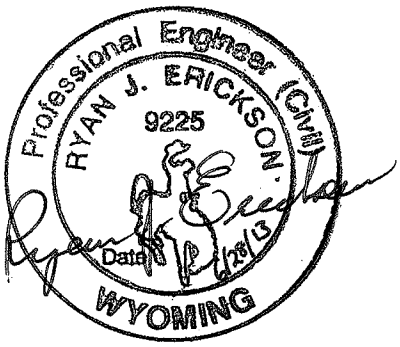
TOWN OF AFTON

PUBLIC WORKS STANDARD SPECIFICATIONS

and

DRAWINGS



June 2013

Prepared by Sunrise Engineering Inc.

TOWN OF AFTON

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LARRY LANCASTER

June 2013

SUNRISE ENGINEERING

TOWN OF AFTON, WYOMING

PUBLIC WORKS
STANDARD SPECIFICATIONS
&
DRAWINGS

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PART I

GENERAL INFORMATION AND REQUIREMENTS

These Public Works Standard Specifications and Drawings are intended as guidelines for designers and developers in preparing their plans and for the Town in reviewing plans. They are not intended to replace Town Land Use Ordinances (copies of the Land Use Ordinances may be obtained from the Town). Where minimum values are stated, greater values should be used whenever practical; where maximum values are stated, lesser values should be used where practical. The developer/proponent is however cautioned that higher standards and/or additional studies and/or environmental mitigation measures may, and will, in all likelihood, be imposed by the Town when developing on, in, near, adjacent, or tributary to sensitive areas to include, but not be limited to, steep slopes, creeks, ponds, lakes, certain wildlife habitat, unstable soils, etc. Alternate design standards will be accepted when it can be shown, to the written satisfaction of the Town, that such alternate standards will provide a design equal to or superior to that specified. In evaluating the alternate design, the Town shall consider appearance, traffic operations, durability, ease of maintenance, public safety and other appropriate factors.

Any improvements not specifically covered herein by these Standards and Specifications must meet or exceed the current "Wyoming Standards for Public Works Construction". Where improvements are not covered by these Standards Specifications and Drawings, the Town will be the sole judge in establishing appropriate standards. Where these Standards conflict with any existing Town ordinances or discrepancies exist within the body of this text, the higher standards shall be utilized as determined by the Town Council.

Plans for major improvements in the public right-of-way or within public easements, or improvements to be "deeded" or "gifted" to the Town, shall bear an approval signature from the Town.

The designer shall submit calculations or other appropriate materials supporting the design of utilities, pavements and storm drainage facilities. The designer shall submit calculations for structures and other designs when requested by the Town Engineer and/or Public Works Director and/or Utilities Superintendent.

PART II

SUBDIVISION PLAN REQUIREMENTS AND CHECKLISTS

Before filing a preliminary plat, the applicant should consult with the Planning & Zoning Administrator for advice regarding general requirements affecting the proposed development. The applicant should furnish the Planning Department with the following information:

1. A general description of existing conditions of the site, including data on existing land and soil characteristics, existing structures and ponds, existing covenants, availability of utilities and other public facilities, documentation of existing easements and wastewater disposal systems (including lateral fields), and proposed uses.

2. A conceptual plan of the proposed subdivision on a current USGS topographic survey map showing proposed streets, lots, and other features.

3. A general location map showing the relationship of the proposed subdivision to existing utilities, major streets and community facilities, and to surrounding developed and undeveloped land when such information is considered necessary by the Planning & Zoning Administrator.

The Planning & Zoning Administrator shall advise the applicant of the requirements pertaining to the proposed development as such requirements are established by the Planning and Zoning Regulations and Town Ordinances. The pre-application procedure requires a formal application, but does not require filing of a plat with the Planning Department.

In addition to the Planning & Zoning Administrator, participants in the pre-application conference may include representatives of other Town and County departments, Town Engineer, and any affected rural water districts and other persons and agencies as deemed necessary by the Planning & Zoning Administrator.

Comments made during the pre-application conference are for general direction only and shall not be legally binding. The purpose of the pre-application conference is to provide the applicant information concerning the potential impacts the proposed development will have on existing infrastructure and potential upgrades that will be required to the infrastructure in order to serve the proposed development.

CONCEPTUAL PLAN CONFERENCE

- ☐ Can the proposed development be serviced with culinary water
- ☐ Potential Impacts to the culinary water system
- ☐ Can the proposed development be serviced by sanitary sewer system
- ☐ Potential Impacts to the sanitary sewer system
- ☐ Potential Roadway Requirements and/or upgrades

After the Conceptual Plan Conference, the applicant should submit a Preliminary Evaluation of Impact Report (PEIR) which the proposed development will have on the existing and future infrastructure including: streets, electric and communication utilities; sewer, water, and storm drainage, etc.

PRELIMINARY PLAT/PLAN SUBMITTAL PURPOSE

The purpose of the preliminary plan submittal is to require formal preliminary approval of a subdivision or project as provided herein in order to minimize changes and revisions which might otherwise be necessary on the final plans. The preliminary plans and all information and procedures relating thereto shall, in all respects, comply with the provisions of these Public Works Standards and any other applicable Town ordinances, local, and State regulations.

REQUIREMENTS FOR PRELIMINARY PLAT/PLAN

Three (3) Plan Set copies must be submitted to the Town to receive preliminary review. The Plat/Plan Review process will take no less than fifteen (15) days. If the Preliminary Plat/Plan Drawings and required information are not complete, or do not meet the minimum Town of Afton requirements, the Staff will deny the Preliminary Plat/Plan. Denied projects will not be placed on the agenda for Planning and Zoning Commission review. Only when the minimum requirements are met will a project be placed on the agenda. All items for review must be submitted at least fifteen (15) days before a Planning and Zoning Commission meeting.

The preliminary drawings shall be prepared, stamped and signed by a professional engineer licensed by the State of Wyoming. Each preliminary plan drawing shall include a north arrow, project name, name and number of engineer preparing the drawings and the sheet name (i.e. site plan, grading, plan & profile, etc.). The preliminary plans submitted shall include the following information:

I. TITLE SHEET WITH LOCATION MAP

- A. Drawn to the scale of one inch equals 1,000 feet.
- B. Provide vicinity map showing proposed location of the project within the Town.
- C. North Arrow.
- D. Subdivision/Project name.
- E. The name and phone number of engineering firm preparing the project drawings.

II. SUBDIVISION OR DEDICATED PLAT: *Title 17 – Land Development Code* is the Town of Afton ordinance governing the preparation of subdivisions and dedicated plats in addition to the list shown below. This ordinance is available at the Town Offices.

- A. Subdivision or dedicated plat shall be prepared, signed and stamped by a Professional Land Surveyor licensed by the State of Wyoming.
- B. The location of and dimensions to the nearest benchmark or monument.
- C. The boundary lines of the proposed subdivision or project indicated by a solid heavy line and the total approximate acreage that is encompassed therein.
- D. Show all property under the control of the developer(s), although only a portion is being developed. When the plans submitted cover only a part of the developer's project, a sketch of the prospective street system of the unplatted parts of the developer's land shall be submitted. The street system of the part submitted shall be considered in the light of existing master street plans or other Planning Commission studies.
- E. The location, width and names of all existing streets within two hundred feet of the project and of all prior platted streets or other public ways, railroad and utility rights-of-way. The plat shall also include parks and other public open spaces, permanent buildings and structures, houses or permanent easements and section and corporation lines, within and adjacent to the tract.
- F. Boundary lines of adjacent tracts of unsubdivided land, showing ownership, where possible.
- G. Other conditions on the adjacent land must be on the preliminary drawings. Indicate approximate direction and gradient of ground slope. Show in the drawings any embankments, retaining walls, buildings, railroads, power lines, towers, nearby non-residential land uses of adverse influences of adjacent properties. Show ownership of adjacent unplatted lands.
- H. Zoning on and adjacent to the project.
- I. Ground elevation of the site.
- J. Required building setback lines:

1. Front setbacks
2. Side setbacks
3. Rear setbacks

K. Other right-of-way easements
1. Location
2. Width
3. Purpose

L. Lot information (where applicable):
1. Lot dimensions and layout
2. Lot numbers
3. Address numbers

III. SITE PLAN/PROJECT OVERVIEW MAP

All proposed public improvements shall be in accordance with the Town's design and construction standards. The project drawings must reference these standard plans or a detail sheet must be provided in the drawings to show any deviations from the standard drawings. All proposed improvements shall show tie-ins to any existing improvements.

A. Public Improvements:
1. Existing and Proposed Public Improvements must be shown on Preliminary Drawings. Show Public Improvements such as roads, storm drains, water, sewer, gas, electric or other major improvements planned for future construction on or near the project.
2. Sites, if any, reserved or dedicated for public uses such as schools, parks or playgrounds.

B. Other conditions on the tract must be provided on the preliminary drawings. Show the location of all special conditions of the property such as water courses, marshes, rock outcropping, wooded areas, houses, barns, shacks, isolated preserveable trees (1-foot diameter or larger at 1-foot above the ground level) and other significant features.

C. Preliminary road plans shall include the following:
1. Proposed street names approved by the Town and Lincoln County.
2. Street right-of-way widths and pavement cross-sections
3. Approximate street grades and gradients.

IV. DRAINAGE AND GRADING PLAN

A. Plan drawn to scale not smaller than 100 feet to the inch, showing the road(s) and lot layout or site plan.
B. Topography at 1 foot minimum contour intervals.
C. Show any existing wetlands.
D. Areas of grading and earth moving with erosion control plan.
E. Location of existing watercourses, canals, ditches, springs and culverts.
F. Location of any 100 year flood plain as designated by the Federal Emergency Management Agency (FEMA).
G. The developer shall investigate the existing and proposed use of any irrigation ditch or canal within the project limits to determine if they are to be perpetuated. If the irrigation system is to be continued, the developer is responsible to contact the water right holders or canal company to obtain their requirements for protection of the irrigation system.
H. The discharge of storm water into irrigation ditches shall not be allowed without special approval from the Town. If an irrigation ditch is to be used as a storm water receptor, secure an agreement from the irrigation Ditch Company that the company will accept responsibility for receiving the water.
I. A storm drainage plan showing water flow directions, inlets, outlets, catch basins, waterways, culverts, detention basins, orifice plates, outlets to off-site facilities and off-site drainage facilities planned to accommodate the project drainage. Drainage plans are to facilitate peak flow for the 10-year, 24-hour storm event. An off-site discharge rate of 0.2 cfs per acre of the gross project

area is permitted included with hydraulic and hydrologic calculations. All detention basins are to facilitate the 100-year, 24-hour storm event. Adequate spillway provisions must be provided to pass the storm water in excess of the 100-year, 24-hour storm event.

J. Public water shall not be discharged onto or through private property without the appropriate easement. An easement with the right of access conveyed to the Town of Afton shall be provided whenever conveyance systems are constructed in lands of private ownership. A minimum easement width of twenty feet centered on the drain is required. The width may be in excess of the minimum when situations require.

K. In the event that proposed construction shall direct surface or storm water runoff to properties or facilities owned and maintained by agents other than the Town of Afton, written proof of permission, or approval from these agents must be provided prior to acceptance of drainage concepts, and subsequent issuance of Town drainage approval.

L. It is Town policy and the developer's responsibility wherever attainable to restore, protect and maintain the chemical, physical, and biological integrity of Town and State waters and to restore their beneficial uses. To do so, drainage design shall address the treatment of surface and storm water runoff, both wet-weather and dry-weather discharges.

V. DETAIL SHEET

Detail sheets and/or references to the Town of Afton Public Works Standards.

VI. PRELIMINARY PLANS – OTHER DOCUMENTS

The developer shall provide the following documents with the application:

A. Hydraulic and hydrologic storm drainage calculations.

B. When subdivision roads intersect state highway properties and where subdivisions access off state highways, written consent must be granted by the Wyoming Department of Transportation. Also, include any written agreements with adjacent property owners, irrigation companies, etc., regarding conveyance systems or other matters pertinent to approval.

C. Traffic studies when required by the Planning Commission or Town Engineer.

Construction should not start on a subdivision project or submitted projects until the Planning and Zoning Commission grants full final approval and the Planning Commission Chairperson has signed the plat. Final and preliminary approval for new subdivisions or submitted projects will not be considered at the same time. A preliminary submittal may cover the entire project for approval with smaller phases of construction being submitted for final approval and constructed individually.

PRELIMINARY PLAN SUBMITTAL CHECKLIST

DRAWINGS: 24"x36" format (3 copies) - 11"x17" (6 copies)

- ☐ Title Sheet with Location map
- ☐ Subdivision Plat or Dedication Plat (as required)
- ☐ Site Plan(s)/Project Overview Map(s)
- ☐ Drainage and Grading Plan
- ☐ Detail Sheets and/or reference to Town of Afton Public Works Standards

OTHER DOCUMENTS: 8½"x11" format (2 copies)

- ☐ Storm Drain Calculations (As required)

☐ Written Approvals (irrigation companies, etc., as required) Post Office

☐ Current List of Adjacent Landowners

☐ Traffic Study (as required) (ITD recommendations when applicable)

☐ Public Entities Contacts and Responses

ELECTRONIC FORMAT: Compact Diskette (CD)

☐ Computer files of plat (compatible with Town's AutoCAD mapping system, ACAD 2012, ACAD 2013)

NOTE: 1. All plans must be submitted to the Town of Afton Planning & Zoning Administration at the Town Offices.

TOWN OF AFTON
P.O. Box 310
416 South Washington Street
Afton, WY 83110

☐ Everything must be complete and checked off prior to placement on the P & Z agenda for preliminary plat.

Preliminary project plat/plans must have been submitted and approved by the Planning and Zoning Commission before proceeding with Final Plat/Plan submittal. The Final Plat/Plan may cover only a portion of the approved preliminary plat/plan, which the Developer proposes to record and develop at one time. All required conditions of the preliminary approval must be reflected in the Final Drawings.

FINAL PLAN SUBMITTAL PURPOSE

The purpose of the Final Plat/Plan submittal is to require formal approval by the Planning and Zoning Commission and Town Council before a subdivision plat is recorded in the office of the County Recorder or a conditional use project is developed. The Final Plans and all information and procedures relating thereto shall, in all respects, comply with the provisions of these Public Works Standards and any other Town ordinance, local, and State regulations. The Final Plans and construction drawings shall be submitted and shall conform, in all respects, to those regulations and requirements specified during the preliminary plat procedures.

REQUIREMENTS FOR THE FINAL PLAT/PLAN

The final drawings shall be prepared, stamped and signed by a professional engineer licensed by the State of Wyoming. Each final plan drawing shall include a north arrow, project name, name and number of engineer preparing the drawings and the sheet name (i.e. site plan, grading, plan & profile, etc.). The Final Plat/Plan submittal shall include the following information:

I. TITLE SHEET WITH LOCATION MAP

- A. Drawn to scale of 1,000 feet to the inch.
- B. Provide vicinity map showing proposed location of the project within the Town.
- C. North Arrow.
- D. Subdivision/Project name.
- E. The name and phone number of engineering firm preparing the project drawings.

II. SUBDIVISION OR DEDICATED PLAT: *Title 17 – Land Development Code* is the Afton Town ordinance governing the preparation of subdivisions and dedicated plats in addition to the list shown below. This ordinance is available at the Town Offices.

A. The following information shall be included on all final subdivision plats or conditional use projects (where applicable).

1. North point, scale of the drawing, the date of preparation and any revisions with dates.
2. Accurately drawn boundaries showing the bearings and dimensions on all boundary lines of the subdivision or project. These lines shall be slightly heavier than the street and lot lines. The boundary survey shall be of second order accuracy. A traverse of the exterior boundaries of the tract, and of each block, when computed from field measurements on the ground shall close within a tolerance of one foot to 10,000 feet of perimeter. Elevations shall be referenced to nearest Lincoln County benchmark.
3. The adjoining corners of all adjoining subdivisions shall be identified by lot and block numbers, subdivision name and place of record or other proper designation.
4. The names, widths, lengths, bearings and curve data on centerlines of the proposed streets, alleys and easements; including bearing and distance of straight lines, and central angle, radius and arc length of the curves; and such information as may be necessary to determine the location of the beginning and ending points of curves.
5. All proposed streets shall be named or numbered in accordance with, and conform to the adopted street naming and number system of Town of Afton and Lincoln County. Individual lots shall be assigned after final plat.
6. The final plat shall show all survey, mathematical information and data necessary to locate all monuments and to locate and retrace all interior and exterior boundary lines appearing thereon, including bearing and distance of straight lines, central angles, radius

and arc length of curves, and such information as may be necessary to determine the location of the beginning and ending points of curves.

7. All lots and blocks, and all parcels offered for dedication or any purpose shall be delineated and designated with dimensions, boundaries and courses clearly shown and defined in every case. Parcels offered for dedication, other than for streets or easements, shall be designated by letter. Sufficient linear, angular and curve data shall be shown to determine readily the bearing and length of the boundary lines of every block, lot and parcel which is a part thereof. In general, all remnants of lots below minimum size must be added to adjacent lots, rather than allowed to remain as unusable parcels.
8. The plat shall show fully and clearly all stakes, monuments and other evidence indicating subdivision boundaries, street intersections, individual lot corners and any other monument used in establishment of lines, grades and curves of the plat.
9. Sheets shall be so arranged that no lot be split between two or more sheets. No ditto marks shall be used for dimensions.
10. The plat shall show the right-of-way lines of each street, and the width of any portion being dedicated, and widths of any existing dedications. The widths and locations of adjacent streets and other public properties within 50-feet of the subdivision shall be shown with dotted lines. If any street in the subdivision is a continuation or an approximate continuation of an existing street, the conformity or the amount of nonconformity of such street to such existing streets shall be accurately shown.
11. Fine dashed lines shall show the sidelines of all easements. The widths of all easements and sufficient ties thereto, to definitely locate the same with respect to the subdivision shall be shown. All easements shall be clearly labeled and identified. All lots shall have easements as required by the Subdivision Ordinance.
12. Plat shall include a statement that each and every owner of any interest in a private roadway shall be jointly and severally responsible for the maintenance and repairs to the roadway. The Town shall have no responsibility or liability for the maintenance of, or repair to, any private roadway.
13. Sewer "Will Serve" letter from the Town.
14. Any other requirements required by the County Recorder must be met.

B. The first sheet of the plat, below the title, shall show the name of the licensed land surveyor, together with the date of the survey, the scale of the map and the number of the sheets. The following certificates, acknowledgements and descriptions shall appear on the first sheet of the final plat, and may be combined, where appropriate.

1. A description of all property being subdivided with reference to maps or deeds of the property shall have been previously recorded or filed. Each reference in such description shall show a complete reference to the book and page of records of the County.
2. Certification of survey by a licensed land surveyor.
3. Owner's dedication which shall "warrant and defend and save the Town harmless against any easements or other encumbrance on a dedicated street which will interfere with the Town's use, maintenance and operation of the street".
4. Notary Public's acknowledgement.
5. Town Planning Commission's certificate of approval.
6. Town/County Health Department's certificate of approval.
7. Town Engineer's certificate of approval.
8. Mayor's certificate of acceptance.
9. Town Attorney's certificate of approval.
10. A one-and-one-half by five-inch space in the lower right hand corner of the drawing for the County Recorder's use.

C. Addressing: The Town shall provide addresses to be shown on the final plat for all building lots using the Town Master Address Grid.

1. Streets that back-track loop or are longer than 600 feet and curve more than 30 degrees from original heading shall be assigned at least two separate names.
2. Names of streets will not be allowed to continue in more than one bearing (either due North to South or due East to West, but not both).
3. All street names will be verified with the County before assigned in order to avoid duplication.
4. Proposed street names that sound very similar to existing names or street names that have unconventional spellings shall be avoided.
5. Proposed street names are encouraged to have the following characteristics:
   a. Historic significance
   b. Sense of place
   c. Traditional, i.e., minerals, trees, wildlife
   d. Compatibility with adjacent streets
6. Proposed street names shall not be longer than 17 letters and spaces so they may be legible on a standard Town street sign.
7. To minimize confusion, the following type of proposed streets shall be named:
   a. Streets that change direction.
   b. Loop or horseshoe streets.
   c. Streets that have intersection coordinate changes.
   d. Cul-de-sacs.
   e. Dead-end streets that will likely be extended into one of the above street types.
8. Proposed street names and street types should be matched as follows:
   a. Boulevard – arterial.
   b. Drive, Road – streets longer than 1,000 feet.
   c. Way – curvilinear streets longer than 1,000 feet.
   d. Street, Avenues – straight directional streets.
   e. Lanes – short secondary connecting streets.
   f. Circle, Court, Place, Cove – cul-de-sacs and dead-end streets.

Please note the previous numbers 1, 2, 4, 7, 8, & 14 have been removed. (This is for the Staff and will not be in the final)

III. SITE PLAN/PROJECT OVERVIEW MAP

All proposed public improvements shall be in accordance with the Town's design and construction standards. The project drawings must reference these standard plans or a detail sheet must be provided in the drawings to show any deviations from the standard plans. All proposed improvements shall show tie-ins to any existing improvements.

The scales and elevations referenced to the nearest Lincoln County benchmark must be shown. The Drawings should contain necessary information to verify all of the design standards, monuments, signs and other required improvements, including, but not limited to, road cross sections, storm drainage, landscaping, street lights and contour lines.

A. Roadways: *Title 17 – Land Development Code* is the Afton Town ordinance governing the design of roadways in addition to the list shown below. This ordinance is available at the Town Offices.

1. All street cross sections shall conform to the Afton Standard Details shown in the Development Drawings section of this manual.
2. Signing and striping for new streets shall be in accordance with the Federal Highway Administration (FHWA) and Manual on Uniform Traffic Control Devices (MUTCD).
3. No more than two cross streets shall intersect at any intersection.
4. No half-streets shall be permitted. The Developer is responsible for full development of the street to serve a subdivision or conditional use project.

5. Dead End Streets:
   a. Dead end streets of length greater than 150 feet shall be required to have an all weather surface turn-around with a minimum outside radius of forty five (45) feet in residential areas and sixty (60) feet in commercial and industrial areas at the closed end.
   b. Temporary ends of street in phased development must provide the width and all weather surfaces but may omit curb and gutter on a turn-around.
   c. A Temporary Turn-Around Easement shall be required on the final dedication plat denoting the diameter of the turn-around as temporary until the road is extended at a future date. The dedication of the temporary turn-around must be signed by the property owner on which the turn-around is located.

B. Lots: *Lot Split and Subdivision Regulations* is the Afton Town ordinance governing the design of lots in addition to the list shown below. This ordinance is available at the Town Offices.

1. Numbers to identify each lot or site and block.
2. The lot sizes, width, depth, shape and orientation shall be appropriate for location of the subdivision and for the type of development and use contemplated.
3. The lot dimensions and areas shall conform to the requirements of the zoning ordinance.
4. Lots abutting a watercourse, drainage way, channel or stream shall have a minimum width or depth as required to provide an adequate building site and to afford the minimum usable area required by ordinance for front, side and rear yards.
5. All corner lots shall be sufficiently larger than others so as to allow for buildings setback lines on both streets as provided by Town Code.
6. Double frontage and reverse frontage lots shall be avoided except where essential to provide separation of residential development from highways or primary thoroughfares or to overcome specific disadvantages of topography and orientation.
7. Side lots shall be substantially at right angles or radial to street lines.
8. Purpose for which sites, other than residential lots, are dedicated or reserved.

C. Public Utilities:

1. All Existing and Proposed Public Improvements must be shown on the Final Drawings. Show public improvements such as storm drains, water, sewer, gas, electric or other major improvements planned for construction on or near the project.
2. All utility services lines for electrical power, streetlights, cable television, natural gas and telephone service shall be placed underground within public utility easements dedicated on the final plat or as secured by recorded easements throughout a subdivided area.
3. All utility lines shall be parallel to, but not less than **12** inches from, the property lines.

D. Sidewalks:

Standard sidewalks shall be concrete and a minimum of 60-inches in width and conform to the Town's construction standards.

IV. GRADING AND DRAINAGE PLAN

A. Plan drawn to scale not smaller than 100 feet to the inch, showing the road(s) and lot layout or site plan.
B. Topography at 2 foot minimum contour intervals.
C. Show any existing wetlands.
D. Areas of grading and earth moving with erosion control plan.
E. Location of existing watercourses, canals, ditches, springs and culverts.

F. Location of any 100 year flood plain as designated by the Federal Emergency Management Agency (FEMA).

G. The developer shall investigate the existing and proposed use of any irrigation ditch or canal within the project limits to determine if they are to be perpetuated. If the irrigation system is to be continued, the developer is responsible to contact the water right holders or canal company to obtain their requirements for protection of the irrigation system. In the event that an irrigation ditch or canal is to be piped or covered, the size, type, slope spacing of cleanout structures, etc....will be specified on the Drainage Plan and shall be in accordance with Afton Town Public Works Standards and sound engineering practice. The water right holders, their representative, or the Irrigation Company shall approve all related construction.

H. The discharge of storm water into irrigation ditches shall not be allowed without special approval from the respective owner as well as the Town. If an irrigation ditch is to be used as a storm water receptor, a written agreement must be secured from the Irrigation Ditch Company that the company will accept responsibility for receiving the water. If the Town and the Irrigation/Canal Company approve a ditch or canal, to transport storm water, a hydraulic investigation shall be required to demonstrate the ditch or canals capacity to accept the storm drainage.

I. For private construction, all retention storage, sump storage and groundwater recharge areas must be located on private property only, and designed to contain and dispose of the estimated runoff from a 100 year, 24 hour storm event over the entire gross aggregate project area.

J. In the event that percolation or infiltration is considered in the design of storage volumes, written proof shall be submitted documenting the performance and results of acceptable percolation and groundwater tests within the area. A bound copy of the soil analysis report should be prepared and presented with related drainage submittals for review. All drainage facilities shall be constructed in conjunction with the construction of street or surface improvements. Adequate safety and maintenance precautions shall be addressed in the design. In addition, written notice shall be submitted freeing the Town from any maintenance responsibility or liability.

K. Public water shall not be discharged onto or through private property without the appropriate easement. An easement with the right of access conveyed to the Afton Town shall be provided whenever public conveyance systems are constructed in lands of private ownership. A minimum easement width of twenty feet centered on the drain is required. The width may be in excess of the minimum when situations require.

L. In the event that proposed construction shall direct surface or storm water runoff to properties or facilities owned and maintained by agents other than the Afton Town, written proof of permission, or approval from these agents, must be provided prior to acceptance of drainage concepts and subsequent issuance of Town drainage approval.

M. It is Town policy and the developer's responsibility wherever attainable to restore, protect and maintain the chemical, physical, and biological integrity of Town and State waters and to restore their beneficial uses. To do so, drainage design shall address the treatment of surface and storm water runoff, both wet-weather and dry-weather discharges.

- PROFILE SHEETS

A. Road Profile: *Lot Split and Subdivision Regulations* is the Afton Town ordinance governing the design of roadways in addition to the list shown below. This ordinance is available at the Town Offices.

The Road Profile shall include the following information:

1. Existing Surface Profile and Grades shown with dashed lines.
2. Centerline/TBC Profile and Grades.
3. Appropriate elevations along the Road Profile.
4. Stationing of appropriate points along the Road Profile.
5. Vertical curves and information necessary for the calculation of vertical curves shall be shown on the Road Profile.
6. Utility relocations shall be shown in the Road Profile.

7. Tie-ins to existing roads shall be shown in the Road Profile.

V. DETAIL SHEETS

Detail Sheets and/or reference to Afton Town Public Works Standards are required for all details.

VI. FINAL PLAN SUBMITTAL – OTHER DOCUMENTS

The Developer shall provide the following documents with the application:

A. Hydraulic and hydrologic storm drainage calculations. (As required)
B. When subdivision roads intersect state highway properties and where subdivision access off state highways, written consent must be granted by the Wyoming Department of Transportation. Also, include any written agreements with adjacent property owners, irrigation companies, County Flood Control, etc., regarding storm drainage or other matters pertinent to approval.
C. Traffic study, when required by the Planning Commission or Town Engineer.
D. Soils report demonstrating the subsurface conditions and recommended pavement designs for the project.

VII. ELECTRONIC FORMAT

The applicant shall submit a computer file of the plat on compact diskette (CD). The file must be compatible with the Town's AutoCAD mapping system. (i.e. ACAD 2000, 2004)

IX. ADDITIONAL INFORMATION

A. Street Name and Traffic Control Signs:

1. The cost of all street name and traffic control signs shall be born by the Developer. Street name signs must be installed prior to final inspection and approval of improvements.
2. All traffic control signs and striping must be in accordance with the Federal Highway Administration (FHWA) and Manual on Uniform Traffic Control Devices (MUTCD).

B. Monuments and Markers:

1. Street survey monuments shall be set at each street intersection point and angle point of the centerline. Street survey monuments shall be a brass cap set in concrete, installed under a cast iron ring and lid set to finished road grade. The Developer's surveyor will be responsible for survey, installation and checking of accuracy for all monuments being installed within the development.
2. Lot corners shall have markers of steel bars at least ½-inch in diameter and 24-inches long, tagged with the surveyor's number set 2-inches above finished grade.
3. Subdivision boundary markers shall be set at all boundary corners, angle points and points in between if distances between monuments are greater than ¼-mile. Boundary markers shall be a 2-inch diameter pipe and a minimum of 24-inches long set in a 6-inch diameter hole filled with concrete.

C. Required Improvements:

1. Culinary Water Systems - Building permits will not be issued until culinary water systems have been constructed, tested, approved, and accepted by the Town, the local Fire Marshal, and the Wyoming Department of Environmental Quality. All testing results and acceptance notices shall be submitted to the Town.
2. Roadways - Building permits will not be issued until roadways have been constructed in accordance with the Town Standards to the finished grade.

FINAL SUBMITTAL CHECKLIST - DRAWINGS: (3 copies)

☐ Title Sheet with Location map

☐ Subdivision Plat or Dedication Plat (as required)

☐ Site Plan(s)/Project Overview Map(s)

☐ Drainage and Grading Plan

☐ Road Plan and Profile Sheet(s) (as required)

☐ Storm Drain Plan and Profile Sheet(s) (as required)

☐ Detail Sheets and/or reference to Town of Afton Public Works Standards

OTHER DOCUMENTS: 8½"x11" format (3 copies)

☐ Storm Drain Calculations (As required)

☐ Written approvals (WYDOT, irrigation companies, Town of Afton, Postmaster, Fire District, etc., as required)

☐ Traffic Study (as required)

☐ Soils Report

ELECTRONIC FORMAT: Compact Diskette (CD)

☐ Computer files of plat (compatible with Town's AutoCAD mapping system, ACAD 2012, ACAD 2013)

NOTE: 1. All plans must be submitted to the Town of Afton Planning & Zoning Administration at the Town Offices.

TOWN OF AFTON
P.O. Box 310
416 South Washington Street
Afton, WY 83110

PRECONSTRUCTION MEETING

Prior to commencement of construction activities a pre-construction meeting will be held at the Town Office. Those in attendance shall be the Developer, Contractor, Developer's Engineer, Public Works Director, Utilities Superintendent and Town Engineer.

The Developer shall provide four (4) copies of the approved plans which will be stamped approved and initialed by all parties. A set will remain with the Town, Town's Engineer, Developer's Engineer and Contractor. The Contractor is required to keep this set of drawings on-site at all times.

Items to be discussed at the preconstruction meeting are the following:

1. Construction Requirements and Procedures

2. Construction Approval Checklists

3. Testing

4. Warranty

5. "As-Built" Requirements

Important Information from the Town of Afton's Public Works Department

1. The property owner must have corner stakes marked on their property to make sure that front, back and side setback requirements are met.

2. The Town of Afton needs to have the location of driveway marked on the property to make sure that it does not cross over water meter pits or sewer lids. Water meter pits cannot be located in a driveway. There will be an extra expense for you later if you do not take it into consideration now.

3. **The contractor needs to contact Dig Line before any excavation begins**. **No excavation or building permit will be issued unless this requirement is met.** The phone number is 1-800-849-2476. The Town will not locate any water or sewer lines on private property.

4. Town policy states that there will be no sewer, water, or meter pit excavation in Town easements between October 15th and April 15th. Water meters shall not be installed during this same time period unless written permission from the Public Works Department is granted with possible conditions included. IF you know you will be receiving a Certificate of Occupancy between October 15th and April 15th, you need to have your water meter installed **BEFORE** the 15th of October unless otherwise approved by the Town.

5. The Town needs five days prior notice for any hook-up for water and sewer lines. This allows time for any parts that are needed to be ordered and the work scheduled in a timely fashion.

6. The Town needs to install all water and sewer hook-ups in Town easements.

7. There will be no excavation around Town culinary or irrigation water and sewer lines after 3:00 p.m., Monday though Friday. **No excavation of any sort will be allowed on weekends due to the unavailability to purchase replacement parts on weekends**.

8. When landscaping around meter pits, you need approval from the Public Works. Contact the Town Offices.

9. Landscaping in the Town easement and sprinkler system – if damaged by snow plows is the responsibility of the homeowner to replace. All large trees should be set at the property line, not in the Town easement.

10. The Town will plow into easements to remove snow. Please do not mark edge of asphalt with pipe or rebar as it is a danger to traffic and pedestrians. You are allowed to place snow on Town easements only within 15 feet of roadways. You are not allowed to push snow across Town streets and store in Town easements.

11. Tampering: It shall be unlawful for any person not authorized by the Town to tamper with, enter, alter or injure any part of the Town waterworks or water supply system. Unauthorized use which damages Town valves, damage to Town lines and mains by excavation, driving over meter boxes, etc. where cost is incurred by the Town, shall be charged to the water user or persons responsible for the damage.

12. When installing an irrigation system utilizing culinary water, all State laws must be observed and an inspection by the Plumbing Inspector must be done. There can be no connection between the culinary water source and any irrigation water source. Installation of a backflow prevention device is required. A copy of yearly back flow inspection that is done by a certified inspector must be sent to the Town.

TOWN OF AFTON PUBLIC IMPROVEMENTS APPROVAL CHECKLIST
PATHWAY & PARKS

	Developer's Engineer		City's Representative	
	DATE	**SIGNED**	**DATE**	**SIGNED**
Subdivision Name:				
PATHWAY				
STRUCTURAL BACKFILL				
1. Gradation Requirements				
2. Compaction Tests				
3. Trench Compaction				
BASE COURSE				
1. Gradation Requirements				
2. Compaction Tests				
3. Thickness Tests (if required)				
HOT PLANT MIX PAVEMENT				
1. Gradation Requirements				
2. Compaction Tests				
3. Thickness Samples				
4. Smoothness Checks				
5. Additional Thickness Test Locations (if required)				
PARKS				
IRRIGATION SYSTEM				
1. Installed per Approved Plans & City Standards				
IMPROVEMENTS & VEGETATION				
1. Installed per Approved Plans & City Standards				
"AS-CONSTRUCTED" DRAWINGS				
1. Submitted and Approved				

ENGINEER'S CERTIFICATE

I certify that the public improvements have been constructed in accordance with the Town of Afton Public Works Standard Specifications & Drawings.

Signed: _____ Date: _____

WARRANTY PERIOD FOR THE ABOVE IMPROVEMENTS SHALL BEGIN ON : _____

Note:

1. All items must be dated and signed by a Town Representative Prior to acceptance of the Subdivision.
2. The Contractor shall have a set of the stamped "Approved" Drawings on site at all times.
3. Full Time inspection is required from the Developer. Town Representatives will make spot inspections throughout construction.

TOWN OF AFTON PUBLIC IMPROVEMENTS APPROVAL CHECKLIST
ROADS

	Developer's Engineer		City's Representative	
	DATE	**SIGNED**	**DATE**	**SIGNED**
Subdivision Name:				
ROADS				
STRUCTURAL BACKFILL				
1. Gradation Requirements				
2. Compaction Tests				
3. Trench Compaction				
BASE COURSE				
1. Gradation Requirements				
2. Compaction Tests				
3. Thickness Tests (if required)				
HOT PLANT MIX PAVEMENT				
1. Gradation Requirements				
2. Compaction Tests				
3. Thickness Samples				
4. Smoothness Checks				
5. Additional Thickness Test Locations (if required)				
STREET LIGHTS				
1. Installed per Approved Plans & Town Standards				
STREET SIGNS				
1. Installed per Approved Plans & Town Standards				
SEAL COAT				
1. Installed per Approved Plans & City Standards				
"AS-CONSTRUCTED" DRAWINGS				
1. Submitted and Approved				

ENGINEER'S CERTIFICATE

I certify that the public improvements have been constructed in accordance with the City of Town of Afton Works Standard Specifications & Drawings.

Signed: _____ Date: _____

WARRANTY PERIOD FOR THE ABOVE IMPROVEMENTS SHALL BEGIN ON : _____

Note:

1. All items must be dated and signed by a Town Representative Prior to acceptance of the Subdivision.
2. The Contractor shall have a set of the stamped "Approved" Drawings on site at all times.
3. Full Time inspection is required from the Developer. Town Representatives will make spot inspections throughout construction.

TOWN OF AFTON PUBLIC IMPROVEMENTS APPROVAL CHECKLIST
SEWER

	Developer's Engineer		City's Representative	
	DATE	**SIGNED**	**DATE**	**SIGNED**
Subdivision Name:				
PIPELINES				
1. Sewer Pipe Bedding Materail & Placement				
2. Trench Backfill Material & Placement				
3. Trench Compaction				
MANHOLES				
1. Grouting Completed & Accepted				
2. Manholes are properly sealed				
3. Manholes Lids per City Standards				
4. Ladders or steps installed properly				
5. Spacing meets Wyoming DEQ requirements				
TESTING				
1. Pressure Test				
2. Deflection Test (30 days after installation)				
3. Hydro Cleaning				
3. Closed Circuit Television (CCTV) Inspection				
3. Testing Documentation Submitted & Approved				
SEWER LIFT STATION (Owned, operated, & maintained by Developer)				
1. Installed per Approved Plans & City Standards w/backup pump				
2. SCADA System Complete and Approved				
OTHER				
1				
2				
"AS-CONSTRUCTED" DRAWINGS				
1. Submitted and Approved				

ENGINEER'S CERTIFICATE

I certify that the public improvements have been constructed in accordance with the Town of Afton Public Works Standard Specifications & Drawings.

Signed: _____ Date: _____

WARRANTY PERIOD FOR THE ABOVE IMPROVEMENTS SHALL BEGIN ON : _____

Note:

1. All items must be dated and signed by a Town Representative Prior to acceptance of the Subdivision.
2. The Contractor shall have a set of the stamped "Approved" Drawings on site at all times.
3. Full Time inspection is required from the Developer. Town Representatives will make spot inspections throughout construction.

TOWN OF AFTON PUBLIC IMPROVEMENTS APPROVAL CHECKLIST
CULINARY WATER

	Developer's Engineer		City's Representative	
	DATE	SIGNED	DATE	SIGNED
Subdivision Name:				
PIPELINES				
1. Waterline Pipe Bedding Materail & Placement				
2. Trench Backfill Material & Placement				
3. Trench Compaction				
4. Waterline flushed per City Standards				
5. Blue Board installed in trenches located in roadway				
WATER SERVICES & METER PITS				
1. Installed per Town Standards				
2. 4-inch sleeves installed under roadways				
3. All meter pits and lids inspected and installed per Standards				
HYDRANTS				
1. Installed per Town Standards				
2. Operating				
VALVES				
1. Installed on all legs of Tee's and Crosses				
2. Operating Properly				
TESTING				
1. Pressure Test				
2. Leakage Test				
3. Clorine Disinfection Report (2 ppm min after 24 hours)				
4. Bacteriological Test/Report				
3. Testing Documentation Submitted & Approved				
BOOSTER PUMP STATION				
1. Installed per Approved Plans & Town Standards w/ backup pump				
2. Building Grading and Landscaping				
OTHER				
1				
2				
"AS-CONSTRUCTED" DRAWINGS				
1. Submitted and Approved				

ENGINEER'S CERTIFICATE

I certify that the public improvements have been constructed in accordance with the Town of Afton Public Works Standard Specifications & Drawings.

Signed: _____ Date: _____

WARRANTY PERIOD FOR THE ABOVE IMPROVEMENTS SHALL BEGIN ON : _____

Note:

1. All items must be dated and signed by a Town Representative Prior to acceptance of the Subdivision.
2. The Contractor shall have a set of the stamped "Approved" Drawings on site at all times.
3. Full Time inspection is required from the Developer. Town Representatives will make spot inspections throughout construction.

AS-BUILT DRAWING REQUIREMENTS — SECTION 204

As-Built drawings are required for formal and informal site plans and all systems that are dedicated to the Town of Afton. As-Built drawings shall be prepared by a surveyor or an engineer registered in the State of Wyoming and shall contain the following minimum information:

204.1 MINIMUM REQUIRED DATA

A. WATER DISTRIBUTION SYSTEMS

1. At least two (2) ties to all valves, service lines, fittings, and fire hydrants from permanent points (manholes, property lines, property corners, curbs or pavement). An acceptable station and offset system may be used.
2. Location of mains from property or easement lines and alignment distance from centerline of road at 300+/-ft. intervals.
3. Separation distance between culinary water lines and waste/storm water lines if they exist within 10 feet of water mains.
4. Water main material, lengths, and distance of mains from building or structures within 20 feet of the water main.
5. Distance from hydrant to hydrant valve.
6. Pertinent easement information including width of easement, legal description, and distance from water main to sides of easement.

B. SEWAGE COLLECTION SYSTEMS

1. Manholes are to be designated by stationing from a known, and easily located, starting point. Provide sewer line lengths, materials, and slopes between manholes.
2. Manhole tops and flow lines are to be designated to the nearest 0.01 feet and referenced to a known bench mark.
3. Location of force mains and gravity mains from property or easement lines and alignment distance from centerline of road at 300+/-ft. intervals.
4. Separation between reuse or force mains and water mains if they exist within 10 feet of water mains.
5. Type of sewer main material and distance of mains from buildings or structures within 20 feet of the sewer main.
6. Distance from manhole to manhole and distance from downstream manhole to each sewer lateral/main wye. Finished invert and manhole rim elevations in addition to sewer lateral terminating end elevations.
7. Sewer laterals are to be located with respect to lot corners.
8. Pertinent easement information including width of easement, legal description, and distance from sewer main to sides of easement.
9. A certification by the surveyor/engineer accepting responsibility for accuracy of information supplied on the as-built drawings and a statement that all mains are within easements and/or public right-of-ways.

C. STORM DRAINAGE SYSTEMS

1. Storm inlets are to be designated by stationing from a known, and easily located, starting point. Right and left offsets will be used.
2. Pertinent easement information including width of easement, legal description, and distance from storm drain pipe to side of easement.
3. Pipe size, length, and materials shall be shown.
4. Storm inlet tops and flow lines are to be designated to the nearest 0.01 feet and referenced to a known bench mark.

D. ROADWAYS

1. Roadway centerline elevations shall be shown at intervals of 100 feet, except at high and low points which shall be designated whether at the designated interval or not.
2. Roadway elevations are to be designated to the nearest 0.01 feet and referenced to a known benchmark.
3. Street names should be shown on as-builts drawings.

E. IRRIGATION SYSTEMS

F. LIGHTS

1. Lighting Layout
2. Wiring Layout and Meter Location

G. PARKS

1. Irrigation Layout which includes valve locations, blow-off locations, winterizing equipment and locations, and backflow prevention devices.

204.2 CONTROLS

A. MINIMUM HORIZONTAL CONTROLS

1. Within easements: Bearing and distance of utility as referenced to property corners. Bearing to be based on plat data when within a platted subdivision.
2. Within road right-of-way: Stationing with offsets right and offsets left. Stationing to begin at a prominent, easily described and easily identified point. Stationing to be based on plat data when within a platted subdivision.

B. VERTICAL CONTROL: A bench mark referenced to NAD datum of 1983.

204.3 CERTIFICATION

A. CERTIFICATION SHALL BE PLACED ON THE AS-BUILT DRAWING AND SHALL INCLUDE:

1. Basis of horizontal and vertical control.
2. Statement that drawings were checked in the field and are a true representation of improvements.

204.4 AS-BUILT DRAWING FORMAT

A. Minimum As-Built data letter height size shall not be less than 1/10-inch for 24” X 36” drawings and 1/20-inch for 11” X 17” drawings.

B. The statement "AS-BUILT DRAWING" shall be placed on the drawing.

C. As-Built drawings shall be drawn to scale on sheets not larger than 24" X 36", preferably on 11” X 17” sheets. Rights-of-way, easements, and lot lines shall be accurately shown. Lot and block numbers and street names shall be included.

D. One AutoCAD 2000 digital copy on CD/DVD and three (3) signed, dated, and sealed prints are required. The Engineer/Surveyor's name and registration number shall be either typed or printed, in legible form, below the seal. After the surveyor/engineer has certified the locations, the Engineer of Record shall certify that the system depicted on the As-Built plan was constructed in substantial conformance with approved plans and will function as intended.

E. All submitted "As-Builts" shall be inspected for compliance to the above-mentioned standards. Drawings found to be lacking in one or more items shall be returned to the owner with an explanation of the reasons for rejection.

PART III

TECHNICAL SPECIFICATIONS

300.1 DESCRIPTION

This section covers measures and instructions for prevention of damage to existing structures and utilities, whether above ground or underground.

300.2 PROTECTION OF EXISTING UTILITIES

300.2.1 INTEGRITY OF UTILITIES

The Contractor shall be responsible for safeguarding and maintaining the integrity of all conflicting utilities. This responsibility includes securing the assistance of available utility location services in the area in which the Work is being performed. When a conflicting utility line is discovered that was not shown on the plans, the Contractor shall contact the utility's City immediately for resolution of the conflict.

300.2.2 LOCATING UTILITIES

It shall be the responsibility of the Contractor to locate and expose or identify all existing utilities, both underground and overhead, for the purpose of preventing damage to them. The Contractor shall notify all concerned utility offices at least 48 hours in advance of construction operations in which a utility agency's facilities may be involved. This shall include, but not be limited to, irrigation water, culinary water, telephone, gas, and electric.

300.2.3 CHANGES TO UTILITIES

The Contractor shall be responsible for any and all changes to, or re-connections to, public utility facilities encountered or interrupted during execution of the Work, and all costs related thereto shall be borne by the Contractor. The Contractor shall negotiate with, and pay, the respective utility agency for work it must do in connection with moving, repairing, or restoring its utility(s). The Contractor shall further make all necessary notifications, scheduling, coordination, and management of details related to any such interference. The potential or projected cost of any public utility interference shall be included in the Contractor's price covering the major Contract Item to which the interference or changes are attributable.

300.2.4 MAINTENANCE OF SERVICE

300.2.4.1 CONTINUOUS SERVICE - Unless otherwise approved, all utilities, both underground and overhead, shall be maintained in continuous service throughout the entire contract period. The Contractor shall be responsible and liable for any damages to or interruption of service caused by the construction.

300.2.4.2 ACCIDENTAL INTERRUPTION OF SERVICE - In the event of interruption of other utility services as a result of accidental breakage, the Contractor shall promptly notify the appropriate responsible authority. The Contractor shall then cooperate with that authority in restoration of service as soon as possible, and shall bear all cost of repair. In no case shall interruption of any water or other utility service be allowed outside working hours.. When changeover of service connections to new utility lines becomes necessary, interruptions of individual services for periods of up to 8 hours will be allowed providing 24 hour advance notice has been given to affected users.

300.2.4.3 TEMPORARY INTERRUPTION AND RELOCATION - If the Contractor desires to temporarily or permanently relocate or shut down any utility or appurtenance, the Contractor shall make the necessary arrangements and agreements with the City or operator of the respective utility and shall be completely responsible for all costs concerned with the relocation or shutdown and

reconstruction. Shutdown and relocation and/or reconstruction shall be subject to inspection and approval by the City and the City of the utility.

300.3 PROTECTION OF PROPERTY AND EXISTING STRUCTURES

300.3.1 REMOVAL OR RELOCATION OF PROPERTY - All property removed or relocated by the Work shall be reconstructed in its original or new location as soon as possible. Restoration of existing property or facilities shall be to a condition as good or better than its original condition.

300.3.2 DAMAGE TO PROPERTY - All property damaged by the Contractor, whether inside or outside the limits of easements, shall be the responsibility of the Contractor. All such damages shall be repaired with like material and restored to its original condition, or better. Such repair or restoration shall be accomplished at the Contractor's expense.

300.4 PROTECTION OF PAVED SURFACES

To avoid unnecessary damage to paved surfaces, tracked equipment shall use rubber cleats or paving pads when operating on or crossing all existing paved surfaces unless authorized otherwise in writing by the City. The Contractor/Developer is responsible for keeping debris, dirt, sand, rocks, etc. from paved surfaces. Sweeping will be required at the Contractor's/Developer's expense as directed by the City.

300.5 RIGHTS-OF-WAY AND EASEMENTS

300.5.1 MINIMAL DISTURBANCE OF RIGHTS-OF-WAY - When construction easements have been obtained, the Contractor shall take appropriate measures to minimize disturbances to surface improvements within the easements. The Contractor shall obtain a signed release from each property Owner, approving restoration work in the construction easements across its respective property/s.

300.5.2 CONSTRUCTION AREAS - The Contractor shall confine construction operations to the area within the dedicated rights-of-way for public thoroughfares, or within areas for which construction easements have been obtained, unless the Contractor has made separate special agreements with the affected property Owners in advance.

300.5.3 PROPERTY CITY NOTIFICATION - The Contractor shall give at least 48 hours advance notification of commencement of construction to property Owners having land on which construction will take place. During all construction operations, the Contractor shall construct and maintain such facilities as may be required to provide access by all property Owners to their property. No one shall be cut off from access to their property for a period exceeding eight (8) hours unless the Contractor has made special arrangements with the affected persons. The Contractor shall grade all disturbed surfaces required for motor vehicle traffic at least daily unless directed otherwise in writing by the City.

301.1 DESCRIPTION

This Section includes requirements that shall be followed by the Contractor, to protect the environment. The Contractor shall also comply with any applicable additional requirements made by federal, state, or local government agencies.

301.2 MATERIALS

301.3 CONSTRUCTION REQUIREMENTS

301.3.1 EXPLOSIVES AND BLASTING

The use of explosives on the work will not be permitted unless approved otherwise in writing by the Town and the appropriate regulating authority.

301.3.2 DUST ABATEMENT

301.3.2.1 CONTROL MEASURES - The Contractor shall furnish all labor, equipment, water and means required to provide effective dust control and abatement measures. Control measures shall be applied as often as necessary and wherever directed by the City, to prevent construction operations from producing dust in amounts that may be damaging to property, vegetation, or animals, or detrimental to persons within reasonable proximity of the work site.

301.3.2.2 HAUL ROUTES AND WORK SITES - The Contractor shall identify haul routes or material handling areas, outside of the Work site, whereon dust may be generated, and shall exercise appropriate measures to abate any dust problem caused by its operation. Such dust abatement measures shall be taken immediately when observed or when required in writing by the City.

301.3.3 STORM AND GROUND WATER

301.3.3.1 CONTROL MEASURES - The Contractor shall provide and maintain, at all times during construction, ample means and devices to promptly remove all water entering the Work, whether the water is surface or ground water. Water removed by the Contractor shall be directed into ponds or areas separated from live streams or drainage ways, to keep sediment from entering live water.

301.3.3.2 DRAINAGE PATTERNS - In excavation, fill, and grading operations, the Contractor shall take care, to disturb the existing drainage pattern as little as possible. Particular care shall be taken not to direct drainage water onto private property or into streets or drainage ways inadequate for the increased flow.

301.3.3.3 FORDING OF WATERWAYS - Fording of live streams or any body of live water to accomplish the Work shall not be permitted. Mechanized equipment also shall not be operated in live water to accomplish the Work unless authorized in writing by the Town and the appropriate regulating body (if applicable).

301.3.3.4 FILLING OF WATERWAYS - The Town will not approve the filling of any ditches, washes, drainage ways, streams, wetlands, or other surface waters by the Contractor to accomplish the Work unless specific instructions are included in the proposed improvement drawing and specifications which will provide for how the affected drainages or surface waters are to be treated.

301.3.4 NOISE ABATEMENT

In or near inhabited areas, particularly residential areas, the Contractor's operations shall be performed in a manner to prevent noise from becoming a nuisance or problem. Particular consideration shall be given to noise generated by repair and service activities during the night hours.

301.3.5 CHEMICALS

All chemicals and/or petroleum based products used during project construction or furnished for project shall be handled, applied and disposed of in strict accordance with the printed instructions of the manufacturer and regulations enforced by Federal, State and Local health authorities.

301.3.6 WASTE AND SURPLUS MATERIALS DISPOSAL

301.3.6.1 CLEAN WORK SITE - The Contractor shall keep the work site, haul roads and other areas of use in a neat, clean condition, free from any accumulation of surplus materials. It shall be the responsibility of the Contractor, at its own expense, to remove and legally dispose of all surplus materials resulting from all Work activities.

301.3.6.2 SURPLUS MATERIAL - Surplus material includes, but is not limited to, salvaged materials and equipment that otherwise would have been abandoned in place, rocks too large to be used as backfill, wood and other organic or unsuitable materials, trash, rubbish, and waste products of any nature, and any other debris generated by the Work.

301.3.6.3 REGULATORY COMPLIANCE - Disposal of surplus materials shall be accomplished in accordance with all local codes, laws, ordinances, and all applicable safety laws (particularly to the requirements of Part 1926 of the OSHA Safety and Health Standards for Construction) in affect at the approved disposal site. In no case shall it be acceptable for any surplus material to be disposed of in streams, marshes or wetlands.

301.3.6.4 APPROVAL OF DISPOSAL - The Town will not approve any disposal operation, which creates an unsightly and/or unsanitary nuisance. The Contractor shall maintain disposal sites in a reasonable condition of appearance during construction. When designated and/or public disposal sites are unavailable, written approval must be obtained from the Town to dispose of any surplus materials on any other site. All disposal sites are subject to approval by the City. The Contractor shall secure permission and all permits required for use of any dumpsite not previously arranged and designated by the City. The Contractor shall retain copies, and provide copies upon request, of all disposal permits and/or agreements obtained for the Contract Work.

301.3.6.5 SCHEDULED REMOVAL - The Contractor shall establish regular intervals of collection and disposal of surplus materials during construction. Stockpiling of surplus materials for later disposal will not be approved or allowed. All surplus materials shall be disposed of within 90 days of completion of construction.

301.3.7 OPEN BURNING

Open burning of materials may be allowed only in strict accordance with all regulations in effect for the area at which the burning would be performed, and the Contractor shall obtain any necessary permits from the appropriate governing entity prior to the start of burning. The Contractor shall not allow fire to spread beyond the material intended for burning. No accumulation of residue from burning shall remain on or adjacent to the construction site, without written approval of the City.

301.3.8 SANITATION

301.3.8.1 TOILETS - The Contractor shall provide fixed or portable chemical toilets for employee use in conformance with the requirements of Part 1926 of the OSHA Standards for Construction and when public toilets are not available or within fifteen (15) minutes walking distance of the Work site.

301.3.8.2 COLLECTION OF WASTES - The Contractor shall be responsible for daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor shall be disposed of away from the site in accordance with all laws and regulations pertaining thereto.

301.3.9 HAZARDOUS MATERIAL

301.3.9.1 REGULATORY COMPLIANCE - Disposition of any hazardous material or toxic or hazardous waste shall be made in accordance with the requirements and regulations administered by the State agency wherein the Work site is located.

301.3.9.2 ABNORMAL CONDITONS - Abnormal conditions include, but are not limited to, the following: buried barrels with liquid or solid contents; buried or above ground tanks with liquid contents; obnoxious odors; excessively hot earth; stained and discolored soils; smoke; unidentifiable powders, sludge, pellets; or any other similar condition.

301.3.9.3 DISCOVERY AND NOTIFICATION - If any abnormal conditions are encountered during construction, which indicate the presence of a hazardous material, toxic, or hazardous waste, the Contractor shall immediately suspend work in the area of the discovery and notify the Town Engineer and Public Works Director and treat the situation with extreme caution. The Contractor's operation in the area of discovery shall not resume until so directed by the Town Engineer; however, the Contractor shall continue working in other areas of the project, unless otherwise directed by the Town Engineer.

301.3.9.4 DISPOSAL - When it becomes necessary for the Contractor to dispose of discovered materials, the work may be considered a change. Should the disposition of discovered waste material require special procedures or handling by certified personnel, the Contractor will make all such arrangements. When it becomes necessary to obtain permits for transporting or handling discovered material, the Contractor will obtain the permits.

301.3.9.5 SPILLS AND NOTIFICATION - In the event of spills of petroleum-based products or hazardous wastes by the Contractor, the Contractor shall immediately notify the City. The Contractor shall also notify the appropriate State environmental enforcement agency, unless the spill consists of less than one (1) gallon of petroleum based products. In no case will notification be made later than 24 hours after the discovery of the spill. In addition, written notification shall also be made within 5 calendar days of the discovery.

301.3.9.6 COST OF CLEANUP - <u>All costs</u> for cleanup and disposal of hazardous materials due to spills, inappropriate handling, or negligence of the Contractor shall be borne by the Contractor.

301.3.10 ENVIRONMENTAL COMPLIANCE

301.3.10.1 REGULATORY COMPLIANCE - The Contractor shall comply with the applicable requirements of the National Historic Preservation Act as it relates to the preservation of ALL environmental resources. Clearance for protection of environmental resources located within the designated Work site is the responsibility of the Contractor and such clearances shall be obtained prior to construction of improvements.

301.3.10.2 DISCOVERY OF HISTORIC/ARCHEOLOGICAL OBJECTS – The Contractor shall observe the following:

- DISCOVERY AND NOTIFICATION - If a suspected or unsuspected historic, archeological, or paleontological item, feature, or site is encountered, construction operations shall be immediately stopped in the vicinity of the discovery and the Public Works Director and Town Engineer shall be notified of the nature and exact location of the findings. The Contractor shall not damage the discovered objects and shall provide written confirmation of the discovery to the Town within two (2) calendar days.

- RESTRICTION OF CONSTRUCTION - Should operations in the vicinity of a discovery be restricted, the Town Engineer will keep the Contractor informed concerning the status of the restriction. The Contractor should be aware that the time necessary for the Town to negotiate the handling of the discovered is variable and is dependent on the nature and condition of the circumstances. It is possible that a delay of as much as three weeks in the vicinity of the discovery can be expected. The Town Engineer will inform the Contractor when the restriction is terminated.

301.3.11 OPERATIONS OUTSIDE OF THE PROJECT SITE

In the event the Contractor chooses to use any site or means of obtaining resources beyond the project site, the Contractor shall retain the services of a qualified, certified environmental consultant to produce a research design or plan for obtaining any and all necessary environmental clearances for such use. The Contractor shall provide the plan to the Town Engineer for review and approval, as required. The Contractor shall submit evidence of environmental clearances and compliance before commencing any activities within the extended use area. At a minimum, clearances will include those listed below. Additional clearances may be required as necessary.

301.3.11.2 CULTURAL RESOURCES (Archeological and Historic) - Clearance may require consultation with the State Historic Preservation Office.

301.3.11.3 THREATENED AND ENDANGERED SPECIES - Compliance may require written clearance from the U.S. Fish and Wildlife Service.

301.3.11.4 FLOOD PLAINS – May require consultation with the Federal Emergency Management Agency (FEMA) or corresponding state agency.

301.3.11.5 WETLANDS AND OTHER BODIES OF WATER – May require consultation with the Army Corps of Engineers and/or appropriate state agency.

The Contractor is cautioned that obtaining environmental clearances can be costly and time consuming.

301.3.12 ON-SITE CRUSHING OPERATIONS

All on-site crushing operations shall conform with the all State requirements and requirements as outlined in the MOU with the Town.

302.1 DESCRIPTION

This section covers furnishing and maintaining all traffic control devices, flaggers and pilot vehicles necessary for protection of the Work, the workers and the traveling public. The requirements of this section are not intended to supersede, but shall supplement, the provisions contained in the "Manual of Uniform Traffic Control Devices" (MUTCD) issued by the U.S. Department of Transportation, and any other applicable state or local traffic control regulations. The Contractor/Developer shall provide all signage, barricades, barrels, cones, etc. These items will not be supplied by the City.

302.1.1 RELATED WORK AND REFERENCED SECTIONS

302.1.2 SUBMITTALS

The Contractor, upon request of the Town or its Engineer, shall submit detailed traffic control plans for specific areas of the Work.

302.1.3 DEFINITIONS

Traffic Control Devices - All temporary traffic control and warning devices required to warn traffic of, and to guide it through, construction areas as required, including, but not limited to: portable cones and barricades, signs, channeling devices, paint striping, lighting devices, flags, etc.

Flaggers - Qualified and alert persons equipped with safety warning devices who direct traffic through construction areas.

Traffic Lane - Ten (10) feet of clear-street-width with a safe motor vehicle speed of twenty-five (25) miles per hour.

Pilot Car - Any designated and properly marked vehicle used for leading groups of vehicular traffic through construction areas.

302.2 MATERIALS

302.3 CONSTRUCTION REQUIREMENTS

302.3.1 COORDINATION OF WORK AND TRAFFIC CONTROL

The Contractor shall endeavor to organize its work force in such a manner as to minimize the closure of public streets and roadways within and around the Work site. If conditions justify, the Town may direct the Contractor to conduct Work in specific areas and/or to specific tasks to avoid closure or interference with traffic on public streets and roadways.

302.3.2 CLOSURE OF PUBLIC THOROUGHFARES

The Contractor shall not close any public street or roadway without prior written approval by the City. When closure is necessary the street or roadway shall only be closed to through traffic and not to local traffic. One (1) lane shall always remain open to local traffic. Closure may extend for one Town block only, or 760 feet, whichever is less. Closure of streets and roadways shall be made with barricades meeting State DOT and MUTCD standards. Traffic shall be kept open on streets and roadways where no detour is possible.

302.3.3 MAINTENANCE OF EXISTING SIGNS

Existing traffic signs other than stop, yield, and street name signs shall be maintained by the Contractor until such time as construction renders them obsolete. At that time the Contractor shall remove signs and posts without damage and deliver them to the Town unless otherwise directed by the City.

302.3.4 PROTECTION OF WORK AND TRAFFIC

All obstructions and excavations, within traveled streets and roadways, shall be protected with traffic control devices meeting State DOT and MUTCD standards. Traffic control devices, placed within streets and roadways, shall be illuminated at night, and such illumination shall function from sunset to sunrise. Local jurisdiction may require traffic control measures greater than those of State DOT standards, in which case the Contractor shall comply with such requirements.

Whenever the Town or its Engineer finds traffic control conditions at the Work site to be inadequate to assure public safety, or the Contractor's protective facilities to be inadequate, the Town or its Engineer may require the Contractor to provide the additional necessary facilities or services. The Contractor shall bear the cost of the additional protection.

303.1 DESCRIPTION

This section covers the investigation of existing miscellaneous pipelines, wires or cables, and other miscellaneous sub-surface features.

303.1.1 RELATED WORK

Section 300 - Protection of Existing Improvements

303.2 MATERIALS

The Contractor shall provide a backhoe and qualified operator; laborer with hand shovel: appropriate fuel and lubricants, necessary equipment servicing materials; and appropriate equipment for transporting the backhoe to perform the investigation. The backhoe shall be a rubber tired CASE 580 backhoe, or an approved unit of equivalent or greater size and capacity.

303.3 CONSTRUCTION REQUIREMENTS

303.3.1 EXPOSURE BY EXCAVATION

When directed by the Town or its Engineer, the Contractor shall excavate and expose miscellaneous pipelines, structural features, soil materials and other underground features which may be present at the work site. The location and extent of exposure shall be determined on site by the Town or its Engineer.

303.3.2 REPLACEMENT OF EXCAVATED MATERIALS

Work required hereunder shall include replacement of excavated materials sufficiently to restore the site to a safe condition as determined by the Town or its Engineer. Full restoration of materials such as pavement, concrete slabwork, sod, etc., in the investigated area will be accomplished in accordance with these Technical Specifications and Standard Drawings.

304.1 DESCRIPTION

This section covers obtaining permission, permits, clearances, etc.; as necessary to develop source(s), purchasing or manufacturing, loading, hauling, placing and compacting earthwork materials described herein or required by these Specifications.

304.1.1 RELATED WORK

Section 305 - Trench Excavation and Backfill

304.1.2 SUBMITTALS

The Contractor shall provide test results from a certified independent laboratory which has sampled and performed the prescribed test(s) for those materials.

304.1.3 DEFINITIONS

Granular Material - Material for which the sum of plasticity index (AASHTO T-90) and the percent of material passing a No. 200 sieve (AASHTO T-27) shall not exceed 23.

Silt - Material which passes the No. 200 (AASHTO T-11) sieve and has a plasticity index not greater than 10.

Clay - Material which passes the No. 200 sieve and has a plasticity index greater than 10.

Bedding - Materials placed immediately around and adjacent to pipe installed in trenches.

Borrow - Material obtained from a source away from the site on which installed and/or excavated and used to supplement insufficient quantities of material required.

304.2 MATERIALS

02105.2.1 ON-SITE TRENCH OR STRUCTURAL BACKFILL

On-site trench or structural backfill consists of material excavated during trenching or foundation excavation which is free of cinders, ashes, wood, vegetation, frozen or other deleterious material or rocks with a maximum particle size not greater than 6-inches unless shown otherwise in the Town of Afton Standard Drawings. Material may be required to be processed or transported along the excavation.

304.2.2 IMPORTED TRENCH OR STRUCTURAL BACKFILL

Imported trench or structural backfill consists of granular material obtained from Town approved sources. Borrow materials shall be free of cinders, ashes, wood, vegetative matter, frozen or other deleterious matter and have a maximum particle size not greater than 6-inches unless shown otherwise in the Town of Afton Standard Drawings. Pit Run Borrow may be used as backfill in trenches, excavations for structures, in roadway subgrades, or as otherwise approved by the Town or its Engineer. Material may be processed or may be pit run.

304.2.3 ON-SITE PIPE BEDDING

On-site pipe bedding consists of material excavated during the trenching operation which is free of cinders, ashes, wood, vegetation, frozen or other deleterious material or rocks with a maximum

particle size not greater than that shown below in Table 1. Material may be required to be processed or transported along the trenching operation.

304.2.4 IMPORTED PIPE BEDDING

Imported pipe bedding consists of granular material excavated from an approved borrow source which is free of cinders, ashes, wood, vegetation, frozen or other deleterious material or rocks with a maximum particle size not greater than that shown in Table 1 below. Material may be processed or may be pit run.

Table 1 - MAXIMUM PARTICLE SIZE FOR PIPE BEDDING

PIPE	SIZE
Corrugated Metal and Welded Steel	1”
Galvanized Steel, PVC and Polyethylene	1”
Ductile Iron, Cast Iron and Concrete	1”

304.2.5 SAND

Sand shall be graded granular material which passes a 3/8-inch sieve, with not more than 10 percent passing the No. 200 sieve (AASHTO T-27) and free from cinders, ashes, wood, vegetation, frozen or other deleterious material.

304.2.6 GRAVEL PIPE BEDDING

Gravel pipe bedding shall be graded gravel which has been screened to meet the maximum particle size shown in Table 1 for different pipeline materials and contains no more than 10 percent passing the No. 200 sieve (AASHTO T-11). Gravel pipe bedding material shall be free from cinders, ashes, wood, vegetative matter, frozen or other deleterious material.

304.2.7 UNTREATED BASE COURSE

Untreated base course consists of processed natural gravel and crushed rock with an approved soil binder without any deleterious materials, tested in accordance with AASHTO T-27 and T-11 which meets the gradation requirements of Wyoming Department of Transportation Grading W as shown in Table 2 below.

Table2 - MAXIMUM PARTICLE SIZE FOR UNTREATED BASE COURSE (WYDOT Grading W)

SIEVE SIZE	PERCENT PASSING
1 ½-inch	100
1-inch	90-100
1/2-inch	60-85
#4	45-65
#8	33-53
#30	10-30
#200	3-12

304.2.8 BITUMINOUS SURFACING

Plant mix bituminous material, with maximum particle size not greater than 3/4-inch, meeting the requirements of Section 310 and 311 of these Specifications.

304.2.9 DRAIN GRAVEL

Drain gravel consists of washed natural gravel or crushed rock or slag, with a maximum particle size of 1-inch, with 100 percent being retained on the No. 10 sieve, and without any deleterious material.

304.2.10 RIPRAP

Riprap consists of durable, angular, sound and hard field or quarry stones free from cracks and structural defects. Source of supply shall be approved by the City. Fifty percent of the stones shall be of sizes between one-half and two-thirds of the riprap layer thickness shown on the Development Drawings. Not more then 10-percent of the stones by weight shall be of a size less than one-tenth of the riprap layer thickness shown on the Development Drawings and the specific gravity of the stones must range between 2.5 and 2.82 (AASHTO T-85). Durability of the stones shall be in excess of 40 percent (AASHTO T-210).

304.2.11 SUBGRADE GRANULAR FILL

Subgrade granular fill consists of well graded granular soils with a maximum of 50 percent passing the No. 4 sieve and a maximum of 20 percent passing the No. 200 sieve and no materials greater than 4-inches in diameter. Materials meeting Wyoming Public Works Standard Specifications are also acceptable.

304.2.12 FLOWABLE FILL

Flowable fill is a controlled low-strength material (CLSM) which can be placed in a self-leveling consistency or in a less flowable state to reduce the fluid pressures exerted by the material mixed per ASTM D4838. The ultimate unconfined compressive strengths should be at least 50 psi but not more than 150 psi to maintain the ability to re-excavate.

Table 3 – TYPICAL FLOWABLE FILL MIX DESIGN

ITEM	UNITS/CY
Cement	45 lbs
3/8” Crushed Aggregate	1,700 lbs
Sand	1850 lbs
Water	50 gallons

304.3 CONSTRUCTION REQUIREMENTS

304.3.1 BORROW AND DISPOSAL SITES

The Contractor shall, at its own expense, secure all necessary access and borrow sites for acquisition or removal and to dispose of excess backfill or waste materials.

304.3.2 ON-SITE MATERIALS

Unless otherwise directed by the Town or its Engineer, on-site trench backfill will be used for installation of all pipe. In areas where suitable on-site material is not available, other material, which meets these Specifications, will be used when approved by the Town Engineer.

305.1 DESCRIPTION

This section covers excavation and backfill for piping appurtenances such as manholes, inlets, transition structures, junction structures, vaults, thrust blocks, valve boxes, catch basins, etc..

305.1.1 RELATED WORK

Section 300 - Protection of Existing Properties
Section 302 - Traffic Control
Section 304 - Earthwork Materials
Section 307 - Water for Construction
Section 308 - Removal and Replacement of Surface Improvements
Section 318 - Water Pipe Installation
Section 324 - Sewer Pipe and Manhole Installation

305.1.2 SUBMITTALS

305.1.2.1 MOISTURE DENSITY TESTING AND GRADATION DETERMINATIONS - A documentation system shall be maintained by the Contractor to record results from all moisture/density testing and gradation determinations. Records of these tests shall show the following information as a minimum:

- Date of test.
- Type of test.
- Name of person performing test.
- Location of sample taken.
- Results of test and comparison with specified value required for compliance.

Upon completion of each gradation test or moisture/density test, a copy of the record for the respective test shall be delivered to the Town and its Engineer within one (1) working day following the completion.

305.1.2.2 COMPLIANCE TESTING - Documentation shall also be made, in field diaries, of all compliance tests performed by the Contractor. Documentation shall be made available to the Town and its Engineer upon their request.

305.1.3 DEFINITIONS

Trench Width - Shall not be more than 18 inches greater than the outside diameter of the pipe being installed at a point 12 inches above the top of the pipe unless otherwise approved in writing by the Town Engineer. The width of the trench above that level shall be the minimum width required for safe working conditions, sheeting, bracing, shoring, and for proper installation of the work.

Trench Grade - The vertical elevation of the flow-line of the pipe being installed in the trench.

Open Trench - Shall include trench sections which have been excavated and are awaiting completion of pipe installation, backfill, compaction or installation of a temporary surface.

Surface Restoration - Shall include the Work required to restore the ground surface disturbed for trench excavation. Replacement of road surfacing, planting and landscaping removed for trench excavation, will not be considered as trench excavation and backfilling.

Consolidated Backfill - A condition of backfilling for which a specified compaction density is required. Maximum lift, prior to compaction, for consolidated backfill shall be 8 inches unless otherwise approved by the Town Engineer.

Unconsolidated Backfill - A condition of backfilling for which no compaction density is specified and the required compaction effort is layer placing and then compacting by wheel rolling or use of compacting equipment. Lifts of up to 24 inches are allowed for unconsolidated backfill.

Unclassified Excavation - A determination for excavating whereby no consideration will be given to different kinds of materials that are encountered.

305.2 MATERIALS

As indicated herein.

305.3 CONSTRUCTION REQUIREMENTS

305.3.1 PERMITS

For work which is to take place within state and/or federal road and highway rights-of-way, the Contractor shall be responsible for obtaining all required encroachment and construction permits prior to beginning any work within the rights-of-way.

All work in any city, town or county public right-of-way will also require an approved excavation permit from that entity. The Contractor shall be responsible for obtaining all required encroachment and construction permits from the respective entity prior to beginning any work within the rights-of-way.

All utility crossings (including water, sewer, electric, telephone, etc.) under asphalt roadway surfaces shall be bored by an approved method consistent with the area and soil conditions unless otherwise approved in writing by obtaining a special permit from the City.

305.3.2 CLEARING AND GRUBBING

On areas outside of established roadways, the area to be disturbed by the trenching operation shall be cleared and grubbed prior to beginning the trenching operation.

305.3.3 EXCAVATION

305.3.3.3 EXPOSURE OF UNDERGROUND FEATURES - Before any trench excavation is started, the Contractor shall locate and expose all existing underground utilities, structures, etc., which may interfere with, or conflict with, the trench being excavated. In case of conflicts, the Contractor shall make adjustments in the location of the excavation at the direction of the Town of Afton or its Engineer.

305.3.3.4 The Contractor shall perform all excavation to the depth specified and/or as required to accomplish the Work. During the excavation operations, excavated materials which are suitable for use as backfill for trenches or around structures, shall be piled separately at sufficient distance from the edge of the excavation to be out of the way of equipment and to prevent slides and cave-ins from embankment overloading. All excavated materials not suitable for, or not required for, fill or backfill shall be separated and removed promptly from the site of the Work and disposed in an approved site in accordance with Section 301.

305.3.3.5 PUBLIC TRAVEL - Materials excavated within roadways, regardless of their disposition, shall be piled in such manner that will cause the minimum of inconvenience to public travel and always allow for emergency vehicle passage.

305.3.3.6 OPEN TRENCH - At no time shall the Contractor allow more than 300 cumulative feet and no more than 100 contiguous feet of trench to be open for the overall project, unless otherwise approved by permit from the City.

305.3.3.7 SHORING - Shoring and/or trench boxes shall be used wherever needed to protect workers and adjacent structures and property of the Work in accordance with OSHA requirements. The arrangement of bracing of shoring shall not be set so as to stress any portion of completed work.

305.3.3.8 BARRICADING OPEN WORK - Excavations left open at the end of the work day shall be surrounded by barricades and warning tape.

305.3.4 EXCAVATION IN ROCK

305.3.4.1 SOLID ROCK EXCAVATION – If:

- The Contract Documents contain provisions for “Solid Rock Excavation”, and
- If rock has been encountered in the excavation, and
- If the Contractor has made three attempts to remove the rock using a "Kelly" or similar type ripper having not less than 235 fly wheel horsepower, then the excavation of such material will be considered as "solid rock excavation".

305.3.4.2 BLASTING - When blasting is deemed necessary for rock removal, the Contractor shall comply with all applicable State and Local laws, ordinances, and provisions for blasting safety and obtain written approval from the Town Engineer prior to starting of drilling and/or blasting operations.

In all cases, blasting shall be performed by experienced, qualified blasters. The Contractor is responsible for any and all damage caused by blasting, and blasting will not be allowed within 15 feet of any existing structures.

305.3.5 OVER-EXCAVATION

305.3.5.1 UNAUTHORIZED OVER-EXCAVATION - Care shall be taken to not excavate below the depth required by the Standard Drawings. Any unauthorized over-excavation shall be refilled and compacted with material meeting the requirements of Section 04 and approved for use by the Town at the expense of Contractor.

305.3.5.2 ROCK - Whenever rock is encountered in the trench bottom, the trench shall be over-excavated a minimum of 3 inches below the design elevation of the bottom of the pipe. The over-excavated portion of the trench shall be filled with approved bedding material and the bedding compacted.

305.3.5.3 UNSTABLE NATIVE FORMATIONS - The Contractor shall notify the Town Engineer if soft, spongy, or otherwise unstable native formations, that are not suitable for structure or pipeline foundations, are encountered in excavations. In the event the Town Engineer determines that the existing foundation materials are unacceptable, the Contractor will be directed to over-excavate, remove and replace the unsuitable soil materials. The over-excavation shall be backfilled with approved select materials and compacted in accordance with the requirements described herein.

305.3.6 PIPELINE ACCESSORY INSTALLATION

305.3.6.1 EXCAVATION FOR ACCESSORIES - The Contractor may excavate to place the sides of manholes, vaults, valve boxes, inlet structures, catch basins or other accessory structures directly against the excavated surface, provided that the faces of the excavation are firm and unyielding and are at all points outside the structure lines shown on the plans. If the native material is such that it will not stand without sloughing, the Contractor shall over-excavate to place the structure and this over-excavation shall be backfilled and compacted, using the same material required for the adjoining pipeline trench.

305.3.6.2 ACCESSORY SUPPORT - To prevent displacement of valve boxes and other accessory structures, trench backfill shall be compacted to at least 95% of maximum density as determined by AASHTO T-99 for 6 feet along the trench on each side of the box or structure.

305.3.7 TRENCH BOTTOM PREPARATION

The bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of the pipe. Bell or coupling holes shall be made in accordance with the recommendations of the pipe manufacturer after the trench bottom has been graded. Such depressions shall be of sufficient width to provide clearance for connecting and/or bolting. Holes for depressions shall be excavated only as necessary to permit proper joining of pipe sections.

305.3.8 SURFACE IMPROVEMENTS

When surface improvements must be removed, or are damaged or disturbed by the Work, their removal and restoration shall be accomplished by the Contractor in accordance with Sections 300 and 308 of these Specifications.

305.3.9 PROTECTION OF EXISTING UTILITIES

The Contractor shall protect all existing utilities, either above or below ground, in accordance with the provisions of Section 300 of these Specifications.

305.3.10 IRRIGATION DITCHES, PIPES AND STRUCTURES

The Contractor shall contact the owner(s) of all irrigation facilities to be encountered by the work and make arrangements for construction clearances and/or facility shutdown schedules. All irrigation ditches, dikes, headgates, pipe, valves, culverts, etc., damaged or removed by the Contractor shall be restored by the Contractor to their original condition, or better, in accordance with Section 308 of these Specifications, at no additional cost to the owner(s).

305.3.11 BUILDING FOUNDATIONS AND STRUCTURES

Where trenches are located adjacent to building foundations and structures, the Contractor shall take all necessary precaution against damage to such facilities. Water settling on backfill material in trenches adjacent to structures will not be permitted. The Contractor shall be liable for any damage caused by the construction, and shall restore or replace damaged property in accordance with Section 308 of these Specifications.

305.3.11.1 SIDEWALK, CURB AND GUTTER - Where sidewalk, curb, and gutter exist, excavation may be made by tunneling provided the following requirements are met. Excavation shall be vertical and as near to the curb or sidewalk as possible. The length of the tunnel shall not exceed the width of the sidewalk, curb and gutter. Where a separate sidewalk and curb exist, an excavation shall be made between the sidewalk and the curb. At least three feet of undisturbed earth shall be left under the sidewalk. Where the excavation does not meet these requirements, a section of sidewalk from joint to joint shall be removed and replaced.

Gas Lines and Water Lines may be jacked, augured or jetted under sidewalk, curb and gutter provided the resulting hole diameter does not exceed one (1) inch plus the outside diameter of the pipe installed.

Backfill of Sidewalk Tunnels. Where the sidewalk has been tunneled, the hole shall be filled from each end with earth compacted with mechanical tampers to 90% of AASHTO T-180, Method C. A 3'-0" section of trench on each side of the tunnel and any space between the sidewalk and curb shall be backfilled with mechanically compacted earth as specified.

305.3.12 WATER

305.3.12.1 WATER FLOW - The Contractor's operation shall always ensure the free flow of water in gutters, culverts, and natural watercourses. In irrigated land areas, excavated materials shall be piled on the downhill sides of trenches.

305.3.12.2 GROUNDWATER - The Contractor shall have the responsibility of determining the presence and location of groundwater at the work site.

305.3.12.3 DEWATERING - Grading and other protective measures shall be performed as necessary to prevent surface or ground water from flowing into trenches or other excavations. Any water accumulated therein during construction, from surface or from underground sources, shall be promptly removed by pumping or by other approved methods at the Contractor's expense.

305.3.12.4 INSTALLATION IN WATER - No backfill, subgrade materials, concrete or masonry footings, foundations, floors, equipment, or pipe shall be placed or laid in water. Water shall not be allowed to rise over such work for at least 24 hours following the pour or placement of any concrete or mortar used in the work. Water shall not be allowed to rise unequally against structure walls for a period of 14 days following concrete placement or masonry erection.

Groundwater or surface water in piping trenches shall not be allowed to enter and flow through the piping while installation of pipe is in progress. The pipe and washed rock bedding material shall be wrapped in a filter fabric and MEGALUG joint restraints shall be installed. Details for pipe installation in areas of high ground water shall be submitted and approved by the Town prior to approval of the project.

305.3.12.5 DISPOSAL - The Contractor shall dispose of all water from the work in a suitable manner without damage to adjacent properties.

305.3.13 BEDDING AND PIPELINES

305.3.13.3 BEDDING INSTALLATION - Pipe bedding shall be installed according to applicable sections of these Specifications for pipeline construction.

305.3.14 BACKFILL

305.3.14.1 BACKFILL MATERIALS AND PLACEMENT - Backfill shall be accomplished using acceptable materials as described in these Technical Specifications as follows:

- All backfill materials shall be at ± 2% of optimum moisture content when placed in the trench or other excavation.
- Consolidated trench backfill shall be placed in lifts not greater than 8 inches.
- Unsuitable excavated material, or material with incorrect moisture content shall be removed and replaced.

- Soft spongy material that causes areas which "pump" when heavy loads pass over them, shall be removed and replaced with suitable material.
- Dry material that will not "ball" shall be removed and replaced.

(The two foregoing conditions shall be considered sufficient evidence, without further testing, that the moisture content is incorrect and shall be grounds for removal and replacement of the material. Such replacement, if required, shall be at the sole expense of the Contractor.)

- Placement of backfill against cast-in-place concrete structures shall not be started until the concrete has been cured for the time required in accordance with these specifications.

305.3.14.2 COMPACTION – Compaction procedures shall be as follows:

- The Contractor shall be responsible for obtaining construction water needed for compaction in accordance with Section 307 of these Specifications.
- Bedding and consolidated backfill material shall be compacted with tamping, vibrating or conventional wheeled compaction equipment. Use care not to damage pipe while compacting bedding materials.
- The use of wheel rolling for compaction shall only be approved for compacting unconsolidated backfill materials.
- For work within state or federal highway rights-of-way, compaction shall meet the requirements of the respective applicable specifications.
- Backfill shall be thoroughly compacted to densities not less than those shown in the following table:

TABLE OF MINIMUM DENSITY REQUIREMENTS
(based on AASHTO-99 and T-91 and on ASTM D-2922 and E-3017)

Location	From Surface to 2-Feet Below Surface	From 2-Feet Below Surface to Top of Bedding	Bedding
Within 6 feet of, and/or under, any existing or proposed structure, pavement, curb, sidewalk or similar construction included in the Contract:	95% for all materials	95% for all materials	95% at all locations
Around any structure outside 6 feet:	90% for all materials	90% for all materials	90% at all locations
Cultivated and landscaped areas:	85% for all materials	85% for all materials	85% at all locations
Undeveloped Land:	Unconsolidated – see definition	Unconsolidated - see definition	85% at all locations

305.3.15 SETTLING AND SUBSIDENCE

Dips or uneven surfaces caused by subsidence or post-construction settlement of fill or backfill in any trenches, excavations, fills, or embankments within the work, which become apparent within the warranty period, shall be repaired by the Contractor.

305.3.16 SAMPLING AND TESTING

305.3.16.1 TESTING BY INDEPENDENT LABORATORY - **The Town shall provide for all sampling and testing through a qualified, independent testing laboratory at the Contractor's own expense.**

305.3.16.2 SCHEDULE OF SAMPLING AND TESTING - The following schedule of sampling and testing provides minimum requirements, to assure compliance with all materials and compaction requirements described herein. The number of samples and tests shown shall be considered minimum, and field conditions may necessitate additional sampling and testing as required by the Town or its Engineer.

GRADATION DETERMINATION (AASHTO T-27 and T-11)

TRENCH LOCATION	TESTING REQUIRED
Materials imported or manufactured at a site determined by this contract	One test per site or source
On-site excavated materials along trenches.	One test per geographical area where material composition and gradation visually appears consistent.

MOISTURE/DENSITY RELATIONSHIP (Proctor)
(AASHTO T-99 or T-180 Method D)

TRENCH LOCATION	TESTING REQUIRED
Materials imported or manufactured at a site determined by this Contract.	One test per site unless the material visually appears to change.
On-site excavated materials along trenches.	One test per geographical area where material composition visually appears consistent.

COMPACTION COMPLIANCE TESTING REQUIREMENTS
(AASHTO T-191 or Portable Nuclear Gauges)

TRENCH LOCATION	TESTING REQUIRED
Street crossing with gravel or bituminous surfacing.	One test per lift for each crossing.
Parallel to centerline of bituminous or gravel surfaced streets or roadways.	One test per lift for each 500-feet of trench length.
Along unsurfaced roads or in cultivated or landscaped areas.	One test per lift for each 1,000-feet of trench length with at least one test per area.
Under or adjacent to manholes, wetwells, enclosures, boxes, etc.	None, unless geological conditions are inconsistent and requested by the Town Engineer.

NOTE: The term "test" shall mean a single test with acceptable results, equal to or better than specified minimums. In the event compaction test results fall below the required minimum density; the Contractor shall re-compact and test the material until a test with acceptable results is obtained. Any test failure shall result in additional tests as required by the Engineer, at no cost to the City, to ensure that overall project quality objectives are met.

306.1 DESCRIPTION

This section covers construction of roadways and embankments, roadway ditches, channel changes, furrows, slope rounding, benches, berms, dips, approaches, and subsidiary work.

306.1.1 RELATED WORK AND REFERENCED SECTIONS

Not used.

306.1.2 SUBMITTALS

Not used.

306.1.3 DEFINITIONS

Roadway - The graded portion of a road within the top of cut slopes and the toe of embankment slopes, excavated and placed to form a surface for vehicular travel.

Excavation - That portion of the roadway which is removed from its original position and deposited within the roadway as embankment.

Embankment - Excavated earth materials moved from an original source and placed within the roadway.

Unsuitable Material - Excavated earth materials determined by the Town or its Engineer to be unsuitable for placement in roadway embankment. Such materials may include rock too large for placement in embankment, topsoil containing excessive vegetative debris, unstable earth materials, etc.

Roadbed - That portion of the roadway graded to the surface upon which vehicles travel, including the shoulders.

Subgrade - The graded roadbed finished according to the approved plans and prepared to receive surfacing when required.

Borrow - Earth materials excavated from a designated source, outside the roadway, and placed in embankments within the roadway. Designated sources for borrow material shall be shown on the Development Drawings, and shall be approved by the Town Engineer prior to being place in embankment.

Pioneering - The beginning or opening of a route on which a roadway is to be constructed prior to clearing or starting any earthwork excavation.

Structure Excavation - Excavation, backfill and/or disposal of material required in the roadway for construction of culverts, bridge foundations or other structures.

Cushion - Soil materials placed over rocks or solid rock portions of the roadway to provide a gradable surface. Cushion materials shall not contain rocks large than one-third of the minimum thickness of the cushion layer.

306.2 MATERIALS

306.3 CONSTRUCTION REQUIREMENTS

306.3.1 CLEARING AND GRUBBING

306.3.2 PIONEERING

Pioneering operations for the top of excavation slopes, toe of embankments, or pioneer road construction shall be accomplished to prevent undercutting of the final excavation slope, depositing of materials outside of the roadway limits and any restriction of drainage.

306.3.3 UTILIZATION OF EXCAVATED MATERIALS

All suitable excavated material shall be used in the construction of embankments, subgrades, shoulders, slopes, bedding and backfill for structures and for other purposes as described below:

306.3.3.1 EXCESS EXCAVATION - Designed excess excavation shall be disposed of as indicated in these standard specifications.

306.3.3.2 ROCK FOR SLOPE PROTECTION - When approved by the Town Engineer, excavated rock suitable for protection of embankments may be conserved and used in lieu of a designated materials source.

306.3.3.3 CONSERVING MATERIAL - Material encountered in the excavation, suitable for cushion, road finishing or other purposes, may be conserved and utilized instead of materials from designated sources.

306.3.3.4 EXCAVATION OF UNSUITABLE MATERIAL - Unsuitable material shall be excavated. Disposal will be as shown on the Development Drawings. Excavated areas shall be backfilled with suitable material when necessary to complete the Work. Frozen material shall not be placed in embankments. Rocks that are too large to be incorporated into the embankment shall be broken for incorporation into the embankment or maneuvered to the face of the embankment and embedded so that they will not roll or obstruct the use and maintenance of the roadbed, or moved to locations approved by the City.

306.3.3.5 CONSERVATION OF TOPSOIL - Suitable topsoil shall be removed, transported, and deposited in designated stockpile areas.

306.3.3.6 ABANDONED STRUCTURES AND OBSTRUCTIONS - Abandoned structures and obstructions shall be treated in accordance with Section 308.

306.3.4 DRAINAGE EXCAVATION

Drainage excavation shall include construction of side ditches, minor channel changes, inlet and outlet ditches, furrow ditches, ditches constructed along the road but beyond the roadway limits and other minor earth drainage structures and shall be shown on the Development Drawings. Excavated material shall be utilized in accordance with subsection 306.3.3 above.

306.3.5 FINISHING ROADBED

306.3.5.1 OVERSIZE MATERIALS - For roads receiving aggregate base or surface course, only rocks that do not protrude above the subgrade more than one-third of the depth of the base or surface course or 2-inches, whichever is less, may remain in place.

For unsurfaced roads, the top 4-inches below the finished road surface shall not contain rocks larger than 4-inches in greatest dimension. Oversize material shall be removed, reduced to acceptable size or covered by importing suitable material approved by the Town Engineer.

306.3.5.2 SHAPING AND DRESSING - The subgrade shall be visibly moist during shaping and dressing. Low sections, holes, cracks or depressions shall be brought to grade with suitable material approved

by the Town Engineer. Final compaction of the subgrade shall meet the requirements of the embankment placing method specified.

306.3.6 SNOW REMOVAL

Snow and/or ice shall not be incorporated into the embankment. Snow shall be removed in advance of the work to be performed and shall be deposited beyond the roadway limits in a manner that will not result in erosion or waste material. In no case shall work be performed on the roadway prism when frost or snow is present on the surface.

306.3.7 FINISHING SLOPES

306.3.7.1 SLOPE SURFACE - Slopes shall be finished as closely as is practicable to the lines staked on the ground or shown on the Development Drawings. The finished slope shall be left in a slightly roughened condition to facilitate the establishment of vegetative growth. The finish associated with template and stringline or hand-raking methods will not be allowed. Loose rock, loose debris or other loose material, which is larger than 2-inches in diameter, shall be removed from the slope.

306.3.7.2 SLOPE TOP - The tops of excavations, excluding areas of solid rock, shall be blended with the adjacent terrain by rounding when shown on the Development Drawings. Decomposed rock that may be cut without blasting or ripping shall be rounded. Earth overlying rock shall be rounded above the rock.

306.3.8 BLASTING (WHEN REQUIRED)

306.3.8.1 CONTROLLED BLASTING - All rock excavations that require blasting shall be formed with controlled blasting techniques. Controlled blasting is defined as the controlled usage of explosives and blasting accessories in appropriately aligned and spaced drill holes for the purpose of producing a free surface or shear plane in the rock excavation slopes and of minimizing landscape damage, adjacent ground vibration and overbreak. Presplitting is not intended.

306.3.8.2 TEST SECTIONS - Unless directed otherwise by the Town Engineer, the Contractor shall drill, blast and excavate short test sections (not to yield in excess of 1,000 cubic yards) to determine the controlled blasting method, hole spacing and charge best suited to the material encountered.

306.3.9 OVERBUILDING

Unless otherwise agreed to in writing by the Town Engineer, excavation or embankment material shall be confined within the roadway limits to avoid overbuilding and to protect the adjacent property.

306.3.10 SUBGRADE TREATMENT

306.3.10.1 TREATMENT MATERIALS - Subgrade treatment shall consist of soil modification by mixing aggregates, placing geotextiles, fiber mat, rock blanket or other similar materials over areas of unsuitable embankment foundation material.

306.3.10.2 SWAMPY GROUND - When an embankment is to be placed across swampy ground and removal of unsuitable material or subgrade treatment is not required, the lower part of the embankment may be constructed in a 24” single layer depth necessary to support construction equipment.

306.3.11 EMBANKMENT PLACEMENT

All embankments shall be placed by one or more of the following methods:

306.3.11.1 METHOD 1 - SIDE CASTING AND END DUMPING - Embankment may be placed by side casting and end dumping. Only where material containing a large amount of rock is used to construct embankments, a solid embankment shall be provided by working smaller rocks and fines in with the large rocks and fines to fill the voids.

306.3.11.2 METHOD 2 - LAYER PLACEMENT - Surfaces steeper than a ratio of 3 horizontal to 1 vertical (3:1) upon which embankment is to be placed, shall be keyed or stepped to provide permanent bonding of new and old materials.

- Embankment shall be layer placed, except over rock surfaces, in which case material may be placed by end-dumping to the minimum depth needed for operation of spreading equipment. Each embankment layer shall be leveled and smoothed before placement of subsequent layers. Hauling and spreading equipment shall be operated uniformly over the full width of each layer.

- Suitable material shall be placed in layers no more than 12-inches thick, except when the material contains rock more than 9-inches in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. No layer shall exceed 24-inches before compaction.

- Placing individual rocks or boulders greater than 24-inches will be permitted provided the embankment will accommodate them. Such rocks and boulders shall be at least 6-inches below subgrade. They shall be carefully distributed and the voids filled with finer material to form a dense and compacted mass.

- Where material containing large amounts of rock is used to construct embankments, the layers may be of sufficient thickness to accommodate the material involved. A solid embankment with adequate compaction shall be constructed by working smaller rock and fines in with the larger rocks to fill the voids and by operating hauling and spreading equipment uniformly over the full width of each layer as the embankment is constructed.

- Material shall be at a moisture content suitable to obtain a mass that will not visibly deflect under the load of the hauling and spreading equipment. Excessively wet excavated material shall be handled in accordance with Subsection 306.3.3.1.

306.3.11.3 METHOD 3 - LAYER PLACEMENT (ROLLER COMPACTION) - Embankments shall be placed as specified in Method 2. Placement shall be in horizontal layers not exceeding 12-inches prior to compaction, except when the material contains rock more than 9-inches in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. Compaction shall be obtained with equipment in compliance with the requirements described in the Specifications. Compaction equipment shall be operated over the full width of each layer until visible deformation of the layer ceases or, in the case of the sheepsfoot roller, the roller "walks out" of the layer. At least three complete passes will be made.

306.3.11.4 METHOD 4 - CONTROLLED COMPACTION - Embankments shall be placed as specified in Method 2 except earth embankments shall be placed in horizontal layers not exceeding 12-inches (loose measure) and compacted. Material shall be at a moisture content suitable for attaining the required compaction. Embankments and the top 1-foot of excavation sections shall be compacted to at least 95 percent of the maximum density as determined by AASHTO T 180, Method C or D.

- The density of the embankment material shall be determined during the progress of the Work in accordance with AASHTO T 191, T 205 or T 238; T 217, T 239 or T 255; and T 224.
- Density requirements will not apply to portions of rock embankments that cannot be tested in accordance with approved methods. When this condition exists, compaction shall be provided by working smaller rocks and fines in with the larger rocks to fill the voids and by operating equipment over the embankment materials.

306.3.12 COMPACTION EQUIPMENT

306.3.12.1 EQUIPMENT - Compaction equipment shall be capable of obtaining compaction requirements without detrimentally affecting the compacted material. The compacting units may be any one of the types described herein, provided they are capable of compacting each lift of material as specified and meet the minimum requirements contained herein.

306.3.12.2 ROLLER REQUIREMENT - Minimum requirements for rollers are as follows:

- Stamping or grid rollers shall be capable of exerting a force of 250 pounds per inch of width of roller drum.
- Steel-wheel rollers, other than vibratory, shall be capable of exerting a force of not less than 250 pounds per inch of width of the compression roll or rolls.
- Vibratory steel-wheel rollers shall have a minimum weight of 6 tons. The compactor shall be equipped with amplitude and frequency controls and specifically designed to compact the material on which it is used.
- Pneumatic-tire rollers shall have smooth tread tires of equal size that will provide a uniform compacting pressure for the full width of the roller and capable of exerting a ground pressure of at least 80 psi.

306.3.13 CONSTRUCTION TOLERANCES

A Table of Tolerance is provided below:

TABLE OF TOLERANCES

MEASUREMENT	TOLERANCE CLASS		
	A	B	C
Roadbed Width (feet)	+0.5	+1.0	+2.0
Subgrade Elevation (feet)	±0.1	±0.2	±0.5
Centerline Alignment (feet)	±0.2	±0.5	±1.0

Deviations shall be uniformly graded in the direction of change for a distance of 200-feet or more along the roadway. Roadway ditches shall always be constructed to flow in the direction shown on the Development Drawings, regardless of allowable deviations. Roadbed width shall be no less than the dimension shown on the Standard Drawings. When a tolerance class is not otherwise indicated on the Standard Drawings, Class B tolerance deviations will be allowed for roadway construction.

306.3.14 WATER

Water provided for compaction, dust control, or planting and care of vegetation, shall be developed, hauled and applied in accordance with Section 307.

307.1 DESCRIPTION

This section covers the water for: dust control, pre-wetting, mixing or compacting earth materials for road, site, and/or trench construction, and for other needs associated with the Work.

307.2 MATERIALS

Water shall be free of dirt and silt and be of a quality that it shall not be injurious to plant or animal life. A separate supply of potable water shall be provided by the Contractor for drinking when it becomes necessary to provide water for workers.

307.3 CONSTRUCTION REQUIREMENTS

Water provided for construction shall be obtained from a source approved by the Town and shall be sufficient to provide for the anticipated needs of the project.

Water hauling equipment shall have watertight tanks of known capacity and shall be equipped with a pressure pump and spray system with the capability of applying the whole load uniformly. The spray system shall have a positive shut-off control. The water tank shall have a minimum capacity of 1,000 U.S. Gallons, and the capacity shall be clearly marked on the tank. The Contractor may be required to verify the tank capacity.

A water meter will be used for water dispensing, providing its measurement can be verified. State approved backflow prevention devices are required.

308.1 DESCRIPTION

This section covers removal and restoration of existing features, public or private, including but not limited to asphalt or concrete pavement, concrete structures, curb and gutter, sidewalk, gravel surfacing, driveways, crosswalks, landscaping, field crops, irrigation ditches, fences, culverts, buried or exposed utilities, abandoned utilities, small utility buildings and the disposal of resulting waste materials and debris.

308.1.1 RELATED WORK

Section 300 - Protection of Existing Properties
Section 305 - Trench Excavation and Backfill
Section 309 - Hot Plant Mix Bituminous Surfacing
Section 310 - Road Mix Bituminous Surfacing
Section 313 - Pavement Cutting

308.2 MATERIALS

308.2.1 GENERAL

Restoration work shall be accomplished so as to restore the feature to its original, or better, condition and/or function as it existed prior to removal.

It is recognized that exact duplication of materials cannot always be achieved, but reasonable effort is expected from the Contractor to restore the feature with materials which will provide the same or better service and appearance as observed prior to removal.

All materials shall be new.

308.2.2 BITUMINOUS SURFACE

308.2.2.1 PRIMER OR TACKER COAT – Shall be an approved bituminous material such as type MC-70-250, SS1, or CS-1.

308.2.2.2 PATCHING AND REPAIR - Plant mix material that meets or exceeds the requirements of Section 310 herein, or of the local State Department of Transportation for asphalt surface road repair, shall be used for patching and repair.

308.2.2.3 SURFACING – Shall be hot mix bituminous surfacing, meeting or exceeding the requirements of Section 309, or of the local State Department of Transportation for asphalt surface road repair.

308.3 CONSTRUCTION REQUIREMENTS

308.3.1 UNCLASSIFIED REMOVAL AND RESTORATION

308.3.1.1 EXISTING IMPROVEMENTS - All existing facilities disturbed by the Contractor in prosecution of the Work, including but not limited to asphalt or concrete pavement, concrete structures, curb and gutter, sidewalk, gravel surfacing, driveways, crosswalks, landscaping, field crops, irrigation ditches, fences, culverts, buried or exposed utilities, abandoned utilities, small utility buildings or any other structures or obstructions designated to be removed, shall be removed, cleaned up, and then restored or replaced in kind by the Contractor in new condition.

308.3.1.2 ADJACENT IMPROVEMENTS - Care shall be exercised in such removal to assure that adjacent facilities or structures, which are to remain, are not disturbed. Any damage to such existing

facilities or structures resulting from carelessness or negligence on the Contractor's part shall be satisfactorily restored to new condition at the Contractor's expense.

308.3.1.3 VEGETATION - Trees, shrubs, and other landscape plants designated to be saved for replanting shall be carefully removed, bundled, set aside and protected for replanting by the Contractor. Turf Sod to be saved for replanting shall be removed by machine cutting. In lieu of removal and replacement of turf sod or field crops, the Contractor may, upon approval of the property owner, remove and replant the same. Such agreements shall be documented on the final property release to be signed by the property owner.

308.3.2 TOPSOIL

308.3.2.1 REMOVAL AND PROTECTION - In all construction areas where re-growth of vegetation is desired, the Contractor shall remove, segregate, stockpile, store, and protect topsoil during excavation. Topsoil shall be kept free from contamination from foreign materials and other soils. The Contractor shall arrange construction activities to avoid damage or disturbance to the stockpiled soil.

308.3.2.2 REPLACEMENT - When backfill operations have been completed, the topsoil shall be replaced and restored to the original contours or as called for on the Development Drawings, in accordance with these Specifications.

308.3.3 GRAVEL SURFACE

308.3.3.1 REMOVAL - When restoration of graveled driveways, roadways, or parking areas is required, the existing gravel surfacing shall be graded off and stockpiled safely away from ongoing work activities, to prevent contamination with subsurface materials. It may then be reapplied and compacted during restoration activities.

308.3.3.2 RESTORATION - Areas to be restored shall be backfilled and graded to uniform lines and compacted to the density prescribed for trenching in Section 305. Existing gravel surfacing materials shall then be replaced in uniform 3 inch layers compacted to 95% of maximum density. After compaction, the affected area shall be graded smooth. Sufficient new material of equal or better quality shall be applied and mixed in, to replace materials lost during prosecution of the Work, to ensure a 3-inch minimum gravel cover after compaction and grading.

308.3.4 BITUMINOUS SURFACE

308.3.4.1 REMOVAL - Bituminous pavement surface shall be removed and restored in accordance with this paragraph unless provisions for restoration are made in other Sections of these Specifications. The pavement surface, public or private, designated for removal shall be removed to neat lines. No ripping or rooting will be permitted outside of the limits of the cut lines.

Existing driveways, sidewalks, etc., which do not match the new finished grade as shown on the Development Drawings, also shall be removed preparatory to restoration work.

308.3.4.2 DISPOSAL - Surfacing materials removed shall be disposed of in accordance with Section 301 of these Specifications, and will not be permitted in the backfill, except as specifically authorized by the Town and in accordance with local requirements.

308.3.4.3 RESTORATION – Restoration of bituminous surface shall proceed according to the following steps:

- First, the sub-grade shall be graded to a uniform surface, and 6 inches of Untreated Base Coarse (UBC) gravel shall be placed over the area in lifts not thicker than 3 inches, compacted to 95% of its maximum density.

- Then, the exposed edges of existing pavement shall be primed with a material approved for this purpose.

- Unless approved in writing by the Town, hot or cold mix bituminous surfacing shall be spread and compacted in individual, 2-inch maximum lifts over the base course. Minimum thickness of the new bituminous surfacing layer shall be equal to or greater than the adjacent surface thickness, but shall be not less than 3-inches thick when compacted to 95% of its maximum density.

- Rolling operations shall be conducted in such a manner that shoving or distortion will not develop beneath the roller. The surface shall be finished to a smooth, uniform line and grade with surface deviations not exceeding plus or minus 1/4 inch in 10 feet, unless the surface is subject to more stringent State, County, or Municipal requirements. The determination of smoothness compliance may be made with a straight edge or string line at the option of the Town Engineer. Any irregularities shall be satisfactorily corrected at the sole expense of the Contractor.

- Existing driveways, sidewalks, etc., which were removed because they did not match the new finished grade, shall be replaced and restored to their original or better condition to match the new finish grade shown on the Development Drawings, or as directed by the Town Engineer.

308.3.5 REMOVAL AND RESTORATION OF CONCRETE IMPROVEMENTS.

308.3.5.1 REMOVAL - Existing concrete pavement in streets, alleys, driveways, sidewalks, etc., public or private, shall be cut in accordance with Section 313, and removed to the lines indicated on the Development Drawings, or as directed by the Town Engineer. No ripping or rooting will be permitted outside of the limits of saw cut lines.

Existing driveways, sidewalks, etc., which do not match the new finish grade as shown on the Development Drawings, also shall be removed preparatory to restoration work.

308.3.5.3 DISPOSAL - All materials removed shall be disposed of in accordance with Section 301 of these Specifications, and will not be permitted in the backfill, except as specifically authorized by the Town Engineer and in accordance with local codes.

308.3.5.4 RESTORATION - Sub surface preparations shall be the same as those in paragraph 308.3.4.3 above.

- Concrete pavement including sidewalks, driveways, roadways, and parking area surfacing shall be replaced by the Contractor in accordance with Section 315 of these Specifications, unless otherwise directed by the Town

- Those existing driveways, sidewalks, etc., which were removed because they did not match the new finish grade, shall be replaced and restored to their original or better condition to match the new finish grade shown on the Development Drawings, or as directed by the Town Engineer.

- All other concrete improvements shall be restored in accordance with details shown on the Development Drawings, or as directed by the Town Engineer, and as required by the provisions of these Specifications.

308.3.6 REMOVAL AND RESTORATION OF FENCES

When necessary to remove any fence to facilitate its operation, the Contractor shall obtain prior agreement with the owner of the fence for its removal. Temporary containment measures shall be provided, if needed, at no additional expense to the owner. As soon as practical, the permanent fence shall be restored to its original condition or better.

308.3.7 RESTORATION OF IRRIGATION DITCHES

Restoration of irrigation ditches shall be made in such a manner that the ditch configuration and size will be equivalent to its original condition and the ditch will be located on its original alignment. Any embankment required to restore the original slope of the ditch will be layer compacted with mechanical compaction equipment to 90% of maximum dry density determined by AASHTO T-99.

308.3.8 CLEANUP

Areas of construction activity shall be left in a condition of uniform grade, blending into pre-existing contours and concealing, as much as possible, evidence of construction activity by back dragging or raking to conceal tire marks. Cleanup and disposal of surplus materials shall be performed in accordance with Section 301.

HOT PLANT MIX BITUMINOUS SURFACING — SECTION 309

309.1 DESCRIPTION

This section covers manufacturing, transporting, laying and compacting hot mixtures of bituminous surfacing for roads, parking areas, sidewalks and other traffic surfaces. Also covered are tack coats, seal coats, and saw cutting.

309.2 WYOMING PUBLIC WORKS STANDARD SPECIFICATIONS

Work as described above shall meet the Wyoming Public Works Standard Specifications.

314.1 DESCRIPTION

This section contains requirements for Portland cement concrete materials and concrete mix designs. Also covered are forming, finishing, curing, and reinforcement of Portland cement concrete.

314.2 WYOMING PUBLIC WORKS STANDARD SPECIFICATIONS

Work as described above shall meet Wyoming Public Works Standard Specifications.

317.1 DESCRIPTION

This section is a materials specification and is included for guidance in selecting materials for pipe and related fittings and appurtenances used in the construction of water and sewer systems.

317.1.1 RELATED WORK

Section 318 - Waterline Pipe Installation
Section 319 - Waterline Valves and Hydrants
Section 320 - Water System Control Valves
Section 324 - Sewer Line Pipe Installation

317.1.2 SUBMITTALS

Submittals shall be presented to the Town when requested.

317.2 MATERIALS

317.2.1 NSF COMPLIANCE

All pipe and materials furnished and installed for culinary use shall comply with National Sanitary Foundation (NSF) Standard 61. Also, all plastic pipe must be approved by the NSF for potable water use and shall carry the factory "NSF" stamped label on the pipe indicating such approval.

317.2.2 POLYVINYL CHLORIDE PIPE (PVC)

317.2.2.1 PVC PIPE – Shall be as follows:

- For sizes less than 4 inches OD, PVC pipe shall be Schedule Rated pressure pipe meeting the requirements of ASTM D1785 of the schedule and size shown on the approved Development Drawings.

- PVC pipe 4 inches and larger, shall be rigid, thermoplastic Class Rated pressure pipe meeting the requirements of ANSI/AWWA Standard C900 or C905 (latest revision). The pressure class or the dimensional ratio and the size shall be as shown on the approved Development Drawings.

317.2.2.2 FITTINGS FOR PVC PIPE – Unless specifically authorized otherwise, fittings for 4 inch and larger size PVC pipe in underground service shall be ductile iron (DI) and shall meet the requirements of NSF 61 and ANSI/AWWA C-153. They shall have a standard coating of cement mortar on the interior surfaces in complies with AWWA C-104. DI fittings meeting these requirements may be used with smaller PVC piping. PVC fittings meeting the requirements of ANSI/AWWA C-907 may be used with PVC pipe smaller than 4 inches, and, in some instances, where specifically authorized, with PVC pipe sizes 4 inches through 8-inches.

317.2.3 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

317.2.3.1 PIPE – Shall be as follows:

- PE pipe shall be classified as a Type III, Grade P-34, Class C, Category 5, according to ASTM D1248. All PE pipe shall be manufactured according to ASTM D2513 D3035, F714, or API 15LE and AWWA C906.

- Pipe shall be made of high density, high molecular weight resin. PE plastic shall have a cell classification of 345434C as defined by ASTM D3350/AWWA C906. It shall be rated as

PE3408 according to the requirements of the Plastics Pipe Institute. Internal pressure rating shall be as specified elsewhere in the project documents.

317.2.3.2 FITTINGS FOR HDPE – Molded fittings shall be made of pre-blended virgin resins in accordance with the materials specifications of ASTM D1248. PE3408 fittings shall be made from a Type III, Class C, Category 5, Grade P-34 plastic resin having a cell classification of 345434C according to ASTM D3350. Socket fusion fittings shall be manufactured in compliance with ASTM D2683 and butt fusion fittings with ASTM D3261. Measurements of fittings shall be as required by ASTM D2122. All fittings shall be compatible for heat fusion with any pipe manufactured for like or similar resins.

Heat welded Flange Adapter Couplings shall be used for transition to other type piping material. The Contractor shall follow the manufacturers recommendations, as well as specified procedures herein in fusing fittings to the polyethylene pipe.

317.2.4 DUCTILE IRON PIPE

317.2.4.1 INTERIOR COATING - The interior surface of all DI pipe shall be coated with a standard coating of cement-mortar in accordance with ANSI/AWWA Standard C-104. Field coating of DI pipe will not be acceptable.

317.2.4.2 BURIED PIPE – Unless otherwise approved in writing by the Town and the Town Engineer, shall be as follows:

- Buried ductile iron pipe shall be Thickness Class 50 unless otherwise approved in writing by the Town.
- Shall meet requirements of ANSI/AWWA C-151.
- Joints shall be bell and spigot or mechanical, which meet the requirements of ANSI/AWWA C-111.

317.2.4.3 EXPOSED PIPE – Shall meet these requirements, unless otherwise approved in writing by the Town and the Town Engineer:

- Exposed ductile iron pipe shall be Thickness Class 50 unless otherwise approved in writing by the Town.
- Pipe shall comply with ANSI/AWWA Standard C-151.
- Pipe joints shall be flanged, meeting the requirements of ANSI/AWWA C-115, or mechanical type couplings (MTC), meeting the requirements of ANSI/AWWA C-606. MTC shall be Victaulic grooved couplings, as manufactured by Victaulic Company of America or an approved equal.
- 3” to 12” compact flanged fittings shall be ductile iron and shall be produced in accordance with laying lengths specified in ANSI/AWWA C10/A21.10. Flange surface shall be faced and drilled in accordance with ANSI Class 125 B16.1. Nominal body thickness shall be Manufacturer’s Standard, but shall not be less than those specified in ANSI/AWWA C153/A21.53 “Standards for Ductile Iron Compact Fittings”. Flange thickness shall be in accordance with the Manufacturer’s Standards. Working pressure rating shall be 250 psi for water. Fittings shall be made in the United States of America and shall not have been refurbished or reworked by anyone other than the manufacturer. When greater than 250 psi is called for on the plans, then the Supplier shall furnish higher class rated flanges. Standard

Class 125 template for drilling shall be used for all flanges. Drilling templates shall be in multiples of four, so that fittings may be made to face in any quarter. Boltoles shall straddle the centerline and shall be equally spaced. Misalignment of boltholes of two opposing flanges shall not exceed 0.12 inches. Blind flanges 12 inches and over shall be provided with lifting eyes. Insulated flanges shall be provided where required.

- Gaskets shall be full faced, 1/16-inch thick compressed sheets of Aramid fiber base, with nitrile binder and non stick coating, suitable for temperatures to 700°, pressures to 1000 psig and a pH range of 1 to 11. Blind flange gaskets shall cover the entire inside face of the flange and shall be cemented in place. Gaskets shall be as manufactured by John Crane, style 2160; Garlock, style 3000; or approved equal.

317.2.5 GALVANIZED IRON PIPE AND FITTINGS

Shall be of the schedule rating shown on the approved Development Drawings and shall be used only in exposed, non-corrosive atmospheres where piping diameters are less than 4 inches.

317.2.6 PIPE AND FITTINGS FOR WATER SERVICE LINES

Shall meet the requirements provided in Section 321 for water service connections.

317.2.7 PIPE FOR GRAVITY SEWER SYSTEMS

Gravity sewer pipelines may be constructed with PVC or polyethylene (PE) plastic sewer pipe and fittings. Such materials shall be of the type, configuration and size shown on the approved Development Drawings.

317.2.7.1 PVC PIPE - All PVC sewer pipe and fittings shall meet the standards of ASTM D3034 and F679. Such pipe shall be manufactured with a rubber gasketed joining system which meets ASTM D3212 and shall be furnished with a standard dimensional ratio of 35 (SDR 35) for wall thickness.

317.2.7.2 PE PIPE - All PE sewer pipe and shall be smooth, solid wall, high density polyethylene pipe manufactured from PE 3408 material conforming to ASTM D1248, Type III, Class C, Category 5, Grade P34 with a P3408 rating from the Plastic Pipe Institute. Fittings for this pipe shall be molded from a polyethylene compound equal to or exceeding the properties of the pipe being supplied.

317.2.8 PIPE FOR PRESSURE SEWER SYSTEMS

Pressure sewer pipelines shall be constructed with DI, PVC, or PE plastic sewer pipe. Fittings and materials shall be of the type, SDR rating, (or pressure class) and size shown on the approved Development Drawings.

317.2.8.1 PVC PIPE - All PVC pipe for pressure sewer lines shall be rigid, pressure rated, thermoplastic pipe which meets the standards of ASTM D2241. Fittings for PVC pipelines shall be Class 50, cement mortar lined, rubber gasketed, DI which meet the requirements of ANSI/AWWA C-153 and C-104.

317.2.8.2 PE PIPE - PE pipe for pressure sewer lines shall be smooth, solid wall, high density polyethylene pipe manufactured from PE 3408 material conforming to ASTM D1248, Type III, Class C, Category 5, Grade P34 with a P3408 rating from the Plastic Pipe Institute. Fittings for this pipe shall be molded from a polyethylene compound equal to or exceeding the properties of the pipe being supplied.

317.2.9 PIPE AND FITTINGS FOR IRRIGATION SYSTEMS

Shall be either HDPE or Pressure Rated PVC, of the type and class shown on the approved Development Drawings, for line diameters 4-inches and greater. Buried lines smaller than 4 inches in diameter shall be Schedule Rated PVC or HDPE.

317.2.10 PIPE FOR DRAIN SYSTEMS

Piping for sub-drainage may be constructed with polyvinyl chloride (PVC) or polyethylene (PE) plastic non-pressure drainage or sewer pipe and fittings. Such materials shall be of the type, configuration and size shown on the approved Development Drawings.

317.2.10.1 PVC PIPE - All PVC drainage pipe and fittings shall meet the standards of ASTM F794. Such pipe shall be manufactured with a rubber gasketed joining system which meets ASTM D3212 and may be furnished with ribbed, corrugated or smooth exterior walls with smooth interior wall surfaces. Rubber gasketed joints will not be required for collection pipe applications with perforated or slotted pipe sections.

317.2.10.2 PE PIPE - All PE drainage pipe shall be solid, corrugated or ribbed wall high-density polyethylene pipe with smooth interior wall surfaces. Material shall conform to ASTM D1248, Type III, Class C, Category 5, Grade P34 with a P3408 rating from the Plastic Pipe Institute. Fittings for this pipe shall be molded from a polyethylene compound and with equivalent properties and configurations specifically designed to fit the pipe being supplied.

317.2.11 MISCELLANEOUS FITTINGS AND MATERIALS

317.2.11.1 PIPE SUPPORTS - Floor mounted pipe supports for suspended, exposed piping systems shall be adjustable stanchion type supports designed to cradle the pipe diameter by 170 degrees. The support shall fit ductile iron or steel diameters snugly, without excessive gaps between the support and the pipe. Support saddle width shall be a minimum of 2 inches wide. The support must offer a minimum of 3 inches of final adjustment, after installation. Supports shall be supplied with independent base and adjustment collar designed to accept standard sized Schedule 40 galvanized steel pipe for coarse adjustment. Supports shall be fabricated from A36 mild steel, and shall have an electro-galvanized finish. Floor mounted pipe supports shall be the Standon Model S92 or C92 as manufactured by Material Resources, Inc., 22700 N. W. Quatama Street, Hillsboro Oregon 97124, or approved equal. The standard required model shall be the S92.

317.2.11.2 "Y" STRAINERS - shall be constructed of high-tensile ASTM A126 Class B Cast Iron with blow-off connections and self-aligning cylindrical screens and shall be equal to Watts Regulator Series 77F or better quality.

317.2.11.3 FASTENERS – Fastener requirements are as follows:

- Unless otherwise required in these Specifications, all bolting hardware for buried pipe, fittings, valves, and components shall be of manufacturer's standard materials.
- Unless otherwise required in these Specifications, all bolting materials for exposed pipe, fittings, valves, and components shall be Type 316 stainless steel. Where space restrictions preclude the use of regular bolts, stainless steel threaded studs may be used on all valve flange connections.
- In all instances where stainless steel threaded fasteners are used, a coating of an approved, permanent anti-seize compound shall be applied to the fastener to prevent galling and to assist in disassembly.

- All bolts and/or studs shall extend through the nuts at least 1/4 inch.

317.2.11.4 COUPLINGS – Couplings shall meet the following requirements:

- Couplings shall meet the requirements of ANSI/AWWA C-219. All flexible couplings shall meet the minimum requirements of Smith Blair 400 series.

- Sleeves shall have a smooth inside taper and there shall be no surface irregularities on any sealing surface. Gaskets shall be suitable for the project application.

- Flexible couplings for buried DI and PVC pipe sizes 2 through 16 inches in diameter shall be fabricated of steel or ductile iron. For pipe sizes larger than 16 inches, flexible couplings shall be of steel. Coupling components for use in potable water systems shall be factory coated with an FDA approved, bonded epoxy coating, applied to an average 12 mil thickness.

- Flexible couplings for exposed pipe shall be manufactured of steel, unless otherwise approved by the Town or its Engineer. Coupling components for use in potable water systems shall be factory coated with an FDA approved, fusion-bonded epoxy coating, applied to an average 12 mil thickness.

317.2.11.5 RESTRAINT HARNESS – Where required, restraint harness for bell and spigot pipe joints shall be as manufactured by EBAA Iron Co. or an approved equal. The restraint shall consist of a split bell ring to go behind the bell and a split, serrated ring to grip the pipe on the other side of the joint. The harness shall be held together with clamping bolts and tie bolts. The rings shall be fabricated of 60-42-10 DI conforming to ASTM A-536. Clamping bolts shall be grade 5 galvanized machine bolts. Tie bolts are of low alloy steel. The harness shall have a minimum working pressure of 150 psi. Harness size shall meet the respective application.

317.2.11.6 VALVES AND FITTINGS - Shall be as specified in their respective sections in these Specifications.

317.2.11.7 BOXES AND ENCLOSURES – Shall be of the size, type, and configuration indicated on the approved Development Drawings.

317.3 CONSTRUCTION REQUIREMENTS

See Sections 318 and 319 for construction requirements for applicable piping systems.

318.1 DESCRIPTION

This section covers pipe and fittings for installation of the type, class and size designated for water systems defined, in these Specifications.

318.1.1 RELATED WORK

Section 304 - Earthwork Materials
Section 305 - Trench Excavation and Backfill
Section 317 - Pipe and Piping Systems
Section 319 - Waterline Valves and Hydrants
Section 320 - Water System Control Valves
Section 321 - Water Service Connections
Section 322 - Water Main Flow Meters

318.1.2 SUBMITTALS

318.1.2.1 Shall be submitted to the Town when requested.

318.1.2.2 TESTING - As construction proceeds, the Contractor shall submit test documentation in accordance with this section of these Specifications.

318.1.3 DEFINITIONS

Fitting - Any component of a pipeline, excluding the pipe itself and valves and meters, which is used for connecting pipe sections; changing line direction or size; connecting meters, valves, tanks, etc.; or starting or terminating pipelines.

Mains - Water distribution pipes, located in streets or rights-of-ways, to which water service connections are made for users of the system.

Run - Any identified section of a pipeline.

Saddle - A fitting placed on a pipe to reinforce the pipe wall, through which a tapping hole is drilled.

Service Lateral – The line which connects to the water meter or to the service stub at the property line extending from there, on private property, to the plumbing at the foundation of a house or business.

Service Stub – The line running from the tap on a main to the meter or to the property line as appropriate.

Tap - The actual connection made to water mains which includes drilling an opening into the main, threading, installing a tapping saddle when appropriate, and installing a valve into the opening.

318.2 MATERIALS

318.2.1 PIPE AND FITTINGS

See Section 317

318.2.2 PIPELINE LOCATION IDENTIFIERS

Pipeline location identifiers generally take the form of marker posts, warning tape, and tracer wire.

318.2.2.1 TRACER WIRE - Unless otherwise approved by the Town, the tracer wire shall be an insulated, #12, direct bury copper wire designed and manufactured for this purpose.

318.2.2.2 WARNING TAPE - The warning tape shall be an inert, plastic, direct bury type with a 2-inch minimum width, of the appropriate safety color, and specifically manufactured for underground utility identification. The tape shall have wording imprinted on it identifying the type of utility it is protecting and shall be located as shown in the Standard Drawings.

318.2.2.3 MARKING POSTS - Shall be fiberglass compound, aluminum, or other corrosion resistant metal of 5 foot length and 4 inches wide, or otherwise approved by the Town, and shall be required at the end of all service line stub-outs. They shall be fitted with a deterioration resistant warning notice or label appropriate to the application and line tracer wire.

318.2.3 MISCELLANEOUS FITTINGS AND MATERIALS

318.2.3.1 POLYETHYLENE ENCASEMENT - Where soil conditions are determined to be severely corrosive, tubular polyethylene encasement shall be installed around buried ductile iron piping and fittings in accordance with ANSI/AWWA C-105.

318.2.3.2 CASING PIPE - Where casing pipe is required in the Work, the Contractor shall furnish and install the casing.

318.2.3.3 PIPE PENETRATION OR CASING SEALS – The Contractor shall furnish and install pipe-to-wall linked rubber seals in core drilled structures, walls, pipe sleeves, or casings in accordance with the manufacturer's instructions. Seals shall be "Link Seals" by Thunderline Corporation, or an approved equal.

318.2.3.4 PIPE RESTRAINTS – Pipe restraints shall be as follows:

- Concrete thrust blocking shall be formed, sized, and placed as described herein and shown on the Standard Drawings. Reinforcing bars used in thrust block construction shall be preformed and fusion bonded epoxy coated. Chains used in thrust block restraint systems shall be 304 stainless steel and have a minimum link diameter of 3/8-inch. Chains shall not be used unless their application has been approved by the Town.

- Mechanical restraint of piping shall be accomplished with one of the following restraining systems or an approved equal:

  ⇒ Grooved Ductile Iron AWWA Couplings by Victaulic Company of America (use only with exposed piping systems).

  ⇒ MEGALUG thrust restraints by EBAA Iron Sales, Inc.

All joints of pipe installed under streambeds, canal crossings, or installed in casing pipes, shall be protected with mechanical and thrust block restraints.

Restraint protection of above ground or exposed piping in buildings or enclosures shall be accomplished only with mechanical restraints.

318.3 CONSTRUCTION REQUIREMENTS

318.3.1 HANDLING AND APPROVAL OR REJECTION OF MATERIALS

All materials delivered to and used at the job site are subject to approval of the Town or its Engineer. Care shall be taken during handling of pipe, to avoid any impact which might cause damage. Dropping pipe during unloading will not be permitted. Pipe will be carefully inspected in the field before and after laying. If any cause for rejection is discovered in a pipe before or after laying, it shall be removed and replaced by the Contractor at his own expense. Any pipe found to be unfit or rejected due to cracks, broken bells or spigots, irreparable chipped lining, etc., shall be removed from the job site.

318.3.2 DIAGRAMMATIC LAYOUT

The diagrammatic layout shall be as shown on the approved Development Drawings.

318.3.3 WATERLINE ALIGNMENT

Waterlines shall be aligned to cross perpendicular to roadways. In no case shall the waterline be aligned and laid under asphalt pavement or under other traffic ways unless otherwise approved by special permit from the Town .

318.3.4 ALTERATION OF ALIGNMENT

With written permission from the Town, piping alignment may be varied from that shown on the approved Development Drawings, to avoid structural or mechanical difficulties, to avoid large utilities, or to avoid the work of other trades. The Contractor shall be liable to provide all materials and labor required to complete all work in accordance with the best practice of the trade, and to the satisfaction of the Town.

318.3.4 INSTALLATION

All roadway crossings under asphalt roadway surfaces shall be bored by an approved method consistent with the area and soil conditions unless a permit to do otherwise is obtained from the Town.

All pipe stubs from valves or fittings shall be at least 4-feet in length, capped, and thrust blocked in accordance with these specifications.

318.3.4.1 DEWATERING - Prior to pipe laying and jointing, sufficient dewatering effort shall be provided to maintain the ground water level at or below the surface of the trench bottom or base of the bedding course. The dewatering operation; however accomplished, shall be carried out in such a manner as to not permanently disturb natural underground water conditions. The pipe and pipe washed rock bedding material shall be wrapped in a filter fabric and MEGALUG joint restraints shall be installed. Details for pipe installation in areas of high ground water shall be submitted and approved by the Town prior to approval of the project.

318.3.4.2 CONNECTION TO EXISTING FACILITIES - When connections are to be made to any existing pipe or appurtenances, for which the actual elevation or position cannot be determined without excavation, the Contractor shall excavate for, and expose the existing pipe or appurtenances before laying any new pipe. The Town or Town Engineer shall be allowed to inspect the existing pipe or appurtenances before any connection is made. The Contractor shall make any adjustments in line or grade which may be necessary to accomplish the intent shown on the approved Development Drawings at no cost to the Town.
Where new fittings, valves, meters, restraints etc., are required to be installed in, or attached to, existing piping, or where connections are to be made to existing piping, the Contractor shall

furnish and install the necessary components needed to accomplish the work, whether or not specifically indicated on the Standard or Development Drawings.

318.3.4.3 CAPPING PIPE END - At the close of each workday, or whenever the work ceases for any reason, the end of the pipe shall be securely closed.

318.3.4.4 JOINING – Joining of pipe shall be as follows:

- When making connections, pipe shall be cut and beveled in a neat and workmanlike manner, so as to provide a smooth, beveled end at right angles to the axis of the pipe. Pipe and fittings shall be assembled so there will be no distortion or springing of the pipelines. Flanges, unions, flexible couplings and other connections shall come together at the proper orientation. The fit shall not be made by springing any piping, nor shall orientation or alignment be corrected by taking up on any flange bolts. Flange bolts, union halves, flexible connectors, etc., shall slip freely into place. If the proper fit is not obtained, the piping shall be altered to fit.

- PVC pipe, 2 inches and smaller in diameter, shall be joined by solvent welding. No disturbance of joints, including from trench backfill operations, will be allowed until solvent welded joints are cured.

- PVC pipe, larger than 2 inches in diameter, shall be joined by means of gasketed joints.

- With bell and spigot joints, care should be taken to properly align the pipe before joints are forced home. Gaskets shall be lubricated in accordance with manufacturer's instructions. During insertion of the spigot end, the pipe shall be partially supported by hand, sling, or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since the most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

- Where fusion of polyethylene pipe joints is required, sections of pipe shall be joined in a continuous length on the job site above ground. Joining shall be by the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. Equipment used for butt fusion joining shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements, alignment, and fusion pressures.

318.3.4.5 LAYING - All pipe laid shall be retained in position, using mechanical means if necessary, so as to maintain alignment and joint closure until sufficient pipe bedding and backfill have been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the prescribed line and grade shown on the approved Development Drawings, within specified limits. No blocking of any kind shall be used to adjust the pipe to grade, except when used with concrete embedment. Bedding materials shall be placed so the bottom surface of the pipe will have full bearing for the entire barrel length. The pipe shall rest on not less than 1/4 of its outside perimeter. Bell holes shall be dug as required to assure uniform support along the barrel but shall be no larger than necessary.

Unless otherwise approved by the Town, pipe shall be laid upgrade from the point of connection on the existing pipeline or from a designated starting point. Pipe shall be installed with the bell end forward or upgrade, unless approved otherwise. When pipe laying is not in progress, the forward end of the pipe shall be kept closed with an approved temporary plug.

318.3.4.6 PIPE RESTRAINT – Pipe restraint work shall be as follows:

- The Contractor shall provide and install either concrete thrust blocks, mechanical pipe restraints, or both if so deemed necessary by the Town or Town Engineer, on all pressure piping not connected with bolted flanges or welded joints.

- Pipe restraints (thrust blocks and/or mechanical restraints) shall be furnished and/or constructed and installed as shown on the Standard Drawings and described in the schedule thereon.

- Pressure pipe shall be properly blocked, restrained, or both, at all fittings, wherever the pipeline makes a change in direction of 11.25 degrees or more, wherever it changes sizes, or wherever it ends.

- Placement of concrete thrust blocking shall provide bearing against undisturbed vertical earth banks or approved compacted backfill, sufficient to absorb thrust from line pressure, and in a configuration so that pipe joints and fittings will be accessible.

- All restraints shall be in place before any hydrostatic testing and flushing are performed on the system.

- The Contractor shall allow visual inspection of every thrust block or mechanical restraint before it is buried.

318.3.4.7 FINISH BEDDING - After the pipe is laid, additional imported bedding material shall be placed in 6-inch lifts to a level even with the spring line of the pipe and compacted. The portion of the trench from the spring line to 12 inches above the top of the pipe shall then be filled and compacted in the same way.

318.3.4.8 REQUIREMENTS FOR INSTALLATION NEAR SEWER LINES - Locate potable water piping at least 10 feet horizontally (measured edge to edge) from any existing or proposed parallel sewer or wastewater leach line. Should conditions prevent the 10-foot separation, the water line may be laid closer than 10 feet to sewer lines (but not leach lines) provided:

- The elevation of the bottom of the water line is at least 18-inches above the top of the sewer pipe, and

- The water line is laid in a separate trench, or

- The waterline is laid on an undisturbed earth shelf on one side of the sewer line trench, or

- The waterline is laid in a sewer or drainline trench which has been backfilled and compacted to not less than 95% of maximum density determined by ASTM D-690.

- Where culinary water lines and sewer lines cross, either above or below the other, the lines shall be placed:

- So as to provide a minimum separation of 18-inches between the top of one line and the bottom of the other;

- So that the joints of each are equidistant on either side of the other line with as much separation as possible;

- So that, where a sewer line crosses over a water line, the sewer line is adequately supported to prevent it sagging or falling onto the water line and causing damage to it

- In such crossings, where the foregoing vertical and horizontal requirements are impossible to achieve:
- The sewer shall be designed and constructed of materials conforming to water main standards;
- Such construction shall extend for a minimum distance of ten feet on each side of the point of crossing;
- Mechanical joints shall be used.
- In lieu of constructing or reconstructing the non-potable water main either the non-potable water main or water main may be protected by a sleeving material acceptable to the IDEQ for a distance of ten (10) horizontal feet on both sides of the crossing.

318.3.4.9 EXPOSED PIPING - No exposed piping shall be installed until all equipment to which the pipe is to be attached has been installed and it can be determined where piping and fittings shall be located to make a neat, efficient arrangement. Piping shall be aligned with equipment connections such that no external load or stress will be transferred to any equipment from the piping. Piping shall be installed with a sufficient number of unions, flexible couplings, or flanged joints, to allow for convenient inspection and maintenance.

Exposed pipe work shall be suspended or supported, to prevent sagging or over-stressing of the pipe and connections. Assembly of pipe and fittings shall be accomplished so there will be no distortion or springing of the pipe. The fit shall not be made nor the alignment corrected by taking up on any flange bolts. Joints shall come together in proper orientation, and flange bolts, union halves, flexible couplings, and etc. shall slip freely into place. If the proper fit is not obtained, the piping shall be altered to make the fit meeting the above requirements.

Exposed pipe shall be installed in straight runs parallel to the axis of the structures. Pipe runs shall be horizontal and vertical; except that gravity drain lines shall be pitched down in the direction of flow at a slope not less than 1/4 inch per foot. All exposed pipe shall be painted. Factory finished items are not required to be field painted except touch-up. The color and type of paint used shall be submitted to the Town for their approval.

318.3.4.10 DRAINS AND OTHER SYSTEMS - In addition to other requirements in this Section, all irrigation and other lines fitted with drains shall be installed such that continuous slope is maintained to designated drain locations. In areas where there are both culinary water pipelines and irrigation pipelines, exposed portions of irrigation water piping shall be identified by distinctive coloring or other marking. Culinary and irrigation lines and extensions shall be completely separated, installed in separate trenches, and there shall be no cross-connection between the systems under any circumstances.

318.3.5 FLUSHING AND CLEANING

318.3.5.1 FLUSHING WITH WATER - Prior to proceeding with pressure testing (and/or disinfection if required) of completed lines, the Contractor shall fill the test section with clean, potable water and flush the lines. The Contractor shall furnish all equipment and labor to complete the flushing as required by this section.

318.3.5.2 DIFFICULT CONTAMINANTS - Certain contaminants, especially in caked deposits, resist flushing at any velocity. If, in the opinion of the Town Engineer, such contaminants have entered

the line during construction, the interior of the pipe shall be swabbed, as necessary, to remove the debris prior to proceeding with flushing.

318.4.5.3 MINIMUM FLUSHING FLOW AND VELOCITY - The Contractor shall make all arrangements, to establish a minimum 2.5 feet per second (fps) flow velocity in the line during the flush. Flushing shall proceed until the installed pipe is free of debris. The flows needed to produce the required flushing velocity indicated above are provided in the table below.

FLUSHING FLOW AND VELOCITY

Pipe Diameter (inches)	Flow (gpm) to Produce 2.5 fps
4	100
6	200
8	400
10	600
12	900
16	1600

NOTE: With 40 psi residual pressure, 2 1/2 inch and 4-1/2 inch hydrant outlet nozzles will have the ability to discharge approximately 1,000 GPM and 2,500 GPM respectively.

In no case shall the flushing discharge line or any part appurtenant thereto, be less than 2-inches in diameter.

318.3.6 TESTING

The Contractor shall perform all testing, and shall furnish all materials, equipment, and labor necessary to complete this work as required. Any work that fails to meet the minimum requirements of ANSI/AWWA C600-93 for hydrostatic testing shall be repaired and/or replaced. All repaired work shall be re-tested. This sequence shall be repeated until the work meets the acceptance criteria.

Contractor shall notify the Town 24 hours in advance of testing procedures. Contractor shall ensure that Town water department personnel are present prior to testing such that they may operate Town valves and witness filling and flushing operations. In no case shall the Contractor operate Town water valves.

318.3.6.1 PRESSURE TESTING - All pipelines constructed for carrying potable, non-potable, and water-borne products shall be pressure tested for pressure containment and leakage when they are completely assembled, unless directed otherwise in writing by the Town.

WARNING - The hydrostatic test procedures described herein are not applicable to air pressure testing.

Prior to pressurization all required flushing shall have been completed. Pipeline sections to be tested shall be isolated from any connecting lines. Air release taps shall be provided at points of highest elevation, the test section shall be filled with clean potable water, and all air shall be removed from the line. Pressure on the test section shall then be brought to full test pressure and maintained at that level for a period of not less than four (4) hours. Pipelines shall be tested at 50 psi over normal static pressures or to the manufacturer's class rating, which ever is lower. Test pressure shall not exceed pipe, thrust-restraint, or valve design pressures and shall not vary by more than ±5 psig for the duration of the test. Permanent plugs shall be inserted into the air release tap holes after the test has been completed.

318.3.6.2 LEAKAGE TESTING - The leakage test shall be conducted concurrent with the pressure test. Amount of leakage, if any, will be determined by measuring the quantity of additional water required to maintain the prescribed hydrostatic pressure test during the test period. Accurate means shall be provided to measure the quantity of water required to maintain full pressure on the line for the 4 hour test period, the measured leak rate shall not exceed the rate "L" computed as follows:

$$L = SD(P^{0.5})/133{,}200$$

where:
L = Leakage rate (gal/hour)
S = Length of tested pipe (feet)
D = Nominal diameter of pipe (inches)
P = Average test pressure (psi)

When the allowed amount of leakage is exceeded, leaks shall be located and repaired and the system shall then be re-tested by the Contractor until compliance is achieved.

All visible leaks in exposed pipe shall be repaired.

318.3.6.3 OPERATIONAL TESTING (*pressurized irrigation only*) - Pressurized irrigation systems shall be tested for proper system operation after backfill is in place and sprinkler heads have been adjusted to final position. This test shall demonstrate that the system meets coverage requirements (based on operation of one circuit at a time) and that all automatic controls function properly.

318.3.6.4 NON-RIGID PIPE DEFLECTION TESTING - At the Town's request, the Contractor shall test requested portions of all non-rigid pipe after being installed and backfilled to ensure that circumferential deflection does not exceed 5% of the diameter. Such test will consist of passing a mandrel through an open section of pipe, sized appropriately to detect non-compliance. The mandrel shall be sized in accordance with the requirements provided in Section 319 for checking sewer pipe. In the event deflection non-compliance is found, the Contractor shall make repairs as outlined in Section 319 and additional testing of other sections of pipe will be requested.

318.3.6.5 TESTING DOCUMENTATION - The Contractor shall maintain a record of all testing performed, together with the test results obtained, for each line installed under this Contract. Minimum information to be included in these records shall be as follows:

- All Documents:
  - Date of issuance of the record
  - Name of Contract
  - Contractor's name and address

- Disinfection Report:
  - Name and address of treatment supervisor
  - Disinfection method used
  - Location and boundary description of section to be disinfected
  - Time and date of disinfectant introduction
  - Time and date of disinfectant release
  - Initial disinfectant residual (PPM) for each outlet tested
  - Time and date of flushing after disinfection
  - Signature of treatment supervisor (signifies completion of disinfection activities)

- Bacteriological Report:
  - Date issued
  - Project name and location

- Laboratory's name, certification number, address and phone number
- Test location
- Time and date of sample collection
- Name of person collecting sample
- Time and date of laboratory test start
- Coliform bacteria test results for each sample
- Certification that water conforms (or fails to conform) to bacterial standards of the appropriate state public drinking water regulations
- Bacteriologist's signature

- Test Report:
  - Type of test
  - Location of test
  - Sizes, types, and lengths of pipe in test section, and test boundary description
  - Date and Time test started
  - Date and Time test completed
  - Test pressure (*Pressure Test only*)
  - Amount of leakage/allowable leakage (*Pressure Test only*)
  - Mandrel dimensions(*Obstruction and Non-Rigid Pipe Deflection Tests only*)
  - Test result (*pass/fail*) (*All Tests*)
  - Printed Name/Signature and Date of Test Supervisor (Contractor's representative) (*All Tests*)
  - Printed Name/Signature of Inspector (Town's representative) witnessing and approving the test (*All Tests*)

318.3.7 DISINFECTION

Contractor shall notify the Town 24 hours in advance of water line disinfection. Contractor shall ensure that Town water department personnel are present prior to disinfection procedures such that the Town may operate Town valves and witness filling and flushing operations. In no case shall the Contractor operate Town water valves.

318.3.7.1 REGULATORY COMPLIANCE - All pipelines to be used for culinary water service shall be disinfected in accordance with the requirements of state and local public drinking water regulations. The required chlorine residual after the 24 hour period shall be 24 mg/L

318.3.7.2 METHODS - The Contractor may use any method which complies with the above referenced standards; however, the "slug method", prescribed in ANSI/AWWA C-651, is preferred. This method basically consists of filling the line with potable water and then injecting a "slug" of concentrated chlorine solution (100 mg/L) at the upstream end of the line. The "slug" is then moved through the line by slowly draining the low end. When properly conducted, this procedure provides contact to the interior pipe surfaces with a heavily concentrated dose of chlorine to achieve disinfection.

318.3.7.3 FLUSHING - After disinfection, the lines shall be flushed until residual chlorine is reduced to the levels safe for consumption. Samples for bacteriological testing can then be taken. The Contractor shall safely and legally dispose of contaminated water used for disinfection after consultation with the local authorities. Under no circumstances shall heavily chlorinated water be allowed to mix with "live" waters, meaning waters in lakes, rivers, streams or wetlands.

318.3.8 PIPELINE LOCATION IDENTIFIERS

The Contractor shall furnish and install such identifiers as prescribed in these Specifications.

318.3.8.1 TRACER WIRE – Tracer wire shall always be installed in the trench with all pipelines, during or immediately following their installation. Tracer wire placement shall be as shown on the approved Development Drawings. Tracer wire shall be brought to the surface of the ground at all valves and risers and where otherwise required on the Standard Drawings.

Where splices in the wire are required, the Contractor shall solder the wire connections. Tee splices shall be made with a minimum of 4 turns wrapped tightly around the bared portion of the main tracer. Do not cut main tracer wire. Line splices shall be made by crossing the two bare sections of wire with a minimum of 4 turns in opposite directions as shown in splice detail. Solder and finish connection using a No. 1 welding tip with a soft non-carbonizing flame or a propane torch, using rosin flux and 60/40 rosin core solder. Do not use acid core solder under any circumstances. Use only enough heat to insure a smooth solder joint. Heat should be applied to the wire, not to the solder. Heat the connection for a few seconds and touch the end of the solder to the joint; when the proper temperature is achieved, the solder will melt and flow freely around the connection. Allow the wire to cool and do not move while cooling. Insulate by applying several turns of 3M-88 or approved equal electrical tape around the soldered joint. Extend the tape well over the wire insulation in all directions.

Some soil conditions and/or installation circumstances may require the additional installation of cathodic protection for the tracer wire.

318.3.8.2 SERRATED SILICON BRONZE WEDGES – Serrated silicon bronze wedges shall installed at two (2) per joint, for 3" through 12" diameter ductile iron pipe, and four (4) for larger ductile iron pipe. The wedge shall be driven into the opening between the plain end and bell until snug. When four wedges are used, they shall be inserted side-by-side, in pairs.

318.3.8.3 WARNING TAPE – A continuous ribbon of warning tape shall be installed during the backfill operation. Tape shall be placed 12-inches above the top of the pipeline. At roll ends and at places where the tape has been broken, the loose ends shall be tied together to prevent separation during the rest of backfill.

318.3.8.4 MARKING POSTS – Marking posts shall be installed at the placement intervals shown on the approved Development Drawings and where requested by the Town. Posts shall not be deformed or damaged during installation. The Contractor shall use a posthole digger to install markers when there is danger of damage to posts from pounding or hammering

319.1 DESCRIPTION

This section covers the valves and fire hydrants in water transmission and distribution lines, together with fittings, thrust blocking, and boxes and enclosures related to the operating equipment.

319.1.1 RELATED WORK

Section 318 - Waterline Pipe Installation
Section 317 - Pipe and Piping Systems
Section 320 - Water System Control Valves

319.1.2 SUBMITTALS

Shall be submitted when requested by the Town.

319.1.2.1 VALVES 12 INCHES AND SMALLER, AND HYDRANTS - For valve sizes 12-inches and smaller, and fire hydrants, the Contractor shall furnish the manufacturer's standard data and catalogues for review and approval.

319.1.2.2 VALVES LARGER THAN 12 INCHES - For all valves sized larger than 12-inches, the Contractor shall furnish shop drawings and technical data prepared by the manufacturer for Town review and approval.

319.1.2.3 CONTENT - Submittals shall include complete details, dimensions, weights, diameter of stems, alloy for all valve parts and any information that may be required to assemble, install, operate and maintain the valve.

319.1.2.4 BUTTERFLY VALVES - Certification of performance together with leakage and hydrostatic tests as described in Section 13 of ASTM/AWWA C-504 shall be furnished to the Town upon the Town's request.

319.1.2.5 BALL VALVES - Certification of performance together with leakage and hydrostatic tests as described in Section 5 of ASTM/AWWA C-507, shall be furnished to the Town upon the Town's request.

319.2 MATERIALS

319.2.1 GATE VALVES

319.2.1.1 COMPLIANCE - All gate valves shall conform to AWWA C-500 or C-509 with the following characteristics:

319.2.1.2 3-INCH AND SMALLER VALVES - Valves 3-inches and smaller shall be as follows:

- Valves shall be as manufactured by Ford, Hayes, Mueller, Red & White, or an approved equal.
- Valves shall be standard, double-disc, non-rising stem valves with wheel handles.
- Valve bodies shall be all bronze or brass.
- Valves shall be threaded, unless otherwise approved by the Town.

319.2.1.3 GATE VALVES 4-INCH THROUGH 12-INCH - Gate valves 4-inches through 12-inches in size shall be as follows:

- Valves shall have a ductile iron body.
- Valves shall have a solid cast iron, rubber coated, wedge gate and a resilient seat.
- Gate shall be designed to work equally well with pressure on either side of it.
- Valves shall be of the non-rising stem type and shall be left hand opening (counter-clockwise) with a 2-inch square operating nut.
- All interior ferrous surfaces exposed to fluid flow shall have an NSF approved, fusion bonded, epoxy coating. Epoxy coatings shall be factory applied by an electrostatic or thermosetting process.

319.2.1.4 VALVES 16-INCHES AND LARGER – Gate valves larger than 12-inch shall not be used; valve applications which require a valve larger than 12-inch shall be worm-driven butterfly valves.

319.2.1.5 VALVES ON WATER MAINS - Valves on water mains shall have the following features:

- In-line valves shall have push-on or mechanical joints conforming to AWWA C-111.
- Valves attached to fittings shall be flanged.
- By-pass valves shall be flanged.
- Valves in blow-off lines shall be flanged.
- Valves in fire hydrant lines shall have mechanical joints with mega-lug restraints.
- Valves in air release and vacuum relief lines shall be flanged or threaded.
- Valves 12-inches and smaller shall be equipped with O-ring packing.

319.2.2 BUTTERFLY VALVES

319.2.2.1 MANUFACTURER - Butterfly valves shall be Dresser Industries "450", Allis-Chalmers "Streamseal", Henry Pratt "Groundhog", Mueller Lineseal III, or an approved equal.

319.2.2.2 COMPLIANCE - Butterfly valves shall conform to AWWA C-504.

319.2.2.3 CLASS - Valves shall be Class 150 seated, tight closing valves, furnished with mechanical or flanged joints

319.2.2.4 SEATS - Rubber valve seats shall be replaceable without disassembling the valve and shall not be interrupted by the shafting. Rubber seats may be retained on the disc edge by stainless steel clamping in lieu of bonding to the valve body.

319.2.2.5 SHAFT PACKING - Shaft packing shall be of the self-adjusting permanent type.

319.2.2.6 OPERATION - Underground opening and closing shall be accomplished with permanently lubricated screw-type operators, totally enclosed and of watertight construction. Overload protection shall be incorporated into the operator allowing the application of 450 foot-pounds input torque at full-open and full-closed positions without damage to the operator or valve. A 2-inch square wrench nut and valve box shall be provided for operating the valve. Valves shall open counter clockwise unless indicated otherwise in the Special Provisions.

319.2.3 BALL VALVES

319.2.3.1 MANUFACTURER - Valves shall be produced by a manufacturer having at least five years experience in the manufacture of water works and valves.

319.2.3.2 VALVES 4-INCHES AND LARGER - Ball valves, 4-inches and larger, shall be ductile iron or cast-steel body, double seated valves meeting the requirements of ANSI/AWWA C-507.

319.2.3.3 SMALLER VALVES - Smaller valves shall be stainless steel, bronze, or iron bodied valves of the size, type and class as required by the application.

319.2.4 CHECK VALVES

319.2.4.1 COMPLIANCE - Check valves shall be manufactured in accordance with ANSI/AWWA C-508.

319.2.4.2 DESIGN - Check valves shall be of a clear waterway, swing-check type. They shall be designed to be mounted horizontally. They shall be fitted with flanged ends for easy servicing. They shall have an iron body and be bronze mounted.

319.2.4.3 SEATING - Valves shall be provided with a metal to resilient material seating.

319.2.5 HOSE BIBS

Hose bibs shall be 3/4-inch bronze or brass body, Watts Model SC-1, Red & White Model RW 301 or approved equal. All hose bibs shall have a tee handle.

319.2.6 SAMPLE FAUCET

Sample faucet shall be a ½-inch chromed or brass body hose bib without hose connection threads.

319.2.7 FIRE HYDRANTS

319.2.7.1 COMPLIANCE - Fire hydrants shall be “Mueller-Centurion”, and shall conform to AWWA C-502 and modifications herein specified.

319.2.7.2 DESIGN - Hydrants shall be designed as follows:

- Hydrants shall be of the "compression" or "toggle joint" type with safety flange and safety stem coupling above the ground line so that they can be repaired without shutting off the water.
- Hydrants shall be of the dry top design with two or more "O" rings sealing the water from the operating mechanism.
- Hydrants shall be furnished with 5-inch minimum valve openings, one 4 1/2-inch NST pumper connection and two 2 1/2-inch hose connections.
- Hose nozzle threads, pump nozzle threads, operating nut and opening direction shall match existing hydrants in the system.
- Hydrants shall be designed for 6-feet of cover, unless otherwise approved by the Town.

319.2.7.3 PAINTING - The portion of the hydrant above the ground line shall be painted “fire engine” red.

319.2.8 OPERATING WRENCHES

The Contractor shall furnish two (2), T-handle, operating wrenches for each project incorporating valves with 2-inch, square-head, operating nuts.

319.2.9 VALVE BOXES

Valve boxes shall be cast iron, two piece, and adjustable valve boxes. Valve boxes shall be of the slip joint screw type and be of sufficient length for the pipe burial depth required. The cast iron cover of the valve box shall have the word "water" stamped thereon.

319.2.10 CONCRETE ENCLOSURES

Concrete enclosures for valves shall be precast and of the type, size and configuration required for the application and shall be fabricated in accordance with the requirements for precast concrete construction.

319.3 CONSTRUCTION REQUIREMENTS

319.3.1 SETTING VALVES AND VALVE BOXES

All valves shall be set and jointed to the pipe in the manner described for pipe laying and jointing in Section 318 of these Specifications. Valves shall be oriented with the operating nut vertical. Valve boxes shall be centered and plumb over the operating nut and shall be set so that no shock or stress will be transmitted to the valve. Tops of the valve boxes shall be set flush with the ground surface or concrete collars as appropriate. Concrete collars shall be recessed ¼-inch below the finished street surfacing, unless otherwise directed by the Town.

319.3.2 VALVE RESTRAINT - Restraint shall be installed on all valves connected with slip-on, gasketed, or O-ring joints (i.e., bell & spigot, mechanical, etc.) in accordance with these Specifications.

319.3.3 CONNECTING TO EXISTING MAINS

319.3.3.1 CONNECTION TO EXISTING WORK - All connections to existing water mains shall be made by the Contractor, unless otherwise provided in these Specifications. The Contractor shall provide labor and materials, including special fittings and restraint devices, required to make the required connections between existing lines and new lines.

319.3.3.2 INTERRUPTION OF SERVICES - Where the connection of new work to old requires interruption of service, the Town and Contractor shall mutually agree upon a date for such connection which will allow ample time to assemble labor and materials and to notify all potentially affected customers.

319.3.4 FIRE HYDRANT INSTALLATION - In no case shall a fire hydrant be placed within 10 feet of an existing or proposed water service line or meter. Contractor shall coordinate locations with local and regional electrical power providers when locating hydrants such that no hydrant is placed or located under or near electrical transmission lines or power line easements.

319.3.4.1 SETTING - All hydrants shall stand plumb use hand level with the pumper nozzle facing the street. The hydrant shall be set with the ground line at the location indicated by the hydrant manufacturer.

319.3.4.2 DRAINAGE - Drainage shall be provided at the base of the hydrant by placing clean gravel under and around the base of the hydrant as shown on the Standard Drawings.

319.3.4.3 RESTRAINT - All hydrants shall be restrained by setting thrust blocks or mechanical restraint assemblies in accordance with the Standard Drawings.

319.3.4.4 AUXILIARY GATE VALVES - All fire hydrant assemblies shall include auxiliary gate valves positioned as shown on the Standard Drawings.

319.3.5 THRUST BLOCKS

Thrust blocks shall be formed to prevent coverage of the pipe joints (and appurtenant hardware) in accordance with the details shown on the Standard Drawings. All thrust blocks shall be set against undisturbed earth.

320.1 DESCRIPTION

This section covers the water system control valves, including: pressure release, pressure sustaining, pressure reducing, water level control, air relief, vacuum relief, deep well pump control, back flow prevention and surge control with their enclosures and miscellaneous support equipment.

320.1.1 RELATED WORK

Section 314 - Portland Cement Concrete
Section 315 - Concrete Forming, Finishing and Curing
Section 316 - Concrete Reinforcement
Section 317 - Pipe and Piping Systems
Section 318 - Waterline Pipe Installation
Section 319 - Waterline Valves and Hydrants

320.1.2 SUBMITTALS

Shall be submitted to the Town upon request.

320.1.2.1 CERTIFICATION OF COMPLIANCE - Certification of compliance to the standards and Specifications contained herein shall be obtained from the manufacturer and provided by the Contractor at the time of delivery of these materials to the project site.

320.1.2.2 DESCRIPTIVE LITERATURE - Descriptive literature which identifies the manufacturer, model numbers, materials of which the control valves are fabricated, and their capacities shall be provided by the Contractor to the Town.

320.1.2.3 OPERATION AND MAINTENANCE INSTRUCTIONS - Manufacturer's installation, operation and maintenance literature for each control valve shall be furnished to the Town prior to the time of final acceptance for payment.

320.1.3 DEFINITIONS

320.2 MATERIALS

320.2.1 GENERAL

All control valves furnished and installed shall be of the model, size, and type shown on the approved Development Drawings or as required in these Specifications. They shall have been produced by the same manufacturer and shall be provided by a supplier located in the state in which the installation is to be made. They shall be furnished with a manufacturer applied, NSF approved, fusion bonded, epoxy coating. Seats shall be designed so that they are easily maintained and without edges that induce cutting or wear at low flows. Unless otherwise required to meet specific service conditions, all cast iron or steel valves shall be 150 lb. Class.

320.2.2 ALTITUDE CONTROL VALVES

Altitude control valves shall be as manufactured by CLA-VAL Company, or approved equal. Valves shall be of ductile iron flanged, spring loaded, 3-way, diaphragm actuated, globe pattern valves. Valve control shall be provided by a pressure difference sensor (and when called for, fitted with a direct acting solenoid control) with appropriately sized piping and supports. Valves shall have a valve position indicator, cocks to isolate the pilot system and closing speed control. Four-inch and smaller valves shall be fitted with flow clean strainer while larger valves shall be provided with a "Y"-pattern strainer in the pilot control system.

320.2.3 PRESSURE RELIEF/PRESSURE SUSTAINING VALVES

Shall be ductile iron, modulating, hydraulic operated, pilot controlled, flanged valves with globe pattern. All pressure sustaining valves shall be designed to maintain constant upstream pressure at the set point indicated on the approved Development Drawings. Pressure sustaining valves shall be provided with a position indicator operated by a pressure difference sensor and shall have appropriately sized piping and supports. The pilot system shall be capable of being isolated with shut-off cocks, be fitted with a strainer, and shall be able to control closure to prevent surges.

320.2.4 COMBINATION BACK PRESSURE/SOLENOID SHUTOFF VALVE

Shall be ductile iron, flanged, globe pattern, modulating hydraulic operated, pilot controlled, with solenoid activated shut-off. The valve shall open sufficiently to maintain a pre-set inlet (back) pressure. When the inlet pressure is less than the control setting, the pilot system shall close the valve tight. The pilot system shall be capable of being isolated with shut-off cocks, be fitted with a strainer and shall be able to control closure to prevent surges.

320.2.5 PRESSURE REDUCING VALVES

Shall be modulating pressure reducing with globe pattern. Valves shall be provided with pilot control which operates such that positive and gradual closure can occur to prevent any surge or line shock. Pressure reducing valves shall be equipped with a valve position indicator, cocks to isolate the pilot system, speed for control of closure and a strainer on the pilot system inlet.

320.2.6 BACK-FLOW PREVENTION VALVES

Shall be an assembly of double independently acting, spring-loaded toggle lever check valves with two shut-off valves which meet the requirements of ANSI/AWWA C-510. Valve body and cover shall be of bronze. Valves shall be fitted with stainless steel springs and with molded synthetic rubber clapper, poppet and facing rings, and indicators to show if the valve is open or closed.

320.2.7 AIR/VACUUM RELIEF VALVES

Shall be simple lever type, kinetic combination air valves, with cast iron body and stainless steel floats. Vents for air/vacuum relief valves shall be threaded GI pipe and shall be protected with fittings covered with No. 14 stainless steel, bronze or aluminum screen.

320.2.8 DEEP WELL SOLENOID PUMP CONTROL VALVE

Shall be globe pattern, hydraulically operated diaphragm valve controlled by a solenoid pilot valve. The pilot system shall have separate adjustable flow control valves, a "Y" strainer, and shall be fitted with cocks to enable isolation during servicing. The valve stem shall have a limit switch to serve as an electrical interlock between the valve and pump motor.

320.2.9 ENCLOSURES

Enclosures for control valves shall be concrete, furnished and installed in accordance with these Specifications.

320.2.10 MISCELLANEOUS PIPE, FITTINGS, VALVES AND EQUIPMENT

Miscellaneous pipe, fittings, valves and equipment needed to assemble and support operation of the control valves shall be in conformance with Sections 317, 318, and 319 of these Specifications.

320.3 CONSTRUCTION REQUIREMENTS

Prior to installing control valves, the Contractor shall flush, blowout, or otherwise clean all dirt and debris from connecting lines. Control valves shall be installed with appropriate supporting piping and equipment in accordance with manufacturer's recommendations. Control valves shall be fitted with flanged connections or installed in a manner which will allow easy removal in the enclosure or area wherein the valves are installed.

The Contractor shall notify the Town 24-hours in advance as soon as control valves are ready to be pressurized (placed in service), and shall check and adjust, if necessary, all valve assemblies to assure they are adjusted correctly and functioning as designed for their intended use. All adjustments shall be made in the presence of Town personnel.

321.1 DESCRIPTION

This section covers the materials which include excavation, water main tapping, stops, valves, service lines, meters, settings, boxes and other accessories required for installing water services to system users.

321.1.1 RELATED WORK

Section 305 - Trench Excavation and Backfill
Section 317 - Pipe and Piping Systems
Section 318 - Waterline Pipe Installation

321.1.2 SUBMITTALS

Required when request by the Town.

321.1.2.1 DESCRIPTIVE LITERATURE - Descriptive literature which identifies the manufacturer, model, size, material and parts lists from which the piping, fittings, valves and meters are manufactured, including installation instructions, shall be provided to the Town.

321.1.2.2 CERTIFICATION OF COMPLIANCE - Written certification of compliance from the respective manufacturer shall be provided with each delivery of metal fittings, valves and meters.

321.1.3 DEFINITIONS

Mains - Water distribution pipes, located in streets or rights-of-ways, to which water service connections are made for users of the system.

Tap - The actual connection made to water mains which includes drilling an opening into the main, threading, installing a tapping saddle when appropriate, and inserting (screwing) a valve into the opening.

Saddle - A fitting placed on a pipe to reinforce the pipe wall through which the tapping hole is drilled.

Key - Can mean either: the center piece of a corporation or curb valve which is turned to control flow through the valve; or, the "T-shaped" tool used by operators to reach and turn the key or closing piece of a valve.

Setter (also referred to as "yoke") - Is the prefabricated assembly of pipes and valves installed in a meter box and connected into the service line in which the water meter is mounted (or "set").

321.2 MATERIALS

321.2.1 SADDLES

Saddles shall be copper alloy body with copper alloy or stainless steel straps designed and sized specifically for tapping PVC water mains. Threading shall be tapered and the saddle shall conform to ANSI/AWWA C-800. Straps shall provide full support around the circumference of the pipe and have a bearing area of sufficient width along the pipe axis so that the pipe will not be distorted when tightened.

321.2.2 CORPORATION STOPS

Corporation stops shall be copper alloy body ball-type with tapered threads and in conformance with the requirements of ANSI/AWWA C-800. The corporation stop shall be Ford FB1001-4-G with CC threads or approved equal.

321.2.3 CURB VALVES

Curb valves shall be copper alloy body ball-type valves; or balanced pressure, o-ring sealed, plug type valves. Curb valves shall be furnished with cast iron curb boxes and one piece lids fitted with copper alloy pentagon plug. The curb box shall be sized to properly fit the valve and adjust to the depth to which the valve is set. The valve shall be Ford with grip joint or approved equal.

321.2.4 SERVICE LATERAL PIPE

Service lateral pipe shall be in accordance with the following:

321.2.4.1 COPPER SERVICE PIPE – No copper services shall be used.

321.2.4.2 POLYETHYLENE PIPE - Polyethylene service pipe shall conform to the requirements of AWWA C-901, "Polyethylene (PE) Pressure Pipe and Tubing, 1-inch through 3-inch for water service." PE Pipe shall be pressure tubing conforming to Table 7 of said specification. Tubing shall be Class 160 with a DR of 11.0 or Class 200 with a DR of 9. If not specified, DR 9 shall be used.

321.2.4.3 Ends of polyethylene tubing inserted in compression connections should be fitted with “grip-joint” type insert reinforcement.

321.2.5 METER SETTER (YOKE)

Meter setter shall be fit with copper tubing (when required) and copper alloy and copper alloy fittings. Setters shall be furnished with copper alloy body, angle or straight, ball-type inlet valves with fittings appropriately sized to fit the meter. When required, a cast iron yoke ban shall be furnished to provide the setting.

321.2.6 CHECK VALVE

A check valve shall be provided with each meter setting. Check valves shall be copper alloy bodied and shall meet the requirements of the State of Idaho’s Department of Environmental Quality and local health authority regulations, and conform to ASTM/AWWA C-510.

321.2.7 WATER METERS

Water meters shall be cold water displacement type meters which comply with ANSI/AWWA C-700. The main case and bottom plate shall be of bronze and the lens shall be hermetically sealed providing moisture free fog proof lens. The registers shall read in gallons and the register shall be equipped with an encoder type radio read system with radio. The sensor housing shall be recess mounted in the meter box cover to resist plows and prevent tripping hazards. The meters shall be Model SR II by SENSUS Technologies, PMM Multi-Jet Series by Precision Meters, or an approved equal.

321.2.8 METER BOX (PIT)

Meter boxes for small services shall be fabricated from rigid PVC or ABS plastic pipe. They shall have a minimum diameter of 18-inches, be sized to fit over the meter assembly while allowing reasonable interior access, and shall make an appropriate fit with the meter box ring and cover. Meter boxes shall extend to the full 6' bury depth of the service lines. Yokes shall be raisable with provisions to lock into place. Boxes shall be Ford Coil Pit or Approved Equal. Couplings used in the meter pit shall be Ford with grip type joints.

Meter boxes shall be located as shown on the plans with care taken to minimize potential conflicts with plows and wheeled traffic. The meter boxes shall be located within two to three feet of the right of way line at the point of the existing service line (to be located by the contractor). If the homeowner presents reasons for a location other than the location of the existing service line, the wishes of the home owner shall be met if possible. However, the location of the box must be within a few feet of the property line. In areas with sidewalks (other than Washington) the pit shall be installed on the customer side of the sidewalk where right of way (2'-3') exists on that side. If there is not room (2'-3') on the customer side, the box shall be placed on the public side and the connection made at the sidewalk.

Meter boxes at larger buildings and irrigated areas shall be sized to house the larger meter, check valves, and isolation valves. The plans illustrate minimum representative pits for 1-1/2" through 3" meters.

321.2.9 METER BOX RING AND COVER

The meter box ring and cover shall be cast iron with a minimum diameter of 18-inches but shall be appropriately sized to fit larger meter boxes where required. The words "WATER METER" shall be cast into the cover. The cover shall be a locking type with a pentagonal head, corrosion resistant, screw down, locking device. The cover shall provide a suitable recessed mounting surface for the radio read antenna or the touch read pad. The ring and cover shall be installed 1/4" below finished concrete surfaces and 1" below gravel or grassy surfaces.

Larger meter settings with fixed rigid piping holding the meter shall have a minimum 24" diameter cover.

321.2.10 METER BOX DRAINAGE

Meter box drainage shall be provided by placing 1/2-cubic yards of drain gravel at the base of new meter box drain.

321.3 CONSTRUCTION REQUIREMENTS

321.3.1 TRENCHING AND BACKFILL

Trenching and backfill for installation of service connections shall be completed in accordance with Section 305. Service lines shall have a minimum of 6-feet of cover.

321.3.2 INSTALLATION OF CONNECTIONS

Installation of water service connection components shall be as shown on the Standard Drawing. All components including corporation stop, service line, curb valve, meter setter (yoke), meter box (pit), and meter box ring and cover shall be installed concurrently.

Water meters shall not be installed prior to obtaining a Certificate of Occupancy from the Town.

All connections shall be made by using a saddle rather than a direct tap. Service lines shall be slightly snaked in the trench near the connection to the water main to allow for some movement and to avoid a rigid connection.

321.3.3 REPLACEMENT OF EXISTING FACILITIES

When replacement of specified components of service connections is required, the Contractor shall:

- protect existing equipment;
- provide appropriate connecting fittings to accommodate the new component;
- use care in removal and salvaging of the existing component; and,
- deliver the existing components to the Town's maintenance shop.

WATER MAIN FLOW METERS — SECTION 322

322.1 DESCRIPTION

Includes furnishing and installing tubular flanged water flow meter(s) for services larger than 1-inch in diameter and mainlines.

322.1.1 RELATED WORK

Section 318 – Water Pipe Installation

322.1.2 SUBMITTALS

Submittals are required for all water main flow meters and shall be submitted to the Town.

322.2 MATERIALS

322.2.1 PERFORMANCE CAPABILITY

Flow meters shall be able to accurately operate in working pressures up to 150 PSI, at temperatures up to 140 degrees F. and for flows 40 GPM and greater. Meter sizes and measuring capacity shall be appropriate for the application. The meter's flow indicator shall be mechanically driven with a 3.5-inch (minimum) dial that provides a flow reading and totalizer reading up to six digits in GPM and total gallons. Meters installed in systems or at locations which are controlled by an electronic telemetry system shall be furnished with flow transmitters which can be connected into that system to indicate flow conditions.

322.2.2 FABRICATION

Flow meters shall be manufactured to meet the requirements of ANSI/AWWA C-704 with a steel meter tube fitted with straightening vanes, all of which is coated with a fusion epoxy resin. Interior components of the meter shall be fabricated from stainless steel, plastic or other corrosion resistant materials which will provide long service. The propeller shall be magnetically connected to the drive mechanism and mounted with bearings which provide smooth operation for flows in both directions. The gearbox shall be cast bronze and the meter head shall be fabricated from cast iron or epoxy coated steel.

322.3 CONSTRUCTION REQUIREMENTS

Flow meters shall be installed in accordance with the manufacturer's recommendations and be consistent with the approved Development Drawings. The Contractor shall provide all materials and installation labor to assure proper installation and calibration of the meter(s) required.

323.1 DESCRIPTION

This section covers pressure gauges and their support piping and fittings in buildings and other structures.

323.1.1 RELATED WORK

Section 318 – Waterline Pipe Installation
Section 317 – Pipe and Piping Systems

323.1.2 SUBMITTALS

Submittals are required for all pressure gauges and shall be submitted to the City.

323.2 MATERIALS

323.2.1 PRESSURE GAUGES

Shall be US Gauge, Model 550L, stem mounted and oil filled, as manufactured by AMETEK or an approved equal. Gauges have a 2 1/2-inch (minimum) stainless steel case with a pressure relief plug. The window shall be polycarbonate plastic with neoprene sealing gasket. The pressure reading range shall be as required for the application.

323.2.2 SUPPORTING PIPE AND FITTINGS

Shall be 1/4-inch threaded Schedule 40 brass pipe.

323.3 CONSTRUCTION REQUIREMENTS

Pressure gauges shall be installed in accordance with the manufacturer's recommendations and at the locations shown on the approved Development Drawings. The Contractor shall provide sufficient supporting pipe to mount pressure gauges vertically and oriented to be read easily. When possible, pressure gauges should be installed at least three pipe diameters downstream from any valve in the pipeline.

324.1 DESCRIPTION

This section covers the pipe, fittings and manholes and their appurtenances for sanitary and storm sewers and subsurface drainage systems.

324.1.1 RELATED WORK

Section 304 - Earthwork Materials
Section 305 - Trench Excavation and Backfill
Section 317 - Pipe and Piping Systems

324.1.2 DEFINITIONS

Culvert - A section of pipe installed transversely under a road, highway, railroad, or canal for the purpose of conveying water flow.

Fitting - Any component of a pipeline, excluding the pipe itself, which is used for connecting pipe sections or connecting to valves, tanks, structures, etc.

Flowline - A line formed by the inverts of a pipeline.

Infiltration - Any uncontrolled seepage of groundwater into a sewer line or system.

Inflow - Any water entering a sewer.

Invert - The bottom or lowest point of the internal surface of a cross-section of a pipeline.

Lateral - Any line which connects to, and extends from, a sewer main line. A Service Lateral is any line which connects to a sewer service stub at the property line and extends on private property to the sewer plumbing at the foundation of a house or business.

Permeability - The property of a material which describes the rate of movement of any fluid through the pores of the material.

Resilient Connector - A flexible (rubber, plastic, etc.) connection fitting manufactured specifically for joining one pipe to another or to a structure, and capable of being deflected or deformed without leakage.

Run - Any identified section of a pipeline.

Service Stub - The line which connects to a sewer main line at the service tap and extends from there to the property line.

Service Taps - Connections to sewer main collection lines from individual services.

Springline - The points of maximum horizontal distance on the inside surface of a circular pipe or in rectangular pipe; the mid height of the internal vertical walls.

324.1.3 SUBMITTALS

Submittals are required when requested by the Town.

324.2 MATERIALS

324.2.1 PIPE

See Section 317 for pipe materials specifications.

324.2.2 MANHOLES AND ENCLOSURES

324.2.2.1 MANHOLES - Manholes consist of the base, riser, cone, grade rings, rings and covers. Manholes shall be constructed of pre-cast, reinforced concrete and shall conform to the Standard Drawings, to these Specifications, and to ASTM Standard C478. Unless shown otherwise approved by the Town, the wall thickness of 48-inch and 60-inch manholes shall be minimum 5-inches and 6-inches respectively. Cone sections shall be eccentric and be designed to meet AASHTO HS-20 loading requirements. Pipe connections and/or knockouts shall be sized and located according to the approved Development Drawings. Grade rings shall have 4-inches minimum vertical thickness unless otherwise requested by the Town.

324.2.2.2 JOINTS - All manhole components shall be joined with tongue and groove joints and joints shall be sealed so that they are watertight. Sealant materials shall be flexible butyl resin sealant which conforms to AASHTO M-198B, or a rubber gasket may be used if it is specifically designed for installation in concrete manholes and conforms to ASTM C-361.

324.2.2.3 RINGS AND COVERS - Manhole rings and covers shall be cast iron, be H-20 loading rated, be manufactured to fit the concrete openings of the manhole and shall meet the requirements of ASTM A48, Class 30B. The clear opening of the ring shall be 24-inches minimum. Vented covers, without dustpans, shall be provided for all manholes located where drainage or flooding will not occur. Watertight covers shall be provided wherever the manhole may be flooded with street runoff or floodwater. Combined weight of the ring and cover shall be not less than 360-pounds. All covers shall have cast into the upper surface the word "SEWER" and other lettering and insignias as may be shown on the plans.

324.2.2.4 STEPS - Plastic or fiberglass steps reinforced with steel, which conform to ASTM C487 or ASTM C478 standards, shall be installed in all sections of each manhole at 1-foot intervals as shown on the Standard drawings.

324.2.2.5 CONNECTIONS - All connections to the manhole with piping shall be made with flexible positive seal, watertight gaskets or boots manufactured by Forsheda NPC, Inc., or an approved equal which meets the requirements of ASTM C923.

324.2.3 PIPELINE LOCATION IDENTIFIERS

Pipeline location identifiers generally take the form of marker posts, warning tape, and tracer wire. The Contractor shall furnish and install such identifiers where shown on the approved Development Drawings and as prescribed in these Specifications.

324.3 CONSTRUCTION REQUIREMENTS

All pipelines shall be installed in a road right-of-way or trail easement. The surface over the sewer line must conform to the minimum gravel road or trail standards as outlined in the Standard Drawings.

A CONFINED SPACE ENTRY PERMIT SHALL BE OBTAINED FROM THE TOWN PRIOR TO ENTERING ANY CONFINED SPACE (29 CFR 1910.146, *Permit-required Confined Spaces*). A confined space is defined as any location that has limited openings for entry and egress, is not intended for continuous employee occupancy, and is so enclosed that natural ventilation may not

reduce air contaminants to levels below the threshold limit value (TLV). Examples of confined spaces include: manholes, stacks, pipes, storage tanks, pits, sumps, hoppers, and bins.

324.3.1 HANDLING AND APPROVAL OR REJECTION OF MATERIALS

Care shall be taken during unloading and hauling to avoid impact which might damage the pipe. Pipe dropped during unloading shall not be installed unless approved by the Town and may be rejected by the Town. Pipe will be carefully inspected in the field before and after laying. If any cause for rejection is discovered in a pipe after it has been laid, it shall be removed and replaced by the Contractor at no additional cost to the Owner. Any pipe which is found to be unfit or is rejected due to cracks, broken bells or spigots, chipped exterior or lining, etc., shall be removed from the job site.

324.3.2 TRENCHING

Excavation and backfill of trenches for sewer piping and manholes shall be performed in accordance with Section 305 – "Trench Excavation and Backfill" of these Specifications.

All roadway crossings under asphalt roadway surfaces shall be bored by an approved method consistent with the area and soil conditions unless otherwise approved by special permit obtained from the Town.

324.3.3 PIPE INSTALLATION

324.3.3.1 DEWATERING - Prior to pipe laying and jointing, when water is present in the trench, sufficient de-watering effort shall be made to maintain the water level at or below the surface of the trench bottom or the base of the bedding course. The de-watering operation; however accomplished, shall be carried out in such a manner as not to permanently disturb natural groundwater conditions. The pipe and pipe washed rock bedding material shall be wrapped in a filter fabric and MEGALUG joint restraints shall be installed. Details for pipe installation in areas of high ground water shall be submitted and approved by the Town prior to approval of the project.

324.3.3.2 CONNECTION TO EXISTING WORK - When connections are to be made to any existing pipe, conduit, or other appurtenance for which the actual elevation or position cannot be determined without excavation, the Contractor shall excavate for, and expose the existing pipe conduit, etc., before laying any new pipe or conduit. The Contractor shall furnish and install the necessary couplings, fittings, etc., needed to accomplish the cutting in, or connections, whether or not specifically indicated or otherwise shown on the approved Development Drawings.

The Town and/or Town Engineer shall be allowed to inspect the existing pipe or conduit before any connection is made.

324.3.3.3 PIPE JOINING – Pipe joining shall be as follows:

- When making connections, pipe shall be cut in a neat and workmanlike manner and beveled so as to provide a smooth end at right angles to the axis of the pipe. Pipe and fittings shall be assembled so there will be no distortion or springing of the pipelines. Care must be taken to properly align the pipe before joints are forced home. During insertion of the spigot end, the pipe shall be partially supported by hand, sling or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since the most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

- Where fusion of polyethylene pipe joints is required, sections of pipe shall be joined in a continuous length on the job site above ground. Joining shall be by the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations.

Equipment used for butt fusion joining shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements, alignment, and fusion pressures.

- PVC pipe, 2 inches and smaller in diameter, shall be joined by solvent welding. No disturbance of joints, including from trench backfill operations, will be allowed until solvent welded joints are cured.

- PVC pipe, larger than 2 inches in diameter, shall be joined by means of gasketed joints.

- With bell and spigot joints, care should be taken to properly align the pipe before joints are forced home. Gaskets shall be lubricated in accordance with manufacturer's instructions. During insertion of the spigot end, the pipe shall be partially supported by hand, sling, or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since the most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

324.3.3.4 PIPE LAYING - All pipe shall be laid to conform to the prescribed line and grade shown on the plans, within specified limits, if any. No blocking of any kind shall be used to adjust the pipe to grade, except when used with concrete embedment. Unless otherwise approved by the Town Engineer, pipe shall be laid upgrade from the point of connection on the existing pipeline or from a designated starting point. The pipe shall be installed with the bell end forward or upgrade, unless approved otherwise.

The Contractor shall install gravity sewer pipelines at the proper slope by the use of a laser targeting system. Lasers shall be set at the proper slope in manholes and targets shall be affixed at the end of pipe sections being installed. As an alternative to targets, the laser beam may be set at the sewer invert, slope, and elevation. The inside bottom surface of the pipeline will be set directly next to the laser beam. Gravity sewer pipeline alignment shall be a straight line, both vertically and horizontally, between manholes. The vertical deviation from straight line shall not be greater than 1/4-inch.

All pipe laid shall be retained in position, by mechanical means if necessary, so as to maintain alignment and joint closure until sufficient pipe bedding and backfill have been installed to adequately hold the pipe in place.

0324.3.3.5 PIPE BEDDING - Bedding materials shall be placed so the bottom surface of the pipe will have full bearing for the entire barrel length. The pipe shall rest on not less than 1/4 of its outside perimeter. Bell holes shall be dug as required to assure uniform support along the barrel, but shall be no larger than necessary. After the pipe is laid, additional import bedding material shall be placed and compacted in 6-inch lifts to a level even with the spring line of the pipe. The portion of the trench from the spring line to 12 inches above the top of the pipe shall then be filled and compacted in the same way.

324.3.3.6 COVERING PIPE END - At the close of each workday, or whenever the work ceases for any reason, the end of the pipe shall be securely covered or plugged to the satisfaction of the Town and/or Town Engineer.

324.3.3.7 CONSTRUCTION NEAR CULINARY WATER LINES - Locate sewer lines at least 10 feet horizontally from any existing or proposed parallel culinary water line. When installation conditions prevent the 10-foot separation, the sewer and water lines may be laid closer, provided as a minimum:

- The elevation of the bottom of the water line is at least 18-inches above the top of the sewer pipe, and

- The water line is laid in a separate trench, or
- The waterline is laid on an undisturbed earth shelf on one side of the sewer line trench, or
- The waterline is laid in a sewer or drainline trench which has been backfilled and compacted to not less than 95% of maximum density determined by ASTM D-690.
- Where culinary water lines and sewer lines cross, either above or below the other, the lines shall be placed:
- So as to provide a minimum separation of 18-inches between the top of one line and the bottom of the other;
- So that the joints of each are equidistant on either side of the other line with as much separation as possible;
- So that, where a sewer line crosses over a water line, the sewer line is adequately supported to prevent it sagging or falling onto the water line and causing damage to it
- In such crossings, where the foregoing vertical and horizontal requirements are impossible to achieve:
- The sewer shall be designed and constructed of materials conforming to water main standards;
- Such construction shall extend for a minimum distance of ten feet on each side of the point of crossing;
- Mechanical joints shall be used.
- In lieu of constructing or reconstructing the non-potable water main either the non-potable water main or water main may be protected by a sleeving material acceptable to the IDEQ for a distance of ten (10) horizontal feet on both sides of the crossing.

324.3.4 PRESSURE PIPE RESTRAINT

324.3.4.1 THRUST BLOCKS - Thrust blocks and/or mechanical restraints shall be installed on pressure pipelines in accordance with these Specifications and as shown on the Standard Drawings before any hydrostatic testing is performed on the system. Pressure pipe shall be properly blocked at all fittings whenever:

- The pipeline makes a change in direction of 11 degrees or more,
- It changes size, or
- It terminates (see restraining details in Standard Drawings).

324.3.4.2 CONCRETE THRUST BLOCKS - Concrete thrust blocking shall be formed and placed, so that joints and fittings will be accessible. In addition, all pressure pipe 12" in diameter and larger shall have mechanical restraint furnished and installed at all joints within 60 feet each way from any bend, in addition to the thrust blocks shown in the approved Development Drawings and as required in the Standard Drawings.

324.3.4.3 VISUAL INSPECTION - The Contractor shall allow the Town and/or the Town Engineer to visually inspect every thrust block before it is buried.

324.3.5 MANHOLE INSTALLATION

324.3.5.1 BASES - Prior to setting the base for manholes, the bottom of the excavation shall be carefully graded to provide uniform bearing and support for the manhole. Where the manhole base is cast in place, all loose material shall be removed and excavation shall be made to assure placement is made on undisturbed soil. Where pre-cast bases for manholes are used, the trench shall be over-excavated at least 6-inches and filled with granular backfill as described herein and compacted and graded to provide uniform bearing and support for the manhole. Where manholes are installed on existing piping, the base may be formed by placing concrete around and under the existing pipe and then cutting away the top one-third of the pipe to form an open channel, after the concrete has been allowed to adequately cure (see invert channels below).

324.3.5.2 INVERT CHANNELS - Invert channels shall be formed from concrete to conform in shape and slope to that of the sewer line. The depth of the channel shall be at least three-quarters that of the diameter of the sewer pipe it serves. Adjacent floor area shall be sloped towards the invert channel to provide a minimum slope of one-inch per foot.

324.3.5.3 JOINTS AND CONNECTIONS - All joints between manhole components shall be made watertight with a permanently flexible sealant. Connections to manholes with new piping shall be made with a rubber boot or seal which will assure a flexible, watertight seal and which conforms to ASTM C923. The connector shall be of a size specifically designed for the pipe material and hole size placed in the wall of the manhole.

324.3.5.4 DROP MANHOLES - Drop sewer manholes shall be constructed in accordance with the details shown on the Standard Drawings, whenever a grade difference of more than 18-inches occurs in that manhole. For grade differences of less than 18-inches, the flowline of the manhole base shall be sloped to provide a smooth transition between incoming and outgoing sewer lines.

324.3.6 SEWER MAIN CLEANING

Prior to proceeding with testing, all sewer lines, manholes, and structures and connected piping shall be high pressure water-jet cleaned. All manhole-pipe penetrations are to be grouted prior to cleaning procedures. The Contractor shall be required to have all materials, equipment, and labor necessary to complete the cleaning of the sanitary sewer main and manholes on the jobsite prior to isolating the sewer manhole or line segment and beginning the cleaning process.

Before isolating a specific section of line for jetting, the Contractor shall be responsible for making the necessary arrangements and appropriate piping connections to safely discharge the water used for jetting, to avoid any property damage or contamination of bodies of natural surface or ground water.

The cleaning process shall remove all grease, sand, silts, solids, rags, debris, etc. from each sewer segment, including the manhole(s). Selection of cleaning equipment and the method for cleaning shall be based on the condition of the sanitary sewer mains at the time work commences and will be subject to Town approval. All cleaning equipment and devices shall be operated by experienced personnel. Satisfactory precautions shall be taken to protect the sanitary sewer mains and manholes from damage that might be inflicted by the improper use of the cleaning process or equipment. **Any damage done to a sewer by the Contractor shall be repaired and paid for by the Contractor and shall be completed to the satisfaction of the Town.** Cleaning shall also include the manhole wall washing by high pressure water jet.

Cleaning equipment that uses a high velocity water jet for moving debris shall be capable of producing a minimum volume of 65 gpm, with a pressure of 2,000 psi, for the sanitary sewer line and 3,500 psi for the (manhole) structure at the pump. Any variations to this pumping rate must be approved, in advance, by the Town. A working pressure gauge shall be used on the discharge of all high pressure water pumps. The Contractor shall use, in addition to conventional nozzles, a nozzle

which directs the cleaning force to the bottom of the pipe for sewers 18" and larger. The Contractor shall operate the equipment so that the pressurized nozzle continues to move at all times. The pressurized nozzle shall be turned off or reduced anytime the hose is on hold or delayed in order to prevent damage to the line.

In addition to the requirements herein, the Contractor shall maintain the cleanliness of the work and surrounding premises within the work limits so as to comply with Federal, State, and local environmental and anti-pollution laws, ordinances, codes, and regulations when cleaning and disposing of waste materials, debris, and rubbish. The contractor shall also keep the work and surrounding premises within work limits free of accumulations of dirt, dust, waste materials, debris, and rubbish. Suitable containers for storage of waste materials, debris, and rubbish shall be provided until time of disposal. It is the responsibility of the Contractor to secure a licensed legal dump site for the disposal of this material.

Under no circumstances shall sewage or solids removed from the main or manhole be dumped onto streets or into ditches, catch basins, storm drains, or sanitary sewers. The Contractor may be required to demonstrate the performance capabilities of the cleaning equipment proposed for use on the project. If the results obtained by the proposed sanitary sewer cleaning equipment are not satisfactory, the Contractor shall use different equipment and/or attachments, as required, to meet specifications. More than one type of equipment/attachments may be required at a location. When hydraulic or high velocity cleaning equipment is used, a suitable sand trap, weir, dam, or suction shall be constructed in the downstream manhole in such a manner that all the solids and debris are trapped for removal.

Whenever hydraulically-propelled cleaning tools which depend upon water pressure to provide their cleaning force, or any tool which retards the flow of water in the sanitary sewer lines are used, precautions shall be taken to ensure that the water pressure created does not cause any damage or flooding to public or private property being served by the manhole section involved. Any damage of property, as a result of flooding, shall be the liability and responsibility of the Contractor.

324.3.7 TESTING

324.3.7.1 BACKFILL AND COMPACTION - No testing of any sewer line shall be performed until the trench has been backfilled and compacted to the appropriate unsurfaced grade or level.

324.3.7.2 FORCE MAINS - Force mains shall be hydrostatically tested according to the requirements of AWWA - 600, Section 4, Hydrostatic Testing of Pipelines for Force Mains.

The Contractor shall furnish all necessary personnel, water, equipment, supplies, and plugging devices required to perform leakage tests as described therein. Any leaks or other deficiencies that are detected shall be repaired and the test section of pipe shall then be re-tested by the Contractor. This process shall be repeated until compliance is achieved.

324.3.7.3 GRAVITY MAINS - All gravity main sewer piping shall be air pressure tested for exfiltration. Air pressure testing shall be accomplished in accordance with recommended practice (UNI-B-6) of the Uni-Bell PVC Pipe Association for all pipelines less than 36-inches in diameter. Pressure testing will be made at all joints for lines 36-inches or greater in diameter. Testing will be performed with equipment equivalent to that manufactured by Cherne Industrial, Inc. and consistent with the procedure described as follows:

- All wyes, tees, and/or ends of lateral stubs shall be suitably capped and braced to withstand the internal test pressure of the section being tested. Caps shall be easily removable for making future lateral or extension connections.

- Test sections of sewer line shall be isolated by plugging at each manhole with pneumatic plugs. One of the plugs shall be fitted with connections to allow the following:

  ⇒ Inflation of the pneumatic plug.
  ⇒ Pressure measurement inside the isolated section of sewer line.
  ⇒ Introduction of air under pressure into the isolated section of sewer line.
- Air for pressurizing and gauges for measuring pressures shall be supplied through and incorporated into a control panel manufactured specifically for such testing. The control panel shall be fitted with a 3 1/2-inch (or larger), 0 to 30-psi gauge for reading the internal line pressure. Calibrations on the gauge for the 0 through 10-psi range shall be in tenths of pounds.

- Personnel will not be allowed in any involved manhole while pressure is being applied to a test section.

- Air shall be introduced into the test section until the pressure stabilizes at 3.5 psi. Then the time required for the pressure to drop to 3.0 psi shall be observed, recorded, and compared to the following table of acceptability standards:

ALLOWABLE TIME FOR A 0.5 psi TEST PRESSURE DROP IN PVC SEWER PIPE

Pipe Diam. (inches)	Minimum Time in Minutes and Seconds for Various Lengths of Pipe							
	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
6	2:52	2:52	2:52	2:52	2:55	3:27	3:59	4:27
8	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
18	8:30	9:37	9:37	16:01	19:14	22:26	25:38	28:51

If the level of any groundwater present is higher than the level of the test section, the test air pressure shall be increased until it is 4 psi greater than the average backpressure induced on the line by the ground water. At least two minutes shall be allowed for the interior air pressure to stabilize at that pressure. Pressure in the line then shall be observed until it has decreased to 3.5-psi above the groundwater backpressure. The foregoing described test for a 0.5-psi pressure drop can then be commenced.

- Exfiltration testing for all pipe and joints shall be considered acceptable when the time measured for pressure to decrease from 3.5 to 3.0 psi is equal to or greater than the time shown above in the table.

Infiltration testing also shall be conducted for all gravity main sewer lines when the groundwater level is above the top of the pipe section being tested. Tests shall be made by observing and measuring the amount of water infiltration. Testing shall be conducted from manhole to manhole. The length of pipe to be tested shall not exceed 400 feet. The following steps shall be taken as the testing proceeds:

- Measurement of ground water elevation shall be made at the upper and lower ends of the test section and recorded. The upper end of the test section shall then be plugged and the flow of water leaving the lower end will be measured, either by directing the flow into a container of known volume of by observation of flow over a weir.

- Acceptance of the test section for infiltration compliance will be given when the rate of flow out of the section is less than 200 gallons per inch of internal pipe diameter per mile per 24-hour day.

All manholes shall be checked for infiltration by observing their interior surfaces for signs of water infiltration.

324.3.7.4 DEFLECTION TESTING - All flexible wall sewer piping shall be tested for deflection by passing a mandrel sized to pass through a 5-percent deflection (or deformation) of the pipe section being tested. The Town Engineer may waive this requirement on short footage projects. Requirements for making such tests are provided as follows:

- Deflection testing shall not be conducted until backfill in the trench has been in place for at least 30 days (Contractor shall submit dates/records to indicate/verify said time interval).
- The test shall be performed by moving the mandrel through the test section without the aid of a mechanical pulling device.
- The mandrel shall be fitted with an odd number of fins or legs (at least nine) which are not worn sufficiently to affect the mandrel's diameter. The fins shall be sized to fit the specific type and size of pipe being tested and shall be stamped by the manufacturer to identify the type and size of pipe. When requested, the Contractor shall provide proof rings to check the mandrel's diameter. The length of the contact edge of the fins shall be at least equal to the pipe's nominal diameter.
- Acceptance of the test section of pipe will be given when the mandrel can pass through that section without stoppage. If stoppage occurs, the pipe shall be excavated and exposed for examination to determine if damage to the pipe has taken place. When pipe damage has occurred, the damaged section shall be removed and replaced by the Contractor. If an obstruction has been caused by deflection, but the pipe is undamaged, the Contractor shall replace the bedding as necessary and carefully re-compact the bedding and backfill. When such corrective measures are completed, the mandrel shall be passed through the test section again to assure compliance..

324.3.8 CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION

324.3.8.1 QUALIFICATIONS – CCTV sewer line inspection to be performed by firms which are suitably equipped, experienced, qualified, and staffed for sewer line CCTV inspection. Firms shall be approved and accepted by the Town (i.e. Municipal Services Inc. 1-208-562-8128).

324.3.8.2 PROCEDURE – CCTV inspection shall be conducted after backfill and prior to surface repair. Equipment shall be calibrated for the various water depths and pipe sizes encountered during the inspection. A calibration tape shall be onsite during the calibration process.

324.3.8.3 NOTIFICATION – Contractor shall notify the Town at least 48 hours in advance of conducting the CCTV inspection to allow the Town, at the Town's discretion, to witness.

324.3.8.4 LINE CLEANING – All lines shall be cleaned according to these specifications prior to CCTV inspection.

324.3.8.5 WATER/DYE – Red dye mixture shall be added immediately prior to CCTV inspection. Sufficient dye shall be introduced into the upstream manhole to produce a visible flow in the downstream manhole(s). Once the flow has been noted in the downstream manhole, it shall be stopped.

324.3.8.6 EQUIPMENT – CCTV sewer line inspection equipment to include a color camera system, ½" VHS taping system, high-grade VHS tapes, camera propulsion equipment, and van to allow witness of CCTV by inspector.

324.3.8.7 TAPING – The tapes shall include the following video and audio information:

1. Video:
   - Project Number and Name
   - Date of TV inspection

- Upstream and downstream manhole numbers
- Current distance along line segment

2. Audio:
   - Date of TV inspection
   - Verbal confirmation of upstream and downstream manhole numbers and/or locations
   - Verbal description of pipe, size, type, and pipe joint length
   - Verbal description of location of each service connection

3. Tape identification tag:
   - Manhole to manhole designation

324.3.8.8 SUBMITTAL – Contractor shall submit tapes and logs to the Town for their review within one (1) week after taping. Tapes submitted to the Town shall be the property of the Town.

324.3.8.9 ACCEPTANCE CRITERIA:

- No visible standing water in pipeline caused by grade defects greater than ¼ inch.
- No pipeline structural defects observed.
- No pipeline installation defects observed.
- No infiltration observed.

324.3.8.10 DEFECTIVE PIPE - Contractor shall uncover and remove defective pipe sections, re-work bedding material and install new pipe. The re-constructed sections shall again be CCTV inspected to ensure grade; inspection tapes shall be re-submitted to the Town for their review. All materials, labor, and associated costs with removal and replacement of defective pipe shall be borne by the Contractor.

324.3.9 TESTING DOCUMENTATION - The Contractor shall maintain a record of the procedures performed and the test results for all tests performed on pipelines installed. Information contained on the record shall include the following:

- Identification of Contract.
- Contractor's name and name of testing entity, if performed by other than Contractor.
- Name of Test Supervisor.
- Date of test.
- Type of test (air pressure, infiltration, deflection, CCTV, etc.).
- Identification of test section which includes location, size, and type of pipe.
- Test results (pass/fail, amount of leakage, etc.).
- Description of failure, if any, including reason for failure and corrective measures taken.
- Signature of Test Supervisor.
- Approval signature of Town or Town’s representative witnessing the tests.

Photocopies of the test documentation shall be provided in report format to the Town within one (1) week after the tests are performed.

324.3.10 PIPELINE LOCATION IDENTIFIERS

The Contractor shall furnish and install all pipeline location identifiers where indicated on the approved Development Drawings and where required by these specifications or the Town.

325.1 DESCRIPTION

This section covers furnishing and installing sanitary sewer lift stations in accordance with these Standard Specifications and Standard Drawings.

325.1.1 RELATED WORK AND REFERENCED SECTIONS

Section 304 - Earthwork Materials
Section 305 - Trench Excavation and Backfill
Section 317 - Pipe and Piping Systems
Section 324 – Sewer Line Pipe and Manhole Installation

325.1.2 SUBMITTALS

The Contractor shall submit detailed plans and specifications including pump and system curves to the Town. Any deviations in the Work from the approved plans, specifications, and/or submittals shall not be accepted.

325.1.3 DEFINITIONS

Fitting - Any component of a pipeline, excluding the pipe itself, which is used for connecting pipe sections or connecting to valves, tanks, structures, etc.

Flowline - A line formed by the inverts of a pipeline.

Infiltration - Any uncontrolled seepage of groundwater into a sewer line or system.

Invert - The bottom or lowest point of the internal surface of a cross-section of a pipeline.

Permeability - The property of a material which describes the rate of movement of any fluid through the pores of the material.

325.2 MATERIALS

Lift Station Structure. The lift station structure shall be constructed from precast minimum eight (8) foot diameter reinforced concrete barrel sections meeting the requirements of ASTM C-478 and reinforced concrete floor with #5 epoxy coated rebar on six (6) inch centers each way as a minimum.

Lift Station Lid. The concrete lid shall have a flush mount "Syracuse Castings" #CH-AOSG-M 36" by 48" hinged 300 PSF aluminum access hatch with safety grate. In no case shall the grate openings be greater than ten (10) square inches. The lid shall be equipped with 304 stainless steel upper pump guide brackets, chain hooks, lid support, and horizontal bar for attachment of the liquid level sensor assembly. The access hatch shall meet or exceed HS25 loading requirements when located in vehicular traffic areas.

Piping. Pressure pipe shall be four (4) inch minimum as required by the size of pumps and shall be ductile iron inside the lift station and over to and through the control/valve vault. The pressure pipe down stream from the outlet may be PVC pipe if design conditions permit.

Ball Check Valves. Ball check valves shall be used in all sewer lift stations as shall be "GA INDUSTRIES" #242-D or an approved equal. Ball check valves shall be located in the control/valve vault and shall be sized in accordance to the pump discharge piping.

Vent Pipe. Vent pipe shall be four (4) inch diameter 304 stainless steel pipe fabricated as shown on the Standard Drawings. The down-turned end shall have a welded 1/8-inch 12-gauge stainless steel screen covering the opening.

Electrical Conduits. Electrical conduits shall meet the requirements of NEC and be of the size required for the conductor.

Submersible Pumps. The lift station structure shall contain two (2) "HYDROMATIC" S4NX submersible pumps sized for the application. The Contractor shall also provide and present one (1) standby/backup pump to the Town. All three (3) pumps shall be the same model and equal in every respect.

The pumps shall be equipped with the required size electric motor connected for operation on a 460-volt, 3-phase, 60-hertz, 4-wire service with a minimum of 35 feet of Type SPC cable suitable for submersible pump applications. The power cable shall be connected from the pumps directly to the explosion proof junction box mounted below the control panel.

Each pump shall be furnished with a minimum of 25 feet of 304 stainless steel lifting chain of adequate strength to safely lower and raise the pump; two (2) 2-inch diameter stainless steel guide rails; and, stainless steel mounting hardware to fit the pumps and bases to the lift station as shown on the Standard Drawings.

Pump Control Panel. The pump control panel shall be comprised of a NEMA 4X gasketed, watertight, dusttight, lockable steel enclosure (36"x30"x8" minimum) with "HYDROMATIC" duplex control panel. All electrical equipment shall be U.L. listed.

The control panel shall include the following minimum options:

1. An intrinsically safe solid state alternator for two pumps which provides alternating operation of pumps under normal conditions and provides simultaneous operation of both pumps in case of high level conditions.
2. Anti-condensation heater (ACH).
3. Main alarm flashing light (AFL).
4. Convenience outlet and transformer (COT).
5. Elapsed time meters duplex (ETMD).
6. High water main alarm activation (HWA).
7. High water telemetry with "RACO" Guardit 4-channel phone dialer (HWT).
8. Lightning suppressor (LS1).
9. Low water alarm with redundant off (LWARO).
10. Pump fail telemetry / main alarm (PFTAS).
11. Pump run telemetry (PRD).
12. Swing dead front / non-fused disconnect (SDF).
13. Seal failure indicator (SFD).

The pump control panel shall face the lift station.

Pump Controls. Pumps shall be controlled by a "MILTRONICS" Hydroranger 200 submersible transducer mounted in the lift station wet well, communication cable, and control units. All equipment shall be compatible with the lift station pump control system and be designed for the site conditions.

The control system shall be designed for a duplex pump system capable of ensuring that the lead pump changes with each "pump on" event. The control unit shall allow the operator to control pump operation from the unit mounted on the lift station pedestal. All equipment shall be installed in accordance with manufacturer's recommendations.

SCADA System. All sewer lift stations shall be provided with a SCADA system which shall be of the same type and manufacture as the SCADA systems currently in use by the Town for existing sewer lift stations. The SCADA system shall be installed in accordance with the manufacturer's recommendations and shall report those alarms as requested by the Town.

Standby Power. All lift stations shall be provided with a "GENERAC" propane operated standby generator. As a minimum, the generator shall have the following:

1. Wired for 460 volt, three (3) phase power.
2. Weather-tight enclosure.
3. Automatic transfer switch (ATS)
4. Standard muffler

The generator shall be sized to step-start the duplex pumps and provide additional power for any other lift station components.

325.3 CONSTRUCTION REQUIREMENTS

325.3.1 SUBMERSIBLE PUMPS AND CONTROLS

All equipment shall be installed in a neat, plumb, and workmanlike manner in accordance with the manufacturer's recommendations. The level transducer shall be mounted on the wet-well wall unless otherwise recommended by the manufacturer or required by the Town, and in a location that minimizes false liquid level readings.

325.3.2 ELECTRICAL WORK

All electrical work shall be accomplished in accordance with the Standard Drawings, these specifications, all local Town and State electrical codes, and the National Electric Code (NEC) by licensed electricians. The Town shall be notified 72 hours in advance prior to commencement of any electrical work.

Seal-offs shall be required on all conduits that interconnect the sewer lift station and electrical panels in accordance with the NEC.

325.3.3.1 START-UP AND TRAINING

Upon completion of the construction, the Contractor shall notify the Town of the time and date for initial start-up of the sewer lift station. The Contractor shall complete a minimum eight (8) hour test period, provide up to eight (8) hours of operation training (including emergency operation) for the appropriate Town personnel, if required, and provide three (3) copies of an Wyoming Department of Environmental Quality approved Operation and Maintenance Manual for the lift station prior to Town acceptance.

326.1 DESCRIPTION

This section covers providing materials, equipment and labor necessary for installing topsoil, turf, mulch, and irrigation requirements for Town Parks

326.2 MATERIALS

326.2.1 TOPSOIL

Topsoil shall be obtained from local sources, and shall have similar soil characteristics to those of the soil at the location where it is to be used. Topsoil shall be obtained from well-drained sites where it occurs to a depth of not less than 4 inches, and it shall not be obtained from bogs or marshes. Topsoil shall be fertile, friable, natural loam, reasonably free of subsoil, clay lumps, brush, weeds, litter, roots, stumps, stones larger than 2 inches in any dimension, or any other material which would inhibit the germination of seeds or the growth of the cover crop.

326.2.2 TURF SOD

Turf sod is required to be installed on all Town Parks. Turf sod shall be vigorous, viable, strongly rooted sod, not dormant or less than 2 years old, free of weeds, undesirable native grasses, insect infestations, and fungus. It shall be machine cut to a pad thickness of 1 inch ($\pm$ 0.33 inch). Turf sod types and mixtures must be approved by the Town.

326.2.3 TREES AND SHRUBS

326.2.3.1 NURSERY GROWN - Trees and shrubs shall be nursery-grown, with botanical and common names of plants true to the approved names given in the latest edition of "Hortus", and shall meet the requirements of the American Standard for Nursery Stock adopted by the American Association of Nurserymen. Plants shall be sound, healthy, vigorous, symmetrically proportioned, well branched, densely foliated when in leaf, free of disease, insect pests, eggs, and larvae and shall have well developed root systems.

326.2.3.2 ROOT BALLS AND PRUNING - Root balls shall be protected at all times from sun, drying winds and frost. Plants shall not be pruned prior to delivery. If balled and burlapped plants are not installed immediately upon delivery, they shall be set on the ground and protected with moist soil or wet mulch.

326.2.3.3 WARRANTY - Trees and shrubs shall be warranted for a period of 2 years after Substantial Completion, against death and unsatisfactory growth, except in cases resulting from Owner's neglect, abuse by others or natural phenomena. Unacceptable plant material shall be replaced at end of warranty period. Only one replacement is required.

326.2.4 MULCH

326.2.4.1 TREE AND SHRUB MULCH - Tree and shrub mulch shall consist of well-aged fibrous or shredded bark.

326.2.5 IRRIGATION SYSTEMS

326.2.5.1 All irrigation sprinkler heads shall be manufactured by Hunter, Rainbird, Toro, or approved equal.

326.2.5.2 All irrigation sprinkler system piping laterals shall be PE pipe with a 1 ¼ inch minimum diameter and 100 psi minimum pressure rating. Supply line PE pipe with a minimum size 2 inch diameter and 100 psi minimum pressure rating.

326.3 CONSTRUCTION REQUIREMENTS

326.3.3 TOPSOIL

326.3.3.1 REMOVAL OF TOPSOIL - Topsoil to be saved shall be carefully removed and set aside in a separate location. It shall not be mixed with the remainder of excavated material.

326.3.3.2 REPLACEMENT OF TOPSOIL - When site work conditions permit, topsoil shall be spread as shown on the Drawings. The minimum depth of topsoil shall be **4 inches** over all designated areas. Topsoil shall be fine graded to a firm even surface, matching existing slopes, with no lumps or stones present. The topsoil shall be prepared to a good condition, not muddy or hard, and shall be scarified to a friable condition if it is hard before turf is placed.

326.3.3.3 PROTECTION AGAINST EROSION - Areas where topsoil has been spread shall be protected against erosion.

326.3.4 TURF SOD

326.3.4.1 INSTALLATION - Turf sod shall be laid across slopes such that butt joints alternate. Sod pieces shall be fitted tightly together so no joint is visible and then firmly and evenly hand tamped. The sod shall then be rolled with a 150-pound roller to level and seal all seams.

326.3.4.2 WATERING - After rolling, sod shall be watered until water soaks into underlying topsoil to a depth of not more than 3 inches. For grades of 50% slope or steeper, the sod shall be secured with wooden pegs driven flush with the soil portion of the sod and 2 feet maximum on center.

326.3.5 TREES AND SHRUBS

326.3.5.1 LOCATION - Trees and shrubs shall be installed at locations designated on the approved Drawings. Tree and shrub types shall be approved by the Town. Trees and shrubs to be saved and replanted shall be carefully removed, set aside, protected and preserved until they can be safely replanted.

326.3.5.2 PLANTING - The plant shall be set in the center of a hole of the proper size, plumb and straight. Burlap, ropes and all wire and other materials shall be removed, and then the excavated soil shall be returned to the hole and gently packed around the root ball. The planting shall be flooded with water to promote additional soil consolidation. The Contractor shall give care that, after settling, the top of the root collar shall be even with the adjacent finished grade. Planting shall include a 4-inch layer of mulch to be placed over a 6-ft. diameter weed control map.

326.3.5.3 WATERING - Trees and shrubs shall be watered and maintained until Substantial Completion and defective work shall be corrected as soon as it becomes apparent and as weather and season permit.

326.3.6.5 IRRIGATION SPRINKLER SYSTEMS

326.3.6.5.1 The main line attached to the Town Culinary Water System shall be sized (2-inch diameter minimum) to meet minimum demands of the sprinkler system. All sprinkler systems shall be installed to meet minimum backflow requirements as required by the Town.

326.3.6.5.2 Maximum spacing for sprinkler system laterals shall be 30 ft.

326.3.6.5.3 Maximum spacing for sprinkler heads shall be 25 ft.

326.3.6.5.4 All sprinkler system solenoids shall be hard wired to one (1) timer for each park.

PART IV

STANDARD DRAWINGS

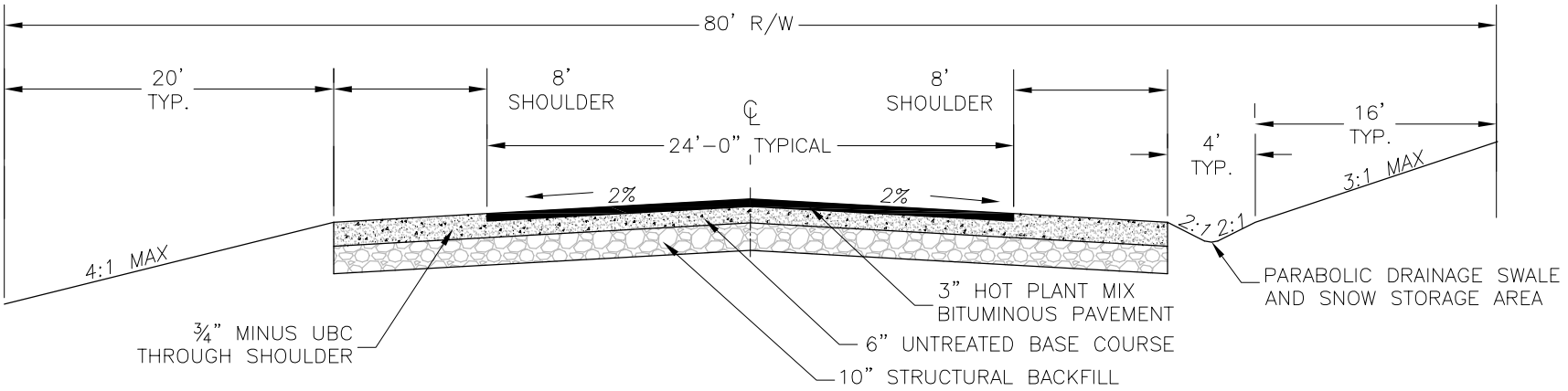
SUNRISE ENGINEERING

TOWN OF AFTON

STANDARD DRAWINGS & SPECIFICATIONS

TYPICAL ROADWAY

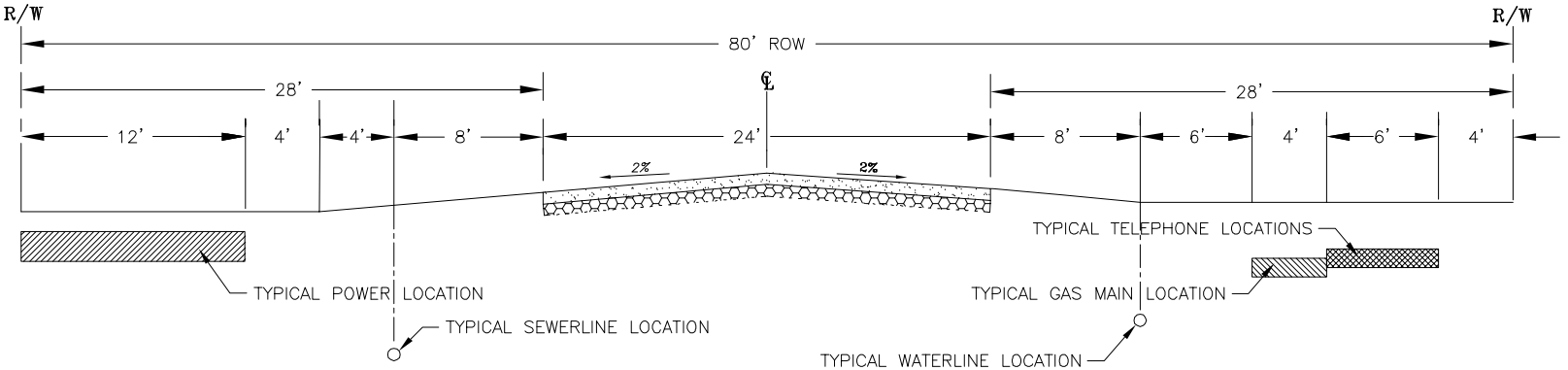
DESIGNED	CHECKED
SEI	EJS
DATE	DRAWING NO.
6-26-13	1



A ~ TYPICAL ROADWAY SECTION
NOT TO SCALE

GENERAL CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE AND PRESERVE ALL UTILITIES.
2. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
3. THE CONTRACTOR SHALL REMOVE 6" INCHES OF EXISTING TOPSOIL AND PRESERVE TO BE USED FOR RECLAMATION OF SIDE SLOPES.
4. MATERIAL DEEMED UNSUITABLE FOR ROADWAY CONSTRUCTION SHALL BE REMOVED AS PER SECTION 02202 OF THE SPECIFICATIONS.



TYP ~ TYPICAL ROADWAY UTILITIES
NOT TO SCALE

UTILITY DESIGN NOTES:

1. TYPICAL LAYOUT IS INTENDED TO PREVENT CONVERGING UTILITIES AND ELIMINATE UTILITY OVERLAP.
2. DEVELOPER SHALL PROVIDE SUITABLE GUIDANCE AND FIELD LOCATION TO HELP UTILITIES LOCATE THEIR FACILITIES FOR CONSTRUCTION.

GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN TOWN EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
4. ALL CONSTRUCTION SHALL CONFORM TO WYOMING PUBLIC WORKS STANDARDS AND ALL APPLICABLE REQUIREMENTS OF THE STATE OF WYOMING, DEPARTMENT OF ENVIRONMENTAL QUALITY. CONSTRUCTION WILL BE SUBJECT TO INSPECTION BY, BUT NOT LIMITED TO, TOWN OF AFTON AND DEQ.
5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED TESTING LAB.
6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.

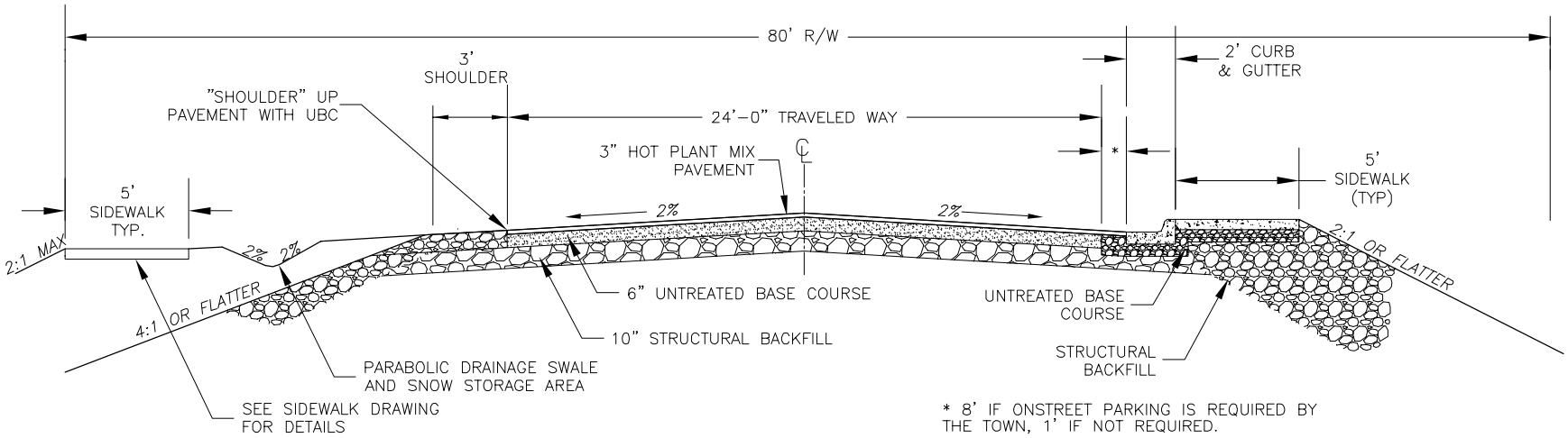
SUNRISE ENGINEERING

TOWN OF AFTON

STANDARD DRAWINGS & SPECIFICATIONS

ROADWAY SECTION 3

DESIGNED	DATE
SEI	6-26-13
CHECKED	DRAWING NO.
EJS	3



TYP ~ TYPICAL ROADWAY SECTION W/SIDEWALK

NOT TO SCALE

CONSTRUCTION NOTES:

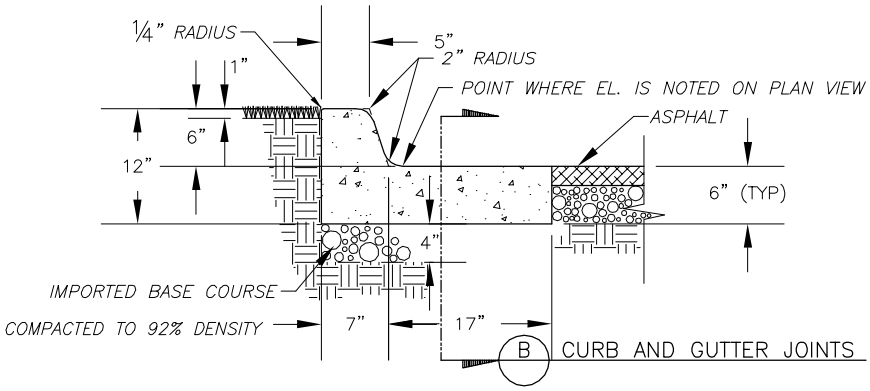
1. AT LEAST 4 INCHES OF ¾" COMPACTED AGGREGATE BASE SHALL BE REQUIRED UNDER ALL CONCRETE WHERE UNSUITABLE BASE MATERIAL IS ENCOUNTERED, IF FILL MATERIAL IS REQUIRED, OR WHERE DIRECTED BY TOWN ENGINEER.
2. ALL CONCRETE SHALL BE CURED WITH A CURING COMPOUND AS SPECIFIED IN THE STANDARD SPECIFICATIONS OR AS DIRECTED BY THE TOWN ENGINEER.
3. STANDARD SIDEWALK WIDTH IS 5 FOOT IN NEW CONSTRUCTION. STANDARD CROSS SLOPE IS 2%
4. PLACE PREFORMED EXPANSION JOINT FILLER AT DRIVEWAY CONSTRUCTION AND AT MAXIMUM SPACING OF 60 FEET FOR NEW SIDEWALK CONSTRUCTION. (SEE DRAWING ?)
5. FULL HEIGHT CURB MAY BE SAW CUT TO PROVIDE RESIDENTIAL DRIVEWAY APPROACH.
6. WHEREVER PRACTICAL PROVIDE ADEQUATE DISTANCE FROM BACK OF DRIVEWAY CURB TO SIDEWALK SO THAT A MINIMUM 4' WIDE PATHWAY WITH A CROSS SLOPE OF 2% IS AVAILABLE FOR HANDICAP ACCESSIBILITY.

STREET DESIGN NOTES:

1. 80' ROW FOR ALL STREETS.
2. PAVED WIDTH OF ALL STREETS SHALL BE 24 FEET MINIMUM. GRADED WIDTH SHALL BE 40 FEET.
3. 10" STRUCTURAL BACKFILL SUB-BASE (MIN.)
   6" UNTREATED BASE COURSE (MIN.)
   3" ASPHALT WITH 2% CROWN SLOPE (MIN.)
4. PARABOLIC DRAINAGE AND SNOW STORAGE SHALL BE PROVIDED ALONG ALL STREETS WITHOUT CURB & GUTTER. DRAINAGE WAYS SHALL BE RESEEDED AFTER CONSTRUCTION.
5. MAXIMUM GRADE OF ALL STREETS IS EIGHT PERCENT (8%).

GENERAL NOTES:

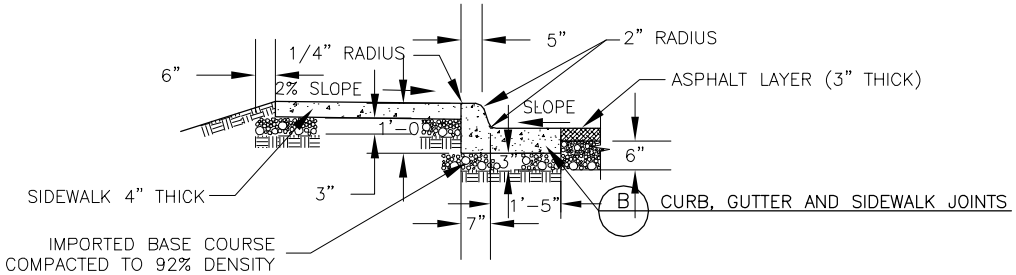
1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN TOWN EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
4. ALL CONSTRUCTION SHALL CONFORM TO WYOMING PUBLIC WORKS STANDARDS. CONSTRUCTION WILL BE SUBJECT TO INSPECTION BY, BUT NOT LIMITED TO, THE TOWN OF AFTON.
5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED TESTING LAB.
6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING OR OTHER MEANS APPROVED BY THE ENGINEER.



TYP ~ TYP. CURB AND GUTTER SECTION
NOT TO SCALE

NOTES:

1. INSTALL EXPANSION/CONTRACTION JOINTS ON 60 FT. INTERVALS.
2. INSTALL CONTROL JOINTS ON 10 FT. INTERVALS.



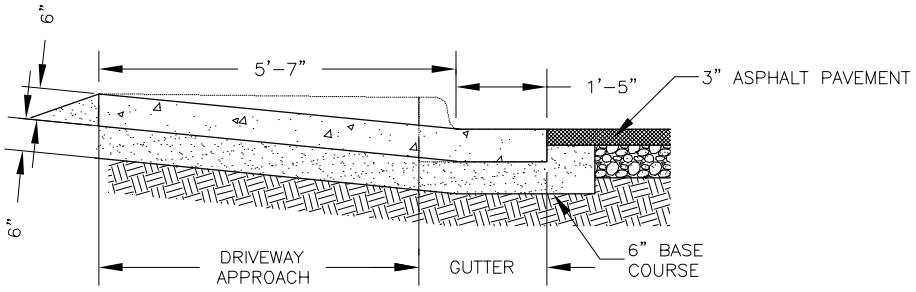
TYP ~ CURB, GUTTER AND SIDEWALK SECTION
NOT TO SCALE

GENERAL NOTES:

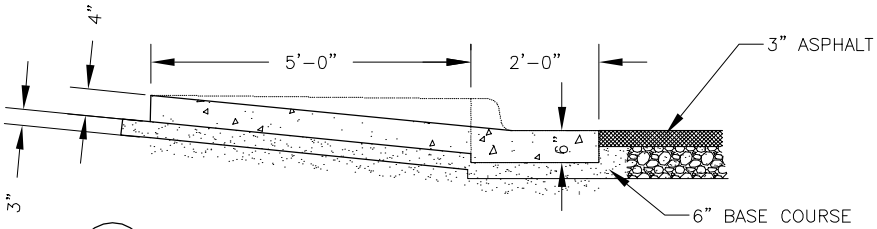
1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN CITY EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
4. ALL CONSTRUCTION SHALL CONFORM TO WYOMING PUBLIC WORKS STANDARDS.
5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED TESTING LAB.
6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.

CONSTRUCTION NOTES:

1. AT LEAST 4 INCHES OF ¾" COMPACTED AGGREGATE BASE SHALL BE REQUIRED UNDER ALL CONCRETE WHERE UNSUITABLE BASE MATERIAL IS ENCOUNTERED, IF FILL MATERIAL IS REQUIRED, OR WHERE DIRECTED BY CITY ENGINEER.
2. ALL CONCRETE SHALL BE CURED WITH A CURING COMPOUND AS SPECIFIED IN THE STANDARD SPECIFICATIONS OR AS DIRECTED BY THE TOWN ENGINEER.
3. SCORING LINES SHALL BE A MINIMUM OF 1½" DEEP AND LOCATED EVERY 10' IN ALL GUTTER SECTIONS.
4. MINIMUM RUNNING SLOPE OF CROSS DRAINS SHALL BE 1% OR AS APPROVED BY THE ENGINEER.



TYP ~ DRIVEWAY SECTION
SCALE: 1" = 3'



TYP ~ WHEEL CHAIR RAMP SECTION
SCALE: 1" = 3'

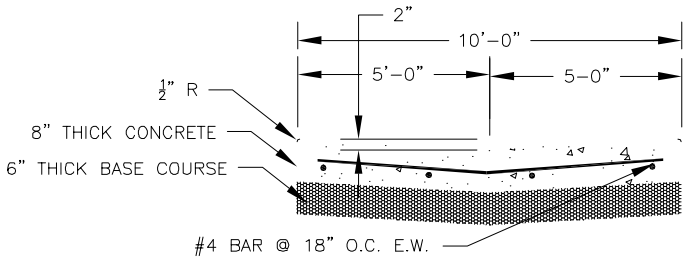
GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
4. ALL CONSTRUCTION SHALL CONFORM TO WYOMING PUBLIC WORKS STANDARDS.
5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED TESTING LAB.
6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.

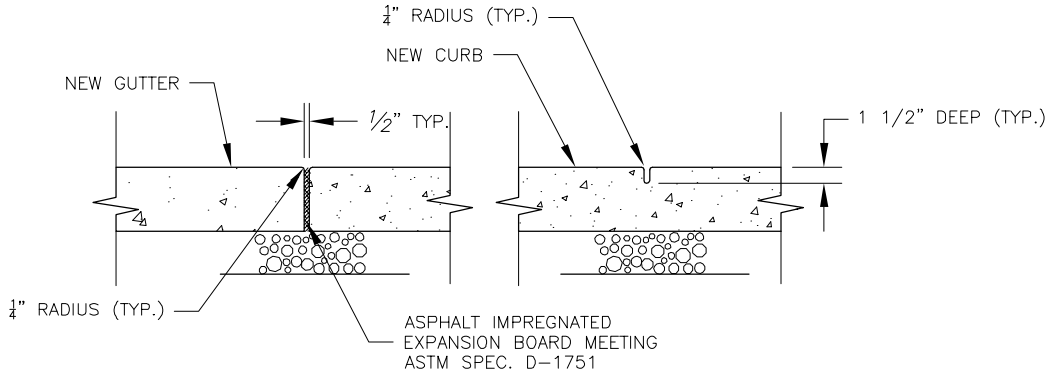
CONSTRUCTION NOTES:

1. 4 INCHES OF $\frac{3}{4}$" COMPACTED AGGREGATE BASE SHALL BE REQUIRED UNDER ALL CONCRETE WHERE UNSUITABLE BASE MATERIAL IS ENCOUNTERED, IF FILL MATERIAL IS REQUIRED, OR WHERE DIRECTED BY TOWN ENGINEER.
2. ALL CONCRETE SHALL BE CURED WITH A CURING COMPOUND AS SPECIFIED IN THE STANDARD SPECIFICATIONS OR AS DIRECTED BY THE TOWN ENGINEER.
3. SCORING LINES SHALL BE A MINIMUM OF $1\frac{1}{2}$" DEEP AND LOCATED EVERY 10' IN ALL VALLEY GUTTER SECTIONS.
4. MINIMUM RUNNING SLOPE OF CROSS DRAINS SHALL BE 1% OR AS APPROVED BY THE ENGINEER.

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	WHEELCHAIR RAMP & DRIVEWAY SECTION	DATE 11-7-07	DRAWING NO. 5	



TYP ~ VALLEY GUTTER
NOT TO SCALE



B TYP CURB AND GUTTER JOINTS
NOT TO SCALE

GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN CITY EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
4. ALL CONSTRUCTION SHALL CONFORM TO TOWN OF AFTON AND WYOMING PUBLIC WORKS STANDARDS.
5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED TESTING LAB.
6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.

CONSTRUCTION NOTES:

1. 4 INCHES OF ¾" COMPACTED AGGREGATE BASE SHALL BE REQUIRED UNDER ALL CONCRETE WHERE UNSUITABLE BASE MATERIAL IS ENCOUNTERED, IF FILL MATERIAL IS REQUIRED, OR WHERE DIRECTED BY TOWN ENGINEER.
2. ALL CONCRETE SHALL BE CURED WITH A CURING COMPOUND AS SPECIFIED IN THE STANDARD SPECIFICATIONS OR AS DIRECTED BY THE TOWN ENGINEER.
3. SCORING LINES SHALL BE A MINIMUM OF 1½" DEEP AND LOCATED EVERY 10' IN ALL GUTTER SECTIONS.
4. MINIMUM RUNNING SLOPE OF CROSS DRAINS SHALL BE 1% OR AS APPROVED BY THE ENGINEER.
5. WORK COMPLETED ALONG HIGHWAY 89 MUST ALSO SATISFY REQUIREMENTS OF THE WYOMING HIGHWAY DEPARTMENT.

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	VALLEY GUTTER AND CONCRETE JOINTS	DATE 6-26-13	DRAWING NO. 6	

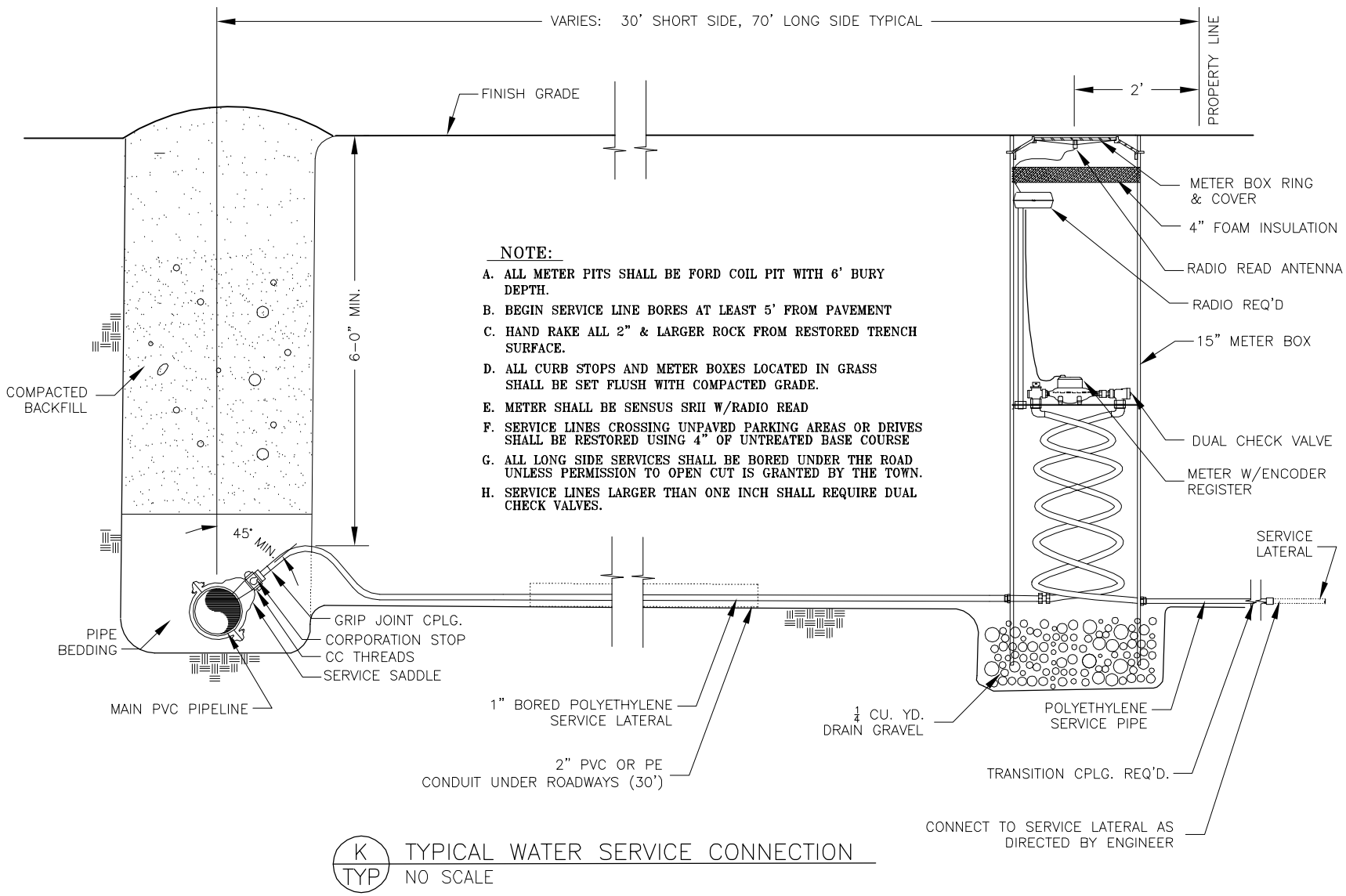
SUNRISE ENGINEERING

TOWN OF AFTON

STANDARD DRAWINGS & SPECIFICATIONS

TYPICAL WATER SERVICE CONNECTION

DESIGNED	CHECKED
SEI	EJS
DATE	DRAWING NO.
6-26-13	7



NOTE:

A. ALL METER PITS SHALL BE FORD COIL PIT WITH 6' BURY DEPTH.

B. BEGIN SERVICE LINE BORES AT LEAST 5' FROM PAVEMENT

C. HAND RAKE ALL 2" & LARGER ROCK FROM RESTORED TRENCH SURFACE.

D. ALL CURB STOPS AND METER BOXES LOCATED IN GRASS SHALL BE SET FLUSH WITH COMPACTED GRADE.

E. METER SHALL BE SENSUS SRII W/RADIO READ

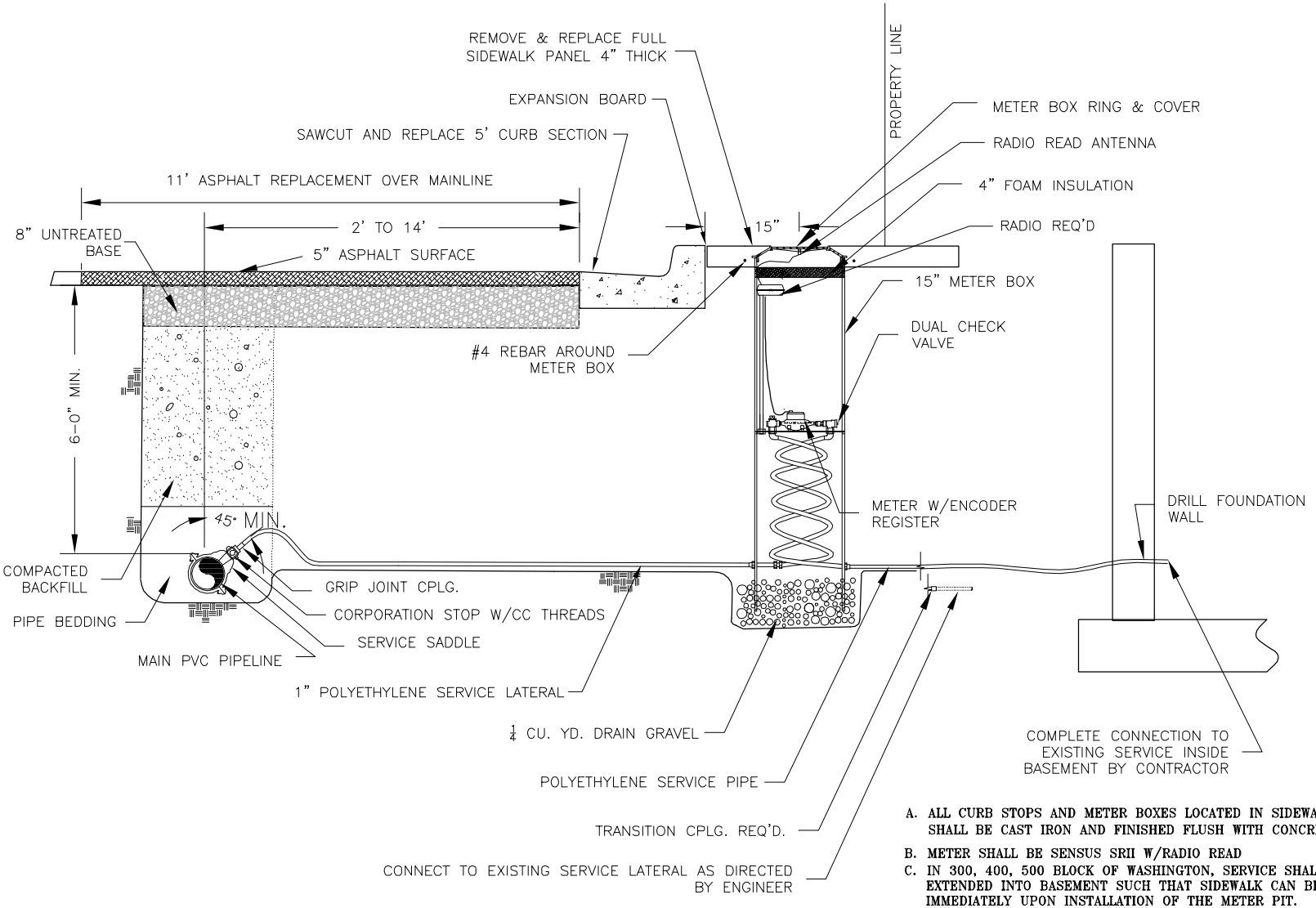
F. SERVICE LINES CROSSING UNPAVED PARKING AREAS OR DRIVES SHALL BE RESTORED USING 4" OF UNTREATED BASE COURSE

G. ALL LONG SIDE SERVICES SHALL BE BORED UNDER THE ROAD UNLESS PERMISSION TO OPEN CUT IS GRANTED BY THE TOWN.

H. SERVICE LINES LARGER THAN ONE INCH SHALL REQUIRE DUAL CHECK VALVES.

K / TYP TYPICAL WATER SERVICE CONNECTION

NO SCALE



L TYP WATER SERVICE CONNECTION WASHINGTON ST.

A. ALL CURB STOPS AND METER BOXES LOCATED IN SIDEWALK SHALL BE CAST IRON AND FINISHED FLUSH WITH CONCRETE.

B. METER SHALL BE SENSUS SRII W/RADIO READ

C. IN 300, 400, 500 BLOCK OF WASHINGTON, SERVICE SHALL BE EXTENDED INTO BASEMENT SUCH THAT SIDEWALK CAN BE REPAIRED IMMEDIATELY UPON INSTALLATION OF THE METER PIT.

D. ANY WORK ON WASHINGTON MUST BE APPROVED BY THE WYOMING DEPARTMENT OF TRANSPORTATION.

E. ALL METER PITS SHALL BE MUELLER THERMA COIL W/6' BURY DEPTH.

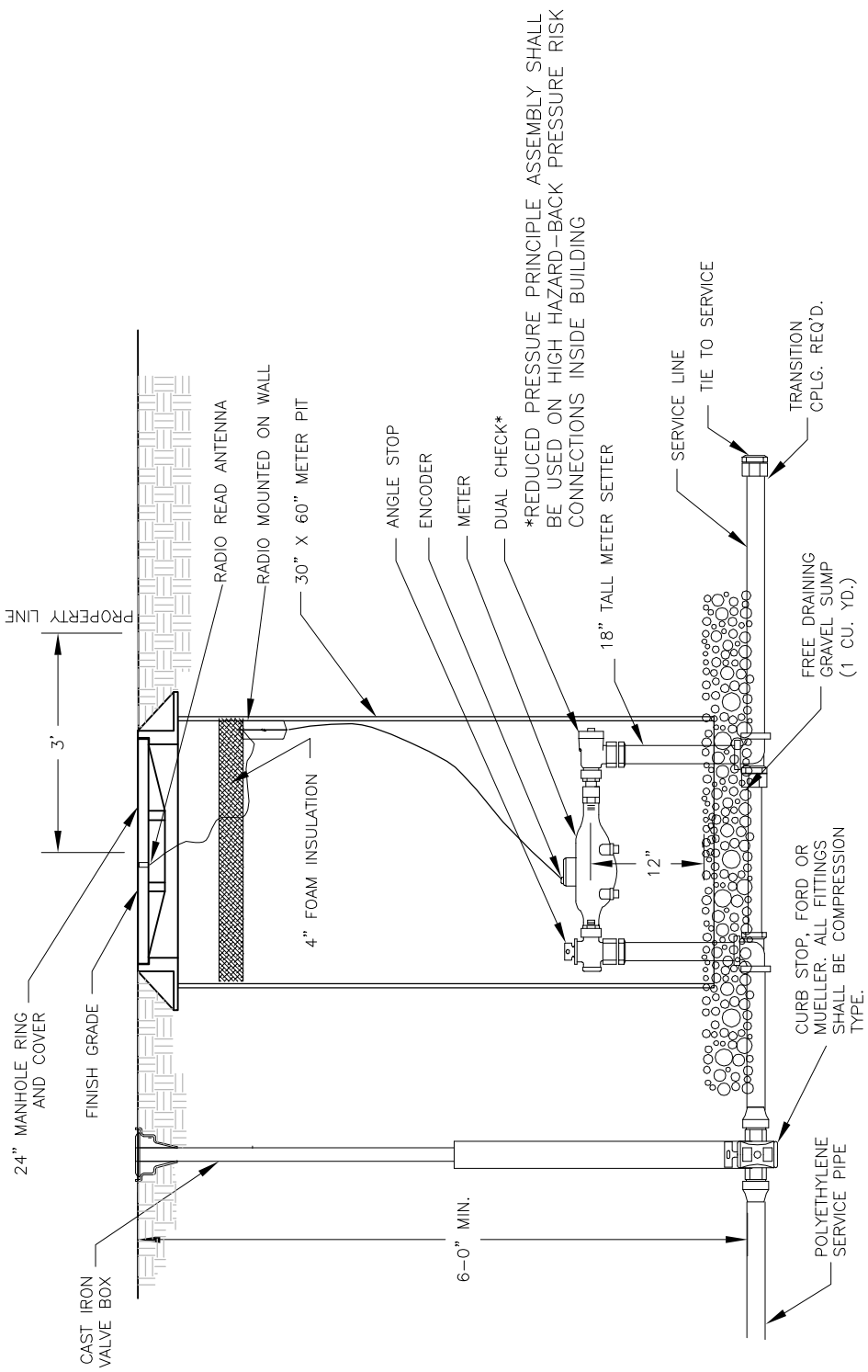
SUNRISE ENGINEERING

TOWN OF AFTON

STANDARD DRAWINGS & SPECIFICATIONS

WATER SERVICE CONNECTION WASHINGTON ST

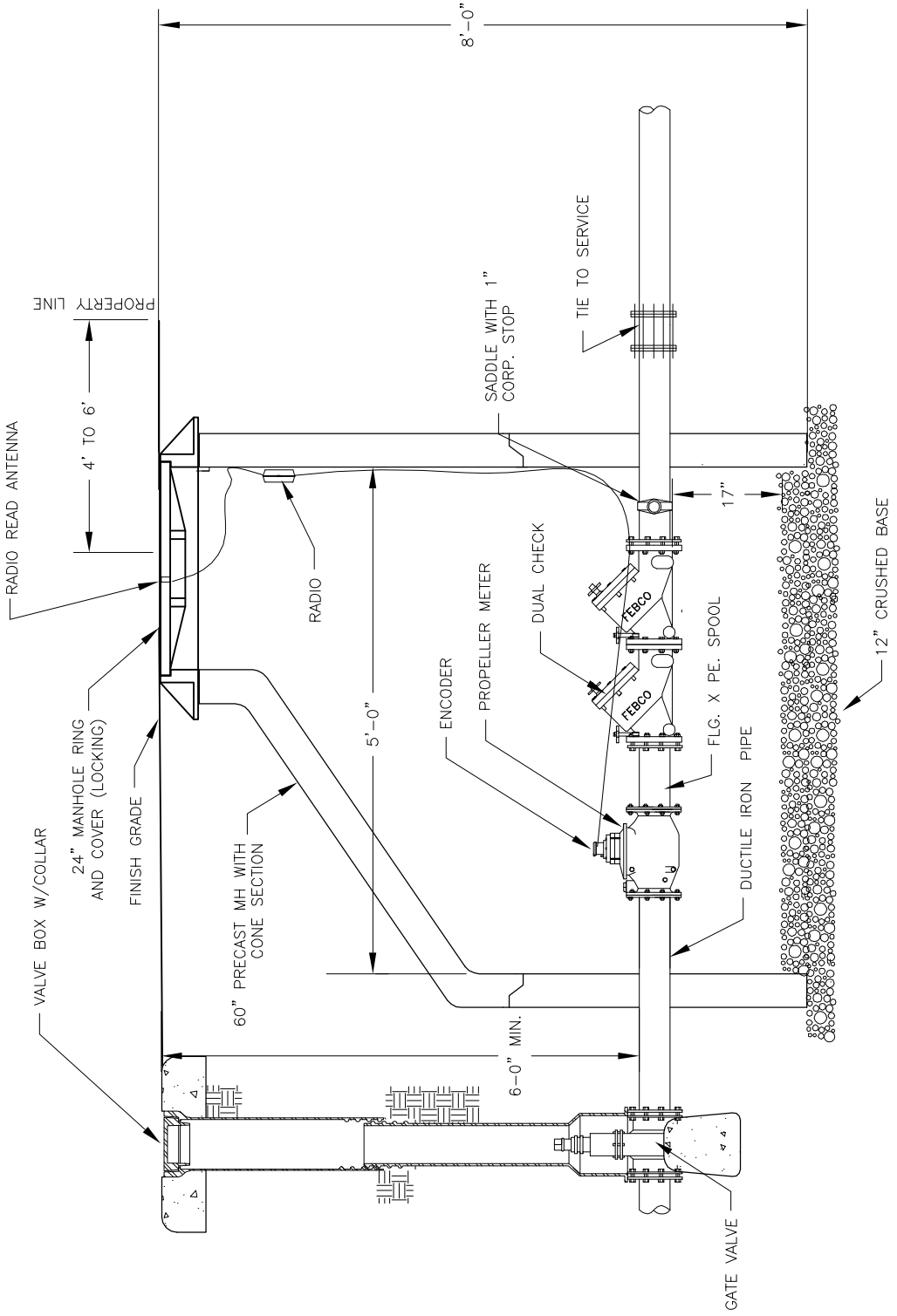
DESIGNED	DATE
SEI	6-26-13
CHECKED	DRAWING NO.
EJS	8



J TYP 1-1/2" & 2" METER PIT

NO SCALE

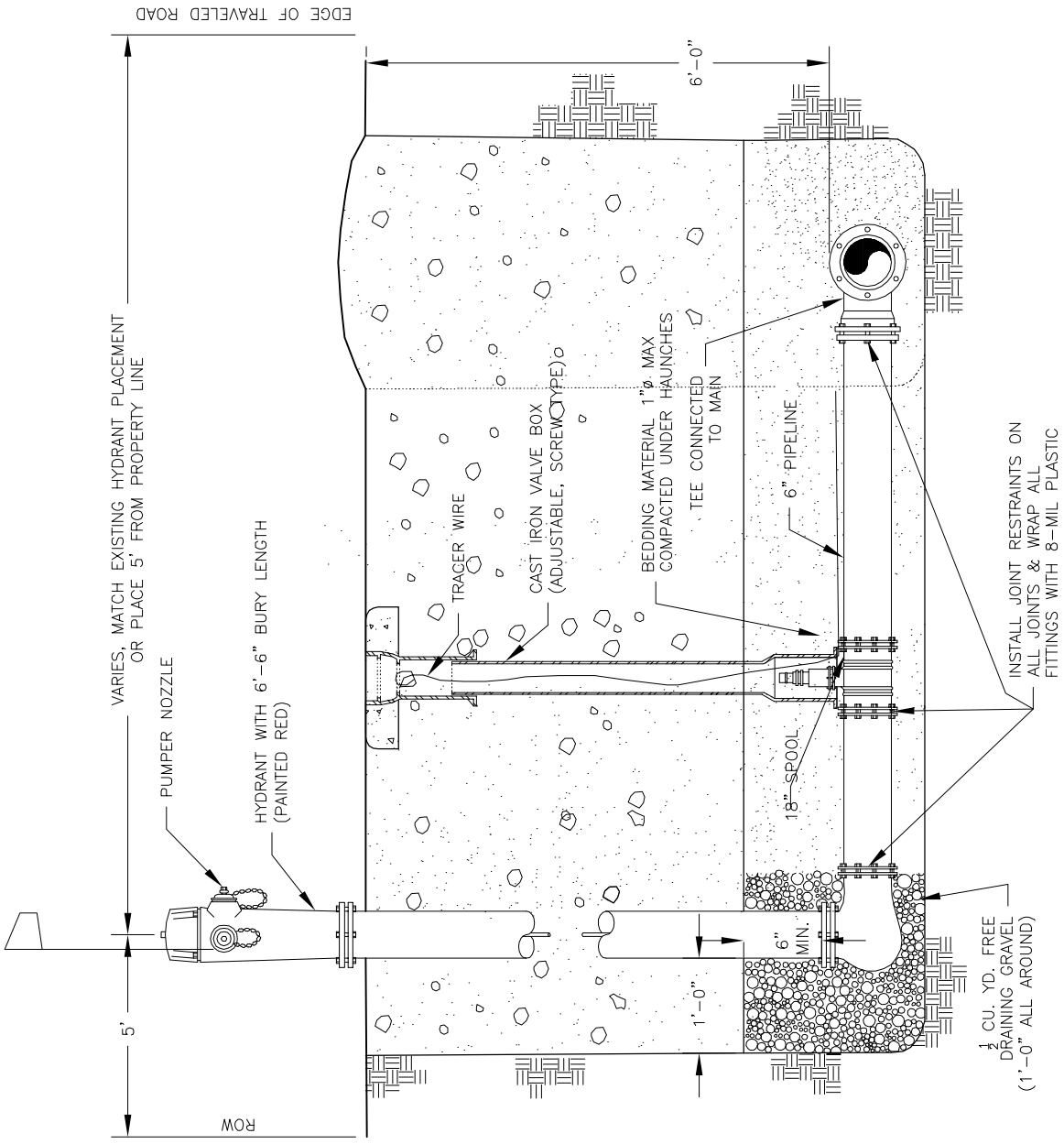
SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	$1\frac{1}{2}$" & 2" METER PIT	DATE 6-26-13	DRAWING NO. 9	



H TYP — 3" & 4" METER PIT

NO SCALE

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	3" & 4" METER PIT	DATE 6-26-13	DRAWING NO. 10	



G TYP FIRE HYDRANT DETAIL GRASSY AREAS
NO SCALE

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	FIRE HYDRANT DETAIL GRASSY AREAS	DATE 6-26-13	DRAWING NO. 11	

SUNRISE ENGINEERING

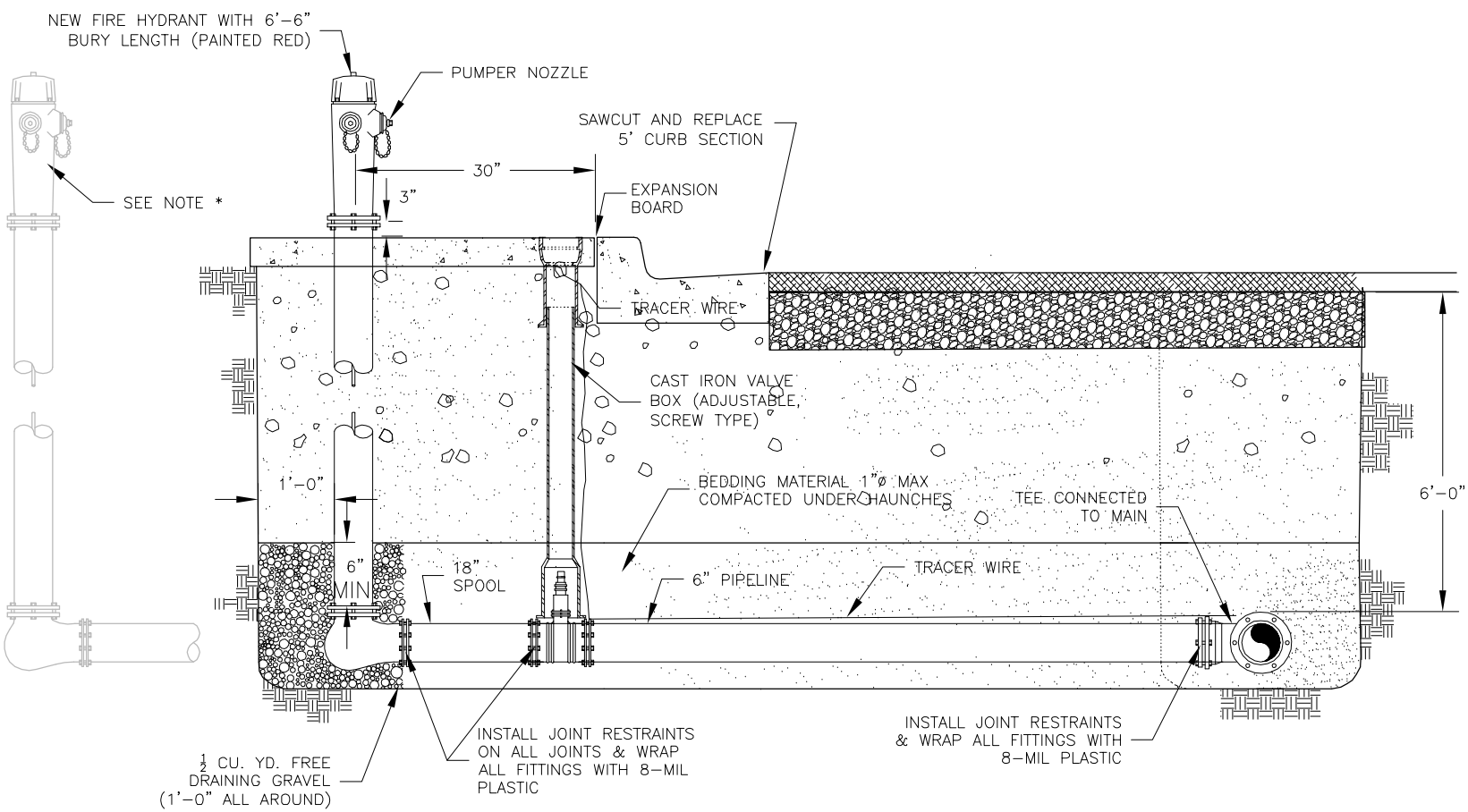
TOWN OF AFTON

STANDARD DRAWINGS & SPECIFICATIONS

FIRE HYDRANT DETAIL WASHINGTON

DESIGNED	DATE	DRAWING NO.
SEI	6-26-13	12

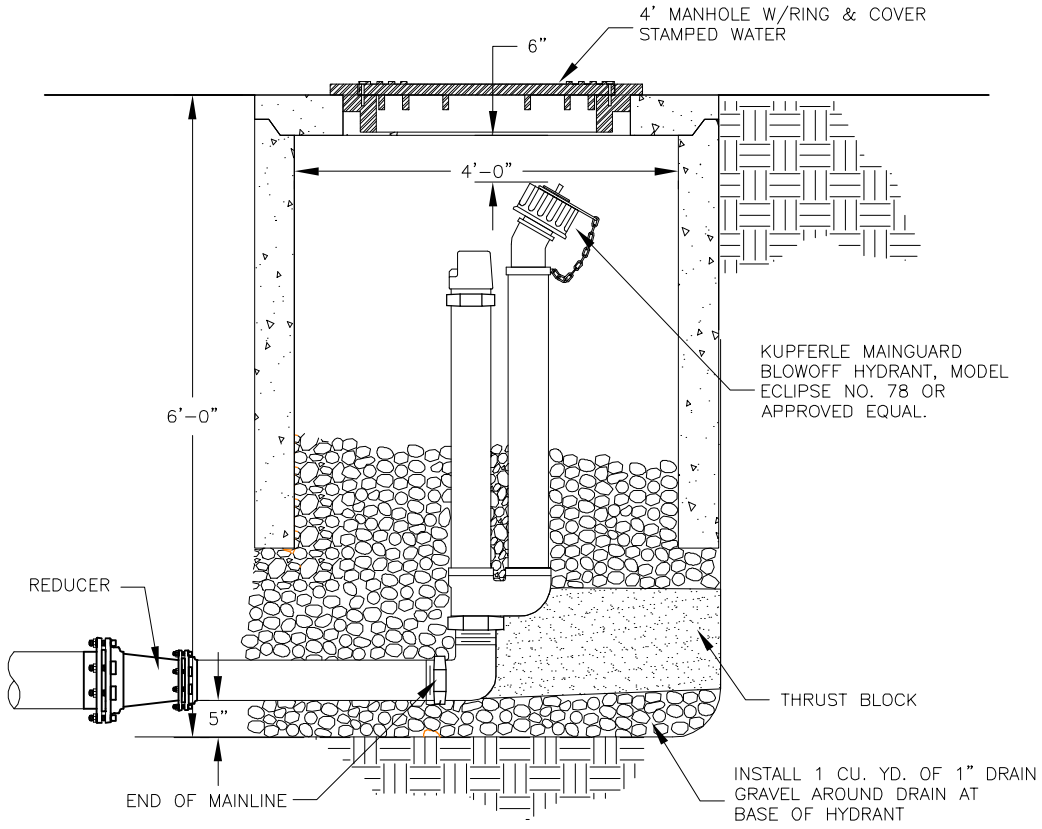
CHECKED: EJS



*NOTE: IF SIDEWALK IS NARROWER THAN 6', PLACE HYDRANT 12" BEHIND SIDEWALK.

F TYP FIRE HYDRANT DETAIL SIDEWALK AREAS

NO SCALE



~ TYP BLOWOFF HYDRANT
NOT TO SCALE

GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN CITY EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.

2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.

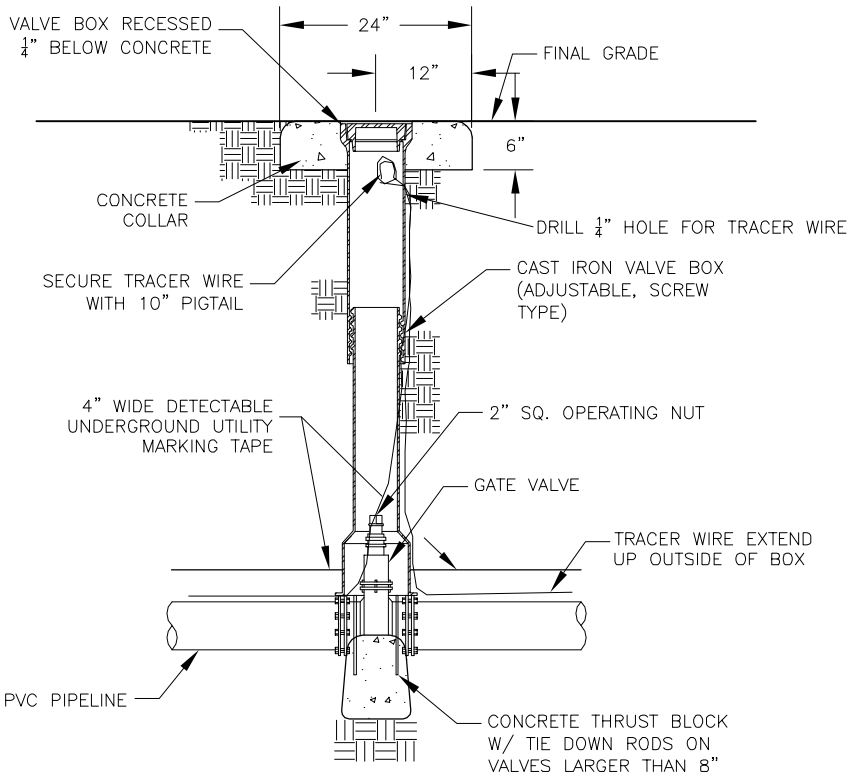
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.

4. ALL CONSTRUCTION SHALL CONFORM TO WYOMING PUBLIC WORKS STANDARDS AND TOWN OF AFTON STANDARDS AND ALL APPLICABLE REQUIREMENTS OF THE STATE OF WYOMING, DEPARTMENT OF ENVIRONMENTAL QUALITY. CONSTRUCTION WILL BE SUBJECT TO INSPECTION BY, BUT NOT LIMITED TO, TOWN OF AFTON AND DEQ.

5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED TESTING LAB.

6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	FLUSH HYDRANT	DATE 6-26-13	DRAWING NO. 13	



A TYP TYPICAL VALVE DETAIL
NO SCALE

GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN TOWN EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
4. ALL CONSTRUCTION SHALL CONFORM TO WYOMING PUBLIC WORKS STANDARDS AND ALL APPLICABLE REQUIREMENTS OF THE STATE OF WYOMING, DEPARTMENT OF ENVIRONMENTAL QUALITY. CONSTRUCTION WILL BE SUBJECT TO INSPECTION BY, BUT NOT LIMITED TO, BOTH TOWN OF AFTON AND DEQ.
5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED TESTING LAB.
6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.
7. VALVE BOX AND OPERATING NUT EXTENSION MAY BE NECESSARY IF VALVE IS INSTALLED DEEPER THAN 5 FEET.
8. 500 FT. MAXIMUM SPACING FOR ALL VALVES IN COMMERCIAL DISTRICTS AND 800' IN RESIDENTIAL AREAS.
9. CONTRACTOR SHALL PROVIDE:
   2 ADJUSTABLE VALVE WRENCHES,
   2 HYDRANT WRENCHES PER PHASE OF DEVELOPMENT
10. VALVES SHALL BE INSTALLED ON ALL LEGS OF TEES AND CROSSES.

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	TYPICAL GATE VALVE DETAIL	DATE 6-26-13	DRAWING NO. 14	

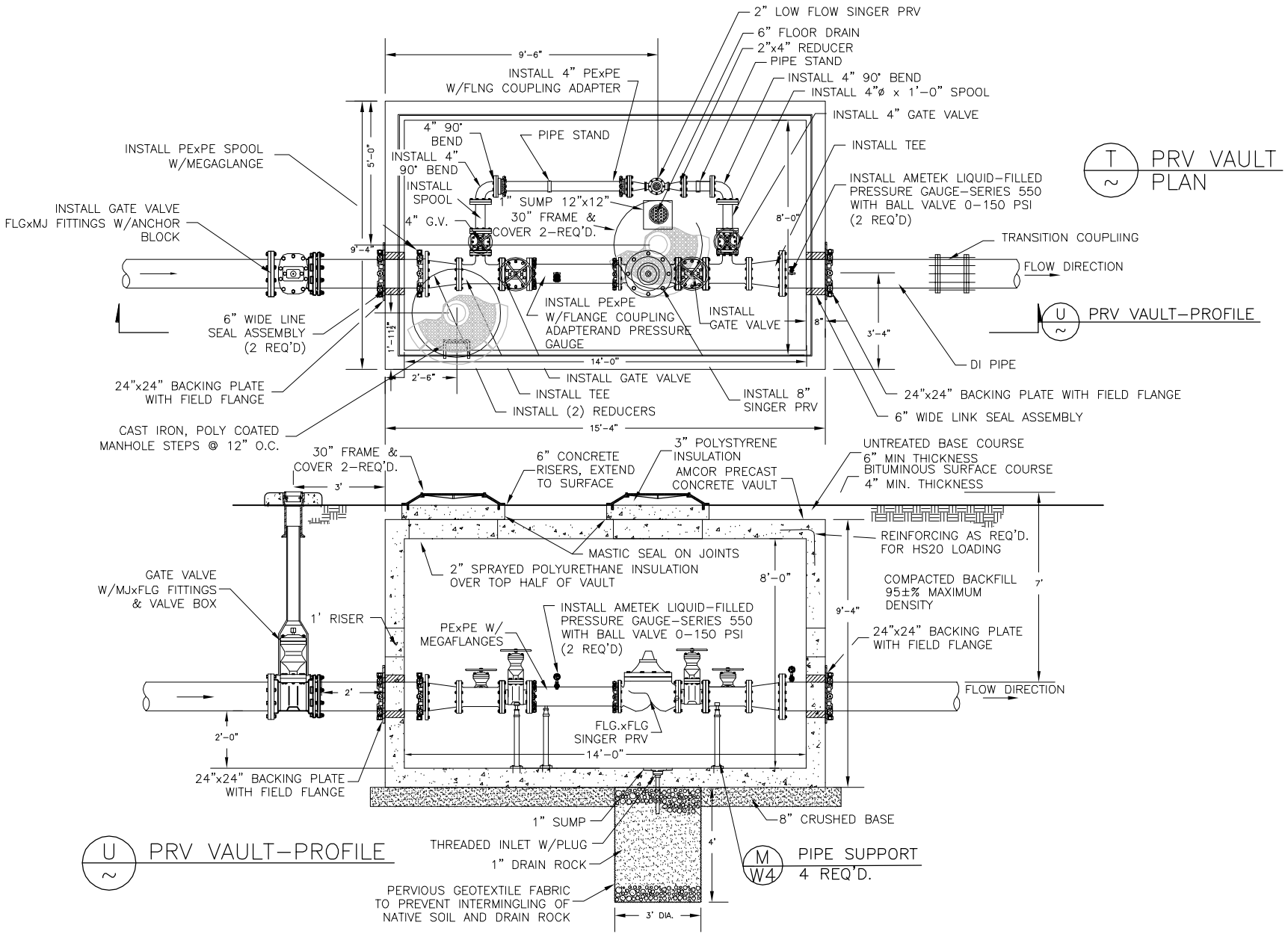
SUNRISE ENGINEERING

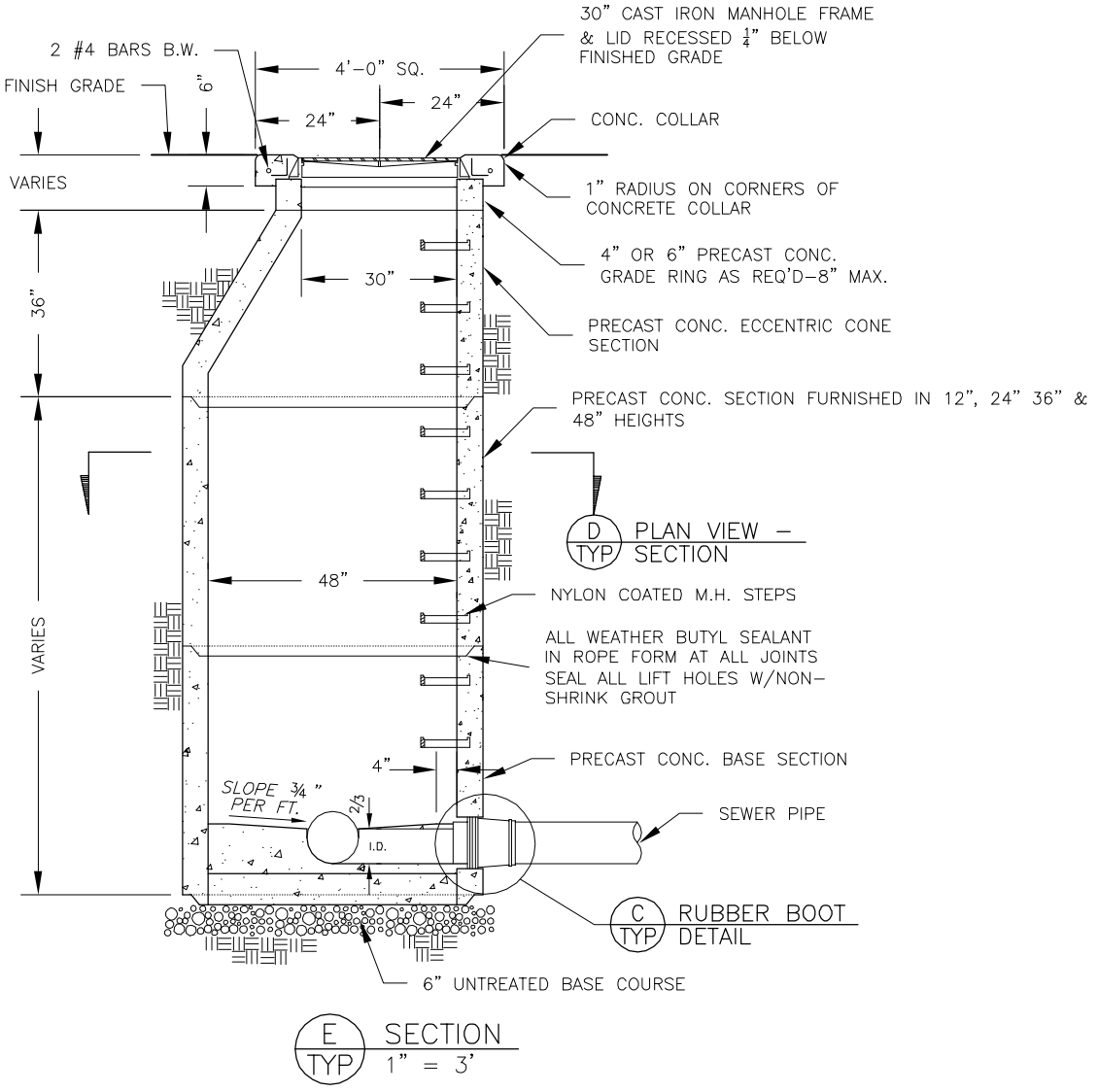
STANDARD DRAWINGS & SPECIFICATIONS

PRV VAULT

DESIGNED	DRAWN	CHECKED
SEI	EJS	
DATE	DRAWING NO.	
6-26-13	15	

TOWN OF AFTON





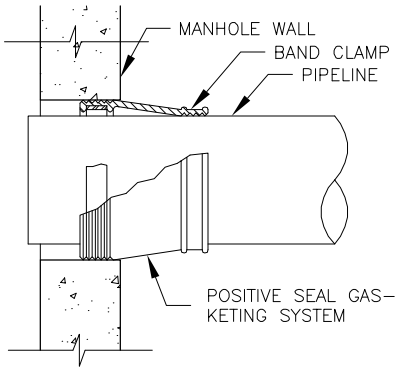
CONSTRUCTION NOTES:

1. ALL MANHOLE FLOW LINES SHALL BE CONSTRUCTED TO PROVIDE SMOOTH FLOW-THROUGH CHARACTERISTIC.
2. JOINTS, ETC., THAT MUST BE GROUTED, SHALL BE "DRY PACKED" WITH A NON-SHRINKING, NON-METALLIC, TYPE GROUT SUCH AS THORITE (STANDARD DRYWALL PRODUCTS INC.) OR EQUAL.
3. MATCH TOP OF PIPES WHEN THE INLET IS SMALLER IN DIAMETER THAN THE OUTLET OR AS DIRECTED BY THE CITY ENGINEER.
4. MAXIMUM SPACING BETWEEN MANHOLES SHALL BE 400 FEET OR AS DIRECTED BY THE CITY ENGINEER.
5. FLOW LINE OF OUTLET PIPE SHALL BE 0.10 FT. BELOW FLOW LINE OF SAME SIZE INLET PIPE.
6. GRADE RING HEIGHT SHALL NOT EXCEED 8".

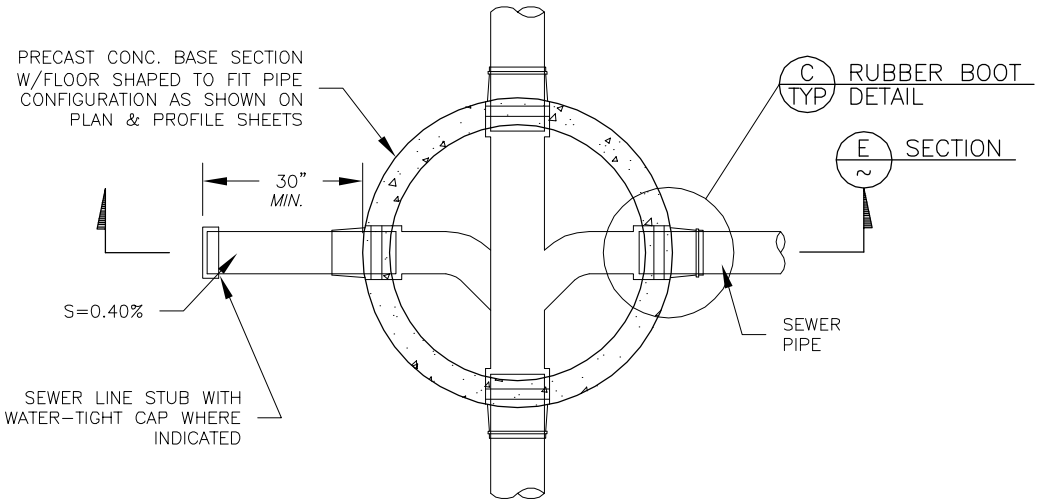
GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN CITY EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE IDAHO WYOMING HEALTH AND SAFETY COMMISSION.
4. ALL CONSTRUCTION SHALL CONFORM TO WYOMING PUBLIC WORKS STANDARDS, THE TOWN OF AFTON, AND ALL APPLICABLE REQUIREMENTS OF THE STATE OF WYOMING, DEPARTMENT OF ENVIRONMENTAL QUALITY. CONSTRUCTION WILL BE SUBJECT TO INSPECTION BY, BUT NOT LIMITED TO, BOTH THE TOWN AND DEQ.
5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED TESTING LAB.
6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	MANHOLE SECTION	DATE 6-26-13	DRAWING NO. 16	



C TYP RUBBER BOOT DETAIL
NO SCALE



D TYP PLAN – MANHOLE
1" = 3'

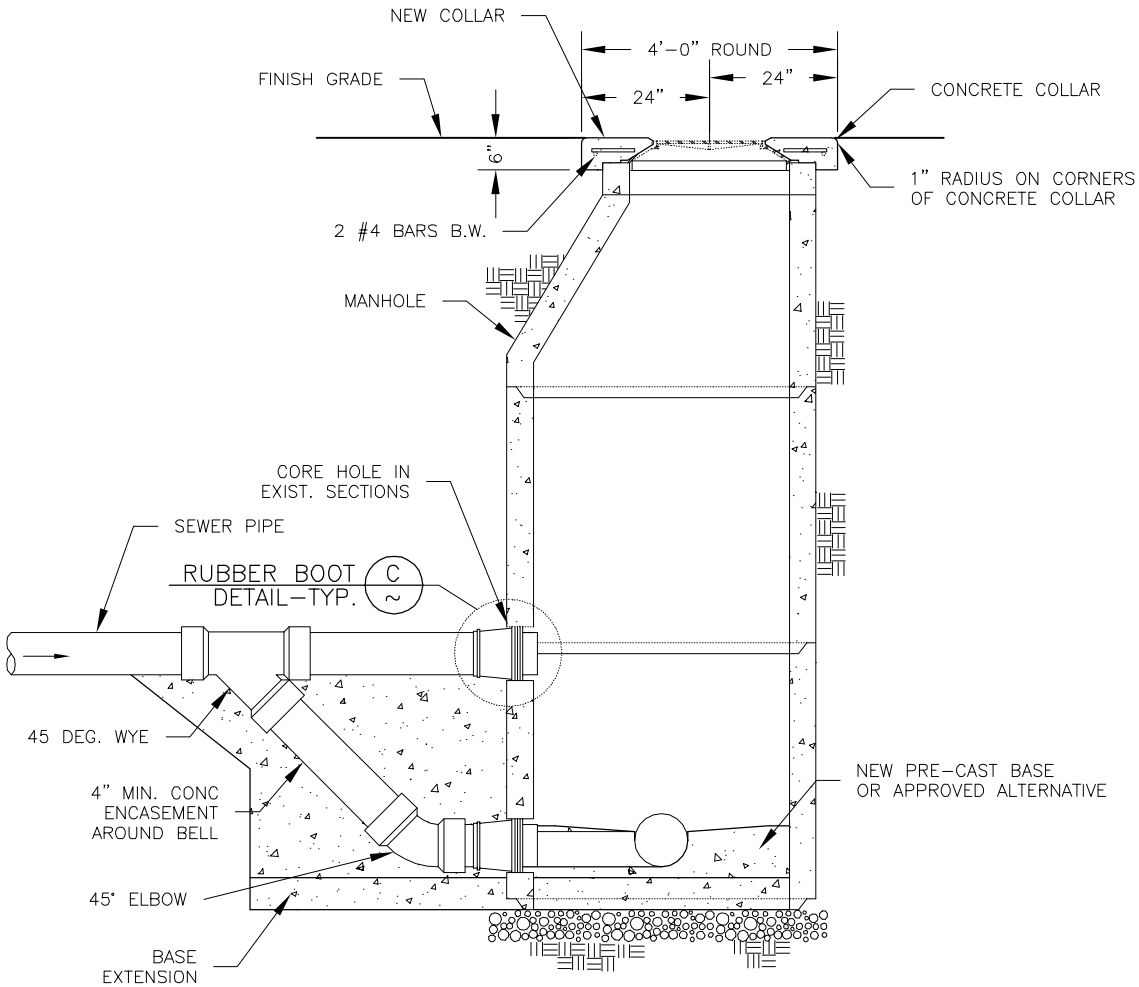
CONSTRUCTION NOTES:

1. ALL MANHOLE FLOW LINES SHALL BE CONSTRUCTED TO PROVIDE SMOOTH FLOW-THROUGH CHARACTERISTIC.
2. JOINTS, ETC., THAT MUST BE GROUTED, SHALL BE "DRY PACKED" WITH A NON-SHRINKING, NON-METALLIC, TYPE GROUT SUCH AS THORITE (STANDARD DRYWALL PRODUCTS INC.) OR EQUAL.
3. MATCH TOP OF PIPES WHEN THE INLET IS SMALLER IN DIAMETER THAN THE OUTLET OR AS DIRECTED BY THE CITY ENGINEER.
4. MAXIMUM SPACING BETWEEN MANHOLES SHALL BE 400 FEET OR AS DIRECTED BY THE TOWN ENGINEER.
5. FLOW LINE OF OUTLET PIPE SHALL BE 0.10 FT. BELOW FLOW LINE OF SAME SIZE INLET PIPE.

GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN CITY EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
4. ALL CONSTRUCTION SHALL CONFORM TO WYOMING PUBLIC WORKS STANDARDS THE TOWN OF AFTON STANDARDS AND ALL APPLICABLE REQUIREMENTS OF THE STATE OF WYOMING, DEPARTMENT OF ENVIRONMENTAL QUALITY. CONSTRUCTION WILL BE SUBJECT TO INSPECTION BY, BUT NOT LIMITED TO, BOTH THE TOWN AND DEQ.
5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED TESTING LAB.
6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	MANHOLE PLAN & RUBBER BOOT	DATE 6-26-13	DRAWING NO. 17	



D ~ DROP MANHOLE
1" = 3'-0"

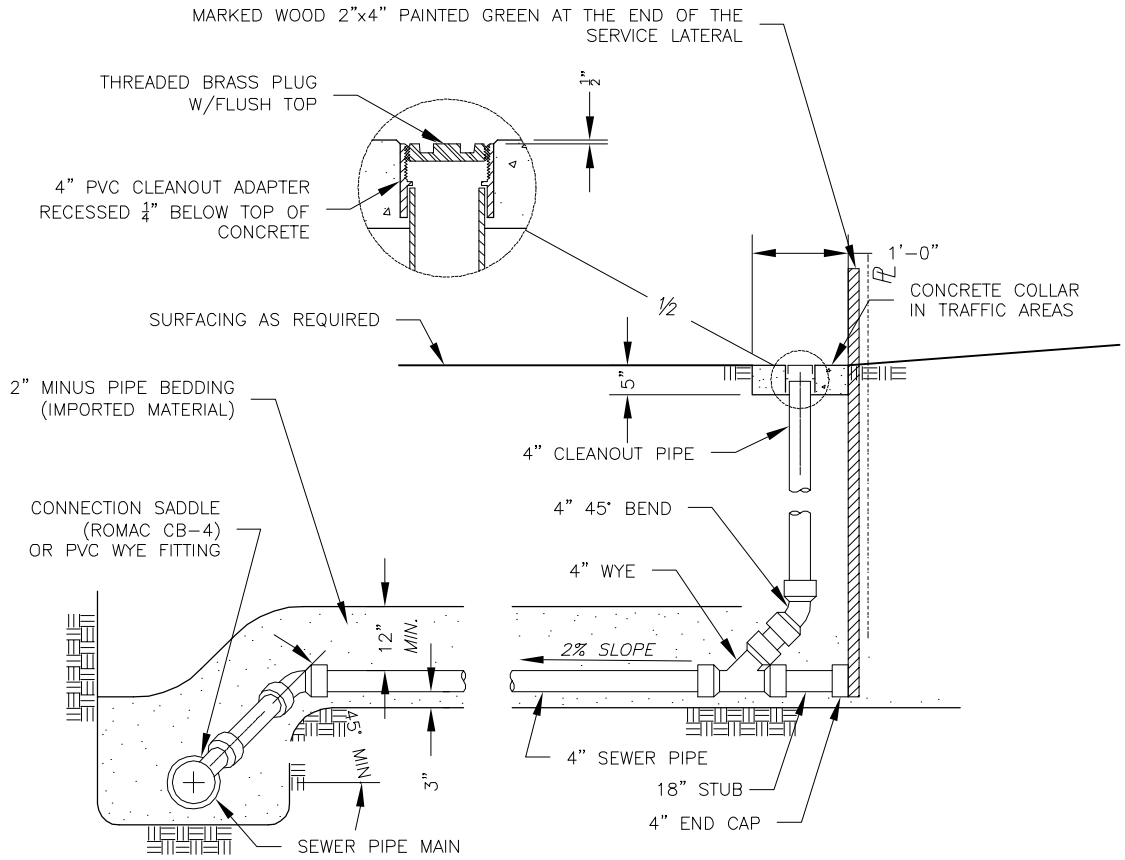
CONSTRUCTION NOTES:

1. ALL MANHOLE FLOW LINES SHALL BE CONSTRUCTED TO PROVIDE SMOOTH FLOW-THROUGH CHARACTERISTIC.
2. ALL CONCRETE PIPES (24" OR LESS IN DIA.) CONNECTED TO MANHOLES SHALL HAVE A BELL AND SPIGOT JOINT LOCATED WITHIN 24" OF THE OUTSIDE WALL OF STRUCTURE. THIS PROTRUDING PORTION OF PIPE SHALL BE SUPPORTED WITH CONCRETE UP TO, BUT NOT INCLUDING THE JOINT.
3. ALL SURFACES (AGAINST WHICH CONCRETE OR GROUT IS TO BE PLACED) SHALL FIRST BE COATED WITH AN EPOXY BONDING AGENT SUCH AS SONNO BOND (SONNE BORN CO.) PROBOND EPOXY ET-150 (PROTEX INDUSTRIES CO.) OR EQUAL.
4. JOINTS, ETC., THAT MUST BE GROUTED, SHALL BE "DRY PACKED" WITH A NON-SHRINKING, NON-METALLIC, TYPE GROUT SUCH AS THORITE (STANDARD DRY WALL PRODUCTS INC.) OR EQUAL.
5. ALL BROKEN PIPE FACES TO BE SMOOTHED OFF WITH GROUT.
6. FLOW LINE OF OUTLET PIPE SHALL BE 0.10 FT. BELOW FLOW LINE OF SAME SIZE INLET PIPE. IF PIPE IS INSTALLED THROUGH MANHOLE WITHOUT ANY JOINTS, PIPES CAN BE INSTALLED AT AT DESIGN GRADE.
7. MATCH TOP OF PIPES WHEN THE INLET IS SMALLER IN DIAMETER THAN THE OUTLET OR AS DIRECTED BY THE TOWN ENGINEER.
8. IF NEW PIPE IS CONCRETE, A SUPPORT BLOCK IS REQUIRED TO THE NEXT JOINT PAST THE CONCRETE BONDED JOINT.
9. GRADE RING HEIGHT SHALL NOT EXCEED 8".

GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN CITY EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
4. ALL CONSTRUCTION SHALL CONFORM TO CITY OF WYOMING PUBLIC WORKS STANDARDS, TOWN OF AFTON STANDARDS AND ALL APPLICABLE REQUIREMENTS OF THE STATE OF WYOMING, DEPARTMENT OF ENVIRONMENTAL QUALITY. CONSTRUCTION WILL BE SUBJECT TO INSPECTION BY, BUT NOT LIMITED TO, BOTH THE TOWN AND DEQ.
5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED TESTING LAB.
6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	DROP MANHOLE	DATE 6-26-13	DRAWING NO. 18	



TYP ~ TYP. SEWER SERVICE LATERAL
NOT TO SCALE

CONSTRUCTION NOTES:

1. WHEN A PRE-MANUFACTURED TAP OR TEE IS USED, THE CONNECTION SHALL BE LOCATED WITHIN THE LIMITS OF SERVICE CONNECTION SHOWN ON THESE DRAWINGS.
2. CLEANOUTS SHALL BE 5'-0" FROM FOUNDATION AND EVERY 100' OF SERVICE AND AT ANY BEND OVER 45°. CLEANOUTS SHALL NOT BE LOCATED IN PUBLIC RIGHT-OF-WAY WITHOUT WRITTEN PERMISSION OF THE CITY ENGINEER.
3. ALL NEW SEWER TAPS SHALL BE FIELD INSTALLED AS SPECIFIED IN THE STANDARD SPECIFICATIONS AND THESE DRAWINGS AT THE TIME OF MAINLINE INSTALLATION.
4. WHEN A RESIDENTIAL USER PLANS TO HAVE A SEWERED BASEMENT, HE SHALL INSTALL A BACKFLOW PREVENTION DEVICE ON THE SERVICE LINE AND SHALL BE RESPONSIBLE FOR MAINTAINING THAT DEVICE.
5. SEWER MAINS SHALL NOT BE SHALLOWER THAN 9 FEET UNLESS AUTHORIZED BY THE TOWN.

GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
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6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.
7. CITY REPRESENTATIVE OR CITY ENGINEER SHALL INSPECT ALL SERVICE CONNECTIONS.
8. STAMP S IN CURB WHERE LATERAL CROSSES CURB AND GUTTER.

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	SEWER SERVICE LATERAL	DATE 6-26-13	DRAWING NO. 19	

SUNRISE ENGINEERING

STANDARD DRAWINGS & SPECIFICATIONS

GREASE TRAP

DESIGNED	CHECKED
SEI	JJL
DATE	DRAWING NO.
6-26-13	20

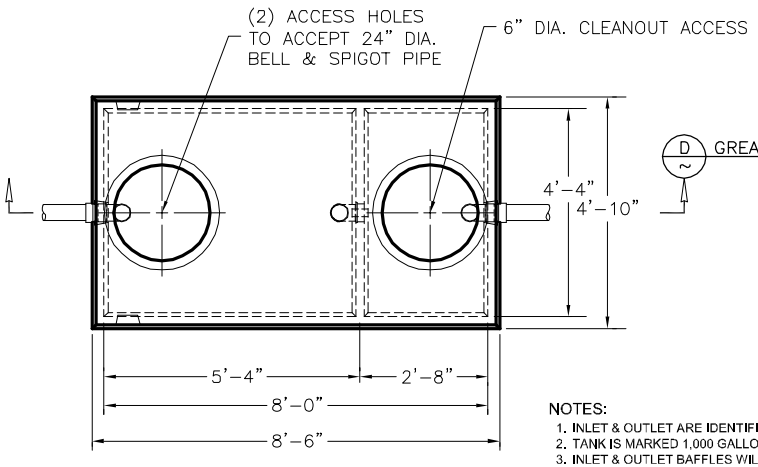
TOWN OF AFTON

DETAIL DRAWING FOR:

1,000 GALLON (3,785L) GREASE INTERCEPTOR
LOW PROFILE(NON TRAFFIC RATED)

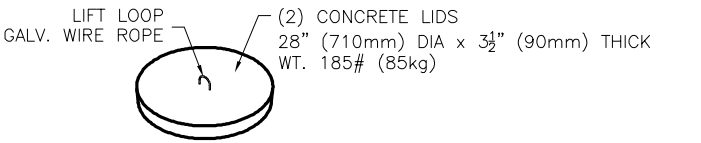
© **OLDCASTLE PRECAST, Inc.**
IDAHO FALLS, ID

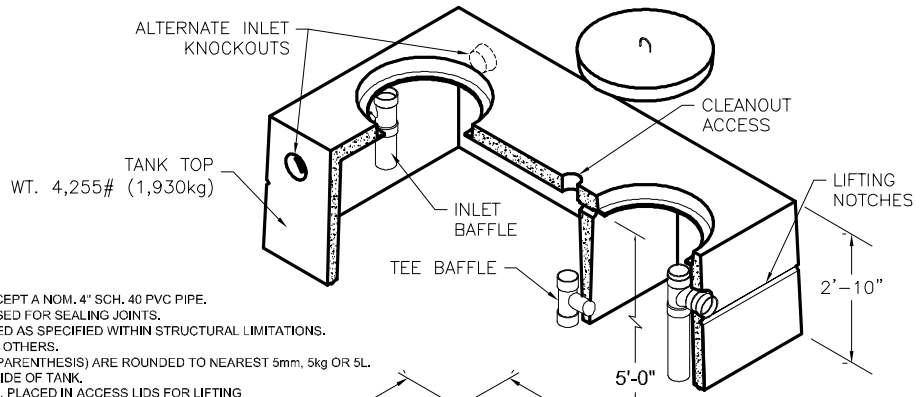
(2) CONCRETE LIDS
28" (710mm) DIA x 3 1/2" (90mm) THICK
WT. 185# (85kg)



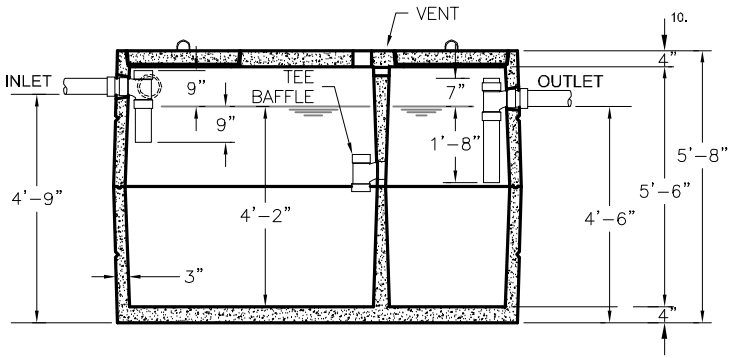
PLAN VIEW

D GREASE INTERCEPTOR-1000 GAL.

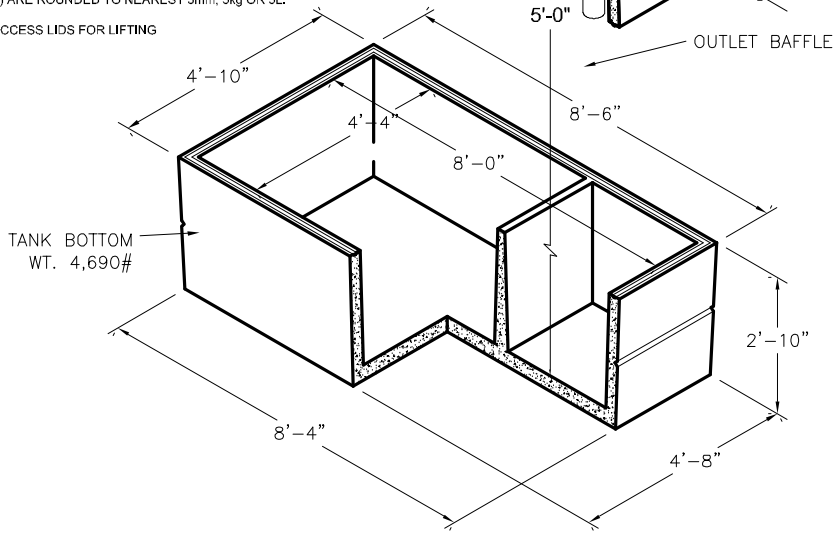




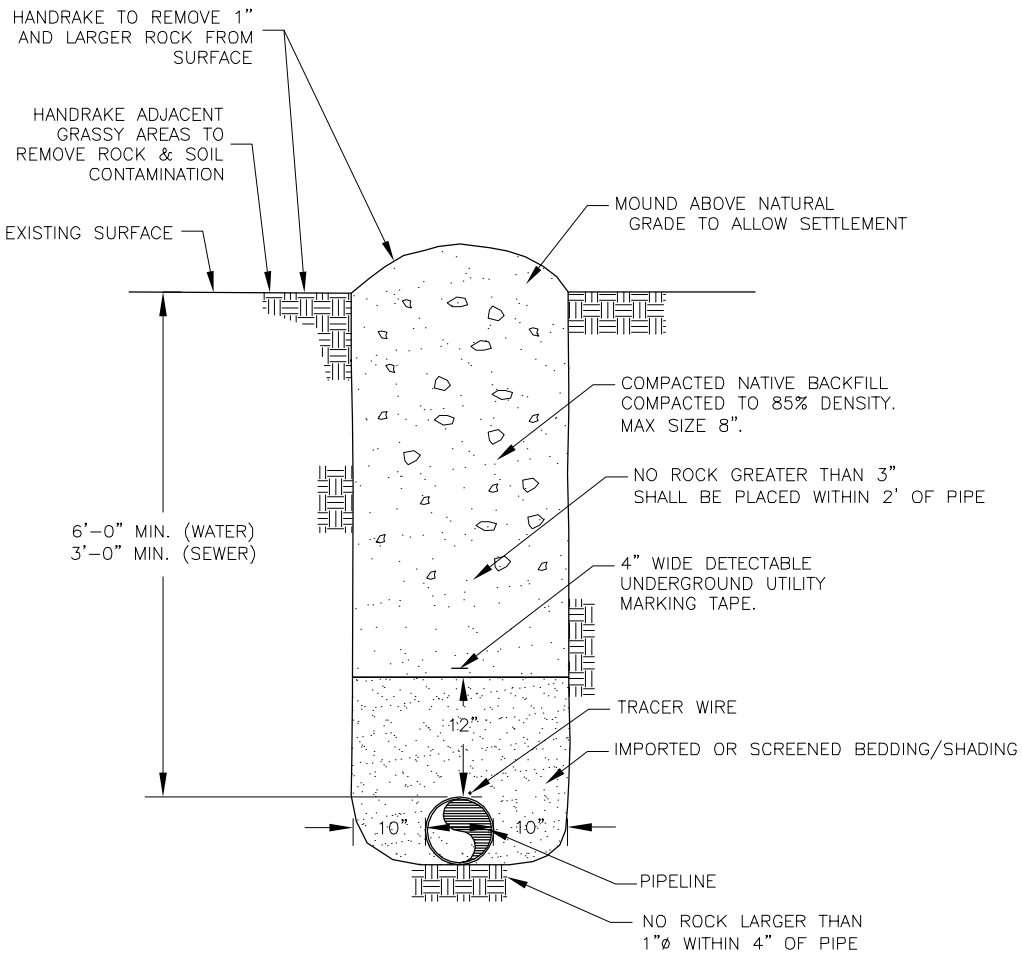
NOTES:
1. INLET & OUTLET ARE IDENTIFIED.
2. TANK IS MARKED 1,000 GALLON.
3. INLET & OUTLET BAFFLES WILL ACCEPT A NOM. 4" SCH. 40 PVC PIPE.
4. 1 1/2" x 3'-6" STRIPS OF RAM-NEK USED FOR SEALING JOINTS.
5. OPENINGS MAY BE SIZED & LOCATED AS SPECIFIED WITHIN STRUCTURAL LIMITATIONS.
6. BAFFLES ARE TO BE INSTALLED BY OTHERS.
7. METRIC EQUIVALENTS (SHOWN IN PARENTHESIS) ARE ROUNDED TO NEAREST 5mm, 5kg OR 5L.
8. PLACE OLDCASTLE LOGO ON OUTSIDE OF TANK.
9. .306 DEFORMED GALVANIZED WIRE, PLACED IN ACCESS LIDS FOR LIFTING DESIGNED FOR 3'-0" MAX BURY.



SECTION VIEW



GENERAL NOTES: TANK SIZES MUST BE APPROVED BY THE TOWN.



B TYP TRENCH DETAIL GRASSY AREAS

NO SCALE

GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN TOWN EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
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5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED MATERIALS TESTING LAB.
6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.
7. SEWER PIPE INSTALLED WITH LESS THAN MINIMUM COVER SHALL HAVE FROST AND STRUCTURAL PROTECTION APPROVED BY THE TOWN.

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	TRENCH DETAIL GRASSY AREAS	DATE 6-26-13	DRAWING NO. 21	

SUNRISE ENGINEERING

TOWN OF AFTON

STANDARD DRAWINGS & SPECIFICATIONS

TRENCH DETAIL UNDER ROADWAYS

DESIGNED	DATE	DRAWING NO.
SEI	6-26-13	22

CHECKED
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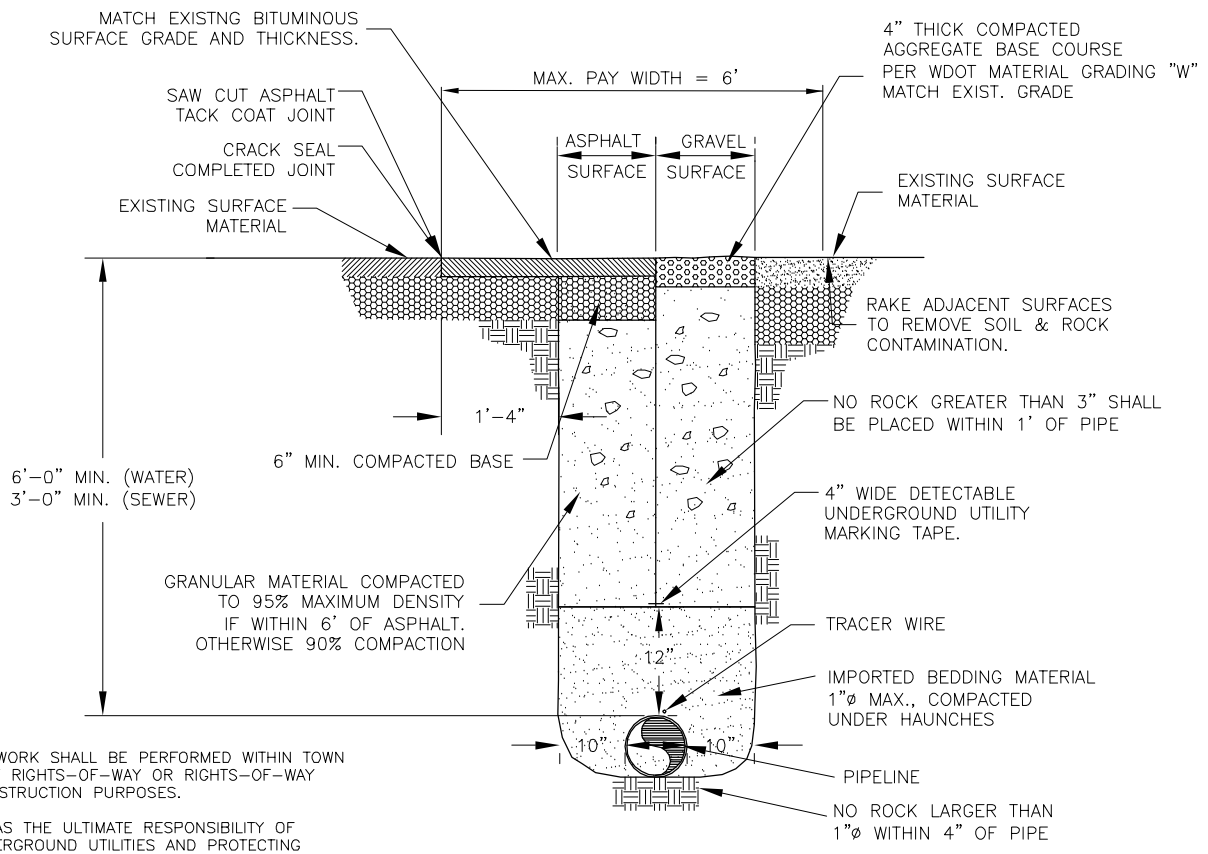

C TYP — TRENCH DETAIL PARALLEL TO ROADWAYS

NO SCALE

GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN TOWN EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
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7. SEWER PIPE INSTALLED WITH LESS THAN MINIMUM COVER SHALL HAVE FROST AND STRUCTURAL PROTECTION APPROVED BY THE TOWN.

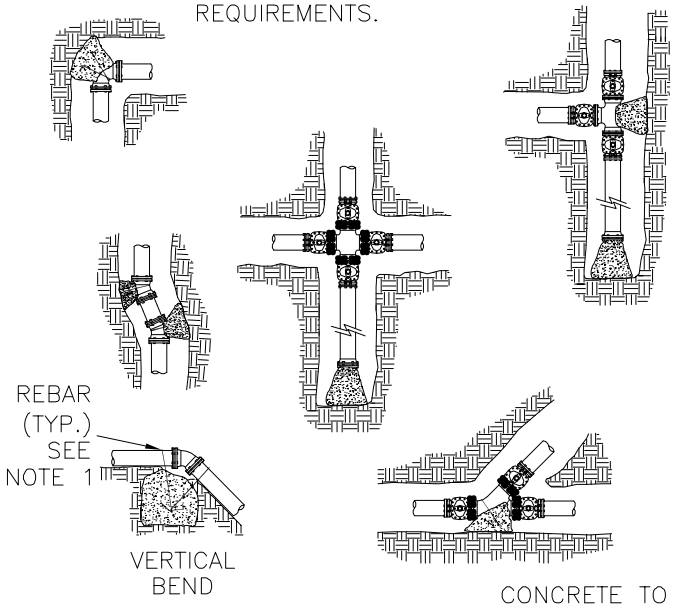
STREET DESIGN NOTES:

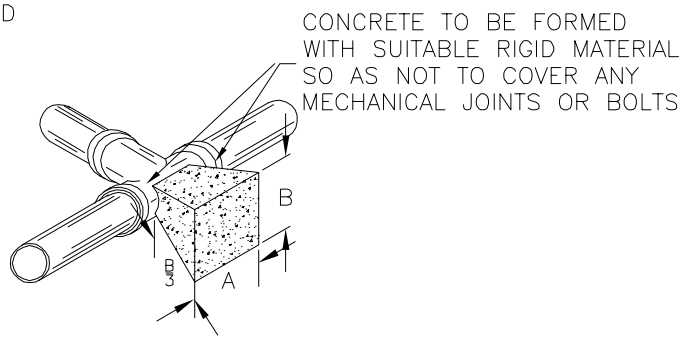
1. 80' ROW FOR ALL STREETS.
2. PAVED WIDTH OF ALL STREETS SHALL BE 24 FEET MINIMUM. GRADED WIDTH OF ALL STREETS SHALL BE 40 FEET.
3. 10" COARSE AGGREGATE SUB-BASE (MIN.)
   6" CRUSHED COARSE A.B. (MIN.)
   3" ASPHALT WITH 2% CROWN SLOPE (MIN.)
4. PARABOLIC DRAINAGE AND SNOW STORAGE SHALL BE PROVIDED ALONG ALL STREETS. DRAINAGE WAYS SHALL RESEEDED AFTER CONSTRUCTION.
5. MAXIMUM GRADE OF ALL STREETS IS EIGHT PERCENT (8%).
6. ADDITIONAL SUB-BASE (UP TO 24") MAY BE REQUIRED IF SUITABLE SUBGRADE MATERIAL IS NOT ENCOUNTERED.

THRUST BLOCKS

1. #4 REBAR REQ'D AS SHOWN. REBAR SHALL RECEIVE A BITUMINOUS COAL TAR BASE–COATING.

2. SEE STANDARD DRAWING BELOW FOR THRUST BLOCK AREA REQUIREMENTS.





NOTE: THIS TABLE IS BASED ON 150 PSI MAIN PRESSURE, 2000 PSF SOIL BEARING PRESSURE. CONCRETE BLOCKING MUST CURE FOR 24 HOURS PRIOR TO CHARGING SYSTEM.

DIMENSION FOR THRUST BLOCKING								
FITTING SIZES	*TEES & PLUGS*		*90° BEND*		*45° BEND & WYES*		*REDUCERS & 22–1/2° BEND*	
	A	*B*	*A*	*B*	*A*	*B*	*A*	*B*
4"	*1'–7"*	*1'–2"*	*1'–9"*	*1'–6"*	*1'–8"*	*0'–10"*	*1'–7"*	*0–6"*
6"	*2'–0"*	*1'–11"*	*2'–5"*	*2'–2"*	*1'–10"*	*1'–7"*	*1'–9"*	*0–10"*
8"	*2'–8"*	*2'–6"*	*3'–2"*	*3'–0"*	*2'–5"*	*2'–1"*	*1'–9"*	*1'–6"*
10"	*3'–4"*	*3'–3"*	*4'–0"*	*3'–10"*	*3'–0"*	*2'–9"*	*2'–2"*	*1'–11"*
12"	*4'–0"*	*3'–10"*	*4'–8"*	*4'–8"*	*3'–8"*	*3'–3"*	*2'–7"*	*2'–3"*

SUNRISE ENGINEERING

STANDARD DRAWINGS & SPECIFICATIONS

THRUST BLOCK DETAIL

DESIGNED	*CHECKED*
SEI	*EJS*
DATE	*DRAWING NO.*
6-26-13	*23*

TOWN OF AFTON

BASED ON:
TEST PRESSURE 200 PSI
SOIL TYPE: GM – SILTY GRAVEL, GRAVEL–SAND–SILT MIXTURE
BURIAL DEPTH: 4 FT.
TRENCH TYPE: 5 – PIPE BEDDED IN COMPACTED GRANULAR MATERIAL TO THE CENTER LINE OF PIPE, 4" MIN. UNDER PIPE. COMPACTED GRANULAR % STANDARD PROCTOR, AASHTO T–99) OR SELECT MATERIAL TO TOP OF PIPE. (APPROX. 90
SAFETY FACTOR: 1.5

NOTE
CONTRACTOR SHALL USE EITHER MECHANICAL JOINT RESTRAINT OR CONCRETE THRUST RESTRAINING SYSTEM FOR THE ENTIRE PROJECT.

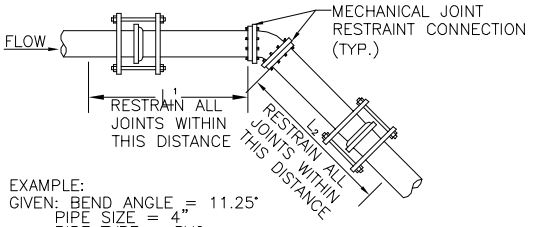
MECHANICAL JOINT THRUST RESTRAINING SYSTEM DETAILS

* CALCULATIONS DERIVED FROM EBAA IRON SALES

PVC VERTICLE BEND RESTRAINED LENGTHS IN FT. (L_1,–BEFORE CONNECTION/L_2, AFTER CONNECTION)

BEND ANGLE	PIPE SIZE									
	4	6	8	10	12	14	16	18	20	24
11.25	4/1	5/2	7/2	9/3	10/3	12/4	13/4	15/5	16/5	19/6
22.5	8/3	11/4	15/5	17/6	21/7	24/8	27/9	30/9	33/10	38/12
45	16/5	23/8	30/10	36/12	43/14	49/16	56/18	62/20	68/21	79/25

CALCULATIONS BASED ON THE ELEVATION OF THE PIPE REMAINING CONSTANT WITH THE CONTOUR OF THE GROUND.
FOR TWO WAY FLOW, SUCH AS FOUND IN DISTRIBUTION SYSTEMS, USE L_1 ON BOTH SIDES OF FITTING.



EXAMPLE:
GIVEN: BEND ANGLE = 11.25°
PIPE SIZE = 4"
PIPE TYPE = PVC
L_1 = 4'
L_2 = 1'

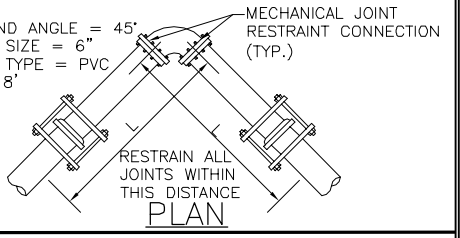
ELEVATION

PVC HORIZONTAL BEND RESTRAINED LENGTHS L, IN FT.

BEND ANGLE	PIPE SIZE									
	4	6	8	10	12	14	16	18	20	24
11.25	1	2	2	3	3	4	4	5	5	6
22.5	3	4	5	6	7	8	9	9	10	12
45	5	8	10	12	14	16	18	20	21	25
90	13	18	24	29	34	38	43	47	52	60

1. ALL JOINTS WITHIN THE "L" DISTANCE SHALL BE RESTRAINED

EXAMPLE:
GIVEN: BEND ANGLE = 45°
PIPE SIZE = 6"
PIPE TYPE = PVC
L = 8'



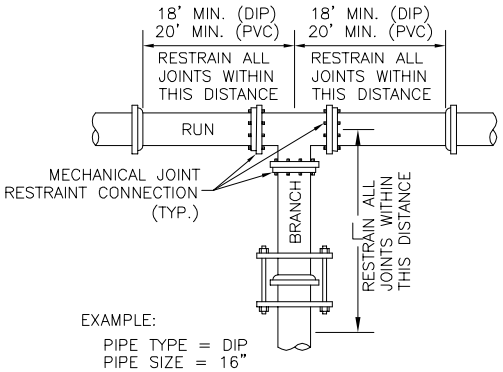
PLAN

PVC TEE RESTRAINED LENGTHS L, IN FT.

BRANCH SIZE DIA.	RUN SIZE DIAMETER									
	4	6	8	10	12	14	16	18	20	24
4	*	*	*	*	*	*	*	*	*	*
6	–	*	*	*	*	*	*	*	*	*
8	–	–	*	*	*	*	*	*	*	*
10	–	–	–	*	*	*	*	*	*	*
12	–	–	–	–	*	*	*	*	*	*
14	–	–	–	–	–	*	*	*	*	*
16	–	–	–	–	–	–	7	*	*	*
18	–	–	–	–	–	–	–	20	4	*
20	–	–	–	–	–	–	–	–	34	3
24	–	–	–	–	–	–	–	–	–	60

* = FOR THIS CONDITION NEED ONLY RESTRAIN THE OUTLETS OF TEE

NOTES:
1. RESTRAIN THE THREE MECHANICAL JOINTS ON THE TEE.
2. ALL JOINTS WITHIN THE "L" DISTANCE ON THE BRANCH SIDE OF TEE SHALL BE RESTRAINED AND ALL JOINTS WITHIN 18' ON THE RUN SIDE OF THE TEE SHALL BE RESTRAINED.



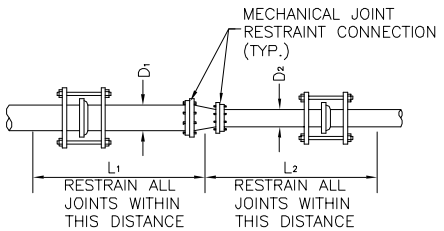
EXAMPLE:
PIPE TYPE = DIP
PIPE SIZE = 16"
L = 12'

PLAN

PVC REDUCER RESTRAINED LENGTHS L, IN FT. (SMALL SIDE/LARGE SIDE)

D2 \ D1	6	8	10	12	14	16	18	20	24
4	42/29	100/52	171/71	258/90	–	–	–	–	–
6	–	40/31	88/54	147/75	217/95	297/113	–	–	–
8	–	–	37/29	82/55	135/77	197/98	266/117	–	–
10	–	–	–	36/30	79/56	128/80	183/100	244/120	–
12	–	–	–	–	36/30	77/57	123/80	174/102	293/142
14	–	–	–	–	–	35/30	74/57	118/81	219/124
16	–	–	–	–	–	–	34/30	73/57	161/104
18	–	–	–	–	–	–	–	34/30	111/82
20	–	–	–	–	–	–	–	–	70/57

1. ALL JOINTS WITHIN THE "L" DISTANCE SHALL BE RESTRAINED

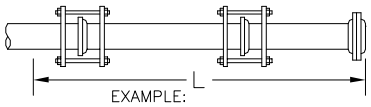


EXAMPLE:
PIPE TYPE = PVC
D_1 = 8"
D_2 = 6"
L_1 = 31'
L_2 = 40'

PVC DEAD END RESTRAINED LENGTHS L, IN FT.

PIPE SIZE									
4	6	8	10	12	14	16	18	20	24
39	55	73	88	104	119	134	149	163	192

1. ALL JOINTS WITHIN THE "L" DISTANCE SHALL BE RESTRAINED



EXAMPLE:
PIPE TYPE = DIP
PIPE SIZE = 10"
L = 57'

SUNRISE ENGINEERING

STANDARD DRAWINGS & SPECIFICATIONS

CONCRETE THRUST BLOCK RESTRAINING SYSTEM

DESIGNED	CHECKED
SEI	JJL
DATE	DRAWING NO.
6-26-13	24

TOWN OF AFTON

SUNRISE ENGINEERING

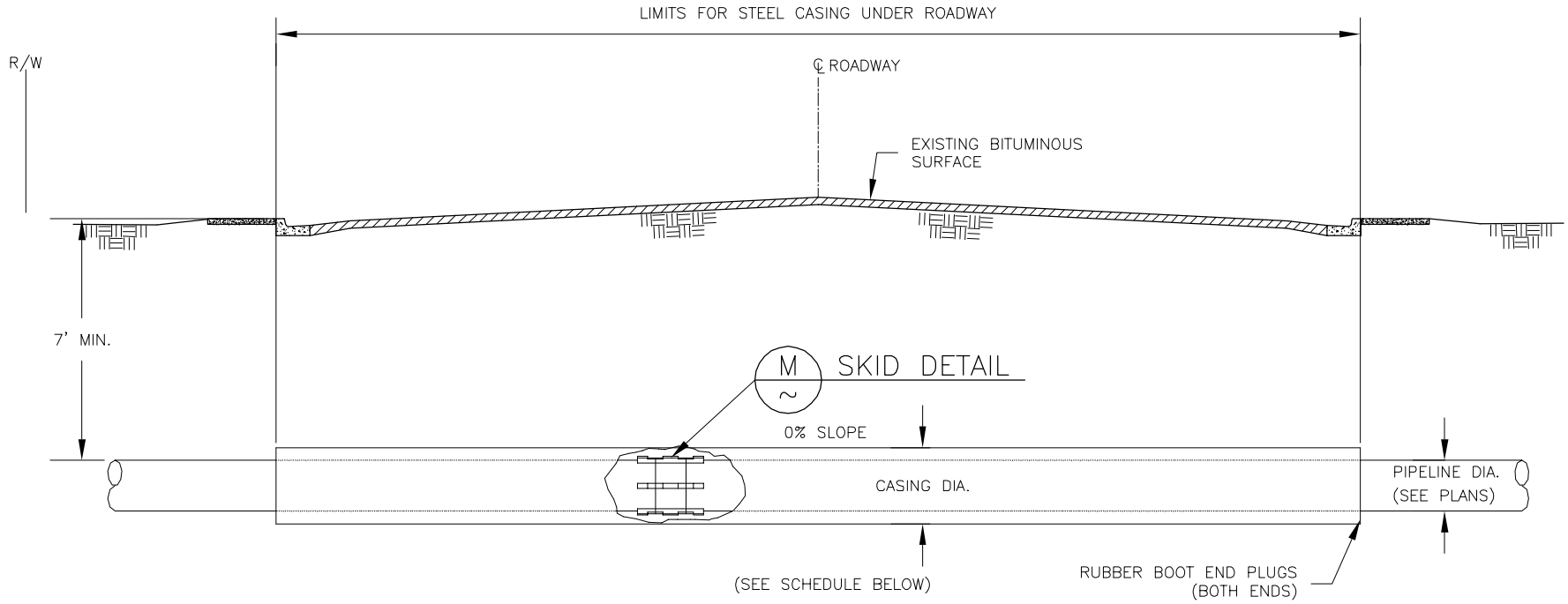
TOWN OF AFTON

STANDARD DRAWINGS & SPECIFICATIONS

CASING UNDER HIGHWAY 89

DESIGNED SEI | DATE 6-26-13

CHECKED EJS | DRAWING NO. 25



PIPELINE DIA.	CASING DIA.	CASING WALL THICKNESS
4"	10"	.2500"
6"	12"	.3125"
8"	14"	.3125"
10"	16"	.3125"
12"	18"	.3125"

NOTES:

1. ALL WORK SHALL COMPLY WITH REQUIREMENTS FOR CONSTRUCTION ON STATE HIGHWAYS.
2. INSTALL CASING LEVEL AND STRAIGHT WITH NO DENTS OR BENDS. WALL THICKNESS AND MATERIAL SHALL MEET STATE HIGHWAY DEPT. REQUIREMENTS.
3. LONGER CASING LENGTHS MAY BE REQUIRED BY WYDOT.

0 TYP CASING W/CURB & GUTTER DETAILS

N.T.S.

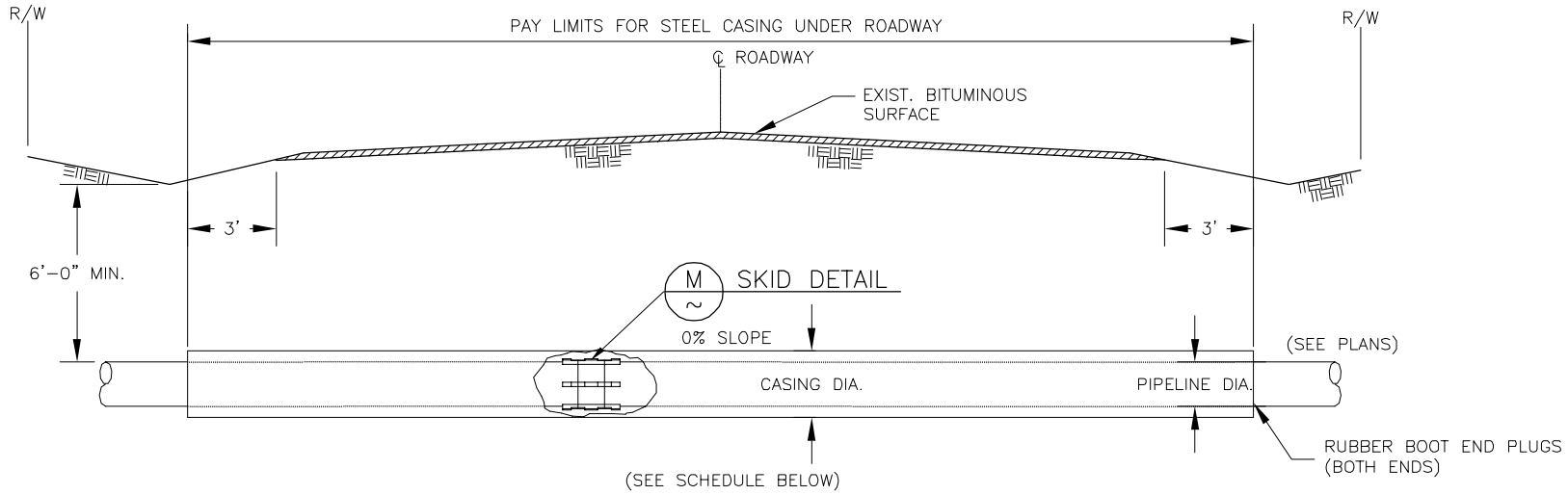
SUNRISE ENGINEERING

STANDARD DRAWINGS & SPECIFICATIONS

CASING UNDER ROADWAY

DESIGNED	CHECKED
SEI	EJS
DATE	DRAWING NO.
6-26-13	26

TOWN OF AFTON



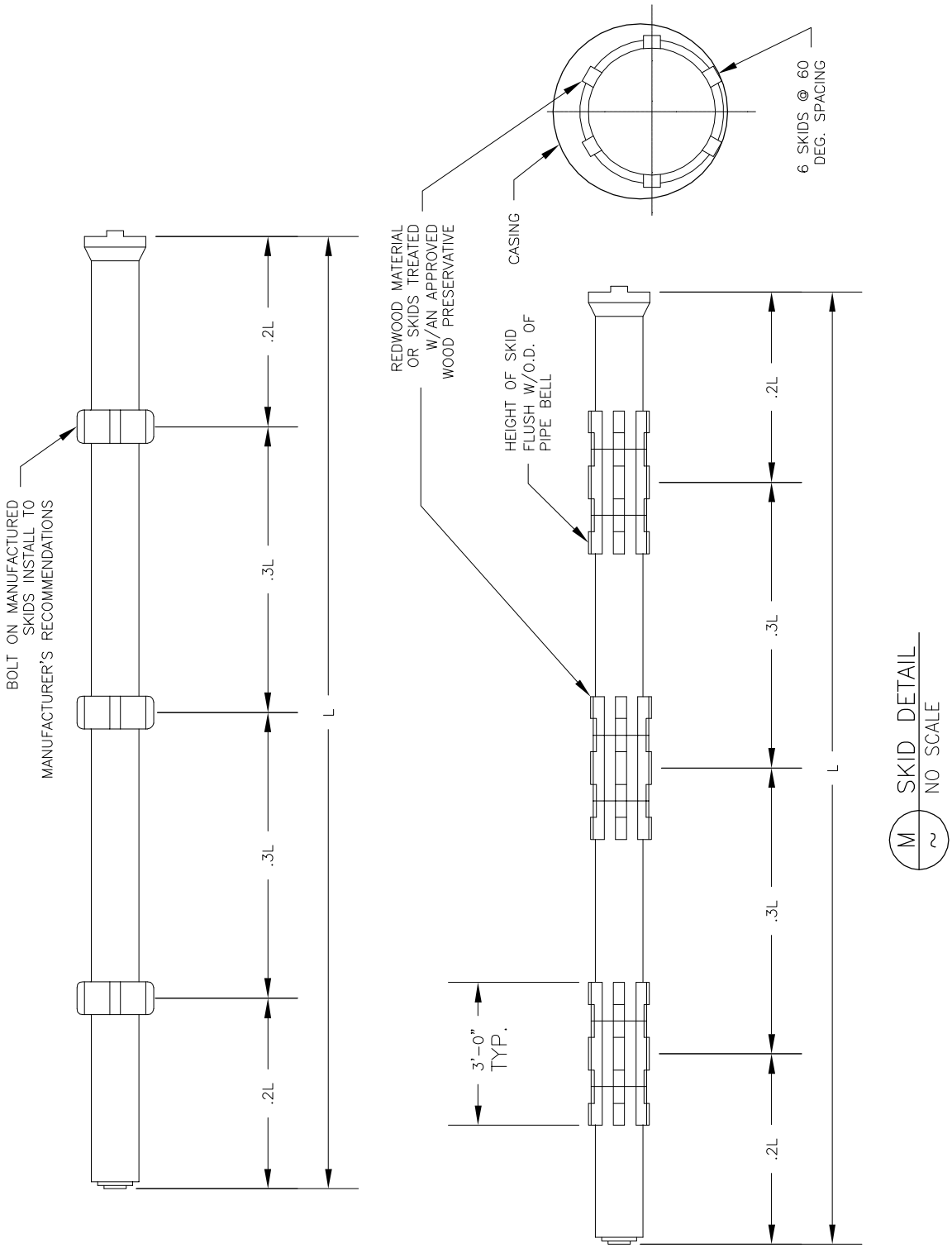
PIPELINE DIA.	CASING DIA.	CASING WALL THICKNESS
4"	10"	.2500"
6"	12"	.3125"
8"	14"	.3125"
10"	16"	.3125"
12"	18"	.3125"

NOTES:

1. ALL WORK SHALL COMPLY WITH REQUIREMENTS FOR CONSTRUCTION ON STATE HIGHWAYS.
2. INSTALL CASING LEVEL AND STRAIGHT WITH NO DENTS OR BENDS. WALL THICKNESS AND MATERIAL SHALL MEET STATE HIGHWAY DEPT. REQUIREMENTS.
3. LONGER CASING LENGTHS MAY BE REQUIRED BY WYDOT.

N TYP CASING UNDER ROADWAY DETAILS

1" = 3'-0"



M ~ SKID DETAIL
NO SCALE

SUNRISE ENGINEERING	STANDARD DRAWINGS & SPECIFICATIONS	DESIGNED SEI	CHECKED EJS	TOWN OF AFTON
	SKID DETAIL	DATE 6-26-13	DRAWING NO. 27	

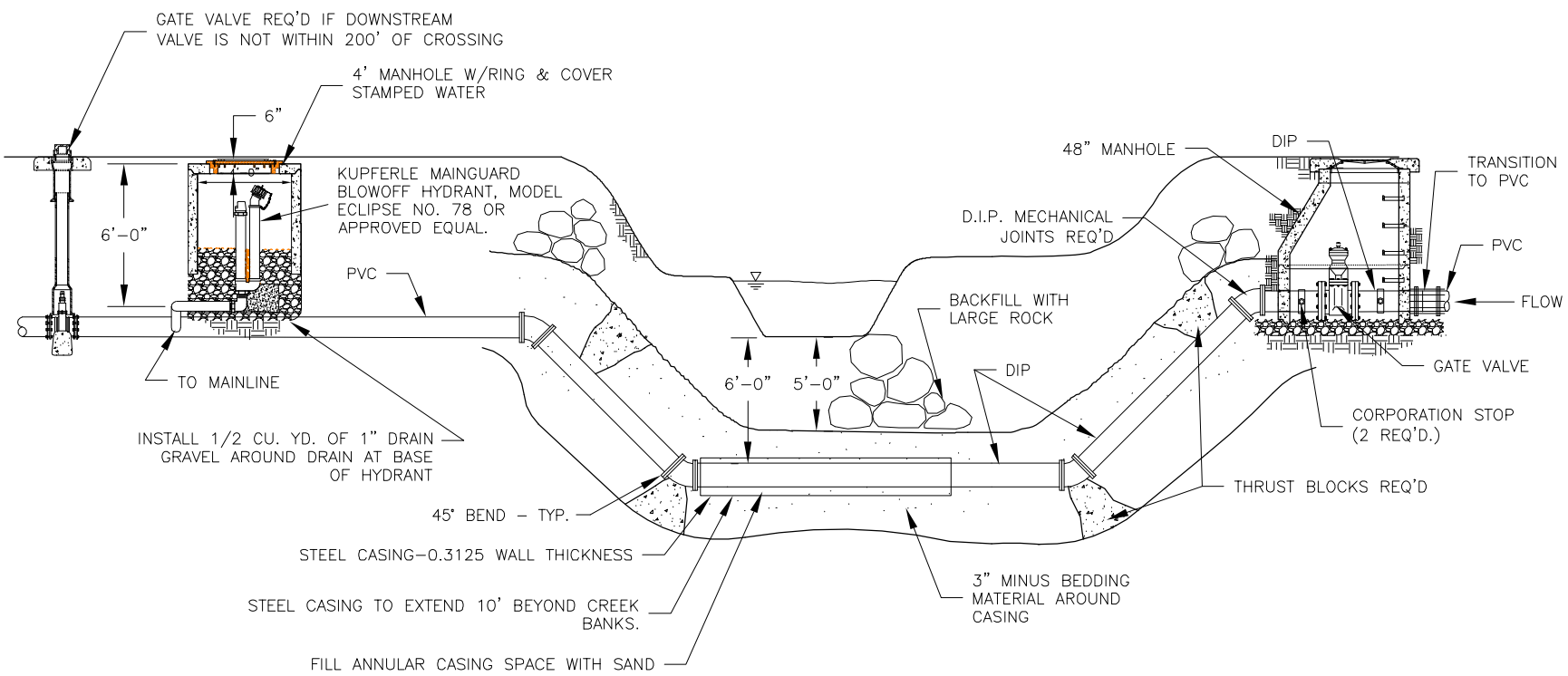
SUNRISE ENGINEERING

STANDARD DRAWINGS & SPECIFICATIONS

CREEK CROSSING DETAIL

DESIGNED	CHECKED
SEI	EJS
DATE	DRAWING NO.
6-26-13	28

TOWN OF AFTON



NOTE: LARGE ROCK BACKFILL SHALL BE 18" DIA. OR LARGER IN MAIN CREEK BED AND WITHIN 6 FT. OF BANKS.
PLACE FLUSING HYDRANT ON DOWNHILL SIDE OF CROSSING

NOTE: CREEK CROSSING PLANS TO BE APPROVED BY DEQ.

P TYP CREEK CROSSING DETAIL

SUNRISE ENGINEERING

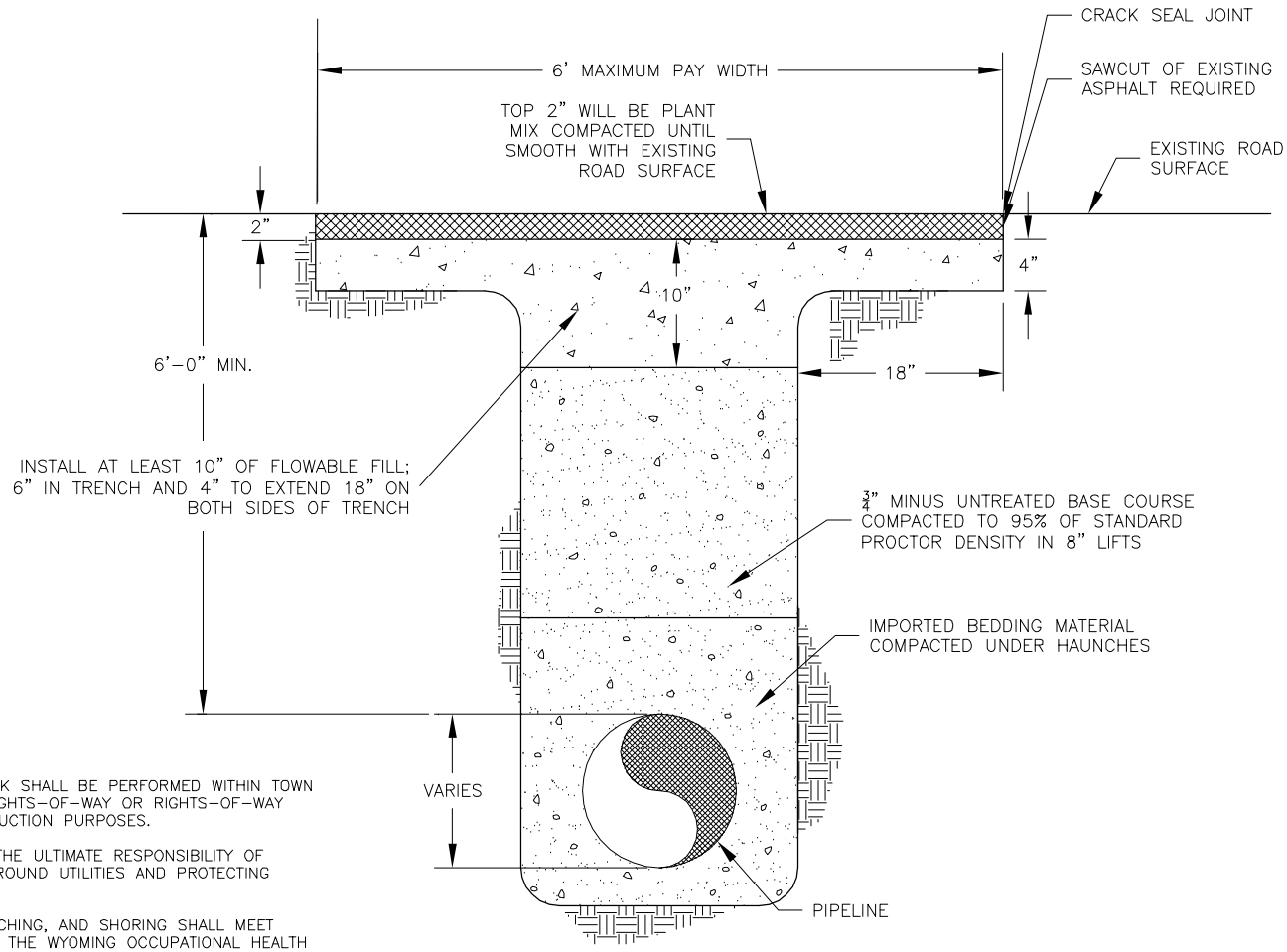
STANDARD DRAWINGS & SPECIFICATIONS

ROAD CROSSING DETAIL

DESIGNED	DATE	DRAWING NO.
SEI	6-26-13	29

CHECKED
EJS

TOWN OF AFTON



GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE PERFORMED WITHIN TOWN EASEMENTS, STREET RIGHTS-OF-WAY OR RIGHTS-OF-WAY OBTAINED FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
3. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE WYOMING OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
4. ALL CONSTRUCTION SHALL CONFORM TO WYOMING PUBLIC WORKS STANDARDS AND ALL APPLICABLE REQUIREMENTS OF THE STATE OF WYOMING, DEPARTMENT OF ENVIRONMENTAL QUALITY. CONSTRUCTION WILL BE SUBJECT TO INSPECTION BY, BUT NOT LIMITED TO, BOTH THE TOWN OF AFTON AND DEQ.
5. CONTRACTOR SHALL PROPERLY PREPARE, PLACE, AND COMPACT ALL FILL MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ENGINEER AND THE TECHNICAL SPECIFICATIONS. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY A CERTIFIED MATERIALS TESTING LAB.
6. CONTRACTOR SHALL KEEP ALL PUBLIC ROADWAYS CLEAR OF MUD, DIRT, AND DEBRIS CREATED BY CONSTRUCTION ACTIVITIES. DUST SHALL BE CONTROLLED BY WATERING.

NOTE:

1. **TRENCH DETAIL INSIDE OF PAVED STREETS IN TOWN OF AFTON RIGHT OF WAY**

E TYP — ROAD CROSSING DETAIL

NO SCALE