DATE	DESCRIPTION

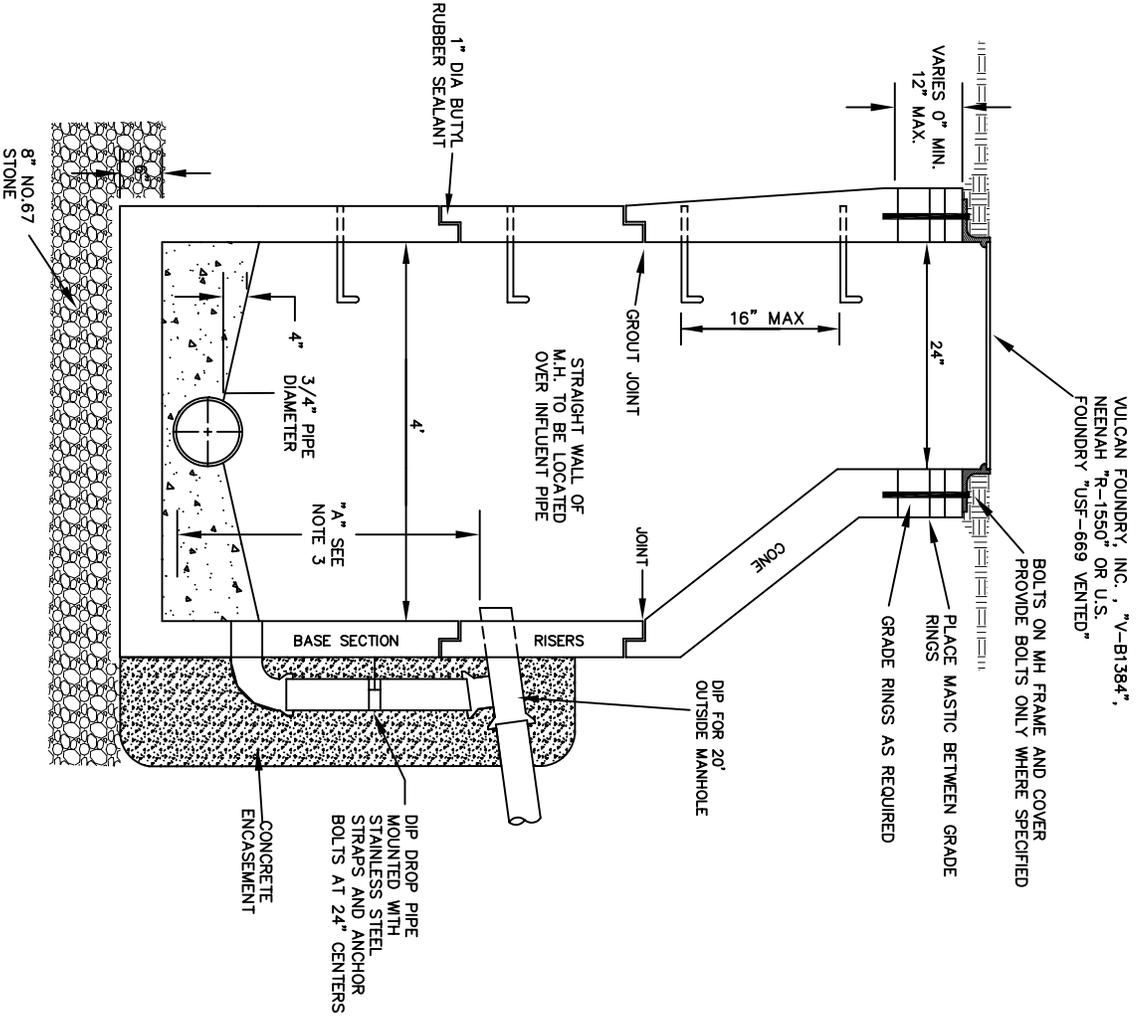
**TOWN OF BOILING SPRINGS
STANDARDS**

**STANDARD MANHOLE RING
AND COVER ENCASEMENT**

STD. NO.

7.06

NOTES:
 THE SEWER LINE ENTERING A DROP MANHOLE SHALL BE CONTINUOUS D.I.P. FROM THE UPSTREAM MANHOLE.
 A DROP MANHOLE IS REQUIRED WHEN THE DIFFERENCE BETWEEN INVERTS IS 30" OR GREATER.
 ALL JOINTS WITHIN THE MANHOLE SHALL BE OF THE MECHANICAL JOINT TYPE.
 INSIDE DROP PIPE DIAMETER SHALL BE THE SAME AS THE INFLOW SEWER LINE DIAMETER.
 STAINLESS STEEL STRAPPING SHALL BE 1" WIDE BY 1/8" THICK AND ATTACHED TO THE MANHOLE WALL WITH MASONRY ANCHORS.

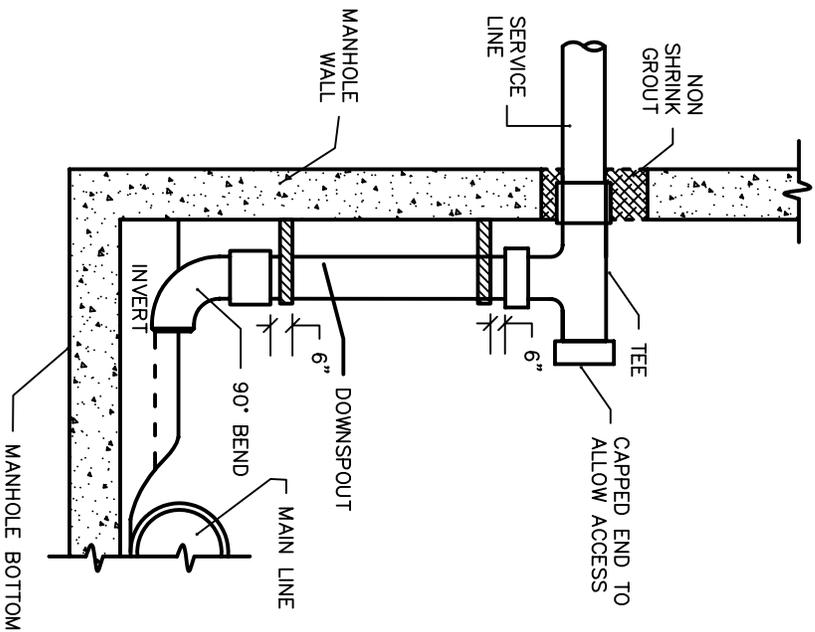


REVISIONS	
DATE	DESCRIPTION

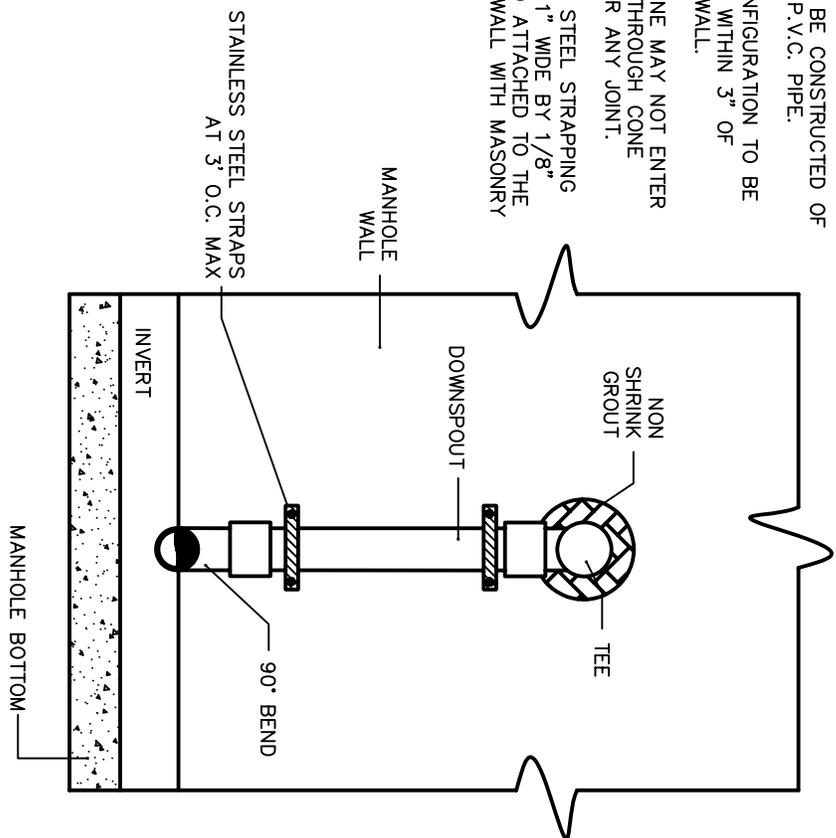
**TOWN OF BOILING SPRINGS
 STANDARDS**

STANDARD DROP MANHOLE

STD. NO.
 7.07



NOTES:
 PIPING CONFIGURATION TO BE USED ON ALL DROPS OVER 30".
 DROPS TO BE CONSTRUCTED OF A.B.S. OR P.V.C. PIPE.
 PIPING CONFIGURATION TO BE INSTALLED WITHIN 3" OF MANHOLE WALL.
 SERVICE LINE MAY NOT ENTER MANHOLE THROUGH CONE SECTION OR ANY JOINT.
 STAINLESS STEEL STRAPPING SHALL BE 1" WIDE BY 1/8" THICK AND ATTACHED TO THE MANHOLE WALL WITH MASONRY ANCHORS.



TOWN OF BOILING SPRINGS
 STANDARDS

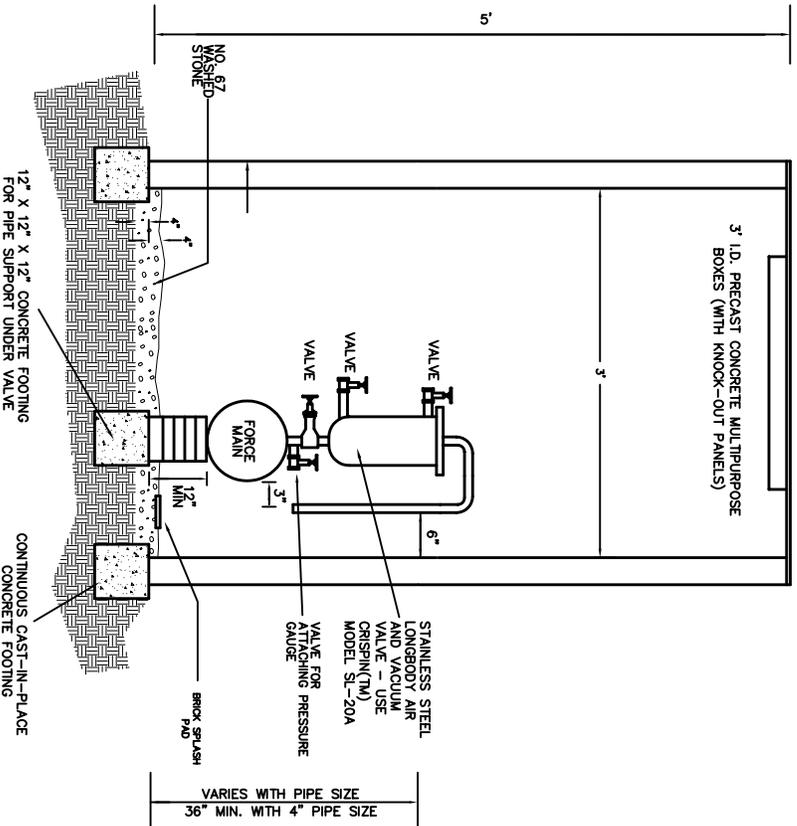
STANDARD DROP MANHOLE FOR
 SEWER SERVICE

STD. NO.

7.08

DATE	REVISIONS
	DESCRIPTION

USE 1/4" THICK ALUMINUM ACCESS COVER WITH 48 X48" OVERALL DIMENSION AND 24 X36" OVERALL COVER WITH LIFTING HANDLE AND LOCKING BAR (HALLIDAY PRODUCTS--SERIES SIR OR EQUIVALENT). DOOR TO HAVE STAINLESS STEEL HINGES WITH TAMPER PROOF FASTENERS AND MUST LOCK IN THE OPEN POSITION. COVER MUST BE ANCHORED TO CONCRETE BOX.



VARIES WITH PIPE SIZE
36" MIN. WITH 4" PIPE SIZE

- NOTES:
1. ALL CONCRETE SHALL BE 3000 PSI COMPRESSIVE STRENGTH.
 2. ALL VALVES SHALL OPEN COUNTER CLOCKWISE.
 3. FRAME TO BE FLUSH WITH GROUND IN ROAD R/W & 2' ABOVE GROUND IN SEWER R/W.
 4. CONCRETE FOOTINGS MAY BE PLACED AGAINST SHAPED BANKS IN LIEU OF FORMS.
 5. FOOTING DIMENSIONS TO BE AS SHOWN OR AS DIRECTED BY THE ENGINEER.
 6. MANHOLE SHALL CONFORM TO SPECIFICATIONS.
 7. AIR & VACUUM VALVE TO BE LONG BODY TYPE FURNISHED WITH BACK FLUSHING ATTACHMENTS.
 8. MANHOLE FRAME & COVER TO BE ANCHORED TO MANHOLE WITH RED JACKET MASONRY ANCHORS OR EQUAL AND THOROUGHLY SEALED TO CONCRETE WITH TAR SEALANT PUTTY.

DATE	REVISIONS	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

**STANDARD AIR RELEASE MANHOLE
FOR SANITARY SEWER FORCE MAINS**

STD. NO.

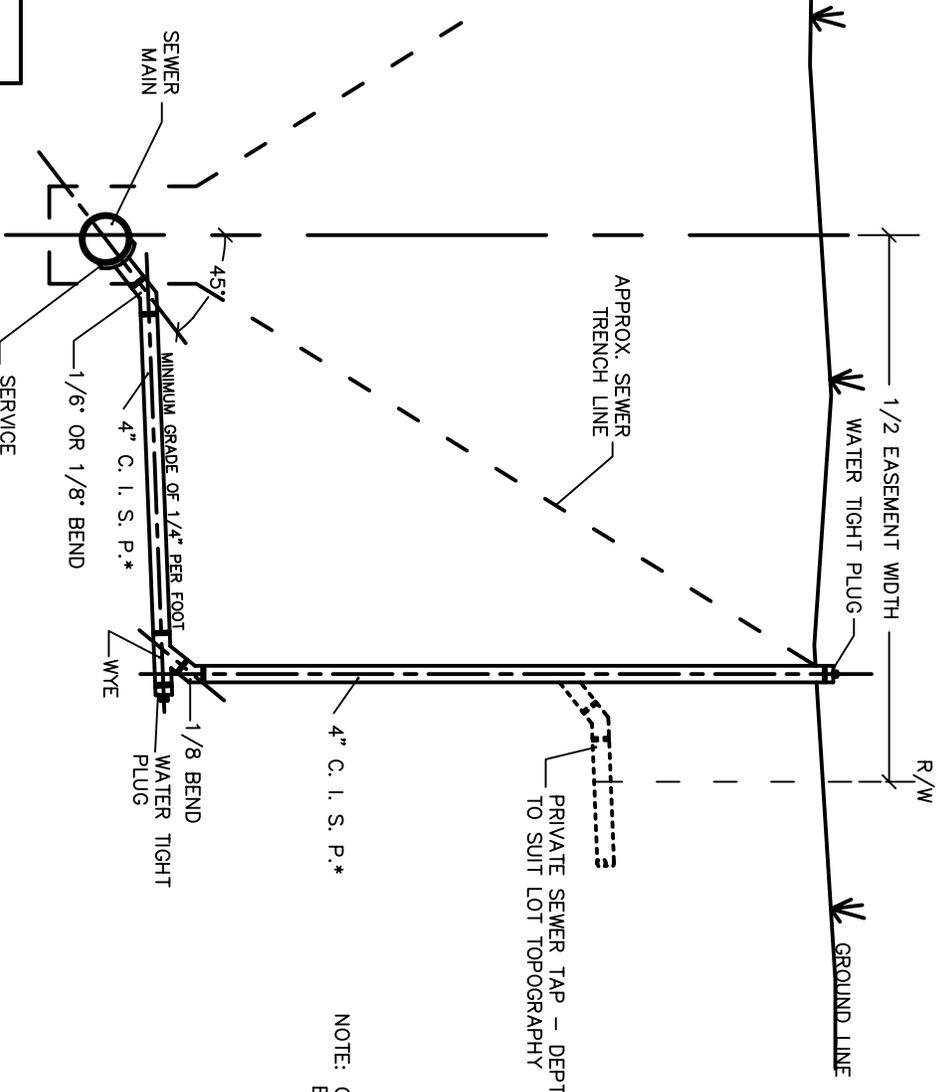
7.09

NOTES:
 ALL PIPE AND FITTINGS SHALL BE OF A CONSISTENT MATERIAL THROUGHOUT THE ENTIRE SERVICE. TRANSITIONS BETWEEN C.I.S.P. AND PVC SHALL NOT BE PERMITTED.

PVC SERVICES SHALL BE INSTALLED WITH CLASS 'B' BEDDING.

SCHEDULE 40 PVC SHALL BE INSTALLED WITH A 4" DEEP #57 STONE BED.

SERVICE SADDLES SHALL BE A ROMAC INDUSTRIES STYLE 'CB' OR EQUAL.



* IN LIEU OF CISP, SCH 40 PVC PIPE WITH CLASS 'B' BEDDING MAY BE USED

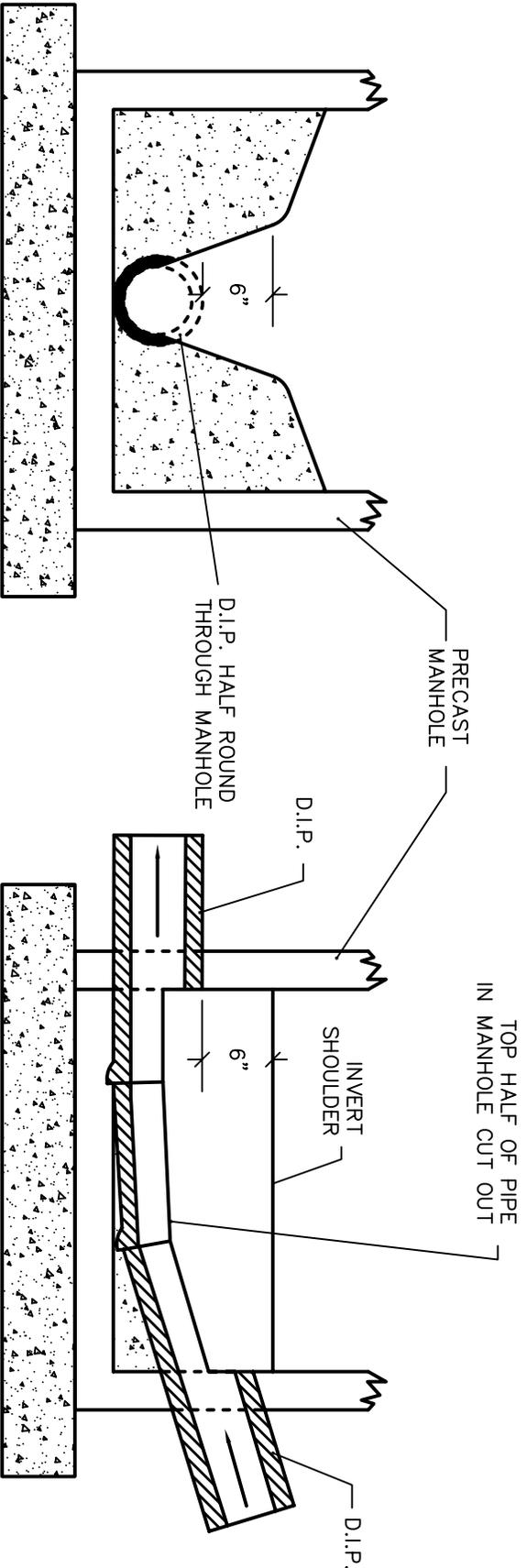
NOTE: CONNECTIONS TO MAIN MUST BE APPROVED BY TOWN

DATE	REVISIONS	DESCRIPTION

**TOWN OF BOILING SPRINGS
 STANDARDS**

**STANDARD 4" SANITARY SEWER TAP AND
 SERVICE FOR SEWER MAINS OVER 14' DEEP**

STD. NO.
 7.10



NOTE:
 NO HORIZONTAL ALIGNMENT CHANGE CAN BE MADE WITHIN THIS MANHOLE TYPE. USE ON GRADES 10% OR GREATER.
 EACH JOINT OF PIPE BETWEEN HIGH VELOCITY MANHOLE & MANHOLE UPGRADE SHALL HAVE A THRUST COLLAR. SEE STD. NO. 6.12.

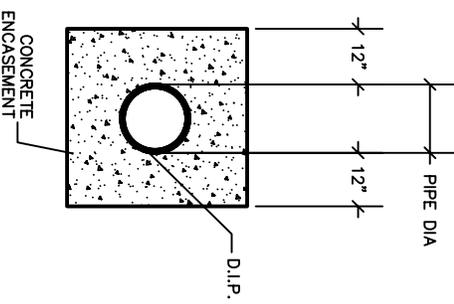
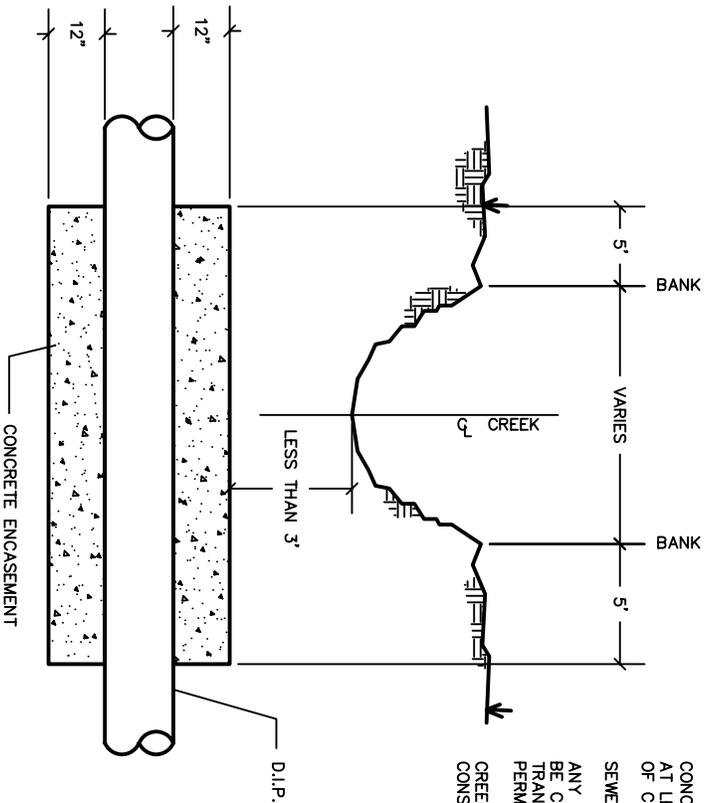
REVISIONS	DESCRIPTION
DATE	

**TOWN OF BOILING SPRINGS
 STANDARDS**

HIGH VELOCITY MANHOLE INVERT

STD. NO.

7.11



NOTE:
 CONCRETE SHALL BE 3000 PSI.
 CONCRETE ENCASUREMENT NOT REQUIRED WHEN PIPE IS AT LEAST THREE (3) FEET UNDER THE CENTERLINE OF CREEK BOTTOM.
 SEWER SERVICES SHALL BE CONSTRUCTED OF C.I.S.P.
 ANY PIPE RUN REQUIRING A CREEK CROSSING SHALL BE CONSTRUCTED OF A CONSISTENT MATERIAL. TRANSITIONS AND FERNCO COUPLINGS SHALL NOT BE PERMITTED.
 CREEK CROSSINGS GREATER THAN 3' DEEP MAY BE CONSTRUCTED OF PVC PIPE.

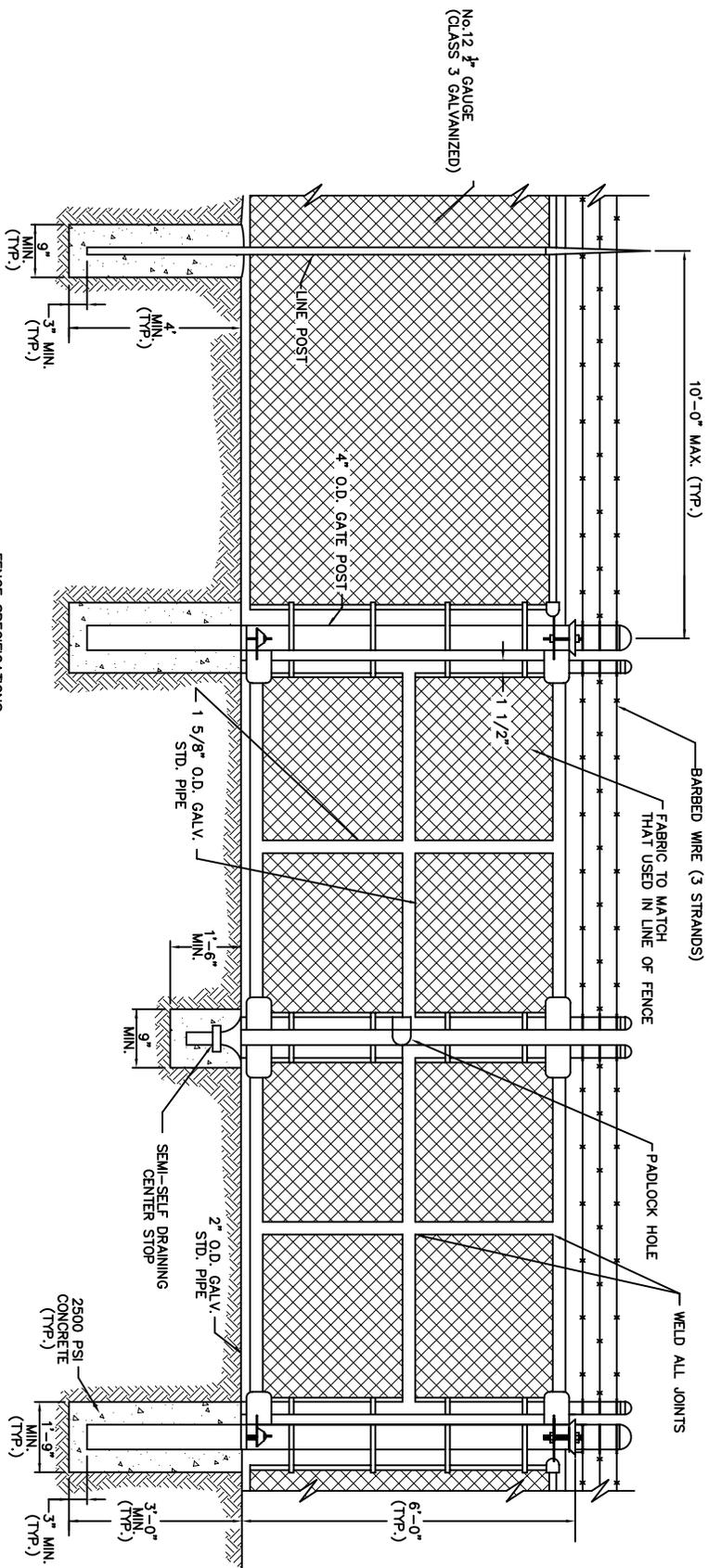
APPLICABLE TO WATER LINES, SEWER LINES, SEWER SERVICES, AND FORCE MAINS.

REVISIONS
DATE
DESCRIPTION

**TOWN OF BOILING SPRINGS
 STANDARDS**

CONCRETE ENCASUREMENT FOR STREAM CROSSING

STD. NO.
 7.12



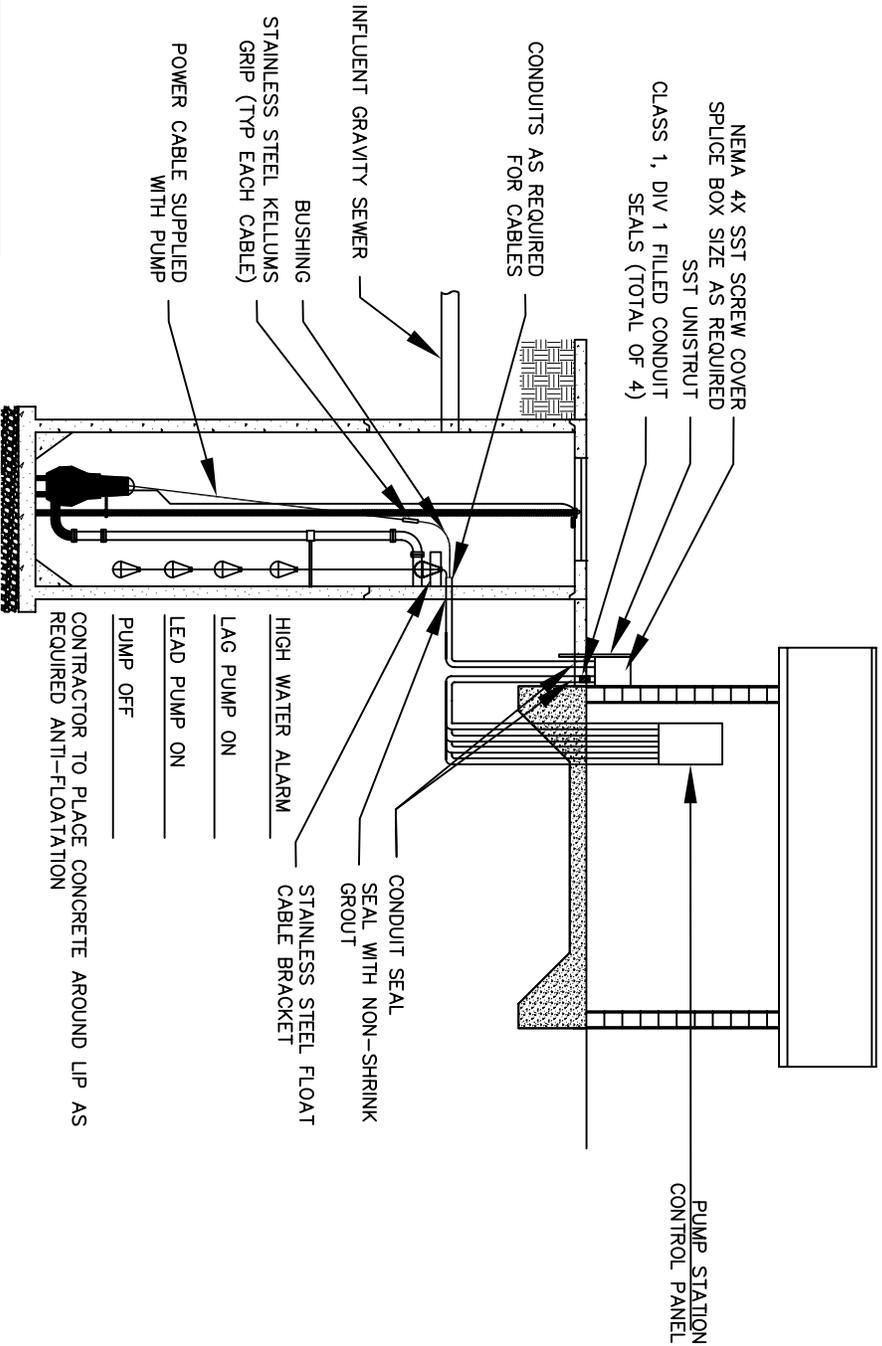
- FENCE SPECIFICATIONS
6. COMMERCIAL CHAIN LINK WITH BARB WIRE
 1. CORNER POST, 2 1/2" X 10' CO20
 2. END POST 2 1/2" X 10' CO20
 3. GATE POST 2 1/2" X 10' CO20
 4. LINE POST 2" X 8" CO20
 5. ALL DOME CAPS WILL BE STEEL
 6. ALL LOOP CAPS WILL BE STEEL NOT ALUMINUM
 7. TOP RAIL 1 3/8" CO20
 8. BARB WIRE 12 1/2" GAUGE CLASS 3 GALVANIZED
 9. BRACE BANDS AND TENSION BANDS WILL BE BEVELED EDGE STEEL
 10. ALL RAIL ENDS WILL BE STEEL NOT ALUMINUM
 11. ALL TENSION BANDS WILL BE 3/8" X 3/4" X 70
 12. ALL CHAIN LINK FABRIC WILL BE 9 GAUGE X2" MESH 1.20Z. ZINC COATING
 13. FENCE WILL HAVE 7 GAUGE GALVANIZED CRIMPED CABLE ON BOTTOM ATTACHED WITH HOG RINGS.

DATE	REVISIONS
	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

FENCE DETAIL FOR LIFT STATION

STD. NO.
7.13d



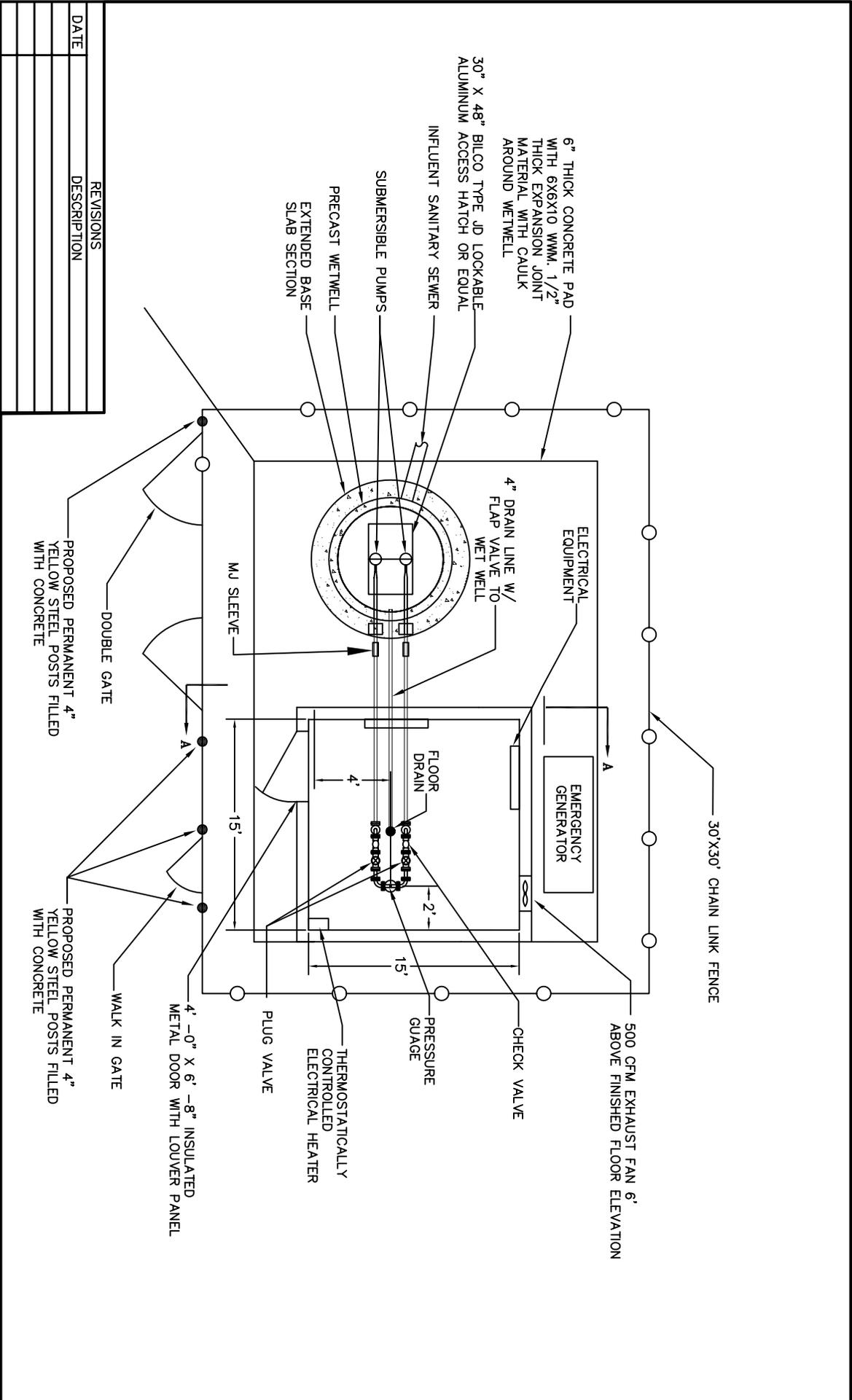
REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

LIFT STATION WIRING DIAGRAM

STD. NO.

7.13b

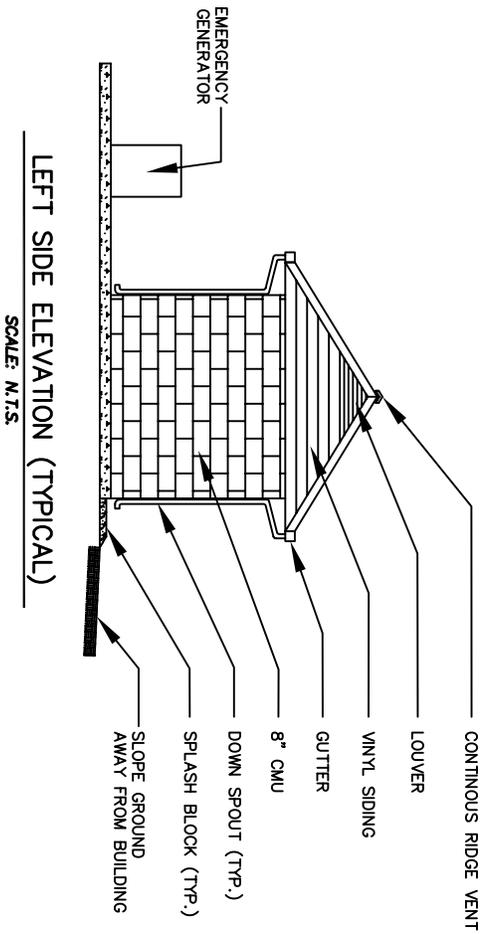


REVISIONS	
DATE	DESCRIPTION

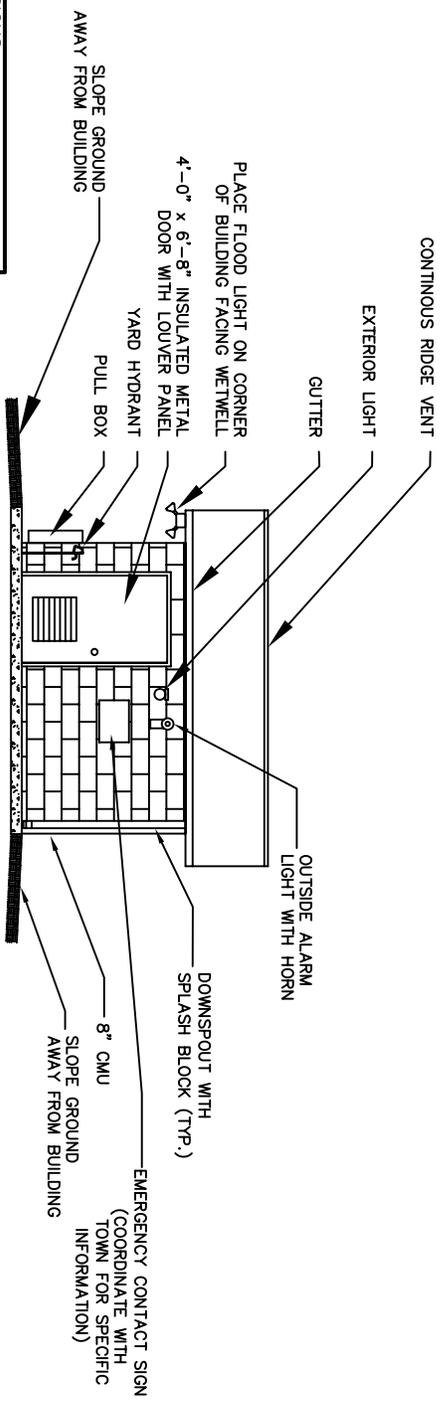
**TOWN OF BOILING SPRINGS
STANDARDS**

LIFT STATION PLAN VIEW

STD. NO.
7.13c



LEFT SIDE ELEVATION (TYPICAL)
SCALE: N.T.S.



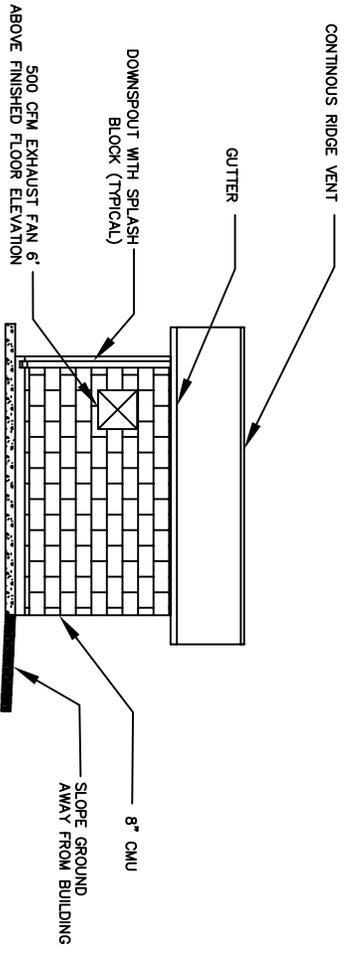
FRONT ELEVATION
SCALE: N.T.S.

DATE	REVISIONS
	DESCRIPTION

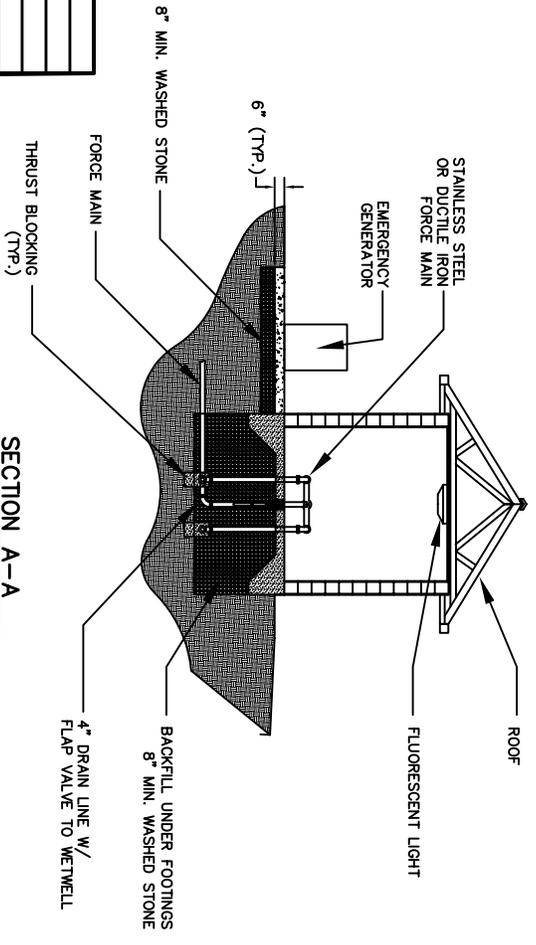
TOWN OF BOILING SPRINGS
STANDARDS

LIFT STATION BUILDING ELEVATIONS

STD. NO.
7.13d



BACK ELEVATION
SCALE: N.T.S.



SECTION A-A
SCALE: N.T.S.

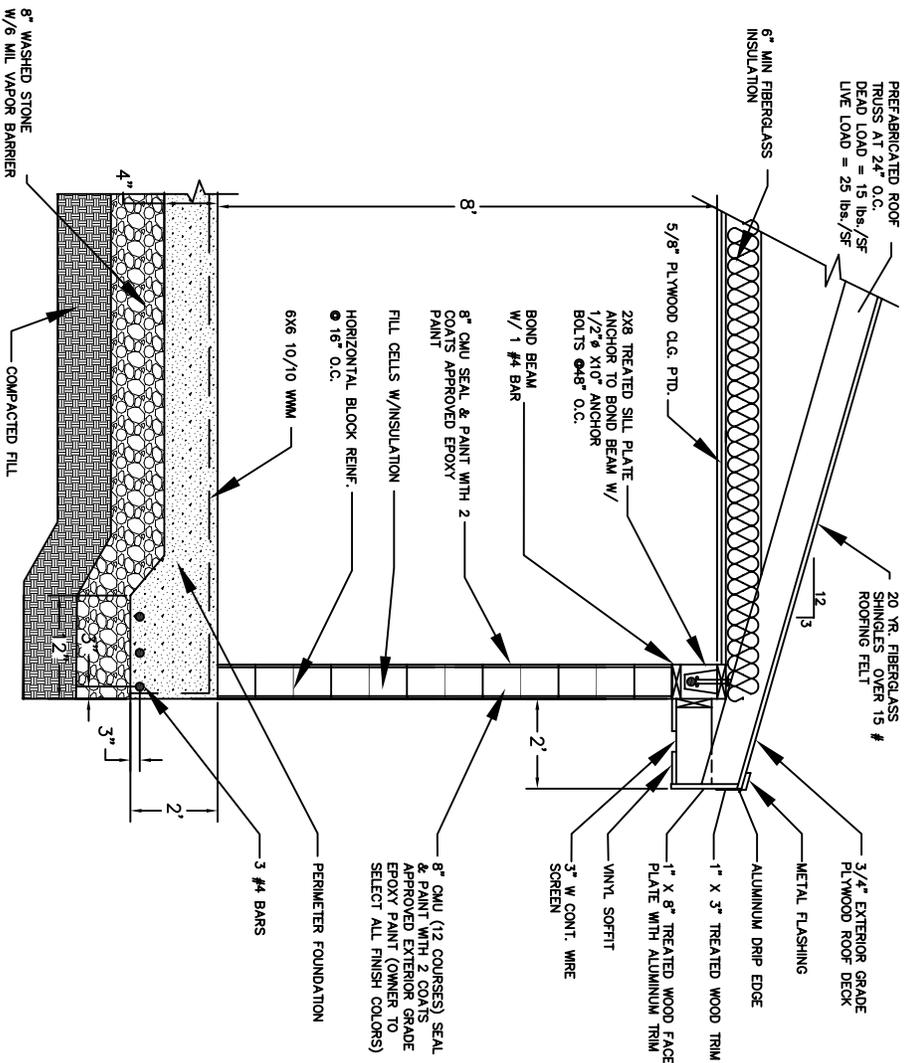
REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

**LIFT STATION BUILDING
ELEVATIONS**

STD. NO.

7.13e

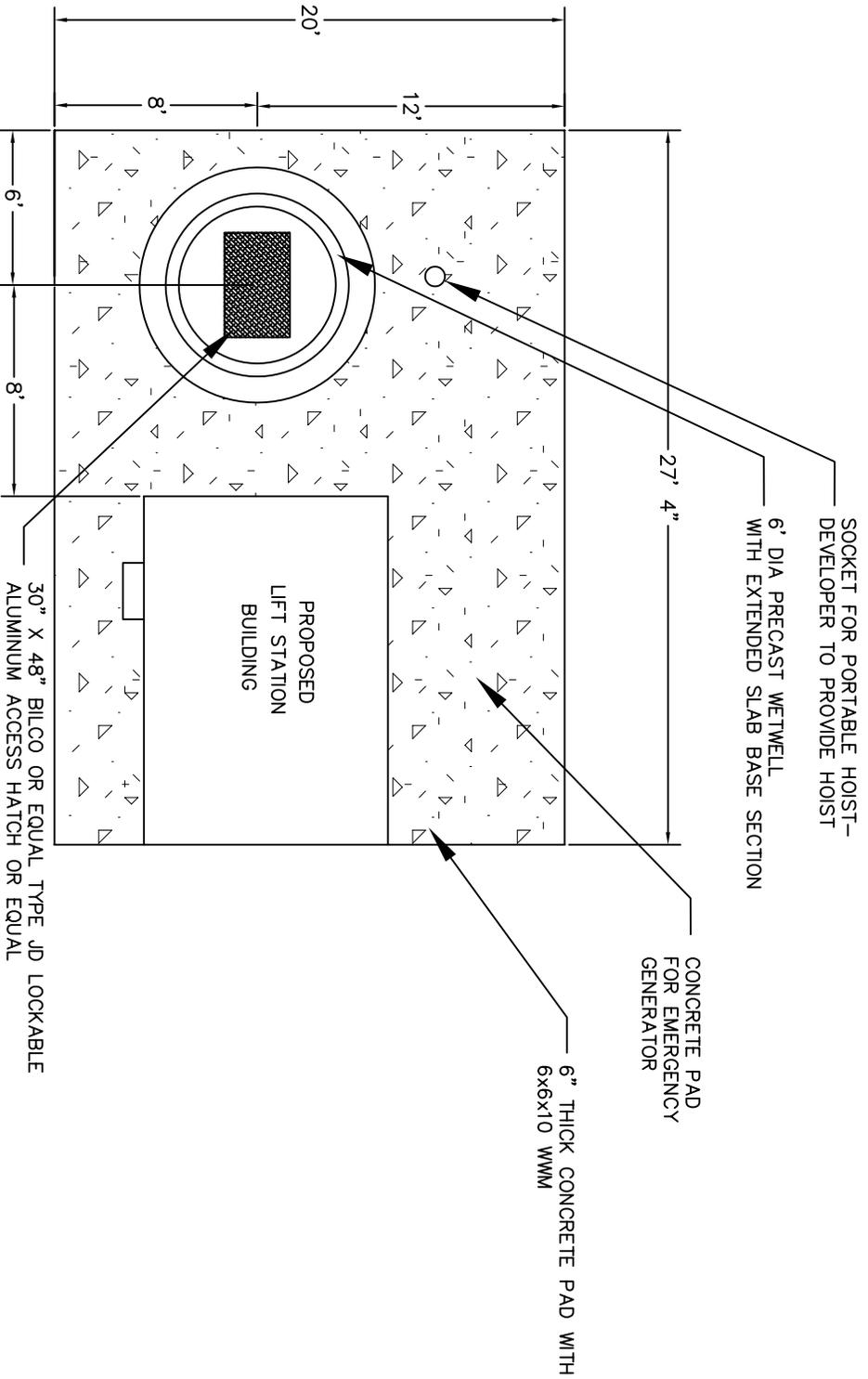


REVISIONS
DATE
DESCRIPTION

TOWN OF BOILING SPRINGS STANDARDS

LIFT STATION BUILDING TYPICAL SECTION

STD. NO. 7.13f



REVISIONS	
DATE	DESCRIPTION

**TOWN OF BOILING SPRINGS
STANDARDS**

**LIFT STATION
CONCRETE PAD**

STD. NO.
7.13g