City of Napavine

Public Works Standards

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CHAPTER 1 – GENERAL CONSIDERATIONS

1.01 Applicability

The guidelines and standards addressed in this document will apply to construction and improvement activities that take place within the right-of-way, or that impact the water, sanitary sewer, storm sewer, sidewalks, street or transportation system, or other such activities with the Hearings Board and the Urban Growth Area (UGA) (see definitions). These Standards will be considered reasonable minimum regulations unless, a variance request is granted.

At this time, the city has no permitting, inspection, or regulatory authority over the activities within the UGA except as they pertain to water and sewer services. However, the guidelines and standards addressed in this document are still applicable to development projects affecting public utilities and infrastructure within the UGA. In addition, the guidelines may be enforced at the time of annexation by the City for all new construction and improvement projects undertaken when these Standards were in effect. An exception may be made if the non-conforming utility or infrastructure remains under private ownership rather than being accepted by the city.

These guidelines and standards will prevail in the event a conflict is found or identified with any other city practice or policy.

1.09 Latecomers Agreement

Any person who constructs a water or sewer main extension or other public improvement in excess of that which is required to meet minimum standards and the needs of the development may with the approval of the City Council, enter into a contract with the city which will allow the developer to be reimbursed for the portion of the construction cost that benefits other adjoining properties and/pf is in excess of the minimum standards. This contract is commonly termed as "*Latecomers Agreement.*" The format for a *Latecomers Agreement* **must** be submitted for review and approval **prior** to plan approval being considered. *Latecomers Agreement* will be valid for a period of time as established by the Revised Code Washington (RCW).

The developer is responsible for initiating, executing, and after city approval, filing the Latecomers Agreement. The agreement will include a list of properties that will benefit from the extension, a map outlining and designating these properties, legal description as required by the city, and backup data supporting the costs submitted. The city will collect the latecomers fee from persons connecting to the water or sewer extension and subsequently see that the developer receives the payment. The city will only allow the reimbursement of "reasonable" construction costs. Any actual costs that appear excessive will be subject to disallowance by the Director of Public Works.

1.10 Standards Enforcement

Plan Review. All plans and reports are to be submitted to the Community Services Department. All necessary easements, dedications, contracts, agreements, or bonds will be submitted for review along with the plans. The Development Review Committee (DRC) will check the plans for completeness against the Application Review Checklist. If plans meet the minimum checklist requirements, they will be routed to appropriate city staff and the plan review process will begin. Two plan reviews will be conducted at no additional charge as part of the plan review process.

If plans require a third submittal, additional fees may be levied as established by resolution of the City Council. "Third Submittal" will mean the third and any subsequent submittals of construction drawings,

specifications, drainage calculations or other information requiring additional plan checking pertaining to public facilities or any applicable construction or development in the right-of-way. New review comments provided by the city, not related to changes/corrections from the engineer will not trigger "third Submittal" requirements.

Upon approval of the plans, the engineer will be requested to submit the original drawings for signature by the Director of Public Works, or his duly appointed representative. Approved plans will be returned only to the engineer and only **after** all applicable fees have been paid. The plan approval will typically be valid for one (1) year. During that time, the project proponent will not be responsible to update the plans in accordance with any new Standards that may be developed, other than as necessary to preserve the health and welfare of the public. If a project has not been initiated and substantially completed upon plan expiration, any new requirements that have been adopted by the city will be applicable.

Plan that have been approved more than one year **prior** to construction beginning (i.e., a preconstruction meeting scheduled and inspection fees paid) will be subject to subsequent review and additional fees may be levied as established for the "Third Submittal".

Inspection. All construction or work within the scope of this code and all construction or work for which a permit is required will be subject to inspection by the City Engineer or duly appointed designee, in accordance with and in the manner provided by this code.

It is the responsibility of the contractor to notify the Public Works Department two (2) business days in advance of the commencement of any authorized work. Failure to provide sufficient advanced notice as noted in these Standards may lead to a delay in the stary of construction. In such cases, the city accepts no liability for construction delays.

All specific tests and inspections required by these Standards or necessitated by the unique nature of a project will be performed at the contractor's expense. In addition, one re-inspection will be granted at no cost. Non-compliant or unsatisfactory work may result in removal or modification of construction at the expense of the contractor or developer.

Violations. It is unlawful for any person, firm, or corporation to erect, construct, enlarge, alter, repair, move, improve, convert, equip, use, or maintain any frontage improvements/public utilities or cause or permit the same to be done in violation of this code.

Abatement. All frontage improvements and infrastructure that are determined after inspection by the city, to not comply or meet minimum standards as defined in this code, will be abated by repair, rehabilitation, or removal in accordance with the procedure specified in this code. A Correction Notice may be issued by the city to define the work that must be adjusted **prior** to acceptance and the timeframe in which the modifications must be made. To ensure that the corrections are made in an acceptable manner, a *Stop Work* order may be placed on the project while they are completed.

Appeals. In order to provide for reasonable interpretation of the provisions of this code and to hear appeals provided for hereunder, appeals must initially be addressed to the Director of Public Works.

1.11 Permits

A *Right-of-Way Permit* will be obtained from the Public Works Department before any person, firm or corporation will:

A. Commence <u>any</u> work to alter, construct, or repair <u>any</u> facilities within a public right-of-way or easement, including but not limited to: pavement, sidewalk, utilities, conduits, vaults, or any other structure, utility or improvement located over, under or upon a public right-of-way or easement in the City of Napavine, or;

B. Place any structure, building, barricade, or materials tending to cause a dangerous situation or obstruct, damage, or disturb the free use of the right-of-way or any improvement situated therein.

A separate permit will be obtained for each separate project. The timeline for a *Right-of-Way Permit* will depend upon the needs of the project. However, the city will also factor the health, safety, and welfare of the community when determining the allowable time for a permit to remain valid. In no case will Right-of-Way Permits be issued for longer than one (1) year. Upon expiration of a permit, a new permit request may be submitted for consideration, by the Public Works Department.

The issuances or granting of a permit or approval of plans, specifications, and computations will not be construed to be a permit for, or an approval of, any violations of any of the provisions of this code or of any other ordinance of the jurisdiction. Permit appearing to give authority to violate or cancel the provisions of this code or other ordinances of the jurisdiction. Permits appearing to give authority to violate or cancel the provisions of this code or other ordinances of the jurisdiction will not be valid.

The Director of Public Works may, in writing, suspend or revoke a permit issued under the provisions of this code whenever the permit is issued in error or on the basis of incorrect information supplied, or in violation of any ordinance or regulation or any of the provisions of this code.

Much of the work covered under these Standards will require multiple permit authority review and approvals. Sever types of permits and approvals require **prior** approval from the authority before a building or other permit can be issued. Any questions regarding information about permits, approvals and agreements should be directed to the Community Development Manager.

1.12 Design Standards

A. Detailed plans prepared by a licensed engineer must be submitted to the Public Works Department for review and approval **prior** to the commencement of any construction. Applicant's engineering will be a Professional Engineer registered as such in the State of Washington. All plans must be signed and stamped by the applicant's engineer **prior** to submittal for plan review. The city will review all submittals for general compliance with these Standards. An acceptance by the city does not relieve the applicant of the applicant's engineer from the responsibility of ensuring that all facilities are safe and that calculations, plans, specifications, construction, and as-built drawings comply with normal Engineering Standards, these Standards, and all applicable Federal, State, and local laws and codes.

B. Final plans must be signed and approved by the Director of Public Works **prior** to the start of construction. It is the contractor's responsibility to ensure that a signed and approved set of plans and all necessary permits are on the job site whenever work is being performed.

   The Director of Public Works must also approve any subsequent revisions to the plans deemed significant by the Public Works Department field representatives. Failure to secure Director approval for plan modifications may lead to corrective actions undertaken at the expense of the developer. The city may seek reimbursement for staff and material costs associated with any re-work necessitated by unapproved modifications.

C. Materials proposed for use in construction of publicly owned or maintained utilities must be in conformance with approved material standards in place at the time of submittal. Alternate materials will not be evaluated or considered during the plan review period.

D. Four copies of plans must be submitted along with a completed *Public Work Plan Checklist.* All drawings will be either a 22" x 34" x 36" sheet size. Original sheets will be good quality reproducible

ink on mylar. Original drawings of the approved plan will become the property of the City of Napavine. A reproducible copy of the drawing will be returned to the applicant's engineer.

E. Plan and profile drawings are required for all proposed transportation related improvements; street illumination; traffic signalization; storm drainage facilities; or sewer and water improvements. For specific minimum requirements see the *Plan Checklist* at the end of this chapter. On occasion, the scope of a project (i.e., installation of a driveway, replacement of sidewalk, or replacement of sanitary side-sewer) may not require engineered plans and can be handled via a *Right-of-Way Permit*, as determined by the Director of Public Works.

1.13 Drafting Standards

A. All plans submitted for either design approval or permanent record will be free of photographs or stick-ons. Shading or hatching may be acceptable if the pattern is not excessively dense and does not compromise readability.

B. Design drawings will be submitted on clean, legible blue or black line format. Half-size drawings may be submitted for design review if **prior** authorization is granted by the Public Works Department. Half-size drawings will be 11" x 17" and will be in a format that can be scaled using a standard engineer's scale.

C. As-built drawings will conform to the *Plan Checklist* and be submitted on static-free 4 mil mylar with permanent image, and three sets of blue-line copies. Sheet sizes will be 22" x 34" or 24" x 36". No sepia will be accepted.

D. Plans will be prepared with the understanding that each may be microfilmed. Minimum nominal text size will be 1/8".

E. No engineering plans will be accepted with architect's scale.

F. Street drawings will be either 1" = 5', 1" = 10', 1" = 20', or 1" = 30' horizontal with vertical not to exceed 1" = 10'. Utility drawings may be accepted at 1" = 50' or 1" = 40' if they are legible and able to be microfilmed.

G. Plans will show all existing and proposed monuments. All monuments will be described using current City of Napavine coordinates. Centerline of roadways, easements (with type and dimensions), and other pertinent data will be referenced to existing monuments.

H. All existing features (pipes, curbs, power poles, etc.) are to be produced with a small pen or half tones. Proposed features will be distinguished by a larger or bolder line weight.

I. Different line types will be used to distinguish different features. For example: centerline and right-of-way will have different line types.

J. It will be noted that the preceding guidelines should not be construed to be the only requirements for completed drawings, rather an outline of minimal requirements for submitting complete drawings for the city's review. Particular care should be exercised in the preparation of the plans to ensure their completeness and clarity that will facilitate a timely response following the city's review.

1.14 Fees

Fees, charges, or bonding requirements will be as established by an ordinance passed by the City Council except where specifically set forth in CMC. The City Council will further set the dollar penalty for failure to pay said fee or charge in a timely manner by passage of such ordinance.

All plan check fees are due prior to the release of approved plans and all inspection fees are due at the time of the pre-construction meeting. In addition, there are various miscellaneous service and connection fees and charges. Applicants should request an estimate of these fees and charges from the city's Community Development Director as soon as practical.

Prior to physical connection to and use of city water and sewer systems, all Public Works improvements must be completed and approved, and all applicable fees paid.

1.15 Financial Guarantees

Financial guarantees may be required by the City to guarantee the performance of required work. A financial guarantee shall be required for maintenance as outlined in subsection B. below. The type and amount of security shall be per code, or, if not specified, shall be at the discretion of the City. Types of securities include but are not limited to a bond with a surety qualified to do a bonding business in this state, a cash deposit, an assigned savings account, a set aside letter or a letter of credit.

Final Public Works approval shall not be given until all the required work is done and approved and the maintenance financial guarantee(s) is in place.

The following are the most frequent financial guarantees required:

A. **Performance Guarantee.** A Final Plat shall not be recorded, and no building permit shall be issued until all Public Works improvements are completed and final approval is granted or, with the approval of the Director of Public Works, for commercial and industrial projects, a performance guarantee as outlined above posted with the City in an amount equal to 150% of the cost of the outstanding public works improvements, including the on-site storm system, is posted with the City. No certificate of occupancy shall be issued until all the improvements are completed and approved unless otherwise allowed by the Director of Public Works.

B. **Maintenance Guarantee.**

1. **General Public Works Maintenance Guarantee.** Prior to final Public Works approval, the permittee or the contractor for the permittee shall post with the City a maintenance guarantee for the guarantee of the Public Works improvements in an amount equal to 20% of the estimated cost of the improvements for a period of eighteen (18) months after the completed job is accepted by the City. Release of the guarantee will occur one (1) year from the date of City acceptance if all maintenance has been accepted by the City.

2. **Storm Maintenance Guarantee.** Prior to final Public Works approval, the permittee or the contractor for the permittee shall post with the City a maintenance guarantee for the guarantee of the storm drainage infiltration facilities in an amount equal to 20% of the estimated cost of the improvements for a period of two (2) years after Final Public Works Approval is granted.

   Maintenance shall include cleaning of the storm system at the end of the one-year period at the developer's expense. The developer shall be responsible for cleaning the storm conveyance system, including treatment facilities after one year.

1.16 Utility Locations

A. Utilities within a right-of-way or easement on new roads or in roadways where existing utilities are not in conflict will be located in accordance with these Standards as approved by the Public Works

Director. Where existing utilities are in place, new utilities will conform to these Standards as nearly as practical and yet be compatible with the existing installations. All deviations of location must be approved by the Director of Public Works. Existing utilities will be shown using the best information available. This verification may require exploration/excavation (potholing) if utilities are in conflict with proposed design. The contractor/developer will be responsible for utility locates in conjunction with their project until a final Public Works approval is given.

B. All new utilities other than those located on private property will be installed underground by the utility owning said facility and new and existing facilities will comply with provisions as set forth in these Standards and/or in the applicable Franchise Agreement.

C. A Right-of-Way Permit is required of any utility, except city owned facilities and utilities who hold a Franchise Agreement with the city for any work done within the right-of-way. The utility will comply with all provisions as set forth in these Standards.

1.17 Utility Extensions

A. Anyone wanting to extend any city utility should contact the Public Works Department for Extension/Connection Fee Estimate and any special extension requirements.

B. Utility mains will be extended to and through the extremes of the property being developed for loop closures and/or future development provided that further utility extension is possible, as determined by the Director of Public Works and current utility comprehensive and master plan.

1.18 Easements

A. Where public utilities and/or their conveyance systems cross private lands, an easement must be granted to the city. The Public Works Department will generally process, record, and file all easements. If the property is platted, the easement may be conveyed when the short plat or final plat is filed. All easements not shown on a plat, must be prepared by a land surveyor or engineering firm, licensed by the State of Washington, and able to perform such work.

B. Easement widths will typically be twenty (20) feet. Construction easements will be a minimum of thirty (30) feet wide, including the permanent easement. Under special circumstances, the Director of Public Works may require alternate easement widths.

C. Easements are required to be submitted in draft form, unsigned for review and approval **prior** to plan approval. Signed copies are required **prior** to final acceptance of the project and issuance of Certificate of Occupancy. Any change in design that places an amenity, i.e., water, sewer, sidewalk, etc., outside of the easement may necessitate stopping of construction until plan and easements can be resubmitted and approved. Easements will be filed by the city upon satisfactory completion of the work.

1.19 Annexation Agreement Requirement

Owner of properties lying outside city boundaries must sign an Annexation Agreement that legally commits their property to eventual annexation **prior** to being served by city utilities (Resolution Nos. 7-76 and 8-81). This Annexation Agreement requirement will be applied to all extensions of city utilities to areas outside the city limits.

1.20 Traffic Control

A. The contactor/developer will be responsible for interim traffic control during construction on or along traveled roadways. Traffic control will follow the guidelines of the WSDOT/APWA Standard Specifications. All barricades, signs, coning, and flagging will conform to the requirements of the MUTCD. A traffic control plan will be submitted and approved by the Public Works Department **prior** to the start of construction.

   City Utilities constructed within the Lewis County right-of-way will follow all traffic control requirements set forth by the Lewis County Department of Public Works and MUTCD.

   Signs must be legible and visible and will be removed at the end of each workday if not applicable after construction hours.

   All necessary and/or required traffic control devices will be in place **prior** to the beginning of project construction, or on a daily basis during project construction.

B. When road closures and detours cannot be avoided, the contractor/developer will notify the Public Works Engineer Division a minimum of two (2) business days in **advance**. The city may require that a detour plan be prepared and submitted for approval **prior** to closing any portion of a city roadway.

C. A Right-of-Way Permit is required and must be obtained **before** any work in the street can commence.

1.21 Call Before You Dig

All contractors/developers are responsible for timely notification of all utilities in **advance** of any construction in the right-of-way or utility easements. The Underground Utilities Location Center telephone number is 1-800-424-5555. A minimum of two (2) business days advance notice is required. The contractor/developer must provide separate notification to any utility not participating in or using the Underground Location Center.

1.22 Public Works Plan Checklist

The Public Works Plan Checklist on the following pages provides a list of the information that is to be included on the plans submitted to the Public Works Department for review. Although the list is not all-inclusive, it should serve as a general guide for reference purposes. Not all items listed will apply in all situations. The checklist should be completed by the applicant and included with all plan submissions.

PUBLIC WORKS PLAN CHECKLIST

STANDARD ITEMS: WATER, SANITARY SEWER, STORM, SEWER, STREET, LIGHTING & SIGNALS

Check Boxes as Applicable:

APPROVED FOR CONSTRUCTION

By: _____ Date:_____

Public Works Director

Approval Expires: _____

- ☐ Vicinity Map
- ☐ Legend (APWA Standard Symbols)
- ☐ North Arrow
- ☐ Scale Bar
- ☐ Datum – Bench Mark Elevation and Location
- ☐ Title Block:
    - ☐ Title:
    - ☐ Date:
    - ☐ Design By:
    - ☐ Checked By:
    - ☐ Napavine Drawing Number (if applicable)
    - ☐ Signature Approval Block (see above example)
    - ☐ Sheet Number of Total Sheets
    - ☐ Revisions & Revising Dates
- ☐ Section, Township and Range
- ☐ Engineer/Land Surveyor Stamp (signed & dated)
- ☐ Utility System Map (showing all proposed utilities on one drawing)
- ☐ Plan Submitted on 24” x 36” sheet (Mylar)
- ☐ Detail Sheet(s) (describing applicable work)
- ☐ “Call Before You Dig” note
- ☐ General Notes and Construction Notes
- ☐ Traffic Control Plan (per MUTCD)
- ☐ Coordinates
- ☐ As-built Drawings

PLAN PORTIONS STANDARD ITEMS

- ☐ Centerline and Stations
- ☐ Edge of Pavement, Width and Pavement Type
- ☐ Right-of-Way Dimensions and Right-of-Way Lines Labeled
- ☐ Proposed Survey Monument Locations
- ☐ Sidewalk and Width
- ☐ Match Lines with Station and “see page” Notation
- ☐ Roadway and Restoration Sections (if applicable)
- ☐ Existing Utilities (above ground and below ground)
- ☐ Adjacent Property Lines, Ownership, Parcel Number and Address
- ☐ Note When Matching Existing Utilities and Features
- ☐ Easements, Existing, Proposed, Type, and Dimensions (if applicable)
- ☐ Define Survey Baseline vs Construction Baseline (if applicable)
- ☐ Steet Name with Quadrant Suffix

PROFILE PORTION STANDARD ITEMS

- ☐ Profile Grades (decimal ft./ft.)
- ☐ existing Ground Profile (on construction baseline for street or over utility installation when roadway section not included)

☐ Scale (horizontal and vertical)
☐ Stationing
☐ Vertical Elevation Increments
☐ Existing Utilities (if available)
☐ Stations for Structures (if applicable)

SANITARY SEWER

Plan Review

☐ Station and Offset Shown at Each Proposed Manhole
☐ Manholes Numbered with Type Designation and Invert and Rim Elevations
☐ Flow Direction (with arrow on pipe)
☐ Depth at Property Line (if applicable)
☐ Distance from Water Lines (if applicable)
☐ Type, Size and Length of Pipe from Center of Manhole to Center of Manhole
☐ Stations for Sewer laterals at Property Line
☐ On As-builts, Laterals Will be Related to Property Corners Measured Along the Right-of-Way Line
☐ Force Main and Appurtenances with Station and Offset

Profile Review

☐ Manholes Numbered with Type Designation and Invert Elevations Showing Direction In and Out
☐ Rim Elevation
☐ Grades Shown (decimal from ft./ft.)
☐ Type of Pipe
☐ Size of Pipe
☐ Length of Pipe (in L.F.) From Center of Manhole to Center of Manhole
☐ Existing Utilities Crossings
☐ Force Main and Appurtenances with Stations and Offsets

WATER

Plan Review

☐ Existing Utility Crossings
☐ Fire Hydrants
☐ Fixtures with Stations, Including Type and Band Blow-off (at dead-end of line)
☐ Vacuum and Air Release Valves when Required
☐ Tees, Crosses, Elbows, Adapters, and Valves, Meter Station and Offset
☐ Distance from Sanitary or Storm Sewer (if applicable)
☐ Type, Size, and Length of Pipe Between Fixtures

Profile View

☐ Existing Utility Crossings
☐ Show Fixtures with Stations and Elevations
☐ Show Valves with Stations and Elevations
☐ Type, Size, and Length of Pipe Between Fixtures
☐ Grades

STORM SEWER

Plan Review

☐ Station and Offset at each Manhole/Catch basin
☐ Manhole/Catch basin Type and Size
☐ Manhole/Catch basin Rim Elevation
☐ Flow Direction with Arrow on Pipe Channel
☐ Type, Size and Length of Pipe
☐ Stormwater Detention Facility (pond dimensions with elevation)
☐ Control Structure with Orifice Size and Elevation
☐ Emergency Overflow Location and Elevation
☐ Design High Water Elevation

Profile View
☐ Station and Offset at Each Manhole/Catch basin
☐ Invert Elevations of Manholes/Catch basin Showing Direction of Flow
☐ Rim Elevation
☐ Type, Size, and Length of Pip (in lineal feet)
☐ Grades (decimal form ft./ft.)
☐ Existing Utility Crossings
☐ Stormwater Detention Facilities
☐ Control Structures

EROSION CONTROL DRAWING
☐ Construction Entrance Detail
☐ Silt Fences and Traps
☐ Mulching and Vegetation Areas
☐ Clearing and Grubbing Limits
☐ Existing and Finished Grade
☐ Details and Locations of all BMPs Recommended
☐ Location and Details of Temporary Sediment Ponds

STREET
Plan Review
☐ Identify Adjacent Property Lines, Ownership and Addresses
☐ Flow Direction Arrows at Curb Returns Showing Grade
☐ Spot Elevations on Curb Returns
☐ PC, PT, PI Stationing of Horizontal Curves
☐ Curve Information Delta, Radius, Length and Tangent
☐ BCR and ECR (begin curb radius and end curb radius)
☐ Identify all Field Design Situations by Notes
☐ Match Existing Features Noted By Station with Elevation
☐ Typical Roadway Sections and Pavement Types
☐ Pavement Markings Noted by Station and Offset
☐ Sidewalks
☐ Bus Pullout/Shelter
☐ Driveway Entrances
☐ Station at Center of Street
☐ Width, Type (AC, PCC), Note Applicable City Standard Detail
☐ Curb and Access Ramps – per City Standard Detail

Profile View

☐ Vertical Information PVC, PVI, PVT, AP, Low Point, High Point
☐ Show Grades in Decimal Form (ft./Ft.) with (+ and -) Slope
☐ Super Elevated Roadway Segments

ILLUMINATION

☐ Station and Offset of Fixtures
☐ Pole Types, Including Manufacturer and Model Number
☐ Mounting Height, Arm Length, Anchor Bolt Size and Pattern
☐ Power Source
☐ Wire Size, Type, Conduit
☐ Luminaire Type, Lamp Wattage
☐ Location of Service Disconnects
☐ Line Loss Calculations
☐ J-Box Location

SIGNALS

☐ Station and Offset of Signal Base, Cabinets, Ped. Lead, Loops, Etc.
☐ Wiring Schedule
☐ Signal heads and Mounting Assembly
☐ Detection Loops
☐ Opticom
☐ Control Cabinet, Size and Layout
☐ Power Source
☐ Conduit
☐ Wire Size and Type
☐ Construction Notes
☐ J-Box Schedule0
☐ Pedestrian Signal Type with Push Button
☐ Controller Type, Configuration and Wiring Schematic

Project Category: _____ Division:_____

Reviewed By: _____ Date:_____

Checked By: _____ Date:_____

CHAPTER 2 – TRANSPORATION

2A GENERAL CONSIDERATIONS

2A.01 General

This chapter provides minimum development standards supplementing the applicable standards as set forth in Chapter 1, and to encourage uniform development of an integrated, fully accessible public transportation system that will facilitate present and future travel demands with minimal environmental impact to the community as a whole.

2B STREETS

2B.01 General

City streets are classified as arterials, collectors, and local access streets in accordance with regional transportation needs and the functional use each serves. Function is the controlling element for classification and will govern right-of-way, street width, and street geometries. The Director of Public Works will determine the classification of new streets.

Street design must provide for the maximum loading conditions anticipated. The width and grade of the pavement must conform to specific standards set forth herein for safety and uniformity. See Table I, *Minimum Street Standards.*

2B.02 Design Standards

The design of streets and roads will depend upon their type and usage. The design elements of city streets will conform to the Standards as set forth herein and current design practices as set forth in Chapter 1.

The layout of streets will provide for the continuation of existing principal streets in adjoining subdivisions or of their proper projection when adjoining property is not subdivided. Minor streets, which service primarily to provide access to abutting property, will be designed to discourage through traffic. See Table I, *Minimum Street Standards.*

Table I – Minimum Street Standards

DESIGN STANDARDS	***BOULEVARD***	***MAJOR OR MINOR ARTERIAL***	***COMMERCIAL COLLECTOR***	***NEIGHBORHOOD COLLECTOR***	***LOCAL ACCESS***	***PRIVATE***
DESIGN LIMITATIONS	Access and intersections should be limited. No on-street parking		N/A	N/A	N/A	N/A
MINIMAL STRUCTURAL DESIGN	See Standard Drawing Number 2-2					
STANDARD RIGHT-OF-WAY	90’ – 102’	84’ – 104’	66’ – 78’	60’	60’	N/A
STANDARD PAVEMENT WIDTH	48’ (may have a 16’ median)	48’ – 60’	40’	28’ – 40’	36’	20’
PARKING LANE	None Allowed	None Allowed	8’ Both Sides	7’ One Side	7’ One Side	N/A
MINIMUM MAXIMUM GRADE	0.5% - 8.0%	0.5% - 8.0%	0.5% - 10.0%	0.5% - 12.0%	0.5% - 15.0%	0.5% - 15.0%
CURBS	Both Sides					N/A
SIDEWALKS	Both Sides 6’ (mln) 8’ – pedestrian corridor 10’ – zero lot setback			Both Sides 5’	Both Sides 5’	One Side 5’
CUL-DE-SAC RADIUS (PAVEMENT WIDTH)	N/A	N/A	50’ (on industrial street only)	N/A	47’ with landscape island and island radius of 17’	Fire Department Standards
INTERSECTION CURB RADIUS	35’	35’	35’	35’	25’	25’
DESIGN SPEED (MPH)	40	40	30	30	25	N/A
MINIMUM CENTERLINE RADIUS	w/ superelevation per AASHTO w/o superelevation 800’	w/ superelevation per AASHTO w/o superelevation 600’	150’	150’	100’	N/A
****Maximum superelevation – 6%***						

A. **Alignment** of major arterials, minor arterials and collectors will conform as nearly as possible with that shown in the Comprehensive Plan.

B. **Grade.** Street grade should conform closely to the natural contour of the land. In some cases, the Director of Public Works may require a different grade. The minimum allowable grade will be 0.5 percent. The maximum allowable grade will be 8 – 15 percent depending on the street classification.

C. **Width.** The pavement and right-of-way width will depend on the street classification. Table I, *Minimum Street Standards*, shows the minimum widths allowed.

The General Notes on the following page will be included on any plans dealing with street design in addition to all other applicable requirements.

General Notes (Street Construction)

1. All workmanship and materials will be in accordance with the City of Napavine Standards and the most recent edition of the State of Washington Standard Specification for Road, Bridge, and Municipal Construction.

2. The contactor will be responsible for all traffic control in accordance with MUTCD. **Prior** to disruption of any traffic, traffic control plans must be prepared and submitted to the city for approval. No work will commence until all approved traffic control plans are in place.

3. All curb and gutter, street grades, sidewalk grades, and any other vertical and/or horizontal alignment, will be staked by an engineering or surveying firm capable of performing such work.

4. Where new asphalt joins existing, the existing asphalt will be cut to a neat vertical edge and tacked with Asphalt Emulsion type CSS-1 in accordance with the Standard Specifications. The new asphalt will be feathered back over existing to provide for a seal at the saw cut location and the joint sealed with grad AR-4000W paving asphalt.

5. Compaction of subgrade, rock and asphalt will be in accordance with the Standard Specification.

6. Form and subgrade inspection by the Public Works Department is required **before** pouring concrete. Twenty-four hours (one workday) **advance** notice is required for form inspection.

7. Testing and sampling frequencies are described in the Standards.

8. The Public Works Department will install or oversee the installation of street name and regulatory signs at the contractor's and/or the developer's expense. All street name and regulatory signs will be requested and approved by the city **prior** to the start of construction.

2B.04 Signing and Striping

Street signs are defined as any regulatory, warning, or guide signs. The developer is responsible for the cost of all street signs. Street signs will comply with the latest edition of the *U.S. Department of Transportation Manual on Uniform Traffic Control Devices (MUTCD).*

Pavement markings and street signs, including poles and hardware, will be paid for by the developer, but will be designed, furnished and installed by the city or by the developer under the city's direction to establish and maintain uniformity. The Public Works Department will determine whether pavement markings and street signs will be provided by the city or by the developer. If the work is to be performed by the city, the developer must submit a written request to Public Works and the developer will then be billed upon completion of the work.

2B.05 Right-of-Way

Right-of-way is determined by the functional classification of a street. Refer to Table I, *Minimum Street Standards.*

Right-of-Way requirements may be increased if additional lanes, pockets, transit lanes, but loading zones, operational speed, bike lanes, utilities, or other factors are required as determined by the Director of Public Works.

Right-of-way will be conveyed to the city on a recorded plat or by a right-of-way dedication deed.

2B.06 Private Streets

A. Private streets may be allowed under the following conditions:

    1. Permanently established by tract or lot providing legal access to serve not more than eight (8) dwelling units or businesses on separate parcels, or unlimited dwelling units or businesses situated on a single parcel and sufficient to accommodate required improvements to include provisions for future use by adjacent property owners when applicable; and

    2. Have a minimum 20-foot paved surface and a sidewalk five (5) feet in width of such a design that prevents parking on the sidewalk; and

    3. Accessible at all times for emergency and public service vehicle use; and

    4. Will not result in the land-locking of present or future parcels not obstruct public street circulation; and

    5. Covenants have been approved, recorded, and verified with the city that provide for maintenance of the private streets and associated parking areas by the owner or homeowners association or other legal entity.

B. Acceptance as Public Street. Acceptance of private streets as public streets will be considered only if provision is made for the street(s) to meet all applicable public street standards, including right-of-way widths.

2B.07 Street Frontage Improvements

A. All commercial and residential (including multi-family) development, plats, and short plats will install street frontage improvements at the time of construction as required by the Public Works Department. Such improvements may include curb and gutter; sidewalk; street storm drainage; street lighting system; traffic signal modification, relocation or installation; utility relocation; landscaping

and irrigation; and street widening per these Standards. Plans will be prepared and signed by a licensed civil engineer registered in the State of Washington.

B. All frontage improvements will be made across full frontage of property and on all sides that may border a city right-of-way.

C. Exceptions. See Chapter 1, Section 1.07 “Exceptions”.

2B.08 Cul-de-sac

Streets designed to have one end permanently closed will be no longer than 400 feet. At the closed end, there will be a widened “bulb” having a minimum paved traveled radius as shown in Table 1, Minimum Street Standards.

2B.10 Medians

A median will be in addition to, not part of the specified roadway width except on a road classed as a Boulevard. Medians will be designed so as not to limit turning radius or sight distance at intersections. Landscaping and irrigation will be installed when directed by the Director of Public Works.

2B.11 Intersections

A. Traffic control will be as specified in the most recent edition of the MUTCD or as modified by the Director of Public Works as a result of appropriate traffic engineering studies.

B. Street intersections will be laid out to intersect as nearly as possible at right angles. Sharp angled intersections will be avoided. For reasons of traffic safety, a “T” intersection (three-legged) is preferable to the crossroad (four-legged) intersection for local access streets. For safe design, the following types of intersections features should be avoided:

1. Intersections with more than four intersecting streets
2. “Y” type intersections where streets meet at acute angles
3. Intersections adjacent to bridges and other sight obstructions
4. Offset intersections that are not conducive to side traffic flow

In no case will the angle of the intersection be less than 60 degrees nor greater that 120 degrees. The preferred angle is 90 degrees.

C. Spacing between adjacent intersecting streets, whether crossing or “T”, should be as follows:

When the highest classification involved is:	**Minimum centerline offset should be:**
Major Arterial	350 Feet
Minor Arterial	300 Feet
Commercial Collector	200 Feet
Neighborhood Collector	200 Feet
Local Access	150 Feet

When different classes of streets intersect, the higher standard will apply on curb radii. Deviations may be allowed at the discretion of the Director of Public Works.

D. On sloping approaches at an intersection, landings will be provided with a grade not to exceed a one-foot difference in elevation for a distance of 300 feet approaching any arterial, or 20 feet approaching

a collector or local access street, measured from the nearest right-of-way line (extended) of intersecting street.

2B.12 Driveways

A. All abandoned driveway areas on the same frontage will be removed and the curbing and sidewalk or shoulder and ditch section will be properly restored.

B. All driveways will be constructed of Portland Cement Concrete (PCC) or asphalt from the right-of-way line to the edge of the street. The Director of Public Works will make the acceptable driveway material determination. PCC driveways will be subject to the same testing and inspection requirements as curb, gutter, and sidewalk construction. Residential PCC driveways will have a nominal concrete thickness of six (6) inches. All other PCC approaches will be eight (8) inches thick.

C. Joint-use driveways serving two adjacent parcels may be built on their common boundary with a formal written agreement between both property owners and with the approval of the city. The agreement will be a recorded easement for both parcels of land specifying joint usage.

D. Grade breaks, jgmn including the tie to the roadway, will be constructed as smooth vertical curves. The maximum change in driveway grade will be eight (8) percent within any ten (10) feet of distance on a crest and twelve (12) percent within any ten (10) feet of distance in a sag vertical curve.

E. No commercial driveway will be approved where backing into the sidewalk or street would occur.

F. Driveways will be separated by twenty (20) feet of straight curb between each driveway providing access to a parcel or parcels of land under common ownership or occupancy, unless otherwise allowed by the Director of Public Works.

G. No driveway will be built within fifteen (15) feet of the end of any curb return or within five (5) feet of any property line unless otherwise allowed by the Director of Public Works.

H. **Driveway Widths.**

1. The maximum driveway width for a single driveway onto an arterial or collector will be:

Frontage Width	Residential	Commercial	Industrial
Up to 50 feet	24 feet	24 feet	24 feet
50 to 75 feet	24 feet	30 feet	30 feet
More than 75 feet	30 feet	30 feet	35 feet

2. The maximum driveway width for each of two driveways onto an arterial or collector will be:

Frontage Width	Residential	Commercial	Industrial
Up to 50 feet	No Permitted	No Permitted	No Permitted
50 to 75 feet	20 feet	20 feet	24 feet
More than 75 feet	20 feet	24 feet	24 feet

3. The maximum driveway width for a single driveway onto a local access street will be:

Frontage Width	Residential	Commercial	Industrial
Up to 50 feet	24 feet	26 feet	No Permitted
50 to 75 feet	24 feet	26 feet	No Permitted
More than 75 feet	24 feet	26 feet	No Permitted

4. The maximum driveway width for each of two driveways onto a local access street will be:

Frontage Width	Residential	Commercial	Industrial
Up to 50 feet	No Permitted	No Permitted	No Permitted
50 to 75 feet	20 feet	20 feet	No Permitted
More than 75 feet	20 feet	24 feet	No Permitted

5. The maximum driveway width for one-way driveways will be:

Frontage Width	Residential	Commercial	Industrial
Up to 50 feet	14 feet	22 feet	22 feet
50 to 75 feet	14 feet	22 feet	22 feet
More than 75 feet	14 feet	22 feet	22 feet

6. A road approach or wider driveway may be approved by the Director of Public Works when a substantial percentage of oversized vehicle traffic exists, when divisional islands are desired, or when multiple exit or entrance lanes are needed.

I. **Arterial Street Access**

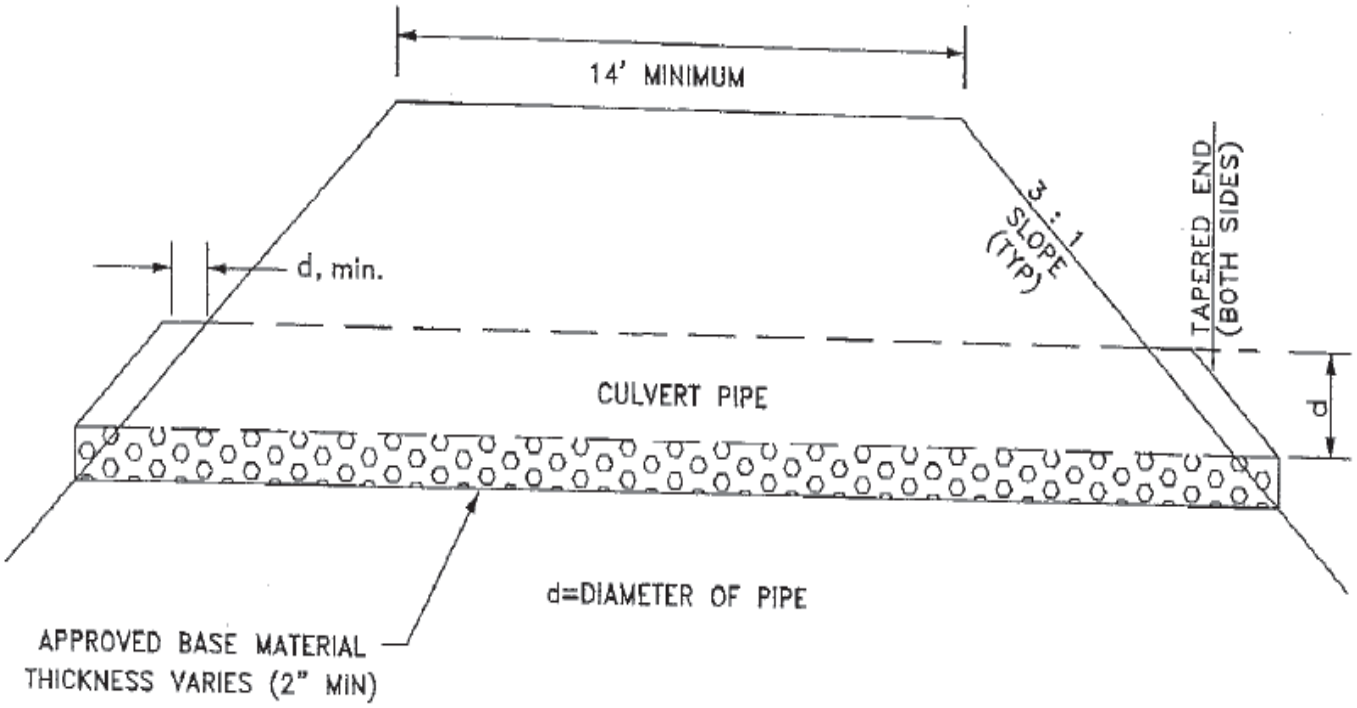
1. No driveway may access an arterial street within seventy-five (75) feet (measured along the arterial) of any other such access to the street on either side of the travel way but may be allowed at locations directly opposite another point of access.

2. No driveway access will be allowed to an arterial street within 150 feet of the nearest right-of-way line of an intersecting street.

3. Within the limitations set forth above, access to arterial streets within the city will be limited to one driveway for each tract of property separately owned. Properties contiguous to each other and owned by the same person are considered to be on tract.

4. Driveways giving direct access onto arterials may be denied. If alternate access is available. The Director of Public Works may permit deviations from this requirement if sufficient justification is provided.

5. Road approaches and/or ingress and egress tapers may be required in industrial and commercially zoned areas as directed by the Director of Public Works. Tapers will be designed, per the most recent edition, “Transportation and Land Development” by V.G. Stover and F. Koepke.



NOTES:

1. If culvert is being connected to an existing closed conveyance system, culvert material and method of connection must be approved by the Public Works Director.
2. See section 3A.03 for information regarding pipe type and sizing.
3. If conditions warrant, armoring of culvert ends with rip rap may be required by city to maintain slope stability.

Drawing Not to Scale

2B.13 Sight Obstruction

The following sight clearance requirements take into account the proportional relationship between speed and stopping distance.

The sight distance area is a clear-view triangle formed on all intersections by extending two lines of specified length (A) and (B) as shown in this section, Uncontrolled Intersection, from the center of the intersecting streets along the centerlines of both streets and connecting those endpoints to form the hypotenuse of the triangle. Refer to Standard Drawing 2-1 at the end of this Chapter. The area within the triangle will be subject to said restrictions to maintain a clear view of the interaction approaches.

Sight Distance Triangle:

A. **Stop or Yield Controlled Intersection.** Providing adequate sight distance from a street or driveway is one of the most important considerations to ensure safe-street and driveway operations. The Intersection Sight Distance criteria given in the following table is based line B-1 shown in Figure IX-40 of "A Policy on Geometric Design of Highways and Streets" published by AASHTO. This table applies to all intersections as well as driveways with an ADT greater than 20. For driveways with an ADT of 20 or less, the Stopping Sight Distance in Table III-1 of the AASHTO publication can be used.

SIGHT DISTANCE			
Operating Speed (MPH)	**Intersection Sight Distance**		**Stopping Sight Distance**
	2 Lanes	**4+ Lanes**	
20	210	230	125
25	255	280	150
30	310	340	200
35	355	390	250
40	410	450	325

Other factors such as vertical and horizontal curves and roadway grades also need to be taken into account. Such factors can require necessary modifications to the intersection sight distance given in the above table.

Sight distance is measured from a point on the mirror road or driveway fifteen (15) feet from the edge (extended) of the major road pavement (or nearest traffic lane if parking is permitted) and from a height of 3.50 feet on the minor road to a height of object of 4.25 feet on the major road.

B. **Uncontrolled Intersection**

Operating Speed (MPH)	**Sight Distance**	
	Major Street (A)	**Minor Street (B)**
20	90	90
25	110	110
30	130	130
35	155	155
40	180	180

C. **Vertical Clearance.** The area within the sight distance triangle will be free from obstructions to a motor vehicle operator's view between a height of two and one-half (2.5) feet and ten (10) feet above the existing surface of the street.

D. **Exclusions.** Sight obstruction that may be excluded from these requirements include; fences in conformance with this chapter, utility poles, regulatory signs, trees trimmed from the base to a height of ten (10) feet above the street, places where the contour of the ground is such that there can be no cross visibility at the intersection, saplings or plant species of open growth habits and not in the form of a hedge that are so planted and trimmed as to leave a clear and unobstructed cross view during all seasons, building constructed in conformance with the provisions of appropriate zoning regulations and pre-existing buildings.

2B.14 Surfacing Requirements

The following are the surfacing requirements for each application listed.

A. **Asphalt Pavements.** The minimum pavement sections listed in Standard Drawing 2-2 are in lieu of pavement design and are based on a subgrade California Bearing Ratio (CBR) value of three (3). Alternate pavement designs will be accepted based on soil tests to determine the actual CBR value and completion of the worksheet on Standard Drawing 2-3 at the end of this chapter. Soil tests and a completed worksheet for each road classification will accompany plans submitted if other than the structures shown below and pavement sections is Standard Drawing 2-2 are used. One soil sample per each 500 LF of centerline, with a minimum of three (3) per project, representative of the roadway subgrade, will be taken to determine a statistical representation of the existing soil conditions.

An engineering firm that specializes in soils analysis will perform the soil tests. The report, signed and stamped by a professional engineer licensed by the State of Washington, must be based on actual soils tests and submitted with the plans. All depth indicated are a minimum compacted depth.

Existing pavement restoration. For utility or street widening projects requiring restoration of existing pavement, additional information and design calculations will be required to ensure that the pavement will need minimal maintenance for five to seven years. The information required may include:

1. Pavement cores representative of typical pavement sections; and
2. Statement of existing pavement condition and discussion of how it will “match up” to the new pavement section

B. **Sidewalks**

Surface: four (4) inches Commercial Concrete

Base: two (2) inches Crushed Surface Top Course or well graded sand

Asphalt sidewalks will not be permitted unless otherwise approved by the Director of Public Works.

C. **Concrete Driveway**

Surfacing: six (6) inches Commercial Concrete for residential, eight (8) inches Commercial Concrete for all others

Base: two (2) inches Crushed Surfacing Top Course or well graded sand.

D. **Asphalt Driveway**

Surfacing: three (3) inches Cass B asphalt concrete for residential, six (6) inches Class B asphalt concrete for all others

Base: four (4) inches ballast

2B.15 Temporary Street Patching

Temporary restoration of trenches will be accomplished by using two (2) inches Class B Asphalt Concrete Pavement (when available) or two (2) inches medium-curing (MC-250) Liquid Asphalt (cold mix) two (2) inches Asphalt Treated Base (ATB), or steel plates.

ATB used for temporary restoration may be placed directly into the trench, bladed, and rolled. After rolling, the trench must be filled flush with asphalt concrete pavement to provide a smooth riding surface. **Prior** to beginning street trenching work, the contractor will ensure that all necessary material for temporary patching is stockpiled at the project site, both for completing and maintaining the patch.

The contactor will maintain all temporary patches until such time as the permanent pavement patch is in place. Patches not properly maintained by the contactor will be repaired by the city at the developer's, contractor's and/or private utility's expense.

2B.16 Pavement Restoration

Trench cuts in roadways greatly degrade the condition of the pavement, as well as reduce its design life. The most significant damage can be seen in newer pavements. Pavement restoration should result in the pavement being as good as, or better than, the pre-trench cut condition. This can be achieved by the prevention of trench cuts, thorough utility coordination, and high-quality pavement restoration.

A. **Trench Cuts in New Pavements.** Trench cuts are <u>not</u> permitted in pavements that have been constructed or rehabilitated within five (5) years. "Rehabilitation" includes all surface treatment such as chip seal, slurry seal, and asphalt overlay.

   If there is no other option but to cut into new pavement, **prior approval will be obtained from the Director of Public Works**. Pavement must then be restored in accordance with the following standards.

B. **Transverse Utility Crossings** must be bored or completed by another trenchless method. Bore pits must be restored in accordance with the following standards.

C. **Pavement Restoration Requirements.** Trench cuts, bore holes, and miscellaneous repairs will be made in accordance with Standard Drawings 2-5 and 2-6, at the end of this chapter. Pavement will be restored across the entire lane. IN addition, the patch will be made perpendicular to the closest affected road edge with a single, straight, continuous cut along the entire width of the required restoration. Minimum restoration width is five (5) feet.

D. **Lane Width Restoration Requirements**. For longitudinal utility trench cuts in pavement over five (5) years old, a minimum two-inch overlay or full-depth pavement reconstruction is required for the following widths:

   1. **One-Lane overlay or reconstruction** – When trench cut or patch is within one travel lane.

   2. **Two-lane overlay or reconstruction** – When trench cut or patch is within two travel lanes.

3. **Additional overlay or reconstruction** – When the remaining pavement area to the edge of existing pavement on either side is less than one travel lane. No longitudinal joints will be allowed in the wheel path.

   All trench and pavement cuts will be made uniformly by wheel or saw cutting. The cuts will be in a minimum of one-foot outside the trench width. If the edge of the trench line degrades, ravels or is non-uniform, additional saw cutting will be required **prior** to final patch or paving.

   All trenching will be backfilled with crushed surfacing materials conforming to Section 4-04 of the most recent edition of WSDOT/APWA Standard Specification. The subgrade will be compacted to 95 percent maximum density, as described in Section 2-03 of the WSDOT/APWA Standard Specification.

   All granular backfill material will conform to Section 9-0.19 of the current edition of the WSDOT/APWA Standard Specification.

   If the existing material is determined by the city to be suitable for backfill, the contractor may use the native material except that the top eight (8) inches of trench will be 2-1/2 inch minus ballast. All trench backfill materials will be compacted to 95 percent density.

   When the trench width is eighteen (18) inches or less and is within the travel-way, the trench will be backfilled with control density fill (CDF) Class B, as defined by the Washington Aggregates and Concrete Association. The aggregate will be 3/8-inch minus. CDF may be required in wider trenches within the travel-way if site conditions dictate.

   Backfill placement and compaction will be performed in six (6) inch lifts.

   Replacement of the asphalt concrete or Portland Cement Concrete will conform to the most current edition of the WSDOT/APWA Standard Specifications.

E. **Tack Coat**. Tack will be applied to the existing pavement along the edge of cut and will be emulsified asphalt grade CSS-1 as specified in the most recent edition of the WSDOT/APWA Standard Specification. Tack coat will be applied as identified in Section 5-04 of the most recent WSDOT/APWA Standard Specification.

F. **Asphalt Concrete Class B**. Asphalt concrete Class B will be placed on the prepared surface by an approved paving machine and will be in accordance with the applicable requirements of the Section 5-04 of the most recent edition of the most recent WSDOT/APWA Standard Specification, except that longitudinal joints between successive layers of asphalt concrete will be displaced laterally a minimum of twelve (12) inches, unless otherwise approved by the Director of Public Works. Fine and coarse aggregate will be in accordance with Section 9-03.8 of the WSDOT/APWA Standard Specifications. Asphalt concrete over two (2) inches thick will be placed in equal lifts not to exceed two (2) inches each.

   The preferred means of connection to existing asphalt at the centerline, lane edges, and overlay ends through grinding. Grinds can be a few inches off centerline to avoud existing stripping. Feathering may be used when grinding is not feasible, with the approval of the Director of Public Works. The affected surfaces within the trenching area will be feathered and shimmed to an extent that provides a smooth-riding connection and expeditious drainage flow for the newly paved surface.

   Surface smoothness will be per Section 5-04 of the most recent edition of WSDOT/APWA Standard Specification. The paving will be corrected by removal and repaving of the trench only.

Asphalt concrete pavement for wearing course will not be placed on any travel-way between October 15 and April 1 without written approval of the Director of Public Works.

Asphalt for prime coat will not be applied when the temperature is lower than 50 degrees Fahrenheit without written **approval** of the Director of Public Works.

G. **Final Patch.** The final patch will be completed as soon as possible but no later than 30 calendar days after the trench is first opened. Time extensions due to inclement weather or other adverse conditions will be evaluated on a case-by-case basis. However, any delays must have **prior** approval of the Director of Public Works.

H. **Staking.** All surveying and staking will be performed by an engineering or surveying firm licensed by the State of Washington and capable of performing such work.

A pre-construction meeting will be held with the Public Works Department **prior** to commencing staking. All construction staking will be inspected by the Public Works Department **prior** to construction.

The minimum staking of curb, gutter and sidewalk will be as follows:

1. Stake centerline alignment every 25 feet (50 feet in tangent sections) with cuts and/or fills to subgrade.
2. Stake top of ballast and top of crushed surfacing at centerline and edge of pavement every 25 feet.
3. Stake top back of curb at a consistent offset for vertical and horizontal alignment every 25 feet (50 feet in tangent sections)
4. Staking will be maintained throughout construction.

I. **Testing**. Testing will be required at the developer's or contractor's expense. The developer or contractor is responsible to order all required testing. The testing lab will be approved by the Public Works Director **prior** to the commencement of any testing. Testing will be done on all materials and construction as specified in the WSDOT/APWA Standard Specification and with the frequency as specified herein.

In addition, the Public Works Department will be notified **before** each phase of street construction commences (i.e., staking, grading, subgrade, ballast, base, top course, and surfacing). A minimum of two (2) business days **advance** notice is required before the start of each phase. All test results and documentation will be submitted to the Public Works Department **prior** to final approval of all projects.

Testing and Sampling Frequency Guide

ITEM	TYPES OF TESTS	MINIMUM NO.	FREQUENCY
Gravel Borrow	Grading & SE	1 Each	1 – 4,000 Ton
Sand Drainage Blanket	Grading	1 Each	1 – 4,000 Ton
CSTC	Grading, SE & Fracture	1 Each	1 – 2,000 Ton
CSBC	Grading, SE & Fracture	1 Each	1 – 2,000 Ton
Ballast	Grading, SE & Dust Ratio	1 Each	1 – 2,000 Ton
Backfill/Sand Drains	Grading	1 Each	1 – 2,000 Ton
GRAVEL BACKFILL FOR:			
Foundations	Grading, SE & Dust Ratio	1 Each	1 – 1,000 Ton
Walls	Grading, SE & Dust Ratio	1 Each	1 – 1,000 Ton
Pipe Bedding	Grading, SE & Dust Ratio	1 Each	1 – 1,000 Ton
Drains	Grading	1 Each	1 – 100 Ton
PCC STRUCTURES: (Sidewalk, curb and gutter, foundations)			
Course Aggregate	Grading	1 Each	1 – 1,000 Ton
Fine Aggregate	Grading	1 Each	1 – 500 Ton
Consistency	Slump	1 Each	1 – 100 CY
Air Content	Air	1 Each	1 – 100 CY
Cylinders (28 days)	Compressive Strength	2 Each	1 – 100 CY
CEMENT:			
	Chemical & Physical Certification	1	1 - Job
ASPHALT CEMENT CONCRETE:			
Blend Sand	SE	1 Each	1 – 1,000 Ton
Mineral Filler	S.G. & PI, Certification	1	1 – Job
Completed Mix	Fracture, SE, Grading	1 Each	1 – 1,000 Ton
	Asphalt Content Compaction	2 Each	5 – 400 Ton
ASPHALT TREATED BASE:			
Completed Mix	SE, Grading	1 Each	1 – 1,000 Ton
	Asphalt Content Compaction	1 Each	5 – Control Lot*
ASPHALT MATERIALS	Certification	1	1 - Job
RUBBERIZED ASPHALT	Certification	1	1 - Job
COMPACTION TESTING:			
Embankment	Compaction	1 Each	1 – 500 LF
Cut Section	Compaction	1 Each	1 – 500 LF
CSTC	Compaction	1 Each	1 – 500 LF
CSBC	Compaction	1 Each	1 – 500 LF
Ballast	Compaction	1 Each	1 – 500 LF
Trench Backfill	Compaction	1 Each	1 – 500 LF

SE = Sand Equivalency

A control lot will be normal day's production. For minor quantities 200 tons or less per day, a minimum of two (2) gauge readings will be taken

2C SIDEWALKS, CURBS AND GUTTERS

2C.01 General

Sidewalks are to be installed as designated in Chapter 1. Sidewalks are to be constructed along all streets that abut the property. Curbs and gutters will also be included with sidewalk construction, unless otherwise authorized by the Director of Public Works. Sidewalks will be designed to accommodate any necessary traffic control signs while still providing a minimum of five (5) foot unobstructed walking area.

Typical sidewalk, curb, and gutter location will be at the edge of proposed or existing pavement. The sidewalk will be aligned in a relatively straight configuration and make smooth transitions around curves and corners. Alternate locations may be proposed, including the incorporation of parking and planting strips, upon review and approval of the Director of Public Works. Where specific site conditions dictate, the Public Works Director may require alternate locations and alignments.

The owner of the property that abuts a sidewalk is responsible for all repair, maintenance, and upkeep of said sidewalk. The city is not liable for any damage or injuries caused by a sidewalk in need of repair.

2C.02 Design Standards

Plans for construction of sidewalks, curbs and gutters are to be submitted as part of the street plans when applicable.

The City has set forth minimum standards that must be met in the design and construction of sidewalks, curbs, and gutters. Because these are minimum standards, the Director of Public Works may modify them should it be deemed necessary.

A. **Sidewalks** will be constructed of Commercial Concrete four (4) inches thick except in a driveway section at which point the concrete thickness must meet driveway standards. The minimum width of sidewalk will be five (5) feet. When the sidewalk, curb and gutter are contiguous, the width of the sidewalk will be measured from the back of the curb and gutter to the back of the sidewalk. In commercial areas, sidewalks may be required to extend from the curb to the property line.

B. **Arterial Streets**. Sidewalks, curbs and gutters will be required to on both sides of arterial streets interior to the development. Sidewalks, curbs and gutters will also be required on the development side of arterial streets abutting the exterior of side development.

C. **Local Access Streets**. Sidewalks, curbs and gutters will be required on both sides of local access streets interior to the development. Sidewalks, curbs and gutters will also be required on the development side of local access streets abutting the exterior of said development including cul-de-sacs.

D. **Design and Construction**. The design and construction of all sidewalks, curbs, gutters and walkways will meet the following minimum standards:

    1. The width of sidewalks will be as shown in the street design drawings. Design of all sidewalks will provide for a gradual rather than an abrupt transition between sidewalks of different widths or alignments.

    2. Form and subgrade inspection by the Public Works Department is required before the sidewalk is poured.

3. Monolithic pour of curb, gutter and sidewalk will not be allowed without specific approval from the Director of Public Works.

E. **Driveways** – see Section 2B.12.

F. **Curbs and Gutters**. Cement concrete curbs and gutters will be used for all street edges unless otherwise approved by the Public Works Director. All curbs and gutters will be constructed in accordance with Standard Drawing 2-7.

G. The face or top of all new curbs will be embossed ¼ - inch into the cement to denote the location of water and sewer service crossings. Water services will be marked with a "W" and side-sewers will be marked with an "S". The markings will be at least three (3) inches in height and clearly legible.

H. **Access Ramps**. Sidewalks will be constructed to provide for access ramps in accordance with State law. Access ramps will be constructed of Commercial Concrete. Form and sub-grade inspections by the Public Works Department is required **before** the access ramp is poured.

2C.03 Staking

All surveying and staking will be performed by an engineering or surveying firm licensed by the State of Washington and capable of performing such work.

A pre-construction meeting will be held with the Public Works Department **prior** to commencing staking. All construction staking will be inspected by the Public Works Department **prior** to construction.

The minimum staking of curb, gutter and sidewalk will be as follows: Stake top back of curb at a consistent offset for vertical and horizontal alignment ever 25 feet (50 feet in tangent sections).

2C.04 Testing

Testing will be required at the developer or contract's expense on all materials and construction as specified in the most recent edition of WSDOT/APWA Standard Specifications.

At a minimum, one slump test and two (2) test cylinders will be taken once per day. All other testing frequencies will be as specified in the *Testing and Sampling Frequency Guide*, contained herein. In addition, the city will be notified before each phase of sidewalk, curb and cutter construction commences.

2D ILLUMINATION

2D.01 General

New commercial or residential subdivisions, short plats or property development along the locations designated in Chapter 1 will provide streetlights in accordance with these Standards for such improvements of the city and they will be owned and operated by the city.

2D.02 Design Standards

A street lighting plan submitted by the applicant and approved by the Director of Public Works will be required for all streetlight installations. Type of installation will be as set forth in the most recent edition of WSDOT/APWA Standard Specifications, Illumination Standards Table in this chapter, and as directed by the city.

All public streetlights designs will be prepared by an engineering firm, licensed by the State of Washington, and capable of performing such work. All developments will submit the lighting plan on a separate plan sheet. After the system is completed and approved, a set of "as built" mylars will be submitted to the city as a permanent record.

Streetlights will be located in accordance with the design criteria contained herein, and as approved by the Director of Public Works. In addition, intersections will be illuminated to 1.5 times the highest foot-candle requirement of the streets surrounding the intersection. Exception: In residential and intermediate classes, local and collector streets intersecting other local and collector streets will not be subject to the 1.5 times illumination factor provided a luminaire is placed at the intersection. Energy efficient fixtures will be incorporated into the streetlight system whenever practical. Poles will be opposite across the roadway or on one side of the roadway. Staggered spacing will be allowed if the roadway width is such that adequate light levels cannot be provided with a one-sided or opposite/both-sided pattern.

For the purpose of this section, area classes are determined by zoning as follows:

Commercial
Multi-family, high density
Central business district
Freeway commercial
General commercial
Neighborhood commercial

Industrial
Heavy Industries
Light Industries

Intermediate
Essential public facilities
Commercial office/mixed use

Residential
Single Family, low density
Single Family, medium density
Multi-Family, medium density

As new zones are created, the Director of Public Works will classify them. The following criteria will be used to determine streetlight spacing:

AVERAGE MAINTAINED HORIZONTAL ILLUMINATION (FOOT CANDLES)				
	AREA CLASS			
Road Class	Residential	Intermediate	Industrial	Commercial
Local	0.2	0.6	N/A	N/A
Collector	0.5	0.7	0.8	0.9
Arterial	0.7	1.0	1.2	1.4
Boulevard	0.7	1.0	1.2	1.4

Uniformity ratio: 6:1 average: Minimum for local

4:1 average: Minimum for collector

3:1 average: Minimum for arterial and boulevard

Dirt Factor: 0.85

Lamp Lumen Depreciation Factor: 0.2 fc (except local residential street)

Line loss calculations will show no more than a 5 percent voltage drop, in any circuit from the source to the most distant luminaire. Branch circuits will serve a minimum of four (4) luminaires.

Pole foundations will be per Standards Drawing 2-16. Luminaire poles will conform to Section 9-29 of the WSDOT Standard Specifications, except as modified herein. Light standards will be tapered aluminum with satin ground finish. The diameter at the base of the poll will not exceed nine (9) inches and the minimum thickness of the pole will be ¼-inches. Mounting height will be 30 feet. Mast arms will be single bracket, taper, minimum ten (10) feet in length. The shaft will heat treated after welding on the based flange to produce T6 temper. The pole davit arm will be designated to support effective streetlight luminaries with a minimum weight of 60 pounds and a minimum effective protected area (EPA) of 1.5 square feet. Poles will be designed to withstand a 100mph (AASHTO) wind loading with a 1.3 gust factor with luminaire and mast arm attached, without permanent deformation or failure. Minimum wall thickness will be 0.188 inches. Poles will be equipped with a removable metal ornamental pole cap secured to the shaft with stainless steel screws. Poles will have a minimum 3 ½ by 6-inch hand hole, with cover, near the base and will be equipped with a grounding lug. The pole will also be equipped with a 120V, 20 AMP recessed weatherproof power receptacle, that meet all applicable guidelines and standards. The receptacle will be located thirteen (13) feet above the base of the pole.

All luminaries will be a medium cut off, IES Type II distribution and will comply with all standards as established by the Public Utility District No. 1 of Lewis County. Unless otherwise required by PUD No. 1, luminaries will be: 20 watt, catalog #GEMDCLZOS3A11GMC31.

All streetlight electrical installations including wiring conduits and power connections will be located underground.

New street lighting will be designed and installed in such a way as to blend with any utility pole-mounted lighting that may exist along the frontage of adjacent properties, but also to accommodate future integration of conforming streetlights along the roadway. To this end, when streetlight(s) are required along the entire frontage, as appropriate, to allow for the interconnection of future streetlight installations. This requirement may be waived with approval of the Director of Public Works, based on the site-specific conditions of the property in question.

Alternate streetlight designs may be allowed or required by the city to accommodate the unique characteristics of a particular street or neighborhood. For example, special lighting may be deemed appropriate along a street that is part of a designated Historic District. The use of any alternate street lighting must be approved in writing by the Director of Public Works.

The General Notes on the following pages will be included on any plans dealing with streetlight design, in addition to all other applicable requirements.

General Notes (Street Light Construction)

1. All workmanship, materials and testing will be in accordance with WSDOT/APWA, MUTCD, NEC or City of Napavine Public Works Standards unless otherwise specified below. In cases of conflict, the most stringent guidelines will apply.

2. Washington State electrical permits and inspections are required for all street lighting installations within the City of Napavine. The contractor is responsible for obtaining said permits **prior** to any type of actual construction.

3. A clearly marked service disconnect will be provided for every lighting circuit. The location and installation of the disconnect will conform to Nation Electrical Code (NEC) and these Standards. The photo controls window will face north unless otherwise. The service disconnect will not be mounted on the luminaire pole. The service disconnect will be of a tyle equal to a Milbank CP3B-11115 AALSP2 service, 120/240 VAC, 10/3W, Caltrans Type 3B with contractors, photo controls and test switch. All service disconnects will be used to fullest capacity, i.e., maximum number of luminaires per circuit.

4. All lighting wire will be copper with a minimum size of #8. All wire will be suitable for wet locations. All wire will be installed in schedule 80 PVC conduit with a minimum of 1 ¼ inches. A bushing or bell-end will be used at the end of a conduit that terminates at a junction box or luminaire pole. Conductor identification will be an integral part of the insulation of the conductors will be #8 copper. All splices or taps will be made by approved methods utilizing epoxy kits rated at 600 volts, minimum (i.e., 3-M 82-A2). All splices will be made with pressure type connectors (wire nuts will not be allowed). Direct burial wire will not be allowed. All other installation will conform to NEC, WSDOT/APWA and MUTCD standards.

5. Each luminaire pole will have an in-line, fused, watertight electrical disconnect located at the base of the pole. Access to these fused disconnects will be through the hand-hole on the pole. The hand-hole will be facing away from on-coming traffic. Additional conductor length will be left inside the pole and pull or junction box equal to a loop having a diameter of one foot. Load side of in-line fuse to luminaire head will be cable and pole bracket wire, 2 conductor, 19-strand copper, #10 and will be supported at the end of the luminaire arm by an approved means. Fuse size, disconnect installation and grounding in pole will conform to NEC standards.

6. Approve pull boxes or junction boxes will be installed when conduit runs are more than 200 feet. In addition, pull box or junction box will be located within 10 feet of each luminaire pole and at every road crossing. Boxes will be clearly and indelibly marked as lighting boxes by the legend, “L.T.” or “LIGHTING”. See WSDOT Standard Plan J-11a.

7. All lighting poles will have tapered round shafts with a linear taper of between 0.125 and 0.14 inches per foot. In existing developed areas, the city may require a specific pole type to maintain consistency within the developed area.

8. Cement concrete bases will follow WSDOT Standard Plan J-1b, Sheet 1, Foundation Detail. Conduit will extend between three (3) and six (6) inches above the concrete base.

9. All streetlights will include a recessed 120V weatherproof receptacle that meets all applicable guidelines and standards. The receptacle will be located thirteen (13) feet above the base of the pole.

10. Ann modification to approved plans will be reviewed and approved by the Director of Public Works **prior** to installation.

2D.03 Staking

All surveying and staking will be performed by an engineering or surveying firm licensed by the State of Washington and capable of performing such work. A pre-construction meeting will be held with the city **prior** to commencing staking. The city must inspect all staking **prior** to construction.

The minimum staking of luminaires will be as follows:

A. Location and elevation to the center of every pole base

B. Location and elevation of each service disconnect.

2D.04 Testing

All luminaires will be subject to an electrical inspection. Lamp, photo controls, and fixtures will be warranted for a period of one year.

2E SIGNALS

2E.01 General

Signals will be installed per the requirements set forth herein. This work will consist of furnishing and installing a complete and functional traffic control system of controllers, signals and appurtenances as required by the city.

2E.02 Design Standards

Signal systems will be designed in accordance with the specifications as set forth in the WSDOT Design Manual and the WSDOT/APWA Standard Specifications unless otherwise authorized by the city.

2E.03 Induction Loops

Induction loops will be constructed per WSDOT/APWA Standard Specification 8-10.3(14)C, WSDOT Standard Plan J-8a; and the following:

A. Loops will not be cut into final lift of new asphalt

B. Loops will be preformed in crushed surfacing top course (CSTC) before paving or will be cut in existing asphalt or leveling course to subbase before intersection is overlaid.

2E.04 Controller

Controllers will be a microprocessor based, solid state, digital timed NEMA eight-phase traffic actuated signal controller providing up to eight (8) phases of signal control, internal pre-emption, time base coordination, internal time-of-day programming, and data base management by the IBM PC. When required by the Director of Public Works, the integration of traffic counting equipment will be accommodated, by the controller.

For the purpose of interchangeability of parts and simplification of maintenance, the City of Napavine has standardized its traffic signal controllers. Only the Traconex Model Number HMP-390 controller will be allowed or accepted.

2E.05 Staking

All surveying and staking will be performed by an engineering or surveying firm licensed by the State of Washington and capable of performing such work. A pre-construction meeting will be held with the city **prior** to commencing staking. The city will inspect the staking **prior** to construction.

The minimum staking of signals will be as follows:

A. Location, with cut or fill, to center of all pole bases.

B. Location of junction box(es).

C. Location of all corners of controller base(s).

D. Location of service disconnects.

E. Locations of conduit crossings.

2E.06 Testing

Each signal will be subject to all necessary electrical inspections as well as the requirements set forth in the WSDOT Design Manual and the WSDOT/APWA Standard Specifications.

Controller and cabinet testing may be required by WSDOT District 4 laboratory and/or the City of Napavine. All specifications and material samples will be submitted to the city for review and approval **prior** to installation.

A signal system will not be approved or accepted by the city until the signal has performed correctly to the city's satisfaction for a 30-day "check-out" period as outlined below.

2E.07 Check-Out Procedure

The contractor will call for an intersection "check-out" after completing the installation of the controller cabinet and all other signal equipment complete with wiring connections. All parts and workmanship will be warranted for one year from date of acceptance.

New signals will operate without any type of failure for a period of 30 days. The contractor will have a qualified individual available to respond to system failure within 24 hours during the 30-day "check-out" period. Failure of any control equipment or hardware within the "check-out" period will restart the 30-day "check-out" period.

2F ROADSIDE FEATURES

2F.01 General

Miscellaneous features included herein will be developed and constructed to encourage the uniform development and use of roadside features wherever possible.

2F.02 Design Standards

The design and placement of roadside features included herein will adhere to the specific requirements as listed for each feature, and, when applicable, to the appropriate Standards as set forth in Section 1.11.

2F.03 Staking

All surveying and staking will be performed by an engineering or surveying firm licensed by the State of Washington and capable of performing such work. A pre-construction meeting will be held with the city **prior** to commencing staking. The city must inspect all staking **prior** to construction.

2F.04 Testing

Testing will be required at the developer or contractor's expense on all materials and construction as specified in the WSDOT/APWA Standard Specifications and with a frequency as specified in th WSDOT Construction Manual.

2F.05 Survey Monuments

All existing survey control monuments that are disturbed, lost, or destroyed during surveying or construction will be replaced at the expense of the responsible builder or developer with the proper monument as outlined below by a land surveyor registered in the State of Washington.

A. **Street type**: Major Arterial: Minor Arterial; Bus Routes and Truck Routes.

   A pre-cast concrete monument with cast iron monument case and cover installed per these Standards is required.

B. **Street type:** Commercial Collector; Neighborhood Collector; and Local Access.

   A cast-in-place concrete surface monument with sufficient ferrous metal embedded to allow for detection by a magnetic detection device per these Standards is required. Cao will be "Berntsen RB Series" or brass plug marker.

C. **Required Monument Locations:**

   1. All intersections;
   2. At the PC and PT's of all horizontal curves;
   3. At PI of all horizontal curves of streets where the PI lies within the limits of the traveled roadway;
   4. At all corners, control points and angle points around the perimeter of subdivisions as determined by the city;
   5. At all sections corners, quarter corner, and sixteenth corners within the right-of-way.
   6. The monument case will be installed after the final course of surfacing has been placed.

2F.06 Bus Pullouts and Shelters

A. **General.** Nothing in these Standards will preclude the local transit provider from conduction on-street- drop-offs and pickups. The intent of these provisions is to provide general guidelines for the installation of new bus facilities and ensure their proper design and integration with the city's transportation network. They must also meet the needs of the transit provider and the community at large.

When bus pullouts and/or shelters are deemed necessary in accordance with the provisions provided herein, the installation of these facilities will be the responsibility of developer or builder.

A. **Frequency & Spacing for Public Transit Stops.** The city is local transit provider will consider the following general guidelines to determine frequency and spacing if improved stops on any given public transit route:

1. When determining the physical location of a bus pullout and/or shelter, consideration will be given to vehicle and pedestrian safety, impacts to adjacent property owners, and operational efficiency of the transit service.

2. Bus pullouts can be initially located at an average of 4 to 6 stops per route-mile along local residential segments of a route.

3. Additional stops may be added if warranted but will not exceed the basic stop spacing guidelines of 8 to 10 stops per mile and no stops may be located within 600 feet of one another.

4. Site designs for businesses, residential subdivisions, and multi-family developments along transit routes will accommodate transit use. This may include the location of a building entrance near a transit stop, pedestrian walkways, sheltered or unsheltered transit stops, and/or a bus pullout.

B. **Placement and Design of School Bus Stops.** The City and the Napavine School District will use the following criteria to jointly determine the placement and design of school bus stops:

1. A school bus stop will be required for each new residential subdivision or apartment complex where school children are to be boarding or disembarking, unless it is determined that adjacent facilities already exist for the site.

2. Location of school bus stops will be designed with safety as a paramount concern. Major arterials with high traffic counts should be avoided when possible and only used when bus pullouts are available and significant protection provided for children.

3. School bus stops will be designed to complement the residential environment and provide convenient location and access for neighborhood children including sidewalk access.

4. Every effort will be made to make school bus stops and sidewalk access to school bus stops a safe and friendly pedestrian environment.

5. The local transit provider and the Napavine School District should make every effort to coordinate the location of bus stops. However, separate bus facilities may be necessary for both service providers.

C. **Physical Location Requirements.** The physical location of all bus pullouts will be primarily determined by the following considerations: maximum safety, operational efficiency, and

minimizing impacts to adjacent property. Bus pullouts may be required on all arterial and commercial collector roads for safe bus berthing and to minimize impacts of bus stops on traffic flow. Additionally, bus pullouts may be required on local access roads of road geometry requires, such as determined by the Public Works Department. Maintaining adequate separation between driveways/intersections and bus pullouts can increase the safety and efficiency of both the roadway and the transit service. When locating a bus pullout in reference to existing driveways or a driveway in reference to an existing bus pullout, the following guidelines will be taken into consideration:

1. On local roads, bus pullouts will be located a minimum of 55 feet (75 feet preferred), from any driveway as measured from the closest driveway edge to the pullout loading area. On arterial roadways, bus pullouts will be located in accordance with the site distance requirements not in Section 2B.13 of this chapter.

   These location requirements will serve as a general guide for bus pullout installations.

   Alternative distances may be considered if sufficient engineering data is provided demonstrating that adequate site distance is maintained, pedestrian safety is protected, and vehicular traffic is not hindered. The final determination for a bus pullout location must be approved by the Director of Public Works.

2. Bus pullouts should not be located where the transit vehicle will block sight distances from a driveway or intersection.

3. Driveways should not be located within the taper of the pullout.

D. **Transit and School Bus Stop Signage.** All designated public transit and Napavine School District bus stops will be identified in some fashion. This may include pavement marking and bus stop signs. Contact the local transit provider for details on their sites.

E. **Shelters.** Passenger shelters may be required at bus pullouts and transfer centers. Shelters may also be required at bus stops as determined by the local transit provider and the Public Works Department.

   Passenger shelters for public transit sites and Napavine School District sites will be transparent for passenger visibility and safety, provide protection from the elements, and be reasonably vandalism resistant for easy maintenance.

F. **Shelter Installations.** When bus shelters are required, they will be installed in the following manner:

1. The developer/builder will provide a concrete pad approximately 12 x 10 feet and 6 inches thick. The pad will extend in from the curb or edge of the pavement at a specific location designated by the city. The pad will be constructed in accordance with the design standards for sidewalks as noted in Section 12C of the chapter.

2. Upon completion of the pad, the local transit provider will construct the shelter. The developer/builder will be responsible for all appropriate costs associated with the shelter installation. A final Certificate of Occupancy will not be issued until all shelter costs have been reimbursed to the to the transit provider.

G. **Design Standards.** A pedestrian friendly environment will be designed into all bus stop locations and surrounding service area to make it user-friendly and safe. The following criteria will be applied to bus stop facilities for new development:

1. Provide paved walkways with a hard all-weather surface linking various sections of subdivisions and developments to peripheral streets with bus stops.
2. Provide access ramps and other facilities consistent with barrier-free design standards along walkways leading to bus stops.
3. Separate roads and parking areas from pedestrian pathways by grade separations, landscaping, and other devises. A minimum four (4) to six (6) foot planting strop will be provided to buffer sidewalks or walkways from streets and parking areas around bus stops and shelters.
4. Provide pedestrian-friendly features such as lighting, signs, and trash receptacles as warranted by anticipated use.
5. New development street systems should be designed to minimize pedestrian travel to bus stops.

2F.07 Mailboxes

During construction, existing mailboxes will be accessible for the delivery of mail or, if necessary, moved to a temporary location. Temporary relocations will be coordinated with the U.S. Postal Service. The mailboxes will be reinstalled at the original location or, if construction has made it impossible, to a location as outlined below and approved by the U.S. Postal Service. Kiosk for 3 units or more.

Location:

1. Bottom or base of box will be 36 to 42 inches above the road surface.
2. Front of mailbox will be 18 inches behind vertical curb face or outside edge of shoulder.
3. New developments. Clustered mailboxes are required (contact the U.S. Postal Service for details). Refer to Standard Drawings 2-18.
4. Mailboxes will be set on posts strong enough to give firm support, not to exceed 4 x 4 inches wood or one 1-1/2-inch diameter pipe, or a material and design with comparable breakaway characteristics.

2F.08 Guard Rails

For purposes of design and location, all guardrails along roadways will conform to the criteria of the Department of Transportation Design Manual, as may be amended or revised.

2F.09 Retaining Walls

A. **General.** Rock walls may be used for erosion protection of cut or fill embankments up to a maximum height of eight (8) feet in stable soil conditions that will result in no significant foundation settlement or outward thrust upon the walls. For heights over six (6) feet or when soil is unstable, structural wall of acceptable design stamped by a licensed structural engineer will be used.

In the absence of such a rock wall design, walls having heights over six)6) feet or walls constructed in conditions where soil is unstable are required to be a pre-engineered structural wall having a design approved by the Public Works Department (or the Community Development Director if outside the right-of-way). Structural walls will be designed by professional engineer, licensed in the State of

Washington and qualified in retaining wall design. Structural walls required issuance of a Building Permit from the Community Development Department **prior** to construction.

Any rock wall over 30 inches high in a fill section will require the design of a geo-technical engineer. The geo-technical engineer will continuously inspect the installation of the wall as it progresses and submit inspection reports, including compaction test results and photographs taken during construction, documenting the techniques used and the degree of conformance to the geo-technical engineer's design.

Terraced walls will be reviewed and approved on a site-specific basis. Use of terraced walls in the right-of-way, must be approved by the Director of Public Works.

B. **Material.** The rock material will be as rectangular as possible. No stones will be used which does not extend through the wall. The rock material will be hard, sound, durable and free from weathered portions, seams, cracks, and other defects. The rock density will be a minimum of 170 lbs. per cubic foot.

C. **Foundation.** The rock wall will be started by excavating a trench with a depth below subgrade of one-half the base course or one (1) foot, whichever is greater.

D. **Rock Placement.** Rock selection and placement will be such that there will be minimum voids and, in the exposed face, no open voids over six (6) inches across in any direction. The final course will have a continuous appearance and will be placed to minimize erosion of the backfill material. The larger rocks will be stable and have a stable appearance. The rocks will be placed in a manner such that the longitudinal axis of the rock will be at right angles or perpendicular to the rockery face. The rocks will have all inclining faces sloping to the back of the rockery. Each course of rocks will be seated as tightly and evenly as possible on the course beneath. After setting each course of rock, all voids between the rocks will be chinked on the back with quarry rock to eliminate any void sufficient to pass a 2-inc square probe.

E. **Backfill.** The wall backfill will consist of 1-1/2-inch washed rock or as specified by a licensed engineer. This material will be placed to a 12-inch minimum thickness between the entire wall and the cut or fill material. The backfill material will be placed in lifts to an elevation approximately 6 inches below the top of each course of rocks as they are placed, until the uppermost course is placed. Any backfill material on the bearing surface of one rock course will be removed before setting the next course.

F. **Drainage.** Perforated drainage pipe and filter fabric will be installed as per Standard Drawing 2-23. The pipe requirement may be waived by the Director of Public Works if, the developer is able to demonstrate, to the city's satisfaction, that no subsurface water problems exist.

2F.10 Street Trees

In order for developers or property owners to plant trees, shrubbery or other vegetation that may attain a height of more than 30-inches within the right-of-way, they must first apply for and obtain a right-of-way permit from the Public Works Department. The application must include information of the type of tree or plant and the proposed location placement.

Certain varieties of trees are prohibited from being planted within a city right-of-way. Such trees are excluded from the right-of-way to protect utilities and infrastructure or to minimize visual obstruction and interference. Trees not to be planted within a city right-of-way specifically included the following:

Alder; Apple (fruiting); Ash, Mountain; Birch, White; Cherry (fruiting); Chestnut; Cottonwood; Elm, American; Hawthorne; London Plane; Maple, Big leaf; Maple, Oregon; Maple, Silver; Oak, Pine; Pagoda; Pear (fruiting); Plum (fruiting); Poplar; Sycamore; Walnut; Willow; and any other species of tree with a

propensity to produce large or extensive root systems that may interfere with or damage underground utilities or public infrastructure including streets, curbing and sidewalks.

Also prohibited from being planted within the right-of-way are any other species of plants or trees that will create an obstruction or potential obstruction to traffic, pedestrian visibility or safe public use of the right-of-way.

2F.11 Parking Lots

A Right-of-way Permit is required **prior** to surfacing a non-surfaced designated parking area that will access a public right-of-way.

Stormwater retention will be provided and will follow the criteria as set forth in the Stormwater Management Plan and as addressed in Chapter 3 of these Standards.

Parking lot circulation and signing needs will be met on site. The public right-of-way will not be utilized as part of a one-way parking lot flow.

All requirements for construction of parking lots will be determined through the Development Plan Review process, including capacity and configuration. Parking lot ingress and egress will be evaluated to determine traffic controls necessary to ensure vehicle safety to and from the public right-of-way.

Parking lot surfacing materials must meet the requirements for a permanent all-weather surface. Asphalt concrete pavement and cement concrete pavement satisfy this requirement and are approved materials. Gravel surfaces are not acceptable or an approved surface material type. Combination grass/paving systems are approved surface material types, however, their use requires submittal of an overall parking lot paving plan showing the limits of the grass/paving system and a description of how the systems will be irrigated and maintained. If the Director of Public Works determines the grass/paving system is not appropriate for the specific application, alternate approved surfacing materials will be utilized.

2G TRAFFIC IMPACT ANALYSIS

2G.01 General

A Traffic Impact Analysis (TIA) is a specialized study of the impacts that a specific type and size of development will have on the surrounding transportation system. The TIA is an integral part of the development review process. It is specifically concerned with the generation, distribution, and assignment of traffic to and from a new development or a re-development. “New development” is defined as any site action involving SEPA. This may include previous development on a site with consideration to cumulative impacts for the purpose of making a SEPA threshold decision. Re-development will include expanded or increased development or use or occupancy of a building or site that has been dormant for a period of more than five (5) years.

For the purposed of this document, the term “proposed project” will be used to refer to both new development and re-development.

These guidelines have been prepared to establish the requirements for a TIA. If a TIA is determined to be necessary for a project, the Public Works Department will have the lead role during the process and will be the contact agency for matters relating to the TIA. The Public Works Department will also be responsible for reviewing and accepting TIA’s as well as approving measures to mitigate impacts.

2G.02 When Required

The need for a TIA will be based on; the size of the proposed development, existing street and intersection conditions, traffic volumes, accident history, community concerns, and other pertinent factors associated with the proposed project.

A TIA will be required if a proposed development meets one or more of the following conditions:

A. The proposed project generates more than ten (10) vehicles in the peak direction of the peak hour on the adjacent streets and intersections. This includes the summation of all turning movements that affect the peak direction of traffic.

B. The proposed project generates more than 25 percent of the site-generated peak hour traffic through a signalized intersection or “critical” movement at a non-signalized intersection.

C. The proposed project is within an existing or proposed transportation benefit area. This may include Transportation Benefit Districts (TBD), Local Improvement Districts (LID), or local/state transportation improvement areas programmed for development reimbursements.

D. The proposed project may potentially affect the implementation of the street system outlined in the transportation element of the Comprehensive Plan the Six-Year Transportation Improvement Program, or any other documented transportation project.

E. If the original TIA was prepared more than two (2) years **before** the proposed project completion date.

F. The increase in traffic volume as measured by ADT, peak hour or peak hour of the “critical” movement is more than 10 percent.

Even if it is determined that a TIA is not required, the Director of Public Works may require the developer to have a Trip Generation Study (TGS) conducted. TGS’s will be used to forecast project-generated traffic for an established future horizon.

2G.03 Qualifications For Preparing TIA Documents

The TIA will be prepared by an engineer licensed in the State of Washington and with special training and demonstrated experience in traffic engineering. The applicant will provide the Public Works Director with the credentials of the individual(s) selected to perform the TIA for approval **prior** to initiating the analysis.

2G.04 References

In conducting TIA's and TGS's, the method for determining capacity will be as described in the most recent version of the "Transportation Research Board Highway Capacity Manual", and the method for determining project-generated traffic volumes will be as forecasted using the most recent edition of "Institute of Transportation Engineers Trip Generation Manual".

2G.05 Scope of Work

The level of detail and scope of work of a TIA may vary with the size, complexity, and location of the proposed project. A TIA will be a thorough review of the immediate and long-range effects of the proposed project on the city's transportation system. The analysis will include the following elements, as applicable:

A. Provide a reduce copy of the site plan, showing the type of development, street system, right-of-way limits, access points, and other features significant to the city's transportation system. The site plan will also include pertinent off-site information such as locations of adjacent intersections and driveways, land-use descriptions, and other features of significance.

B. Provide a vicinity map of the project area showing the transportation system to be impacted by the development.

C. Discuss specific development characteristics such as the size and type of development proposed (single-family, multi-family, retail, industrial, etc.), internal street network, parking spaces provided, zoning, and other pertinent factors attributable to the proposed project.

D. Discuss project completion and occupancy schedule for the proposed project. Identify horizon year(s) for traffic analysis purposes.

2G.06 Existing Conditions

A. Discuss street characteristics including functional classification, bicycle path corridors and traffic control at study intersections, number of traveled lanes, lane width, and shoulder treatment. A figure should be used to illustrate existing transportation facilities. Refer to the Sample TIA Figure, included herein.

B. Identify safety and access problems including discussions on accident history, sight distance restrictions, traffic control, and pedestrian conflicts.

C. Utilize all available traffic data from the City of Napavine and surrounding jurisdictions, if applicable. If data is unavailable, the individual or firm preparing the TIA will collect the necessary data to supplement the discussions and analysis in the TIA.

D. Conduct manual peak hour turning movement counts at study intersections if traffic volume data is more than two (2) years old, unless otherwise required by the Director of Public Works. A copy of the reduced data will be included with the TIA. The peak hour(s) to be counted and analyzed will eb the time period(s) when the combination of proposed project trips during the peak hour(s)

analyzed by the TIA. The Director of Public Works may require that the study also include additional intersections or areas.

E. A figure will be prepared showing existing average daily traffic (ADT) and peak hour traffic volumes on the adjacent streets and intersections in the study area. Complete turning movement volumes will be diagramed or illustrated and included in the TIA. The figure will represent the existing traffic volumes for analysis purposes. Refer to the Sample TIA Figure, included herein.

2G.07 Development Traffic

This element of the TIA will identify the limits of the study area. The study area will include all pertinent intersections and street impacted by the development traffic.

The threshold requirement of development traffic of ten (10O vehicles in the peak direction of the peak hour on the adjacent streets and intersections will apply. The threshold requirement of the development generating 25 percent or more of the site-traffic through a signalized intersection or "critical" movements at a non-signalized intersection will also apply. Each arterial/collector intersection and street impacted as described will be included in the study area for analysis purposes.

A figure illustrating the proposed trip distribution for the proposed project will be included in the TIA. The TGS will be displayed in a tabular format on the figure with peak-hour traffic volumes assigned to the study area in accordance with the trip distribution.

A. **Trip Generation.** Site-generated traffic of proposed projects will be estimated using the latest edition of the "Institute of Traffic Engineers Trip Generation Manual". Variations of trip-rates will require the approval of the Director of Public Works. Trip-Rate equations will be used for all land-use categories where applicable. Average trip-rates will be allowed for those land-uses without trip-rate equations. Site traffic will be generated for daily A.M. and P.M. peak-hour periods. A "pass-by" traffic volume discount for commercial centers will not exceed 25 percent unless approved by the Director of Public Works.

B. **Trip Distribution.** Trip distribution methodology will be clearly defined and discussed in detail in the TIA. For large development projects, the Public Works Director may require regional trip distribution map. The TIA will identify other transportation modes that may be applicable, such as transit use, bicycle and pedestrian facilities.

2G.08 Future Traffic

A. **Future Traffic Conditions Not Including Site Traffic.** Future traffic volumes will be estimated using information from existing transportation forecasts or models, other planned or programmed "on-line" development, and/or transportation projects, or by applying an annual growth rate to the existing traffic volumes as defined in the Chehalis Comprehensive Plan. The future traffic volumes will be representative of the horizon year(s) for project development. Forecasted non-project traffic will be added to existing traffic and illustrated in a figure.

B. **Future Traffic Conditions Including Site Traffic.** The site-generated traffic will be assigned to the street network in the study area based on the approved trip distribution. The site traffic will be combined with forecasted traffic volumes, not including site traffic, to show the total traffic conditions estimated at development completion and at the future horizon year. A figure will be required showing daily and peak period turning movement volumes for each traffic study intersection. Refer to the Sample TIA Figure, including herein. In addition, a figure will be prepared showing future traffic conditions, not including site traffic volumes, with site-generated traffic added to the street network.

Unless the city specifically authorizes another future horizon year for a development, the initial target year for determining future traffic will be five (5) years after the development has been occupied or in full operation for twelve (12) months.

2G.09 Traffic Operations

A Level of Service (LOS) analysis will be conducted for each "screen line" in the study area. The "screen lines" and level of service information will be developed in conjunction with the Chehalis Comprehensive Plan. The methodology and procedures for conducting the capacity analysis will follow the guidelines specified in the most recent version of the "Transportation Research Board Highway Capacity Manual". The LOS for each "screen line" will include the following conditions:

A. Existing peak hour traffic volumes

B. Future traffic volumes not including site traffic.

C. Future traffic volumes including site traffic.

LOS results for each traffic volume scenario will be summarized in a single table. The LOS table will include results for A.M. and P.M. peak periods, if applicable. The table will show LOS conditions with corresponding vehicle delays for signalized intersections and reserve capacity or delay for the "critical" movements at non-signalized intersections. For signalized intersection, the LOS conditions and average vehicle delay will be provided for each approach and the intersection as a whole, in an appendix that contains all LOS calculation sheets.

The LOS analyses for existing signalized intersections will include existing phasing, timing, splits and cycle length in the analysis as observed and measured during the peak hour traffic period.

If the proposed project is scheduled for completion in phases, the TIA will conduct a LOS analysis for each separate development phase. The incremental increases in site traffic from each phase will be included in the LOS analysis for each proceeding year of development completion. A figure will be required for each horizon year of phased development.

If the proposed project impacts a coordinated traffic signal control system currently in operation, the TIA will include an operational analysis of the system. Timing plan and proposed modifications to the coordination system will also be required. For non-signalized intersections the "Highway Capacity Manual" methodology will be used.

The computer software package(s) used for capacity analysis applications will be approved by the Director of Public Works. The Director of Public Works may require a copy of the computer worksheet, along with a 3 ½" floppy disk of each capacity analysis, be submitted concurrently with the TIA to the Public Works Department.

2G.10 Mitigation

The TIA will include a proposed mitigation plan. The mitigation may be either the construction of necessary transportation improvements or contributions to the city for the proposed project's fair share cost of identified future transportation improvements, as approved by the Director of Public Works. Levels of Service "E" and "F" will be used as the threshold for determining appropriate mitigating measures on roadways and intersections in the study area. Mitigating measures will be required to the extent that that transportation facilities operate at a LOS "S" (LOS-C) conditions or better upon completion of the development.

The following guidelines will be used to determine appropriate mitigating measures of traffic impacts generated by proposed projects.

A. The cost for the mitigation will be entirely born by the proposed project. However, in the event that more than one development is being proposed within the study area, a Latecomers Agreement for reimbursement of mitigation costs may be proposed by the project under consideration. The Director of Public Works will then determine the applicability of this request.

B. City projects involving transportation facilities programmed for improvements, and having an adverse traffic impact, will be mitigated by providing a proportionate share of the local costs for the improvements. This share will be based on the percentage of proposed project traffic generated through the intersection. The volumes for the horizon year of the transportation facility, or as defined by the ordinance establishing the cost-sharing mechanism for off-site street improvements.

C. Non-signalized intersections that currently operate at less than Level of Service "C" (LOS-C) will be analyzed for traffic signal warrants are satisfied, signal and intersection improvements will be required as a mitigating measure for the proposed project. If at least three (3) signal warrants are not satisfied by the proposed project's horizon year, the TIA will determine if traffic signal warrants and intersection improvements would be needed within a five (5) year period after the proposed project's horizon year. If so, the proposed project would then be required to provide a proportionate share cost of future traffic signal and intersection improvements.

   When an off-site street improvement(s) is not scheduled to be installed in the near future, the city may allow a developer required to share in the costs of such improvement(s), to post a bond in the amount of the developer's pro-rata share of such improvements. Any developer desiring to post a bond with the city in the amount of the pro-rata share of improvement costs must submit a request in writing to the Director of Public Works, along with all applicable justification or information supporting the request. The Public Works Director will submit all request(s) to the City Council who will then make a decision at a regularly scheduled meeting. All decisions made by the Councill will be considered final.

2G.11 Mitigation Fee Calculation

A. The formula for calculating a developer's mitigation fee or proportional share of an off-site street improvement is derived from by dividing the Project Generated Traffic by the Future Traffic with the Project. In order to determine the developer's pro-rata costs of an off-site street improvement, and this value is multiplied by the Project Costs. Mathematically this formula is written as follows: **PGT/FTP x PC = DMF**

   PGT = Project Generated Traffic

   FTP = Future Traffic with the Project

   PC = Project Cost

   DFM = Developer's Mitigation Fee

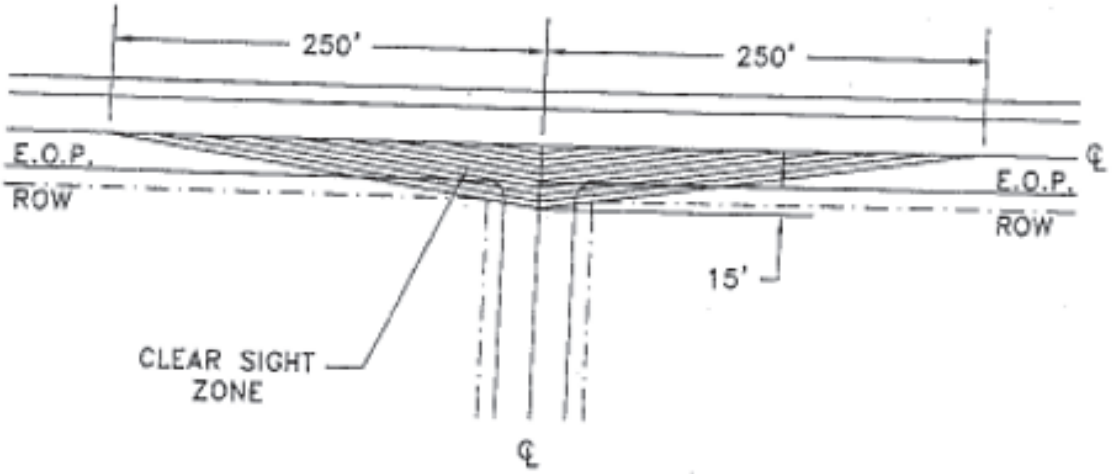
B. **Participation Threshold.** The city has established a participation threshold of ten (10) trips per peak hour. The ten (10) trips per peak hour sets the minimum level at which a developer will be required to participate. As part of the TIA and/or TGS, intersections and traffic locations will be identified when there will be or are ten (10) or more new peak-hour generated trips.

Table of Drawings

SIGHT OBSTRUCTION

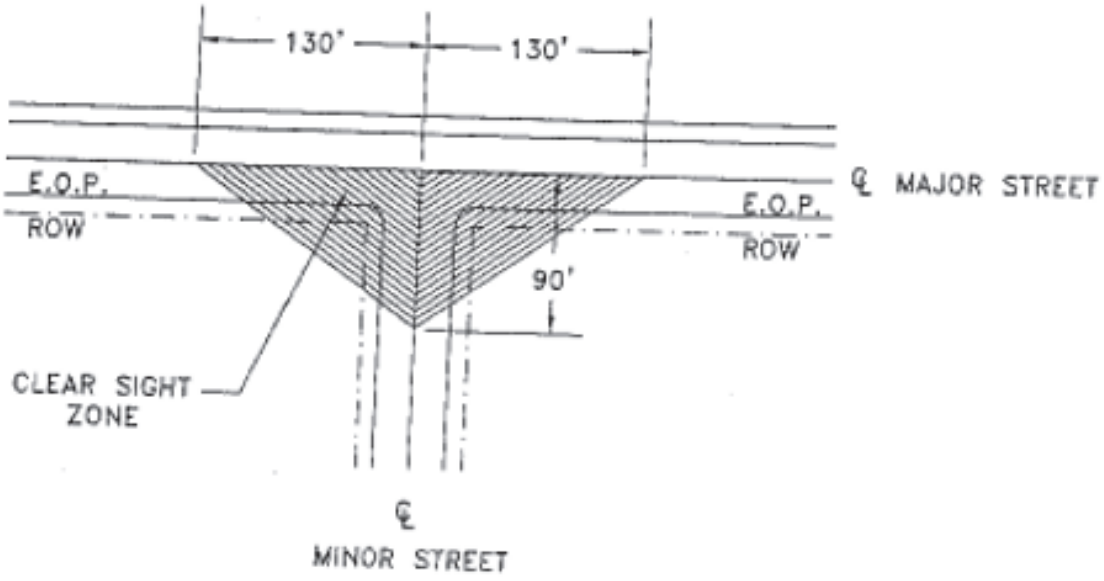
STOP OR YIELD CONTROLLED INTERSECTIONS

EXAMPLE: MAJOR STREET SPEED LIMIT = 35 M.P.H.



UNCONTROLLED INTERSECTIONS

EXAMPLE: MAJOR STREET SPEED LIMIT = 30 M.P.H.
MINOR STREET SPEED LIMIT = 20 M.P.H.



NOTES:

1. See section 2B.13 of the Public Works Standards for more information on the vertical clearance within the clear sight zone.

DRAWING NOT TO SCALE

PAVEMENT DESIGN – CONSTANTS

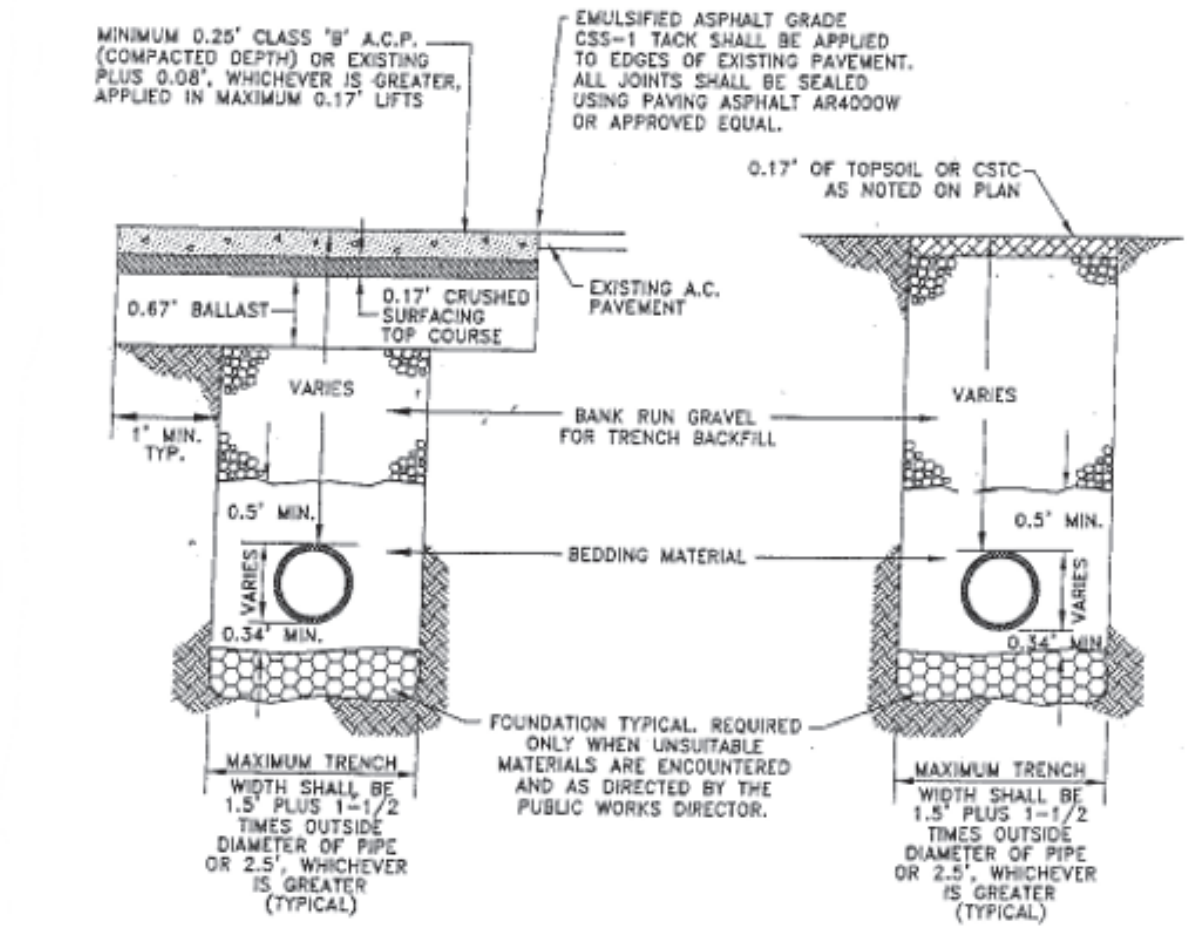
	Boulevard & Arterial	Commercial & Industrial Collectors	Neighborhood Collector	Local
ADT	20,000	5,000	4,000	500
% ADT	8	15	5	5
Growth Rate	5	5	5	2
Lane Factor	0.5	0.5	0.5	0.5
Design EAL	3,00,000	1,400,000	370,000	35,000
R%	95	90	85	80
So	0.45	0.	0.45	0.45
Pi	4.20	4.20	4.20	4.20
Pt	2.5	2.4	2.3	2.2
△ PSI	1.7	1.8	1.9	2.0
*** MAXIMUM PAVEMENT SECTION WITHOUT PAVEMENT DESIGN ***				
AC	6”	6”	4”	3”
CSTC	2”	2”	2”	2”
Ballast	25”	25”	16”	10”
*** MINIMUM PAVEMENT SECTION WITH PAVEMENT DESIGN ***				
AC	4”	4”	3”	3”
CSTC	2”	2”	2”	2”
Ballast	6”	10”	6”	4”

* Pavement design is per AASHTO design guidelines and certified California bearing ratio (CBR) soil tests. See Standard drawing 2-3 for pavement design worksheet.

NOTE:

1. Use 2% street cross slope and no more than 33 feet of roadway sloped in any direction.

TRENCH PAVEMENT RESTORATION DETAIL

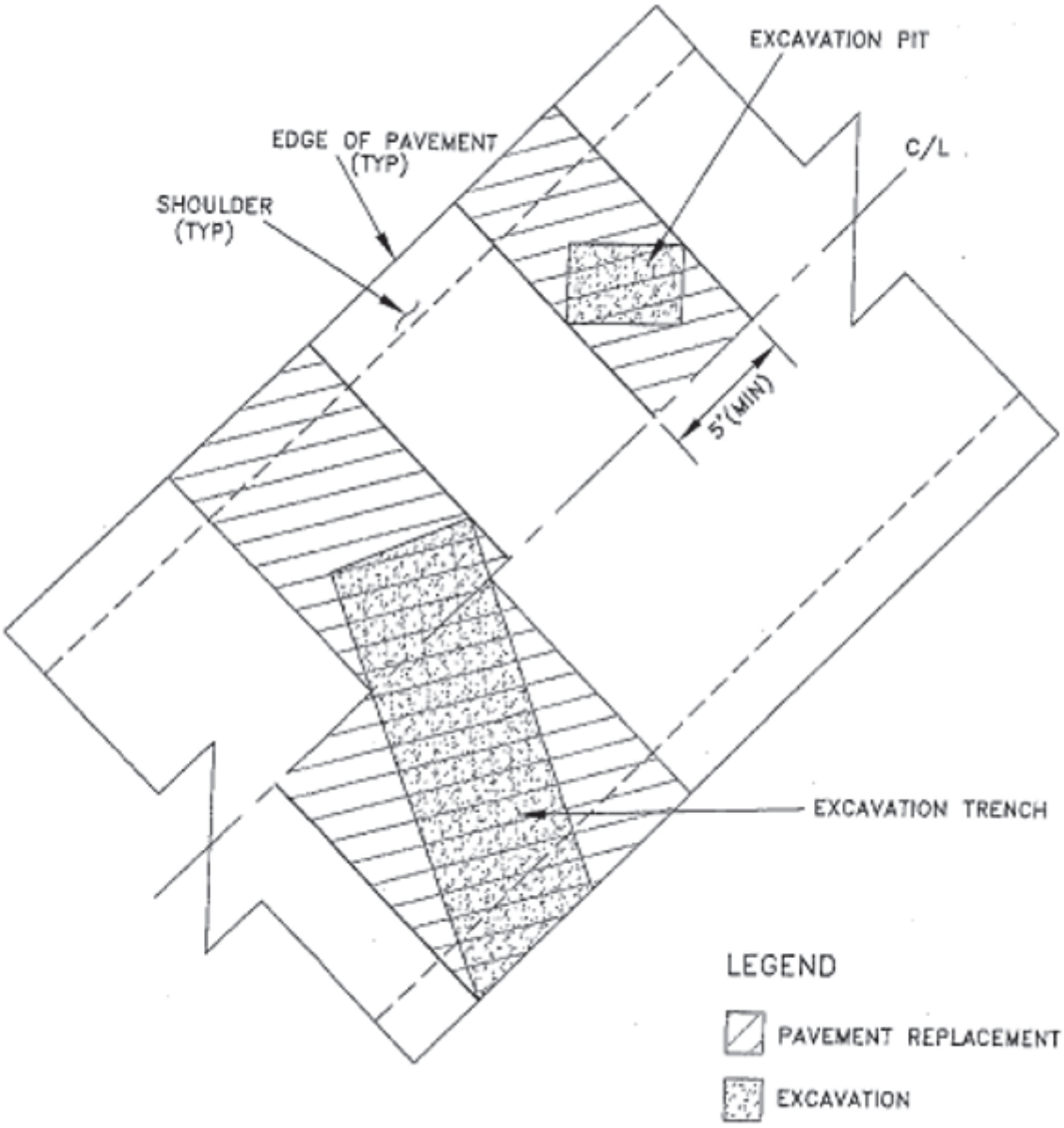


NOTES:

1. All materials except A.C.P. and bedding material shall be compacted in 6-inch maximum lifts to 95% density.
2. Bedding shall conform to section 9 – 03.16 of Standard Specifications as amended by the City of Napavine Standards.
3. Compaction: Bedding shall be compacted to 95% maximum as determined by ASTM D1557. Backfill shall be compacted to 85% in unpaved area, and 95% in paved or shoulder areas as determined by ASTM D1557.
4. All materials, workmanship and installation shall be in conformance with the most recent standard specification for road, bridge and municipal construction as amended by City of Napavine Public Works Standards.
5. Keep trench bottom compacted with uniform grade. A bell joint shall be required at each joint for proper support. No temporary supports, i.e., blocks, will be allowed to support pipe. Trench bottom shall be grade prior to pipe installation.

DRAWING NOT TO SCALE

PAVEMENT RESTORATION

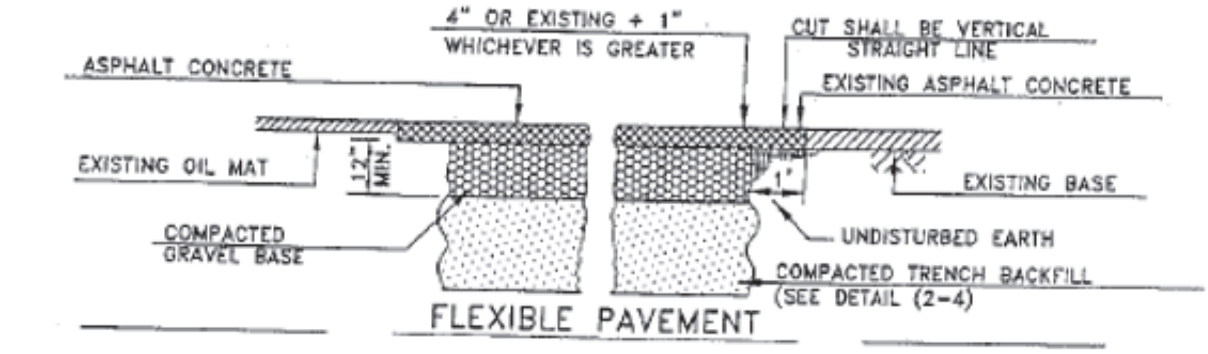


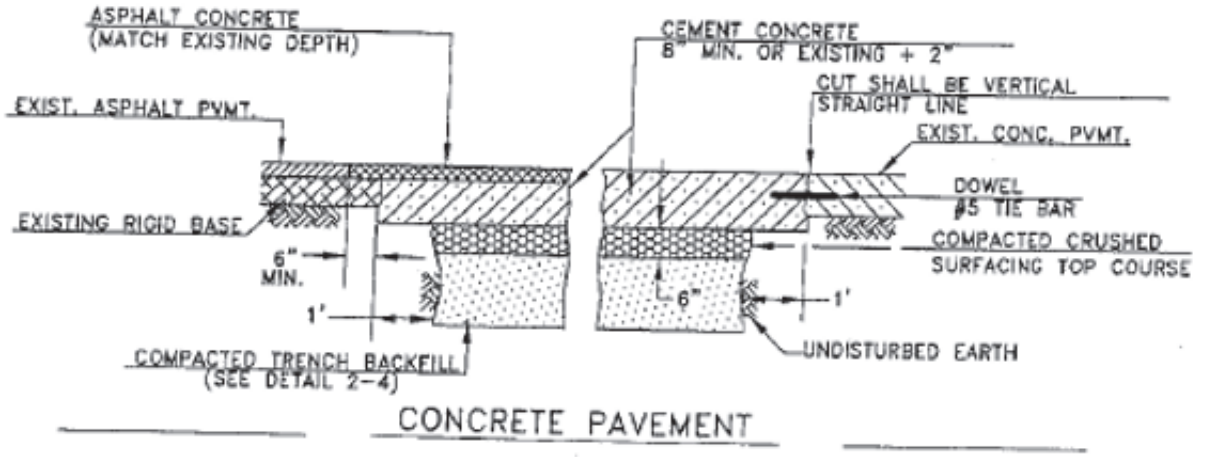
NOTE:

1. Minimum restoration width = 5 feet

DRAWING NOT TO SCALE

PAVEMENT PATCH





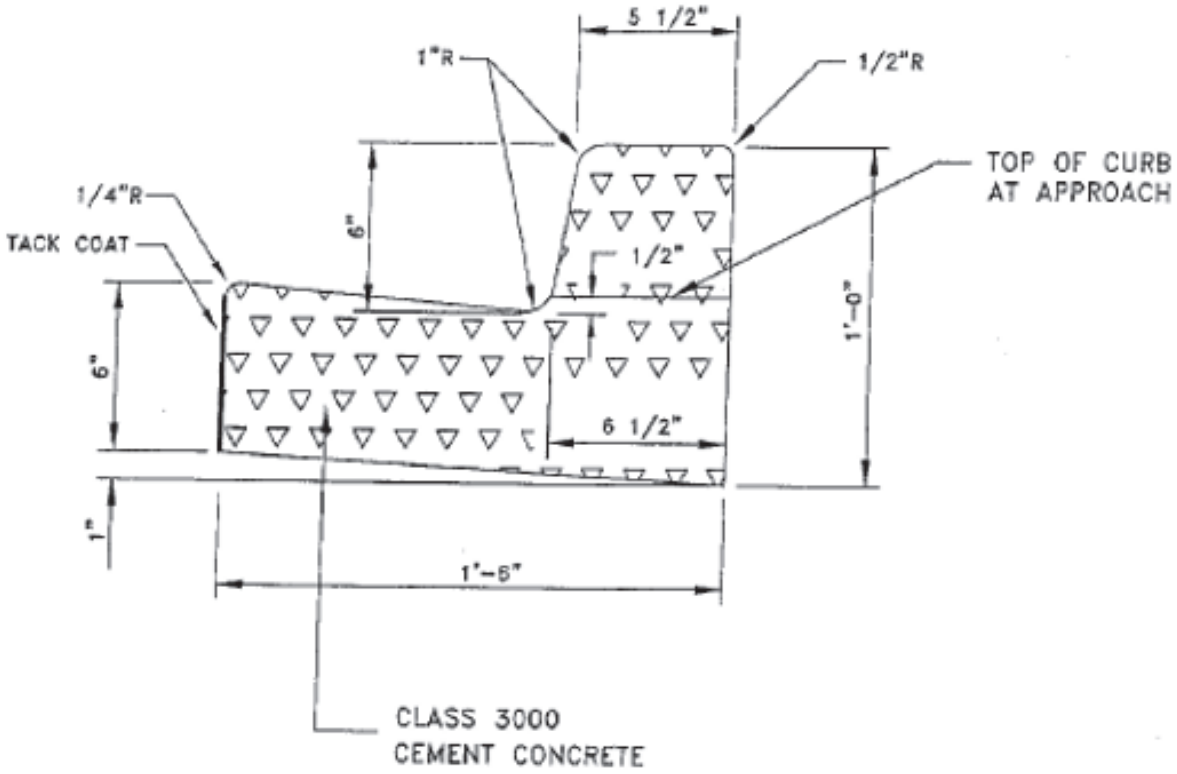
CEMENT CONCRETE REPLACEMENT WIDTH	DOWEL BAR LENGTH	SPACING
LESS THAN 4'	16"	18" O.C.
4' - 6'	24"	18" O.C.
GREATER THAN 6'	30"	18" O.C.

NOTES:

1. Concrete mix shall be class 3,000 cement concrete.
2. When cut line is less than 3' from another cutline, curb, or pavement edge, the existing pavement shall be removed to the cutlines, curb, or edge.
3. Dowels are not required on the side bordering curbs, longitudinal expansion points, or traverse construction joints.
4. Dowels are to be installed a minimum of 6" into existing concrete pavement.
5. All existing pavement & concrete loosened during construction shall be removed before patch is installed.

DRAWING NOT TO SCALE

CEMENT CONCRETE CURB & GUTTER

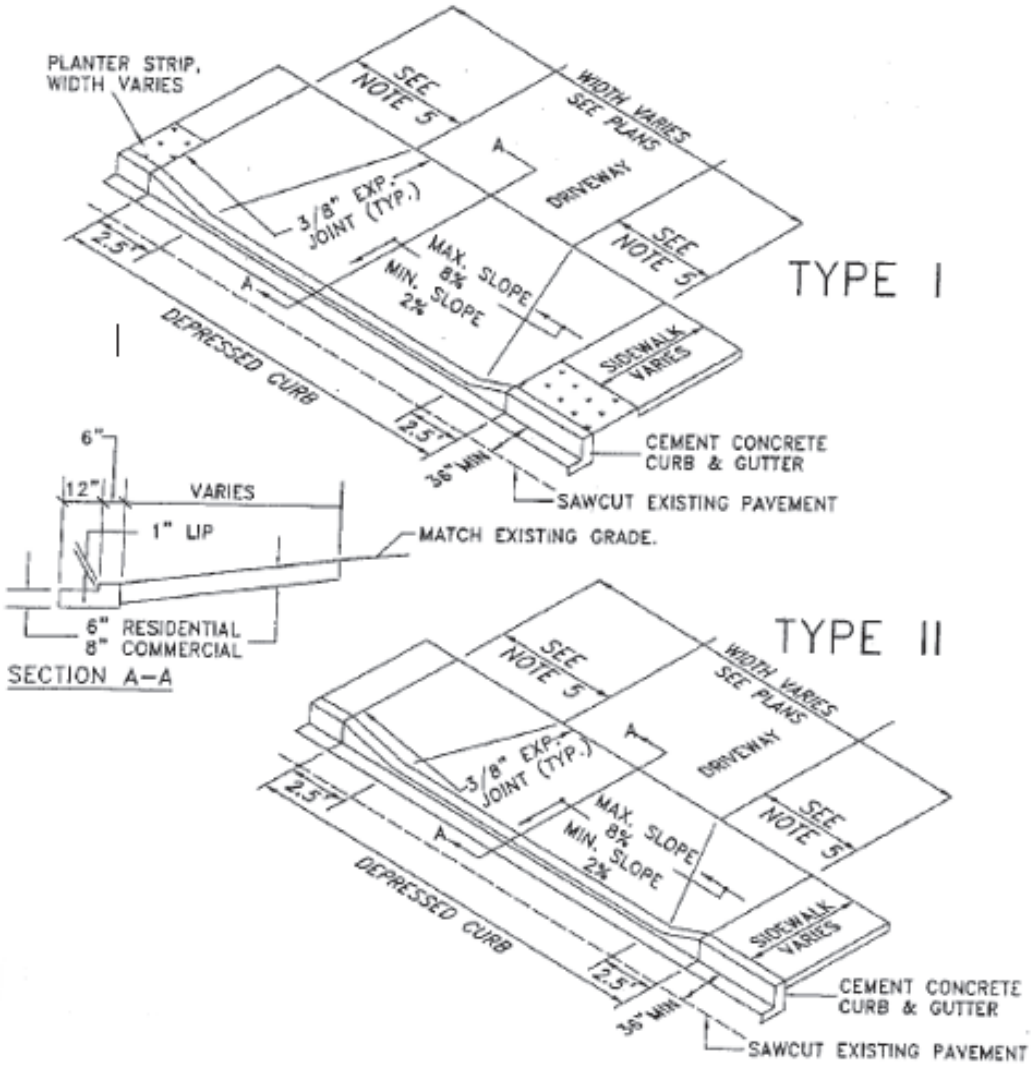


NOTES:

1. Expansion joint material to be 3/8” thick pre-molded joint filler full thickness of concrete.
2. Form and subgrade inspection required before pouring concrete.
3. Subgrade and base requirements shall be the same as for pavement restoration.

DRAWING NOT TO SCALE

CEMENT CONCRETE DRIVEWAY

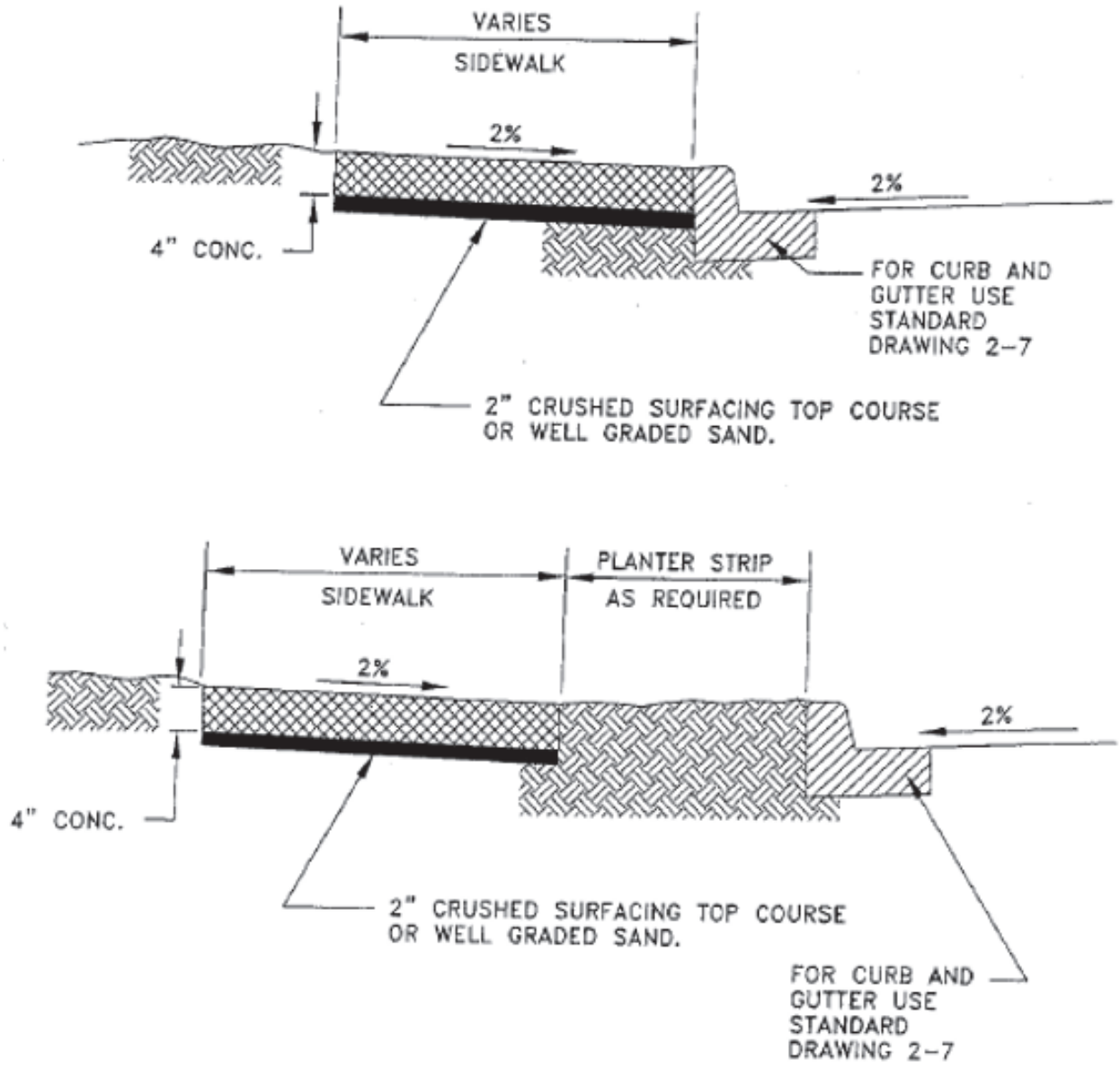


NOTES:

1. Where D/W exceeds 16’ width, a contraction joint shall be placed transversely in walk, centered along driveway.
2. Expansion joints are required to ensure isolation when new concrete is placed against existing concrete or existing features.
3. Expansion joint material to be 3/8” thick pre-molded joint filler full thickness.
4. Form and subgrade inspection are required before placing concrete.
5. Transition width will vary depending on driveway slop. Maintain maximum 12:1 transition slope.
6. When checked with a 10 foot straightedge, grade shall not deviate more than 1/8 inch & alignment shall not vary more than 1/4 inch.
7. Broom finish longitudinally with light broom finish.

DRAWING NOT TO SCALE

SIDEWALK

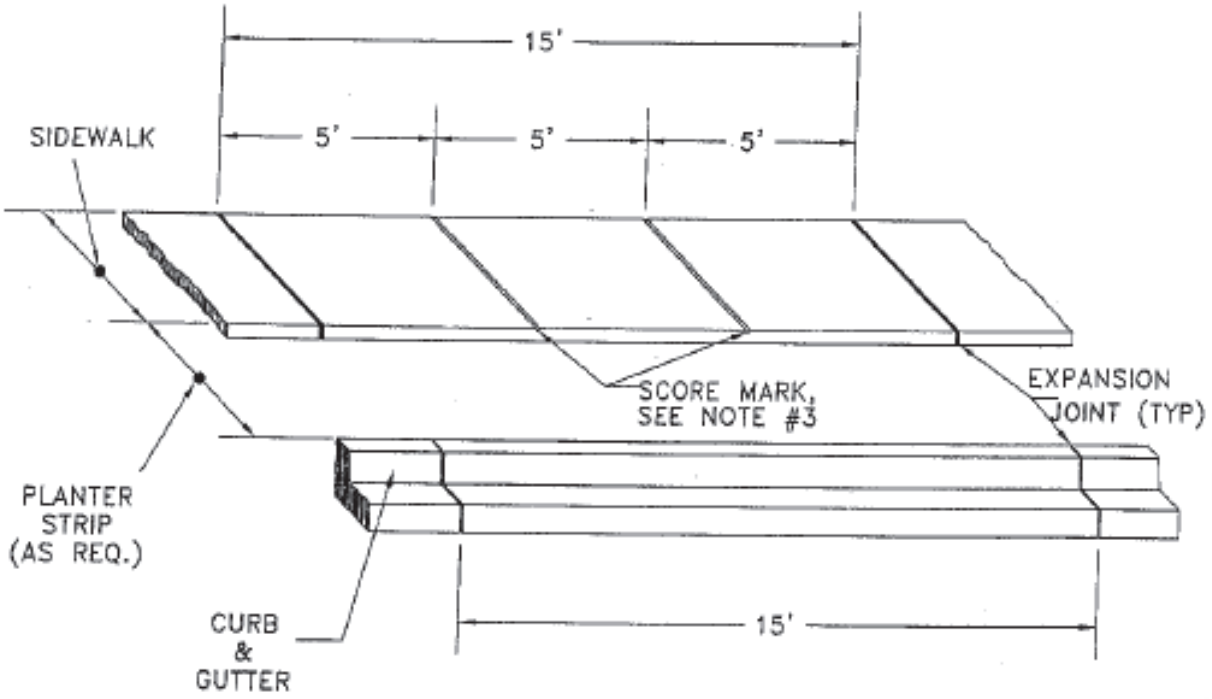


NOTES:

1. Refer to Standard Drawing 2-10 for information on joints and scoring.
2. Sidewalk across concrete driveways require a minimum depth of 6” for residential drives & 8” for all other drives.
3. When checked with a 10’ straightedge, grade shall not deviate more than 1/8 inch & alignment shall not vary more than 1/4 inch.

DRAWING NOT TO SCALE

SIDEWALK SPACING

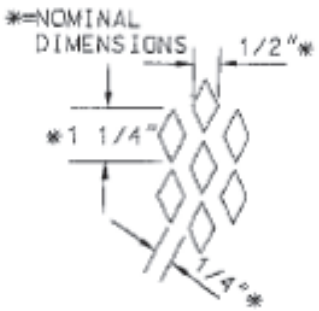


NOTES:

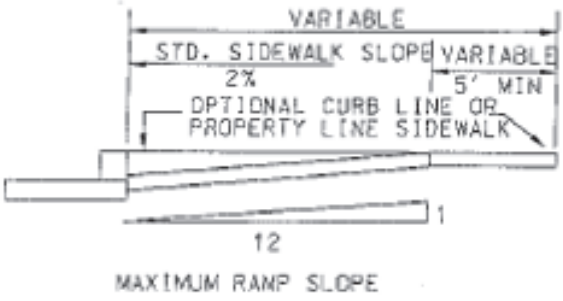
1. Expansion joint material to be 3/8" thick pre-molded joint filler full thickness of concrete.
2. Form and subgrade required before pouring concrete.
3. Score marks shall be ± 1/8" wide by ± ¼" deep. For sidewalks over 8' in width, a longitudinal score mark shall be made along center of walk.
4. Expansion joints shall be installed in curb and gutter and in sidewalk at PC and PT at all curb returns. Expansion joints shall be placed in sidewalk at same locations as those in curb and gutter when sidewalk is adjacent to curb and gutter, unless otherwise directed by engineer.

DRAWING NOT TO SCALE

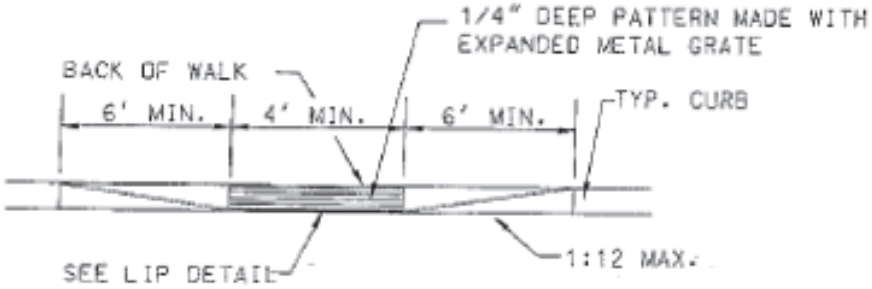
CURB RAMP CONSTRUCTION DETAILS



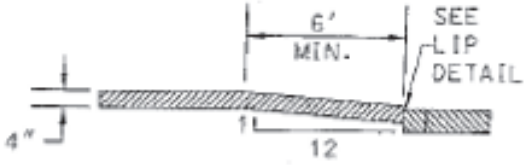
RAMP TEXTURE DETAIL



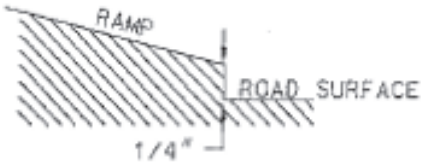
SECTION THROUGH RAMP ALL VIEWS



FRONT VIEW OF RAMP



RAMP SIDE VIEW



LIP DETAIL

NOTES:

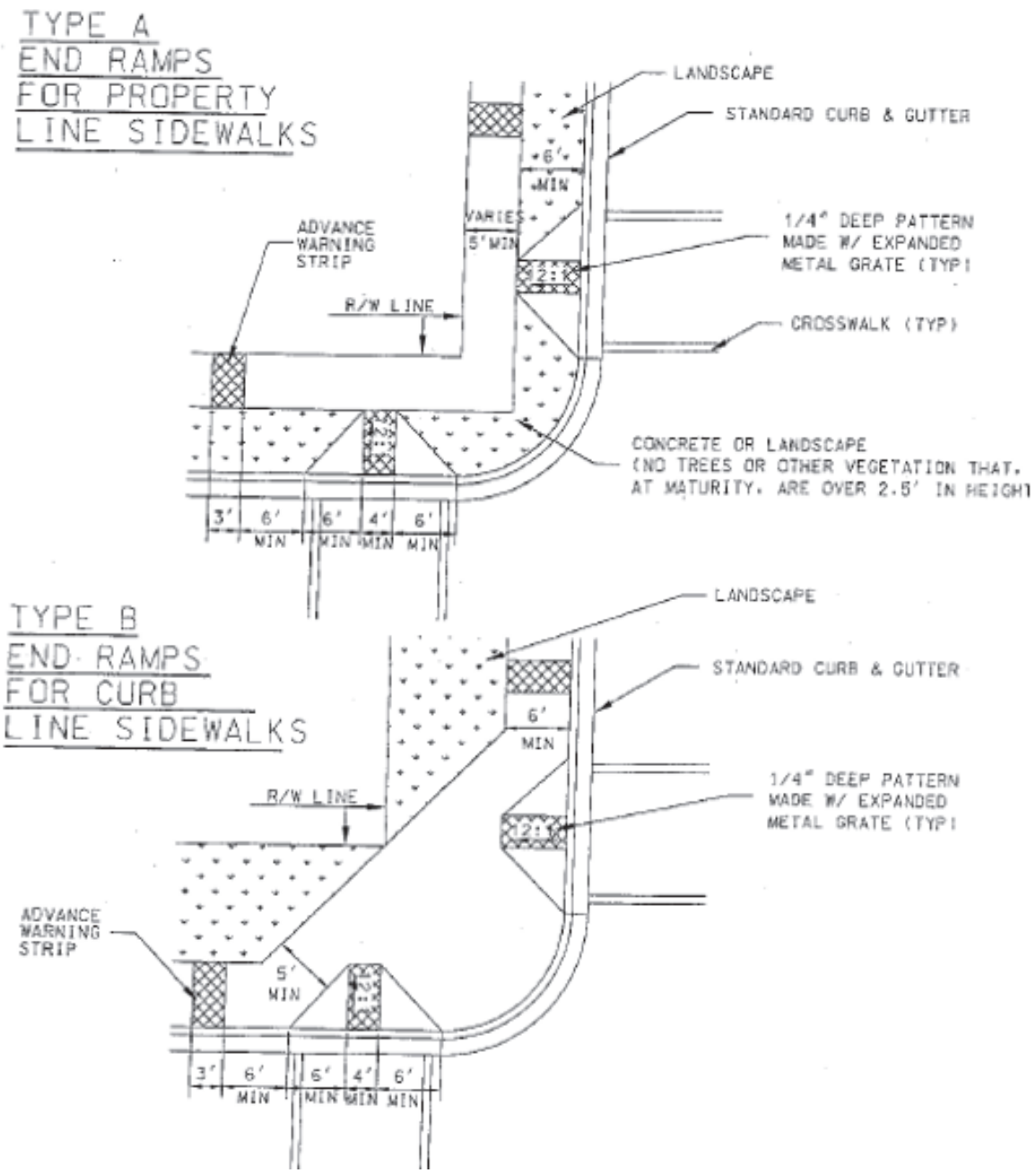
1. Minimum ramp length is six feet (6').

   Minimum ramp width is three feet (4').

2. See sidewalk detail for thickness, expansion joints and score marks.

DRAWING NOT TO SCALE

TYPES A & B CURB RAMPS

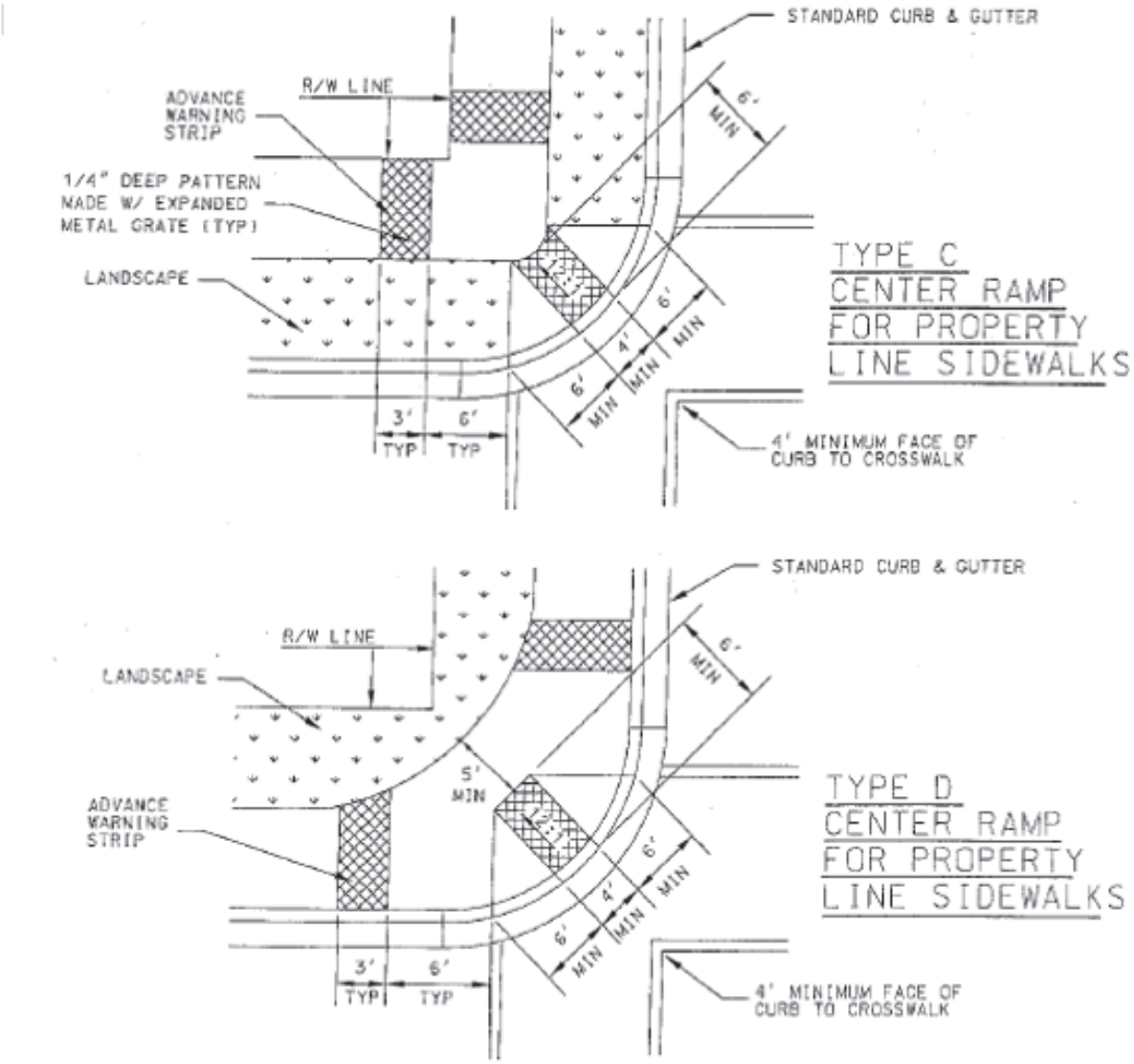


NOTES:

1. See sidewalk detail for thickness, expansion joints and score marks.
2. Crosswalks shall be centered on curb access ramps.
3. The low end of the curb ramp shall be flush with the street (i.e., without a lip) for the entire width of the ramp.

DRAWING NOT TO SCALE

TYPES C & D CURB RAMPS

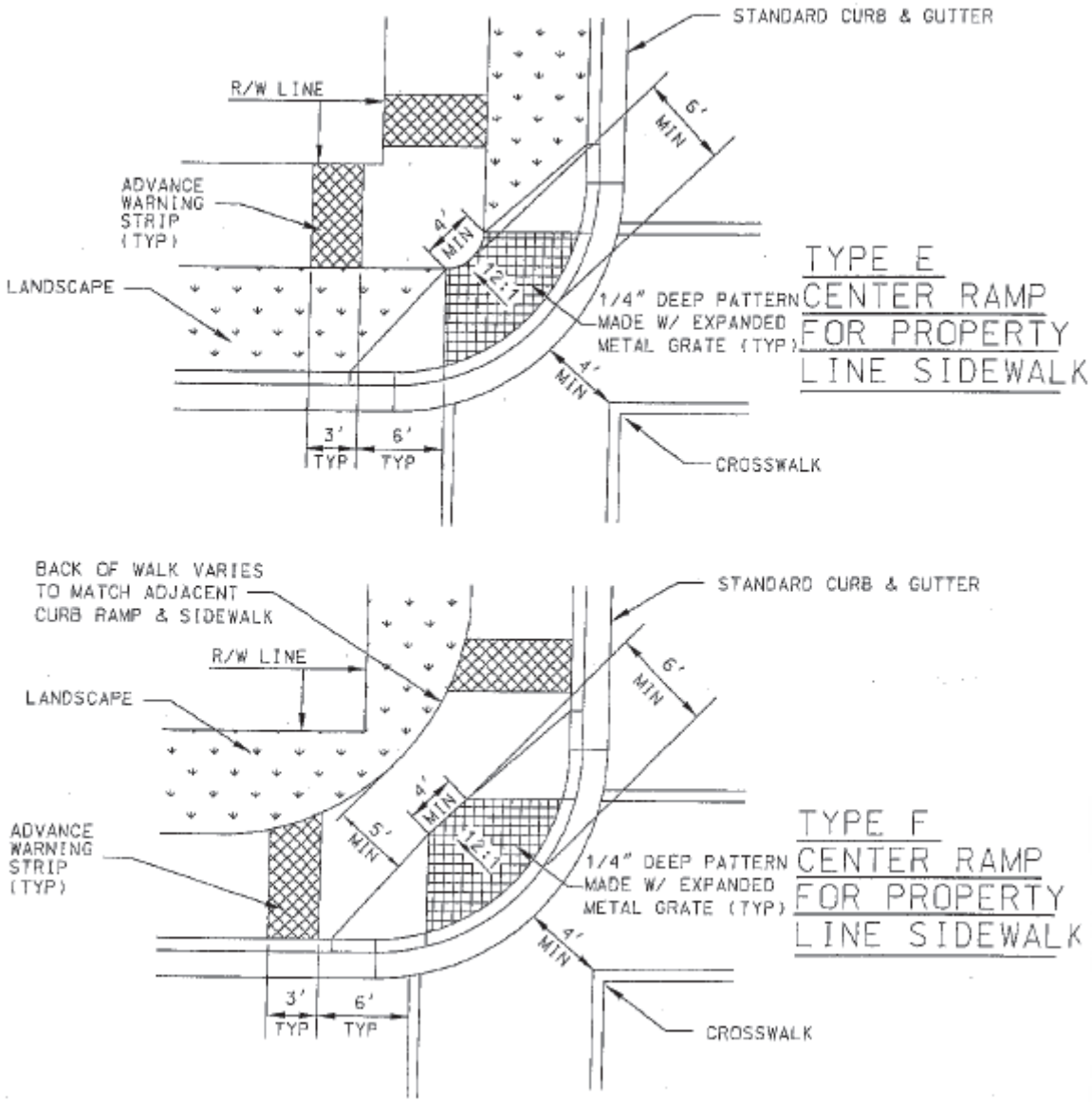


NOTES:

1. These ramps are to be used when curb radius is 35’ or greater, upon approval of the Public Works Director.
2. See sidewalk detail for thickness, expansion joints, and score marks.
3. The low end of the curb ramp shall be flush with the street (i.e., without a lip) for the entire width of the ramp.

DRAWING NOT TO SCALE

TYPES E & F CURB RAMPS

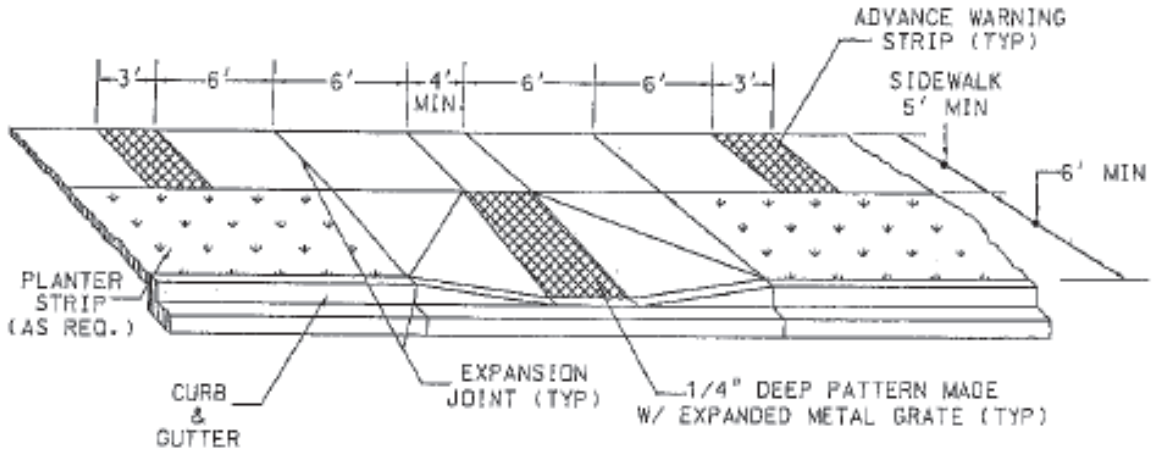


NOTES:

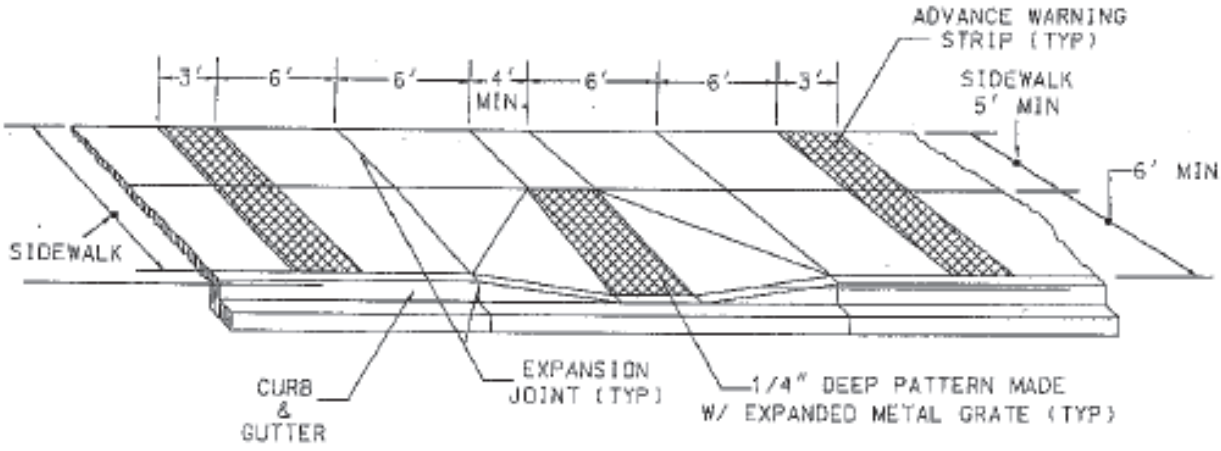
1. These ramps are to be used when curb radius is 35’ or greater, upon approval of the Public Works Director.
2. See sidewalk detail for thickness, expansion joints, and score marks.
3. The low end of the curb ramp shall be flush with the street (i.e., without a lip) for the entire width of the ramp.

DRAWING NOT TO SCALE

MID-BLOCK CURB RAMPS



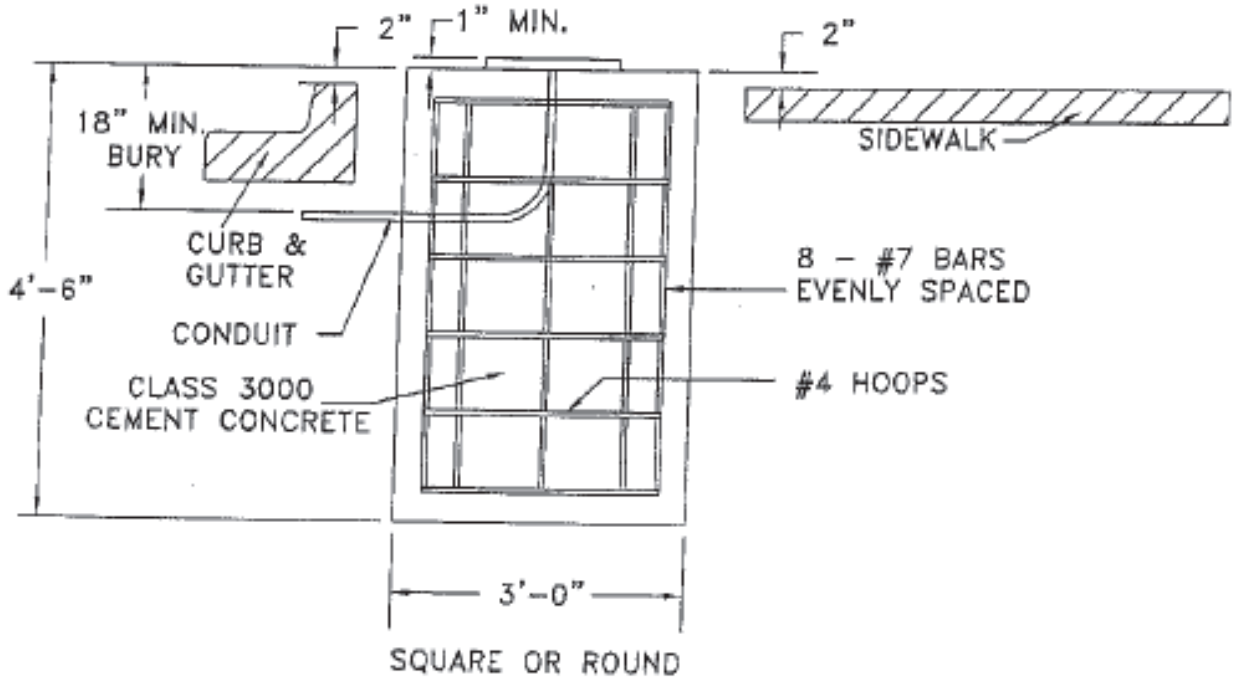
FOR PROPERTY LINE SIDEWALK



FOR CURB LINE SIDEWALK

DRAWING NOT TO SCALE

LUMINAIRE FOUNDATION

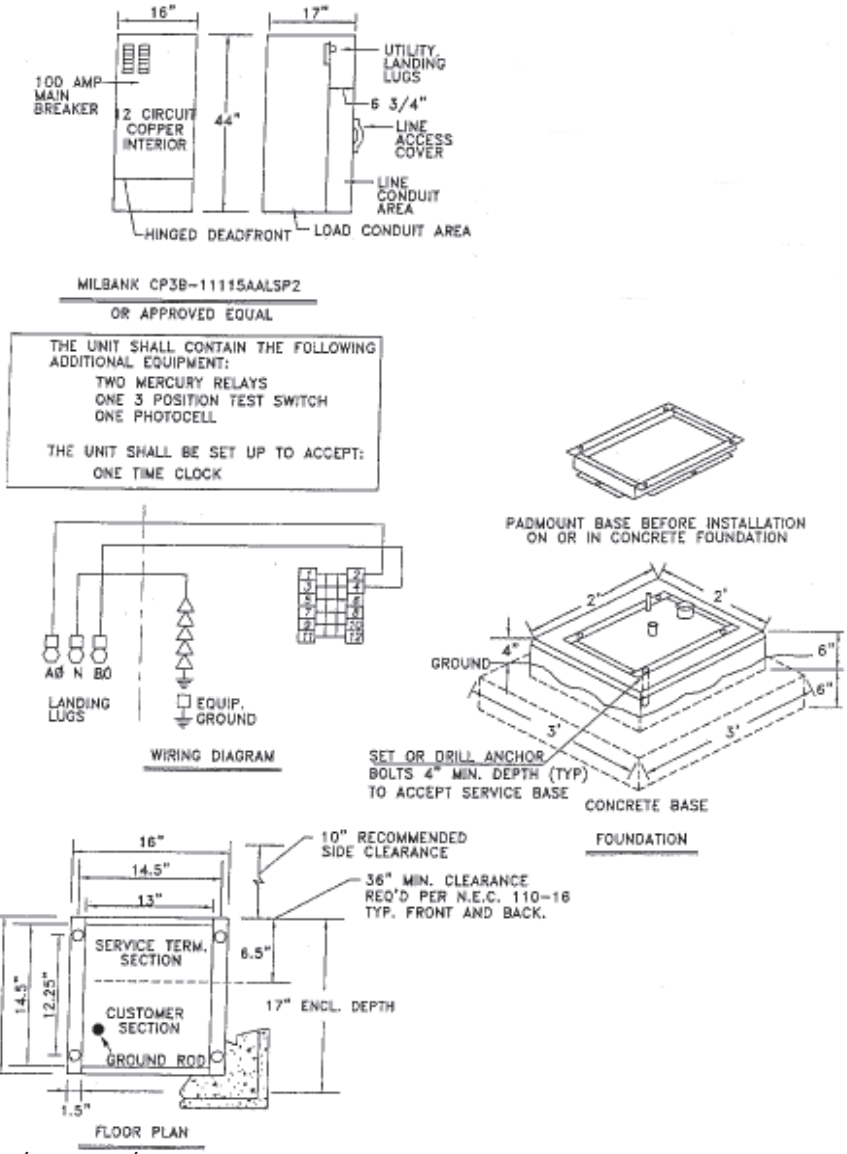


GENERAL NOTES:

1. All reinforcing steel shall have 2-1/2" clear cover of concrete.
2. Provide watertight grout joint between base of pole and concrete.
3. Provide 3/8" expansion joint when placed in a sidewalk area.
4. Anchor bolts & bolt circle to meet manufacturer specifications. Set bolt height to permit double locknut for adjustment.

DRAWING NOT TO SCALE

SERVICE DISCONNECT FOR STREET LIGHTS & TRAFFIC SIGNAL

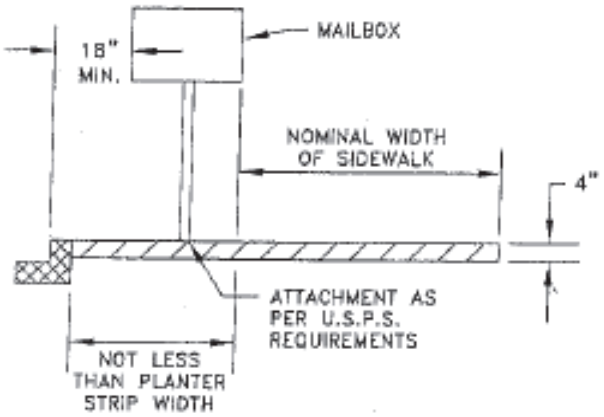


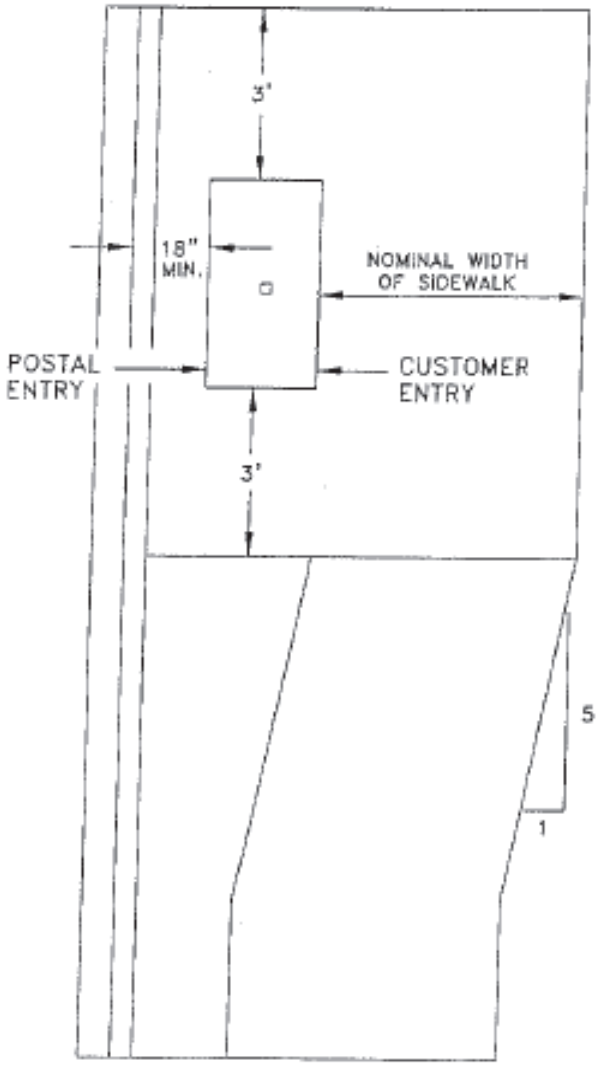
SPECIFICATIONS

1. Standard voltage is 120/240V 10/30W
2. Caltrans type 3Bservice or U.L. approved equal
3. Type 3R rainproof enclosure
4. Aluminum anodized construction
5. Interior will accept plug-in breakers (Bryant, G.E., Westinghouse, ITE, Crouse-hinds)
6. Detachable pad mount sub-base
7. Copper bussed interior has provisions for twelve full one-inch poles
8. Suitable for use without a main when no more than six service disconnects are installed and used in accordance with article 384 of the NEC
9. Seal service to concrete foundation with silicone.

DRAWING NOT TO SCALE

MAILBOX CLUSTER



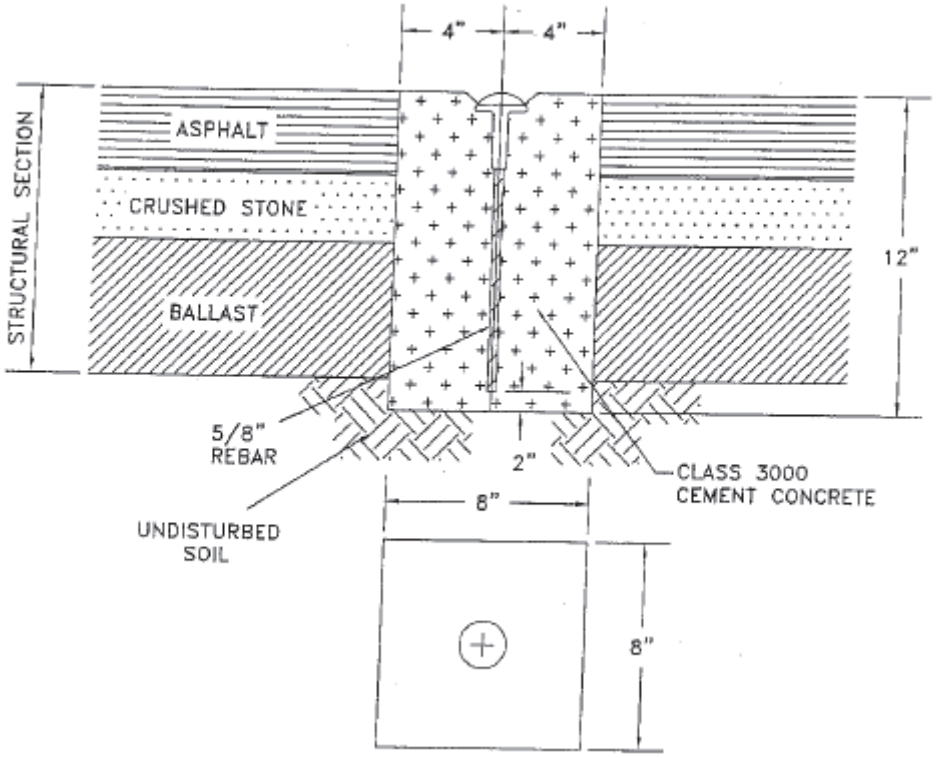


GENERAL NOTES

1. See section 2G.06 for additional requirements.
2. Locate so as not to create an intersection site distance obstruction.

DRAWING NOT TO SCALE

CAST IN PLACE MONUMENT

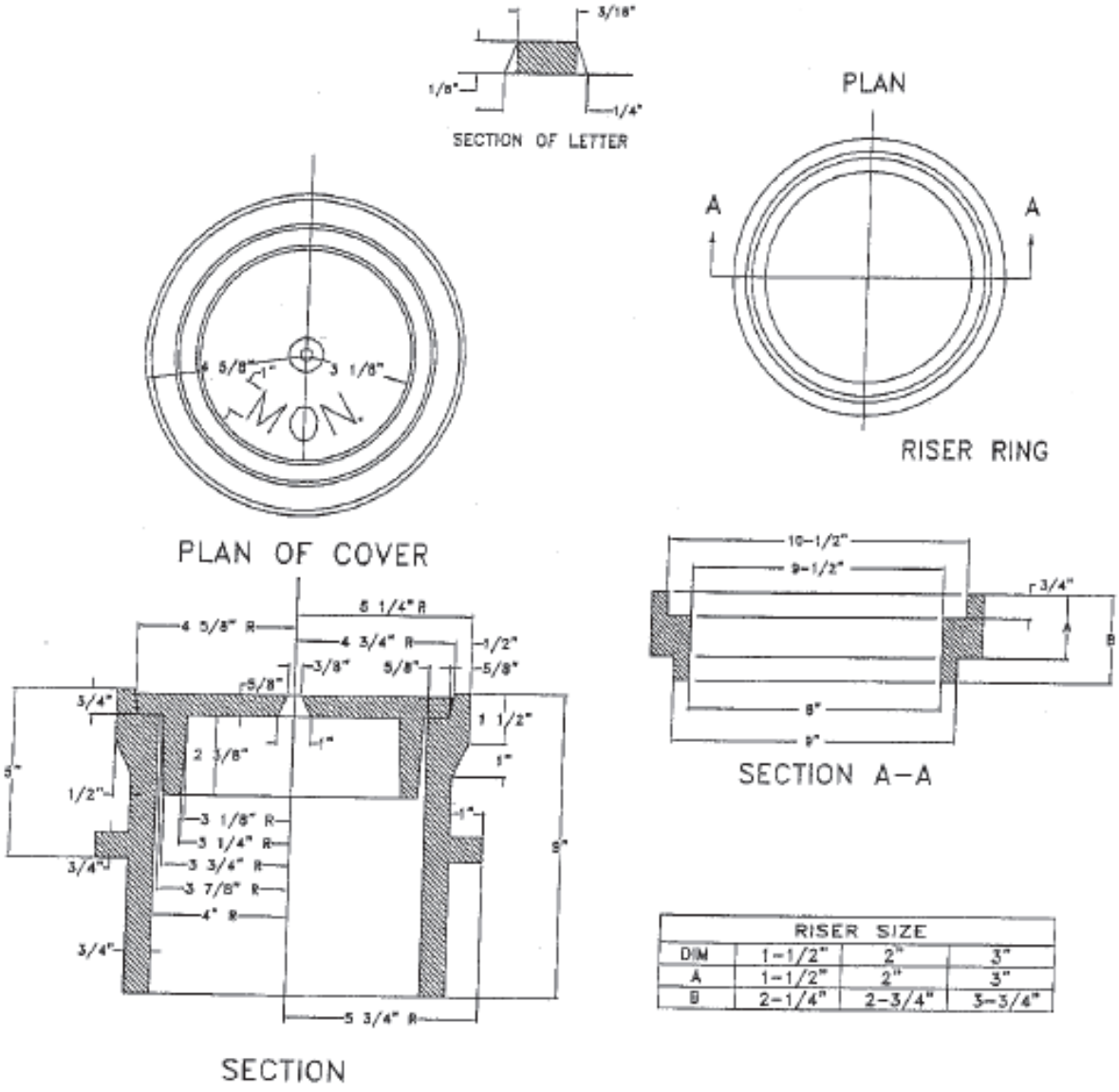


GENERAL NOTES:

1. This monument to be used primarily on bituminous or asphalt concrete pavement for use primarily in subdivisions and minor arterials.
2. Concrete base dimensions shown are minimum. Concrete base need to be formed.
3. Cap shall be “Berntsen RB series” or 2” brass plug marker. (Flat or domed)
4. Concrete to be placed on a firm and unyielding foundation.

DRAWING NOT TO SCALE

MONUMENT CASE AND COVER WITH RISER



RISER SIZE			
DIM	1-1/2"	2"	3"
A	1-1/2"	2"	3"
B	2-1/4"	2-3/4"	3-3/4"

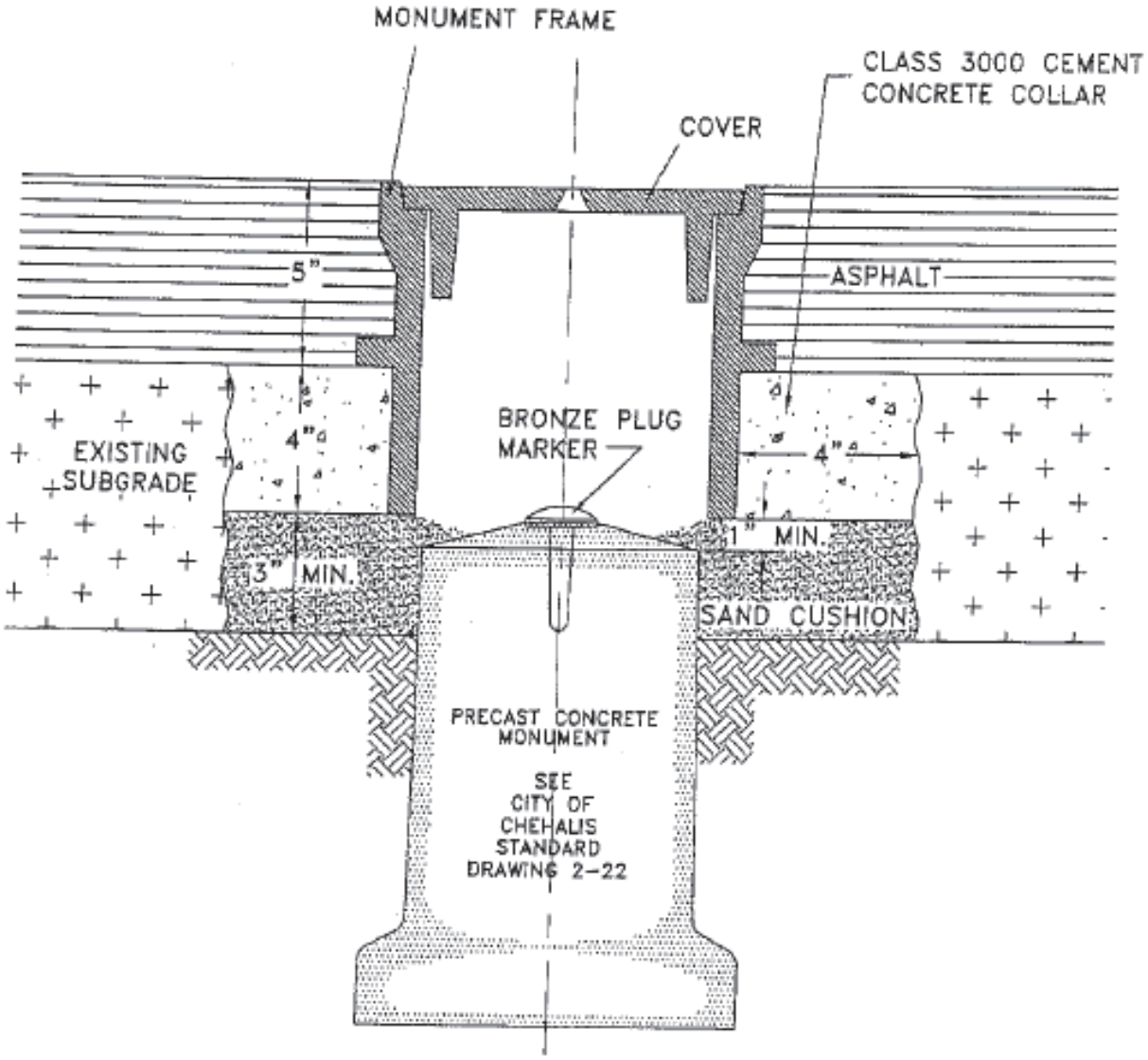
NOTES:

The castings shall be gray-iron castings, ASTM designation a 48, Class 40. The cover and seat shall be machined to have perfect contact around the entire circumference and full width of bearing surface.

When the monument case and cover are placed in cement concrete pavement the concrete base will be necessary.

DRAWING NOT TO SCALE

MONUMENT CASE INSTALLATION

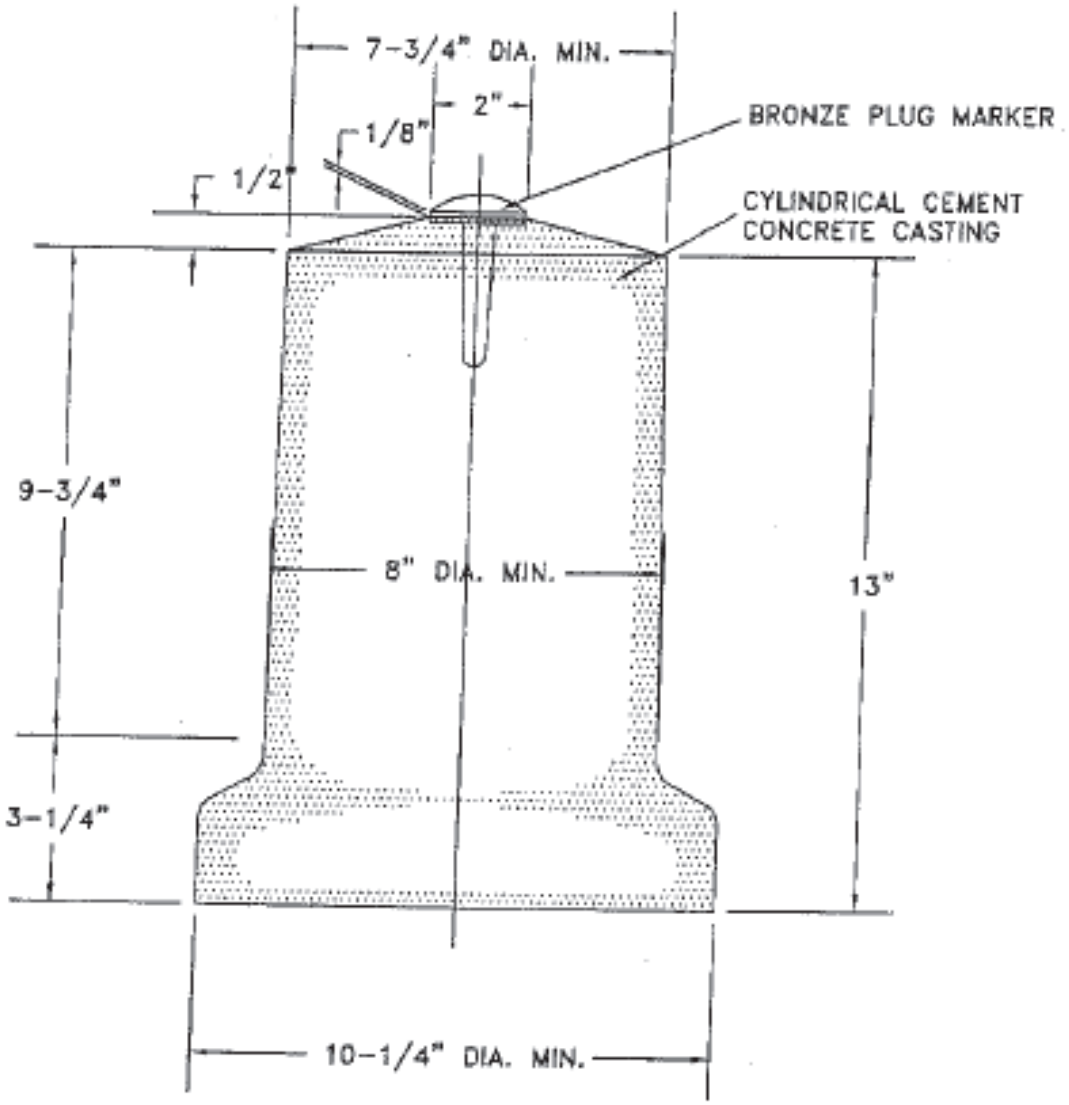


NOTES:

For use primarily on arterial streets, streets with bus traffic and truck routes.

DRAWING NOT TO SCALE

PRECAST CONCRETE MONUMENT



GENERAL NOTES:

1. Minimum ultimate compressive strength of concrete casting at 28 days – 3000#.
2. Maximum aggregate size to be 1”.

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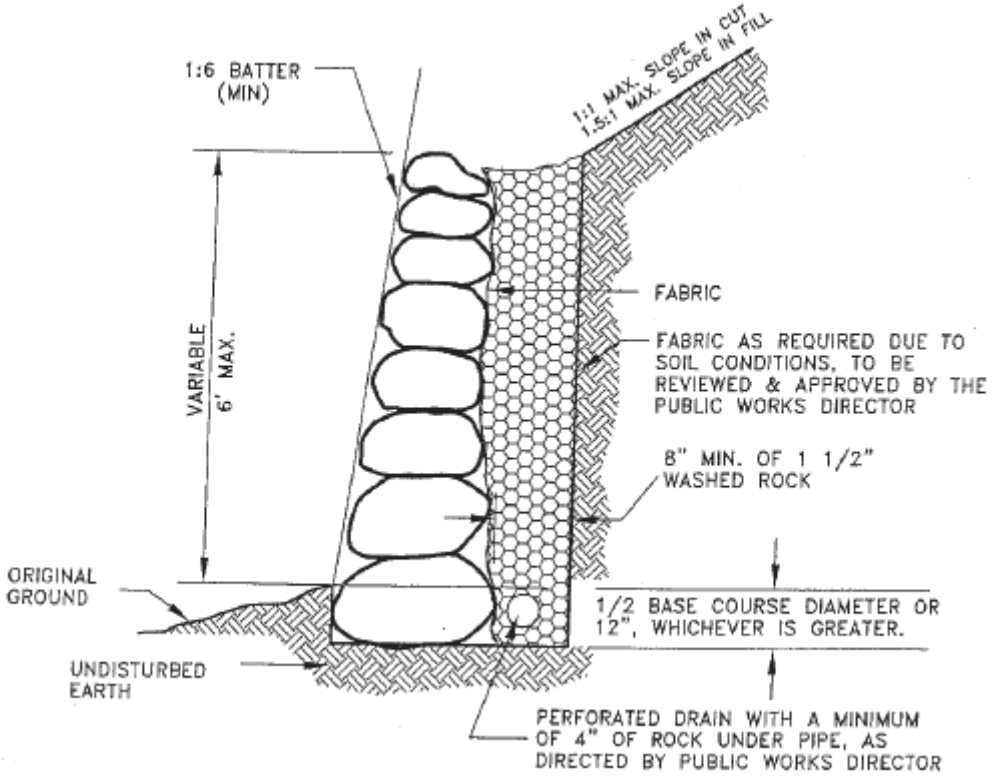
RETAINING WALL



GENERAL NOTES:

1. Rockeries higher than 5' shall be constructed of rocks of graduated sizes from 5-man to 2-man from bottom to top. Rockeries of 5' or lower shall be constructed of 3-man to 2-man from bottom to top. Rock size categories shall include:

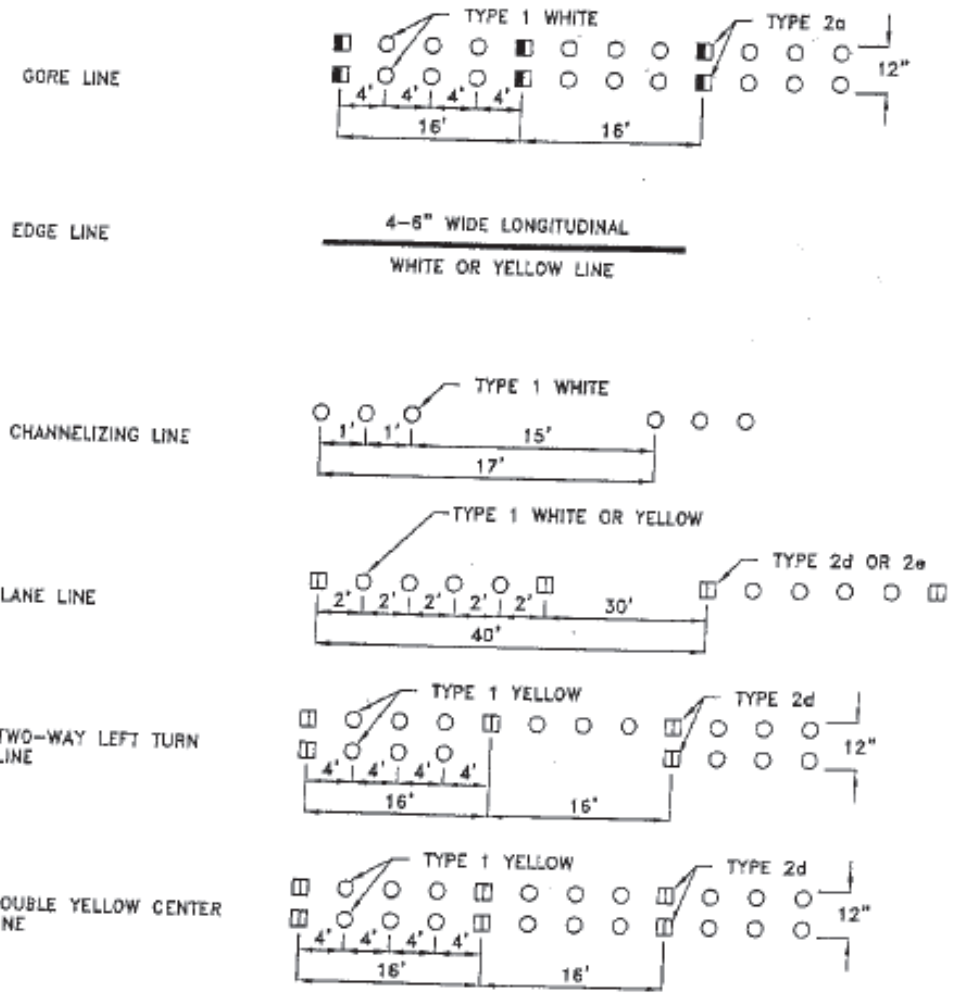
   2-Man rocks (300 to 600 pounds),
   13 inches in least dimension;
   3-man rocks (800 to 1200 pounds),
   16 inches in least dimension;
   4-man rocks (1500 to 2200 pounds),
   18 inches in least dimension;
   5-man rocks (2400 to 3400 pounds),
   24 inches in least dimension.

2. The rockery shall be installed with a smooth face.
3. The long dimension of the rocks shall be oriented towards the bank to provide maximum stability.
4. The rock shall be placed to lock into two rocks in the lower tier.
5. Call for inspection prior to base course being placed (for verification of rockery height, foundation material and rock size).
6. Design varying from those indicated shall carry the seat of a Professional Engineer licensed in the State of Washington, experienced in soil mechanics.

DRAWING NOT TO SCALE

STRIPING DETAIL

PAVEMENT MARKING DETAILS



LANE MARKERS

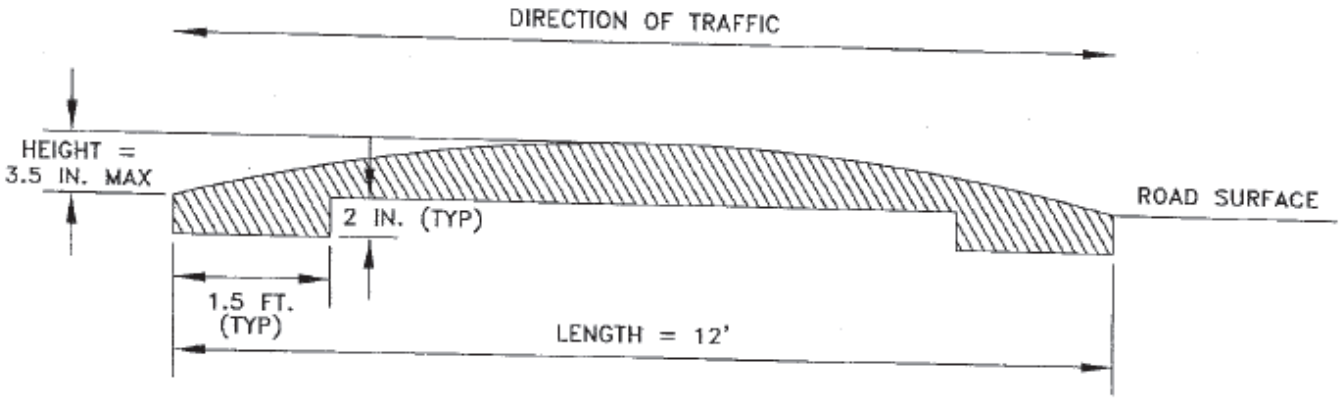
- TYPE 1 LANE MARKERS, WHITE OR YELLOW
- TYPE 2a REFLECTIVE LANE MARKER, WHITE AND RED
- TYPE 2d REFLECTIVE LANE MARKER, YELLOW AND YELLOW
- TYPE 2e REFLECTIVE LANE MARKER, WHITE–ONE SIDE ONLY

NOTES:

All pavement line shall be “durastripe” or approved equal.

DRAWING NOT TO SCALE

SPEED BERM CROSS SECTION



NOTES:

Berm shall make gradual transition to and from point of maximum height.

DRAWING NOT TO SCALE

CHAPTER 3 – STORM DRAINAGE AND EROSION CONTROL

3A STORMWATER MANAGEMENT

3A.01 General

The standards established by this chapter are intended to represent the minimum standards for the design and construction of storm drainage facilities.

The City of Napavine Stormwater Management Plan and the most recent version of "Stormwater Management Manual for the Puget Sound Basin" documents are considered a part of this chapter as well as the City Public Works Standards, except as supplemented herein. The Stormwater Management Plan sets forth the minimum drainage and erosion control requirements as supplemented herein.

3A.02 Design Standards

The design of storm drainage and/or retention/detention systems will depend on their type of local site conditions. The design elements of storm drainage systems will conform to these Standards and follow current design practice as set forth in the City of Napavine Stormwater Management Plan. Properties will not be developed in such a way as to discharge stormwater onto adjacent lots.

The General Notes on the following pages will be included in all plans dealing with stormwater conveyance and/or detention.

General Notes (Storm Drain Construction)

1. All workmanship and materials will be in accordance with the City of Napavine Public Works Standards and the most recent copy of the State of Washington Standard Specifications for Road, Bridge and Municipal Construction (WSDOT/APWA).

2. Temporary erosion/water pollution measures will be required in accordance with the Stormwater Management Plan and Section 1-07.15 of the Standard Specifications.

3. Comply with all other permits and requirements of the City of Napavine and/or other governing authorities or agencies.

4. A pre-construction meeting will be held with the Public Works Department **prior** to the start of construction.

5. All storm mains and retention/detention areas will be staked for grade and alignment by an engineering or surveying firm capable of performing such work.

6. Storm drainpipe will meet the following requirements:

    a. Plain concrete pipe conforming to the requirements of AASHTO M 86, Class 2.

    b. Reinforced concrete pipe conforming to the requirements of AASHTO M 170.

    c. PVC pipe conforming to ASTM D 3034 SDR 35 or ASTM F794 or ASTM F679 Type 1 with joints and gaskets conforming to ASTM D 3212 and ASTM F 477.

    d. Ductile iron pipe conforming to the requirements of AWWA C 151, thickness class as shown on the plans.

    e. High-density polyethylene smooth interior pipe conforming to AASHTO M252 types or AASHTO M294 type S, with a gasketed bell and spigot joints.

    f. Aluminized steel helical or spiral rib pipe in diameters of thirty (30)inches or greater, with a Manning's value of 0.020 or less.

7. Special structures, oil/water separators and outlet controls will be installed per plans and manufacturers recommendations.

8. Provide traffic control plan(s) as required in accordance with MUTCD to the Public Works Department Traffic control plans must be approved **prior** to the start of construction.

9. Call the Utilities Underground Location Center at 1-800-425-5555 a minimum of two (2) business days **prior** to any excavations.

10. Where connections require "field verifications", the contractor will expose connection points and verify necessary fittings two (2) business days **prior** to initiating the work.

11. All storm lines and catch basins will be in high velocity cleaned and pressure tested in accordance with Division 7 of the Standard Specification **prior** to paving. Hydrant flushing of the lines in not an acceptable cleaning method. Testing of the storm main will include television inspection at the contractor's expense. The Director of Public Works will determine whether the inspection will be performed by the city or by a representative of the contractor under the city's direction. Testing will take place after all underground utilities are installed and compaction of the roadway subgrade is completed.

12. Fill replacement will not be allowed in any open channel used for storm conveyance without written approval from the Public Works Director.

Stormwater conveyance and detention system will be designed in accordance with the following design standards table:

Hydrologic Model	
Conveyance Design	
<50 acres	Rational Method
>50 <200 acres	SCS-based Hydrograph Method
>200 acres	Continuous Simulation Method
Detention Design	
<50 acres	SCS Unit Hydrograph Method with Level Pool Routing
>50	Continuous Simulation Method
Design Storm Frequency	
Conveyance	Capacity to handle: 100-year storm event
Detention	Precent peak flow increase: 100-year storm event
	Evaluation of erosion control: 2-year storm event and 10-year storm event
Design Storm Duration/Distribution	
Hydrograph Method	6 and 24-hour duration
SCS Unity Hydrograph Method	6 and 24-hour durations SCS Type 1A distribution
Rational Method	Time of concentration constant rainfall intensity

3A.03 Conveyance

Pipe: Storm drainpipe within a public right-of-way or easement will be sized to carry the maximum anticipated runoff from the contributing area. The calculations of anticipated runoff and pipe sizing will be developed by a professional engineer licensed in the State of Washington. The developer will provide the calculations and all associated information to the Public Works Department.

The minimum main size will be twelve (12) inch diameter, smaller pipe sizes will be considered on a case-by-case basis as approved by the Director of Public Works. Lateral lines may be six 96) inch diameter that a larger size is needed to serve adjacent areas or for future service. The installation of a larger main may allow the developer to seek partial reimbursement through a Latecomers Agreement (see Chapter 1 for details).

All pipe used for storm mains will comply with one of the following types:

A. Plain concrete pipe conforming to the requirements of AASHTO M 170.

B. Reinforced concrete pip conforming to the requirements of AASHTO M 170.

C. PVC pipe conforming to ASTM D 3034 SDR 35 or ASTM F 794 or ASTM F679 Type 1 with joints and gaskets conforming to ASTM D 3212 and ASTM F 477.

D. Ductile iron pipe conforming to the requirements of AWWA C 151, thickness class as shown on the plans.

E. High-density polyethylene smooth interior pipe conforming to ASSHTO M252 types or AASHTO M294 type S, with a gasket bell and spigot joints.

F. Aluminized steel helical or spiral rib pipe in diameters of thirty (30) inches or greater, with a Mannings value of 0.020 or less.

Channels: Open vegetated channels may be utilized for stormwater conveyance when deemed appropriate by the Public Works Department. Open channels located in a public right-of-way will be sized to carry the maximum anticipated runoff from the contributing area without exceeding the confines of the channel. In addition, when the end of the “new” conveyance system is within twenty (20) feet of another piped drainage system, the ”new” system will be extended through the open portion to complete the closed system. Extensions to complete closed drainage systems will only be required along the property where the “new” system originates, unless deemed necessary by the Director of Public Works.

When the flow of an open channel is interrupted by the construction of a driveway, the entire channel across the property will be enclosed with a piped system, unless deemed impractical by the Director of Public Works. However, the culvert under the driveway must be installed to accommodate closure of the ditch in the future. The channel enclosure may necessitate the inclusion of manholes and/or catch basin.

3A.04 Catch Basins

Maximum catch basin spacing will be 300-feet on all street classifications. No surface water will cross any roadway to private property. Additional manholes and/or catch basin may be required by the city to accommodate the maintenance needs of the storm system.

3A.04 Staking

All surveying and staking will be performed by an engineer or surveyor licensed by the State of Washington and capable of performing such work. Staking will be maintained throughout the construction operation.

A pre-construction meeting will be held with the city **prior** to commencing staking. The city will inspect all construction staking **prior** to construction.

A minimum staking of storm sewer systems will be as follows:

A. Stake centerline alignment every twenty-five (25) feet with cuts and/of fills to bottom of trench.

B. Stake location of all catch basin/manholes and other fixtures for grade and alignment.

C. Stake location, size, and depth of retention/detention facility.

D. Stake finished grade of catch basin/manhole rim elevation and invert elevations of all pipes in catch basins, manholes, and those that daylight.

3A.06 Trench Excavation

See Chapter 4.16 of these Standards for requirements regarding trench excavation.

3A.07 Backfilling

See Chapter 4.18 of these Standards for requirements regarding backfilling.

3A.08 Street Patching and Restoration

See Section 2B.15 and 2B.16 of these Standards for requirements regarding street patching and trench restoration.

3B EROSION CONTROL

3B.01 General

All projects requiring Public Works Department approval, as defined in by these Standards, will include erosion control plans if any of the following conditions are met:

A. Proposed land disturbance activities that could cause sediment runoff beyond the project limits.

B. A Clearing, Filling or Grading Permit is required.

C. The proposed project could possibly impact a nearby stream, wetland, or body of water.

D. When deemed necessary by another permitting authority.

Site work will not commence until all erosion control measures have been set in place in accordance with the approved erosion control plan.

The contractor/applicant must ensure that all erosion control measures are properly maintained in accordance with standard industry procedures.

The General Notes on the following pages will be included on any plans dealing with erosion control.

General Notes (Erosion Control)

1. Erosion control measures will be in place **prior** to the beginning of construction. A representative from the Public Works Department will inspect and approve the erosion control measures **prior** to the start of construction.

2. Erosion control measures are not limited to the items on this plan. The contractor is responsible for the installation and maintenance of all erosion measures, as required under the most recent version of the Napavine Stormwater Management Plan. Care will be taken to prevent migration of silt and/or polluted runoff to off-site properties.

3. The contractor will make regular surveillance of all erosion control measures. In addition, erosion control will be thoroughly inspected after each rainfall event. The contractor will make all necessary repairs, modifications, and additions as necessary to ensure the proper operation of the erosion control measures. The city may require more frequent inspections of erosion control measures by the contractor should site or weather conditions dictate.

4. During the wet season, November through March, all disturbed soils will be stabilized **within** forty-eight (48) hours after land disturbance activities have ceased. Erosion control measures will include, but are not limited to, installation of straw matting, jute matting, straw mulch and/or wood chips, and cover the affected area and spoil piles with plastic sheeting.

5. The contractor will check all seeded or sodded areas regularly to ensure that the vegetative cover is being adequately established. Areas will be repaired, reseeded, and fertilized as required.

6. Tracking of soil off-site will not be allowed. If any soil is tracked beyond the limits of the site, it will be removed **before** the end of that working day. To prevent additional tracking, vehicle tires must be swept or washed **prior** to leaving the project site.

7. No more than 500 lineal feet (LF) of trench on a down-slope of more than five (5)percent will be opened at one time.

8. Excavated material will be placed on the uphill side of trenches.

9. Excavated material will not be placed in established drainage ditches, under any circumstances.

10. Trench dewatering devices will be discharged in a manner that will not adversely affect flowing streams, drainage systems, or off-site properties. An established sediment trap will be used as the receiver for all trench dewatering operations.

11. All disturbed areas will be seeded or sodded upon completion of work. The contractor will be responsible to ensure that complete coverage of the disturbed areas is provided, and that growth of vegetation is established. Seed and sod applications will be conducted in accordance with the timelines noted in the most recent edition of the WSDOT Standard Specification.

12. All erosion control will remain in place until such time as the site is adequately stabilized. **Prior** to removal of erosion control measures, the Public Works Department will be notified for final inspection and approval.

3B.02 Best Management Practices

Erosion control may include the following:

A. **Sedimentation Ponds**

Sedimentation ponds are utilized to collect runoff generated on a construction site, thereby allowing sediment to be captured **before** the runoff leaves the site. Sedimentation pond design will include the following considerations:

1. Computation of the sediment storage volume
2. Computation of the settling volume
3. Computation of the pond surface area – (surface area, in sf = 1,250 x 1-yr, 24-hour storm rate, in cfs)

Minimum pond dimensions are as follows:

1. 2-foot depth for settling
2. 3-foot depth for sediment storage
3. 3:1 side slope

The contractor will inspect sedimentation ponds immediately after reach rai event to ensure the integrity of the facility. The contractor will also remove the majority of the sediment collected in the ponds whenever the storage volume is exceeded, or the settling volume is infringed upon. In addition, **prior** to the final completion of the project, ponds will be cleaned out in their entirety.

The length/width ratio of the pond will be as large as possible. A 5:1 ratio is the preferred minimum, but exceptions will be granted when deemed appropriate by the Director of Public Works. The pond will be divided into a series of at least two (2) separate chambers. Perforated pipe risers will be used to convey water between the chambers and at the outlet.

B. **Interceptor Channels**

Interceptor channels are used to capture runoff generated on a construction site **before** it can leave the project limits. The channel is often used in combination with a sedimentation pond. The channel is typically grass lined and runs along the perimeter of the site. The grass must be established **prior** to the start of construction. Therefore, sod is often used to establish the vegetated surface of the channel. Upon completion of the project, the sod can be removed and re-used if the ditch is filled in and restored with a suitable and stable cover material.

C. **Sediment Barriers**

Sediment barriers are filtering devices that are run along the perimeter of a site to capture sediment while allowing runoff water to continue along its natural path. Silt fencing and hay bales are common examples of sediment barriers.

Regular removal of sediment is required to ensure that the barriers function properly. In addition, the structural integrity of the barriers must be maintained at all times. Barriers will be installed, inspected, and repaired, in accordance with the details and requirements included in the Standards.

D. **Stabilized Construction Entrance**

A stabilized construction entrance is a rocked access point to a construction site. The entrance reduces material carried from the site onto the public right-of-way.

Construction entrances must be cleared of mud and debris regularly to ensure that materials are not being tracked from the construction site, onto the right-of-way and beyond. The contractor is responsible for all required maintenance of entrances.

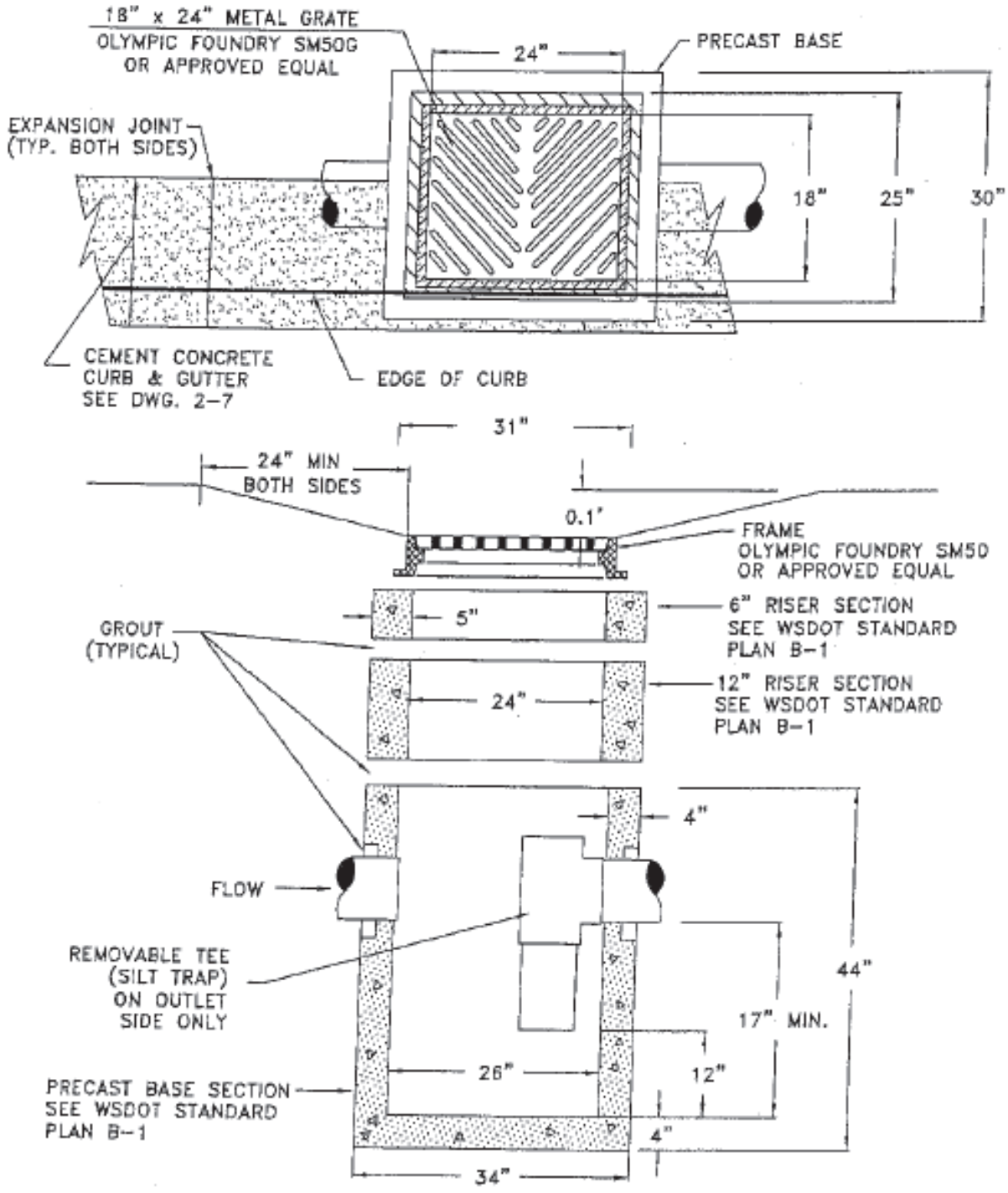
E. **Detention/Retention Facilities**

No retention/detention facility will be located in an area that is used to satisfy an open space requirement unless it enhances a recreational amenity. Use of designated open space areas for stormwater detention/retention and infiltration must satisfy all conditions of the City of Napavine for usability, landscape conformity and ease of access. The city will make the final determination whether or not the proposed stormwater facilities are compatible with and satisfy the intent of an open space.

The primary purpose of a consolidated open space is to provide usable area for recreation activities, buffer zones, and green belt areas, and must be designed for this intent. Any use of this area for stormwater detention/retention must clearly be subordinate to and not detract from open space uses. The usable open space will be predominantly flat, and in no case, exceed 4:1 where drainage facilities are present. A minimum of 50 percent of the linear slop length will not exceed 7:1.

The Director of Public Works will review the use of commercial parking lots for stormwater detention on a case-by-case basis. The detention area will be situated away from areas of pedestrian movement. The maximum depth of water in parking lot storage will be limited to twelve (12) inches.

CATCH BASIN WITH SILT TRAP TEE

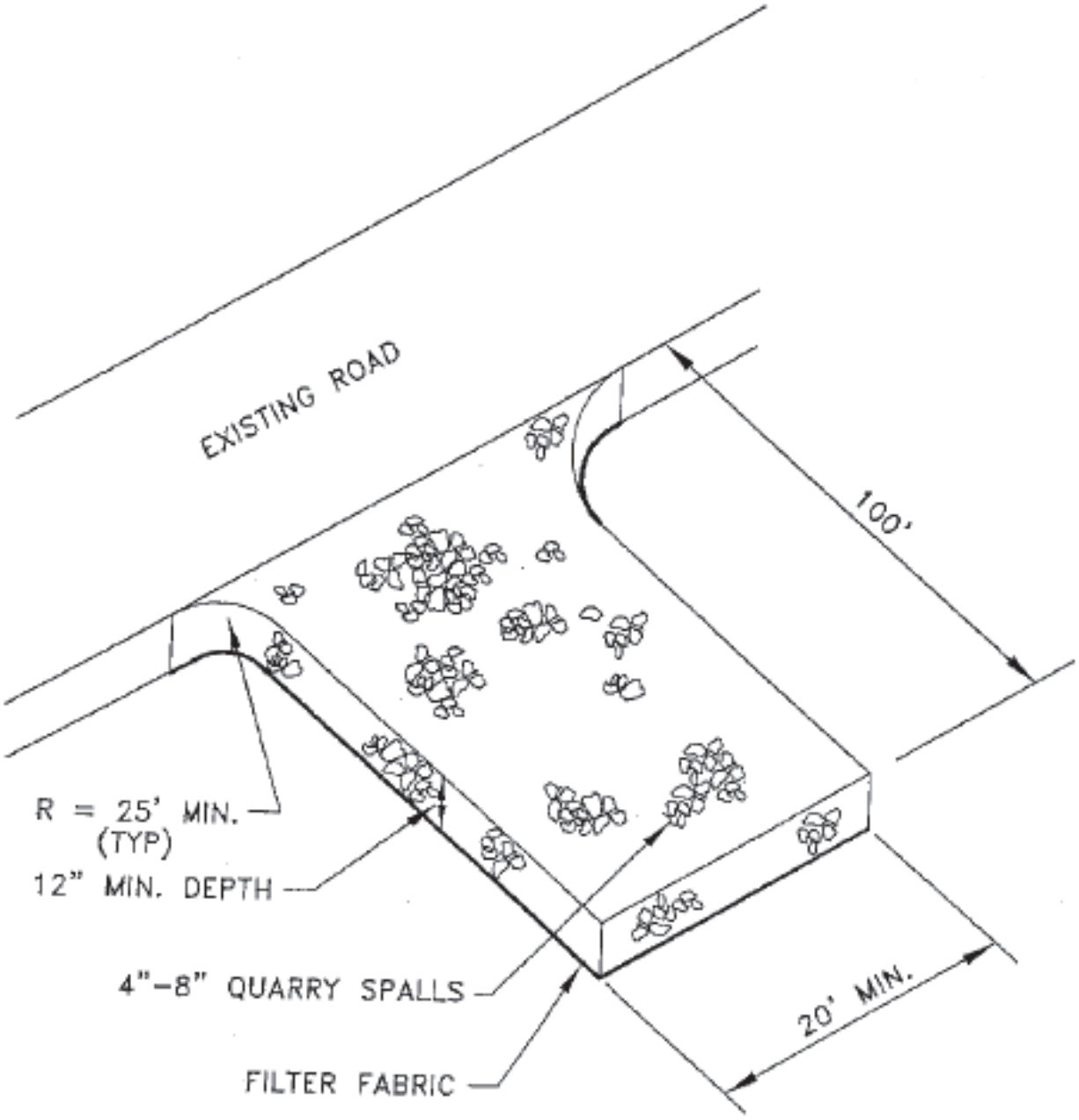


NOTES:

1. Catch basin shall be constructed in accordance with specifications in WSDOT Standard Plan B-1.
2. Olympic foundry grates SM50VG of SM50S (or approved equal), may be required when conditions when conditions warrant, as determined by the Public Works Director.

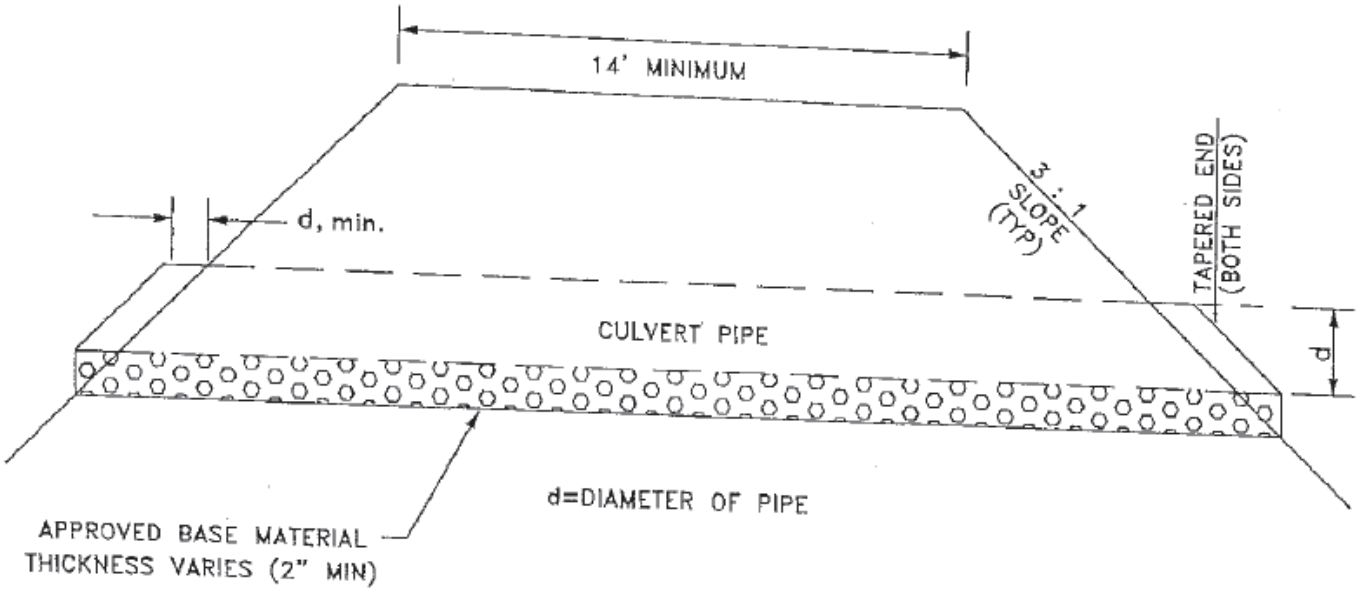
DRAWING NOT TO SCALE

STABILIZED CONSTRUCTION ENTRANCE



DRAWING NOT TO SCALE

DRIVEWAY CULVERT

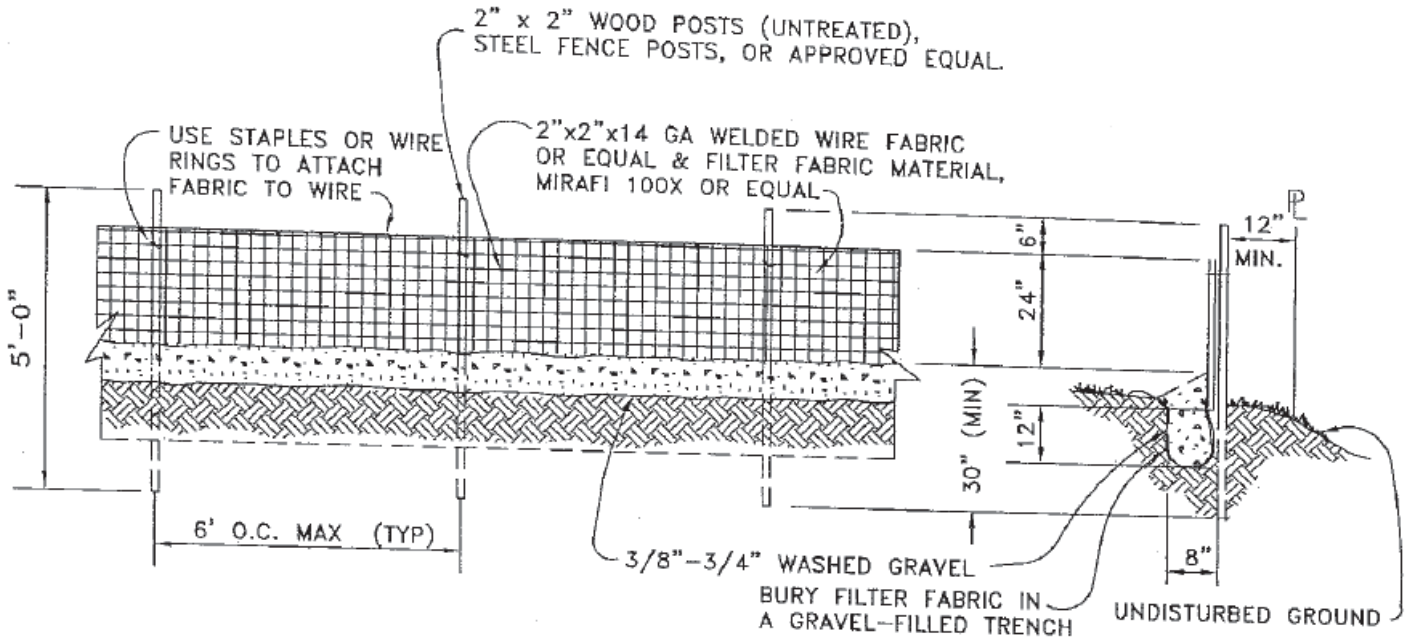


NOTES:

1. If culvert is being connected to an existing closed conveyance system, culvert material & method of connection must be approved by the Public Works Department.
2. See Section 3A.03 for information regarding pipe type and sizing.
3. If conditions warrant, armoring of culvert ends with rip rap may be required by city to maintain slope stability.

DRAWING NOT TO SCALE

TEMPORARY SILT FENCE

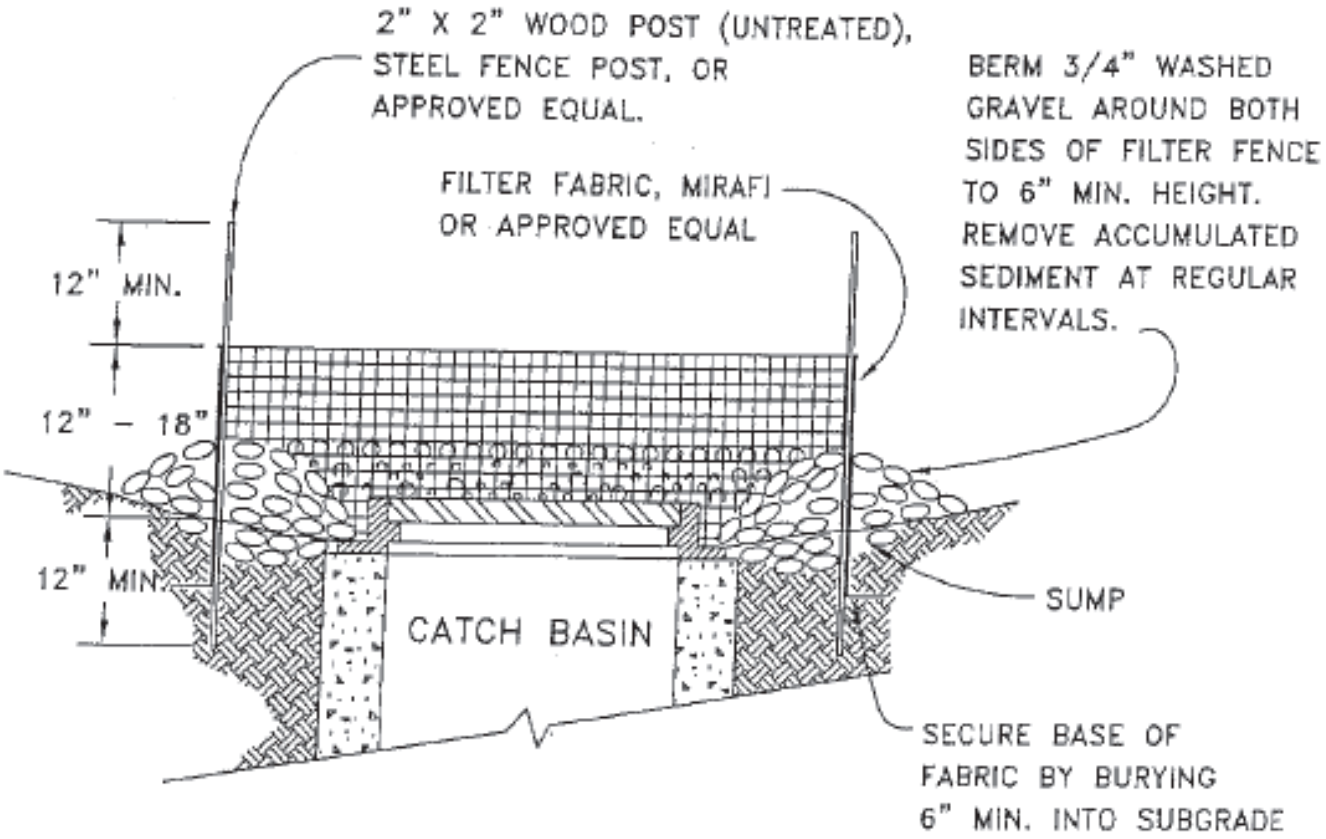


NOTES:

1. Filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid use of joints. When joints are necessary, filter cloth shall be spliced together only at a support post, with minimum 6-inch overlap, and securely fastened at both ends.
2. A wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy-duty wire staples at least 1-inch long, minimum of 4 inches and shall not extend more than 24 inches above the original ground surface.
3. When extra-strength filter fabric and 4-foot maximum post spacing is used, the wire mesh fence may be eliminated. In such cases, the filter fabric will be stapled or wired directly to the posts with all other provisions still applying.
4. Silt fence shall not be moved before the upslope area has been permanently stabilized.
5. Silt fencing shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

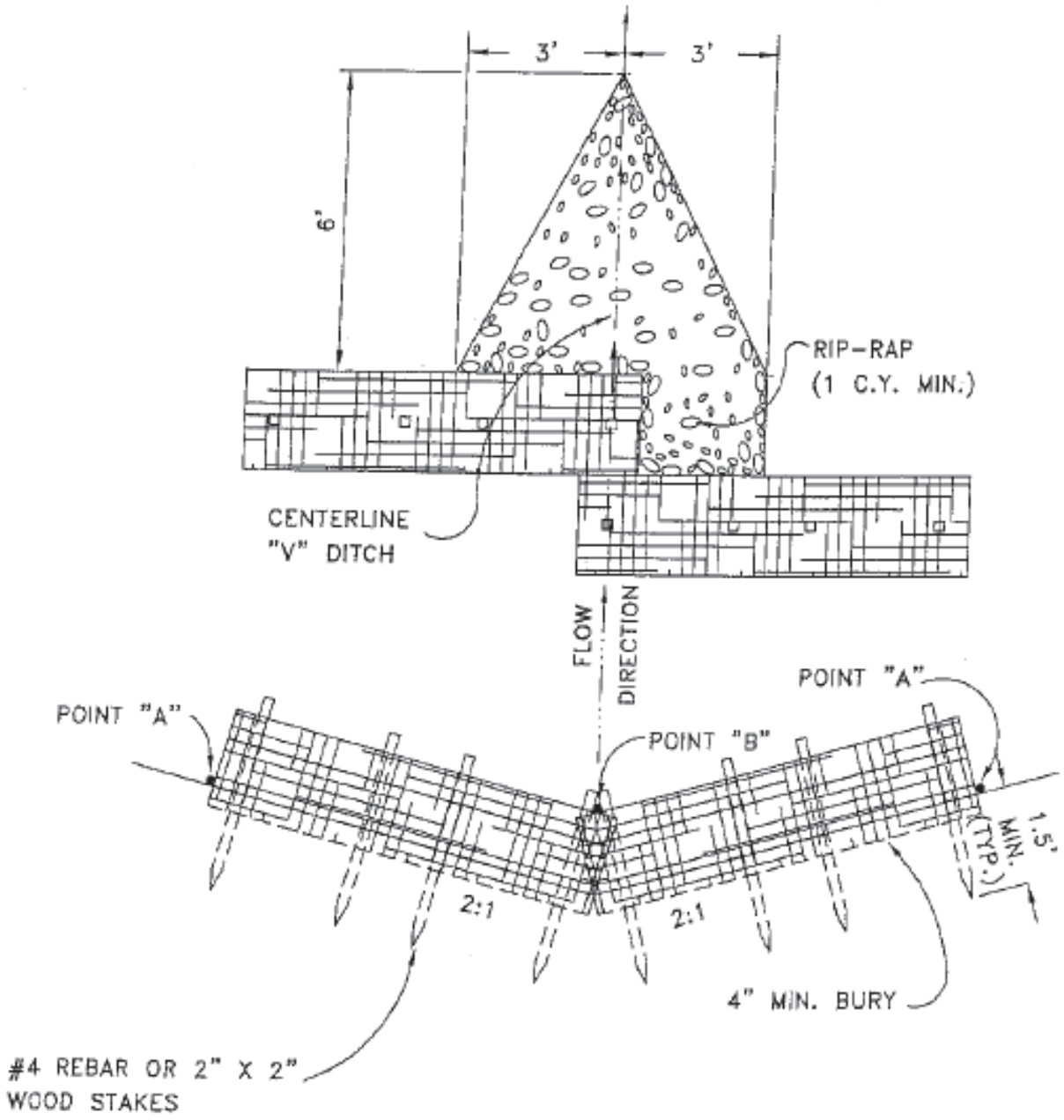
DRAWING NOT TO SCALE

FILTER FABRIC CATCH BASIN PROTECTION



DRAWING NOT TO SCALE

TEMPORARY STRAWBALE CHECK DAM

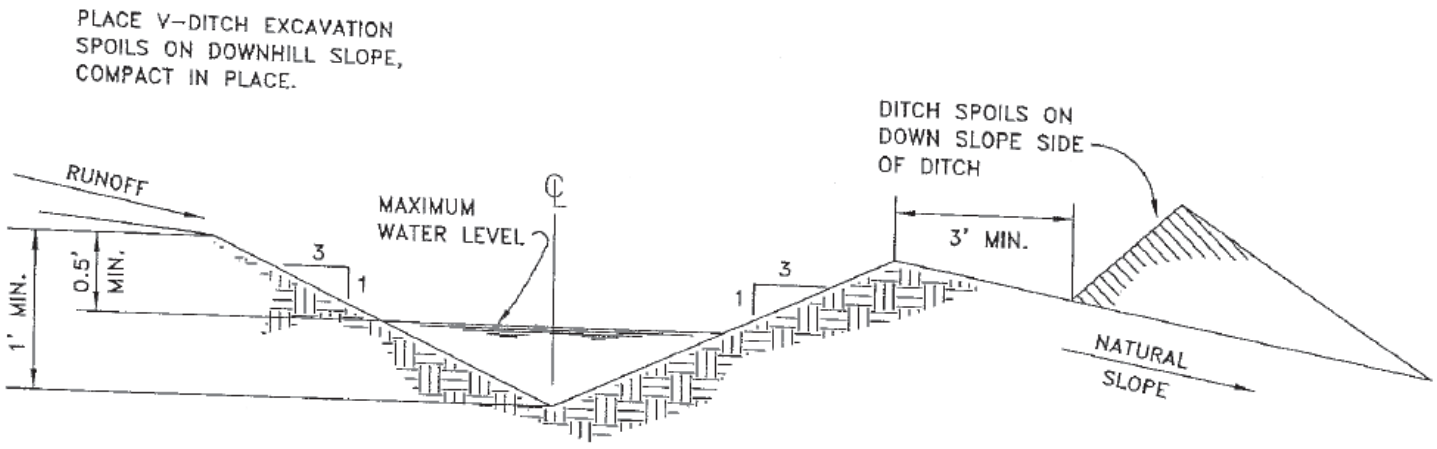


NOTES:

Points “A” must be higher than point “B”.

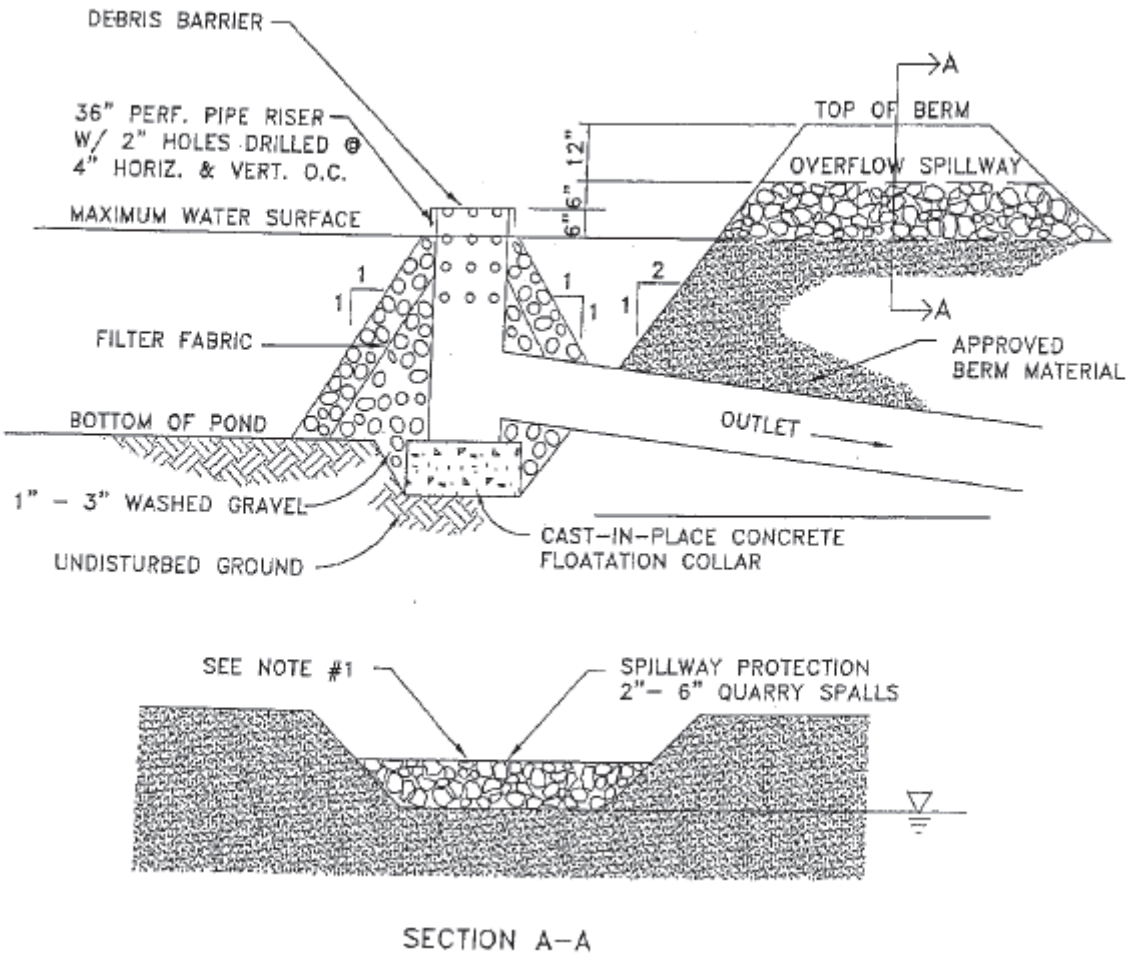
DRAWING NOT TO SCALE

TEMPORARY “V” DITCH



DRAWING NOT TO SCALE

GRAVEL CONE WITH RISER



SECTION A–A

NOTES:

1. Pond, outlet, and spillway dimensions to be designed by an engineer licensed in the State of Washington.
2. All dimensions shown on detail are minimums.
3. Outlet side of berm to be armored with quarry spalls for width of spillway.

DRAWING NOT TO SCALE

CHAPTER 4 - WATER

4.01 General

Any extension of the Napavine water system must be approved by the department of Public Works and conform to Department of Health, the City of Napavine Water System Plan.

In designing and planning for any development, it is the developer's responsibility to determine that adequate water for both domestic use and fire protection is attainable. Proposed plans must show how water will be supplied and whether adequate water pressure and volume will be maintained in case of fire. An analysis of the system may be required if it appears that the system might be inadequate.

Anyone desiring to extend or connect to the city water system must contact the Public Works Department for a Water/System/Stormwater Application form. After the completed application is returned to the Public Works Department, along with any other information that may be required or requested, staff will determine the costs to connect to city utilities. Extension of or connection to city water lines outside of the Napavine Urban Growth Area (UGA) are permitted only when a demonstrated public health risk exists and has been identified in writing by an appropriate health agency.

Prior to the issuance of a water meter for development projects, all Public Works improvements must be completed and approved, including granting of right-of-way or easements, submission and acceptance of as-built drawings, and all applicable fees must be paid.

Building permits for new construction of single-family subdivisions will not be issued without final approval of the Public Works Director. For commercial projects, building permits may be issued upon completion and acceptance of the required fire protection facilities. A construction bond, in accordance with Section 1.14 of these Standards, will be required for the remaining improvements. A Certificate of Occupancy will not be issued until final Public Works approval is given for all improvements.

4.02 Design Standards

The design of any water extension/connection will conform to these Standards and all other applicable standards. The layout of extensions will provide for continuation and/or looping of the existing system.

The General Notes on the following pages will be included on all plans dealing with the Napavine water system.

General Notes (Watermain Installation)

1. All workmanship and material will be in accordance with the City of Napavine Standards and the most recent copy of the WSDOT/APWA Standard Specification for Road, Bridge and Municipal Construction, American Water Works Association (AWWA) Standards and ANSI/NSF Standard 60 or 61.

2. A pre-construction meeting will be held with the Public Works Department **prior** to the start of construction.

3. All watermains will be ductile iron cement mortar lined thickness Class 52.

4. Gate valves will be resilient wedge, NRS (non-rising stem) with O-rings seals. Valve ends will be mechanical joint or ANSI flanges. Valves will conform to AWWA 509-80. Valves will be Mueller, M & H, Kennedy, Clow R/W or Waterous Series 500. Existing valves and all valves installed directly to and connected to a portion of the active water system are to be operated by city employees only.

5. Fire hydrants will be installed every 200' M & H Series 929 and be equipped with Storz Adaptors. Hydrants will be installed in accordance with the most recent version of the Uniform Fire Code. Hydrants will be bagged, and the connecting gate valves left closed until the system has been approved. Hydrants must be painted with sunburst yellow high-grade enamel after installation.

6. All lines will be chlorinated and tested in conformance with the above referenced specifications. (see Note 1)

7. All pipes and services will be installed with continuous tracer tape placed twelve (12) to eighteen (18) inches under the proposed finished subgrade. The marker will be of plastic non-biodegradable, metal core, or backing marked "WATER" that can be detected by a standard metal detector. Tape will be Terra Tape "D" or approved equal. In addition to tracer tape, toning wire will be installed over all pipe and services. Toning wire will be UL listed, type UF, fourteen (14) gauge solid coated copper wire, taped to the top to the top of the pipe to prevent movement during backfilling and laid loose enough to prevent stretching and damage before being brought up and tied loose enough to prevent stretching and damage before being brought up and tied off at the valve operating nut or valve box in such a way that the wire is easily accessible from the ground surface. Two (2) feet of slack will be provided to allow for connection to the locator.

   A 1-lb magnesium anode will be buried with the pipe every 1,000 linear feet maximum for cathodic protection of the toning wire. Toning wire splices and connections to anodes will join wires both mechanically and electrically and will employ epoxy resin or heat-shrink tape insulation. Toning wire will be tested **prior** to acceptance of the pipe system. A written notice from the contractor to the city must be received two (2) business days **prior** to when testing is required.

8. The contractor will provide traffic control plan(s) as required in accordance with MUTCD.

9. All watermains will be staked for grades and alignment by an engineering or surveying firm capable of performing such work. Staking will be maintained throughout construction.

10. All service line and water valve locations will be marked on the face of the adjacent curb with a "W" or "WV" embossed ¼-inch into the concrete.

11. All water system connections serving buildings or properties with domestic potable water, fire sprinkler or irrigations systems will comply with the minimum backflow prevention requirements established by the Department of Health (DOH) and the City of Chehalis Cross-Connection Control Program.

12. Call Utilities Underground Location Center at 1-800-424-5555 a minimum of two (2) business days **prior** to any excavations.

13. The city will be notified five (5) business days **prior** to scheduling a water system shutdown. The city's Water Division will perform all water system shutdowns. When connections require "field verification", connection points will be exposed by the contractor and fittings verified by the city tow (2) business days **prior** to the distribution of shutdown notices. Customers involved with or affected by water service interruptions will be notified at least forty-eight (48) hours in **advance**. Shutdowns will not be permitted on Fridays, weekends, or holidays without written authorization from the Director of Public Works.

14. When connecting to an existing waterline where a new valve is <u>not</u> to be installed, the existing valve must be pressure tested to the Standards by the contractor **prior** to connection. If an existing valve fails to pass the test, the contractor will make the necessary additional provisions to test the new line **prior** to connecting to the existing system or will install a new valve. New lines will not be connected to the existing system until all required tests have been passed.

4.03 Watermain

1. **General**

Watermains will be sized to provide adequate domestic water plus fire flows at the required residual pressure. Fire flow requirements will be determined by City of Napavine Fire Services. However, the quantity of water required will in no case be less than 1,000 gpm at 20 psi residual pressure in single family and/or duplex residential areas, or less than 11,500 gpm at 20 psi residual pressure in multi-family residential areas, commercial areas and/or industrial areas.

The minimum watermain size will be six (6) inches in diameter where looped. Dead-end mains will be a minimum of eight (8) inches in diameter. All mains that may be extended or looped must end with an approved flanged gate valve and blind flange. A straddle block will be installed at a point along the last length of pipe preceding the valve, in lieu of a thrust block at the end.

Larger sized mains may be required in specific areas identified in the Napavine Water System Plan. The city may also require the installation of larger mains if determined necessary to meet fire protection needs, domestic requirements and/or for future service needs. (see Chapter 3, Latecomer Fees)

2. **Piping**

All pipe for watermains will be flexible gasketed joints and will comply with the following specifications, however, nothing will preclude the city from requiring an alternate pipe type based on site conditions and/or the needs of the system.

Ductile Iron Pipe will conform to AWWA C 151 Class 52 and will have a cement mortar lining conforming to AWWA C 104. All pipes will be joined using non-restrained joints that will be rubber gaskets, push-on type or mechanical joint, conforming to AWWA C 111.

3. **Fittings**

All fittings will be ductile iron compact fittings conforming to AWWA C153 or, AWWA C110 or C111. All fittings will be cement mortar lined conforming to AWWA C 104. Plain-end fittings will be ductile iron if mechanical joint retainer glands are installed on the plain ends. All fittings will be connected by flanges or mechanical joints. The city may require the use of MEGALUG retainers for a waterline installation, as necessary.

4. **Pipe Installation**

All pipe and services will be installed as directed in Note 7 of the General Notes.

5. **Cover Required**

The minimum cover for all watermains from top of pipe to finished grade will be thirty (30) inches for ductile iron pipe unless otherwise approved.

6. **Connection to Existing Watermains**

The developer's engineer will be responsible for determining the scope of work for connection to existing watermains. A minimum of two (2) business days **advance** notice to the Water Division is needed to schedule shutdowns. However, shutdowns cannot be scheduled until a Water/Sewer/Stormwater Application has been approved and all applicable fees have been paid in full. The City of Napavine Water Division will be consulted regarding fittings or coupling required. It will be the contractor's responsibility to verify the location and depth of the existing main and the fittings required to make the connections to the existing main. All excavation, connections, piping,

tapping valve fittings, services, anchors, blocking, bedding, backfill, compaction, restoration and other labor and materials required will be furnished and placed by the contractor. The tapping of an existing watermain will be done in the presence of a Water Division representative. The Water Division will be given two (2) business days **advance** notice of a watermain tap and they will perform all shutdowns on existing mains.

4.04 Service Interruption

The contractor will give the Public Works Department a minimum of five (5) business days **advance** notice of any planned connection to an existing pipeline. This includes all cut0ins and live taps. Notice is required so disruptions to existing services can be scheduled and affected customers notified. The contractor will make every effort to schedule watermain construction with minimum disruption of water service. The contractor is responsible for ensuring that the excavation and shoring procedures comply with L & I Standards for worker safety. These procedures are not followed, the connection will not be performed.

4.05 Hydrants

A. The lead from the service main to the fire hydrant will be ductile iron cement mortar lined Class 52, no less than six (6) inches in diameter. A gate valve will be installed a minimum of three (3) feet from the hydrant, unless otherwise approved.

B. Fire hydrants will have two 2-1/2-inch outlets with National Standard threads and one, 4-inch pumper port outlet with Pacific Coast threads (male threaded 4.72-inch diameter). The pumper port will be fitted with a 5-inch quick connect Storz Adapter with a Pacific Coast thread hydrant connection (female threaded 4.75-inch diameter). The Storz Adapter will include a cap. The hydrant valve opening will be 5 ¼-inch diameter. The hydrant will have a positive and automatic barrel drain and will be of the "safety" or breakaway style.

   Hydrants will be manufacturer M & H Style 929. Alternate hydrant stiles and manufactures will be considered on a case-by-case basis and must be approved by the Director of Public Works. All hydrants will be bagged and the connecting gate valves will remain closed until the system is tested and approved. Developments being served by existing hydrants will be required to upgrade to these Standards and use the same type of hydrant throughout the development. Hydrants will be painted with sunburst yellow high-grade enamel after installation.

C. The Department of Public Works and the Napavine Fire Services will work together to determine the required hydrant spacing for installation. All hydrants will be installed and placed in a manner that provides accessibility to Police and Fire Services and their equipment as determined by both departments.

   Unless otherwise required by the Public Works Department, the following guidelines will apply for hydrant number and location:

   1. At least one hydrant will be installed at all intersections.

   2. Hydrant spacing of 200 feet will be required for all single family and duplex residential areas.

   3. Hydrant space of 300 feet will be required for single family and duplex residential areas.

   4. The spacing distance for hydrants will be measured along the frontage street(s) and/or accessible side street(s) only. When determining the sufficiency of existing hydrants related to hydrant

placement and spacing, hydrants located behind or on parallel streets or alleys, or hydrants with flows less than the minimum fire flows listed in Section 4.03A will not be considered.

5. When any portion of a proposed building is in excess of 150 feet from a water hydrant will be required. Such hydrants will be located per Napavine Public Works Department, Fire Services and the Uniform Fire Code. The hydrants will be privately maintained and will include the appropriate metering and backflow prevention, as noted in these Standards. A proposed maintenance schedule will be submitted to the city for review **prior** to final approval of the engineering plans.

D. Fire hydrants will be installed in Standard Drawing 4-8.

E. When necessary, the Public Works Department may require hydrants to be protected by two or more posts, 4-inch diameter x 5 feet high made of either reinforced concrete or steel.

F. G. Fire hydrants must be installed, tested, and accepted **prior** to the issuance of a Certificate of Occupancy.

4.06 Valves

All valves and fittings will be ductile iron with ANSI flanges or mechanical joint ends. All existing valves are to be operated by city employees only.

Valves will be installed in the distribution system at sufficient intervals to facilitate system repair and maintenance, but in no case will there be less than one valve every 1,000 feet. Generally, there will be two (2) valves on each tee and three (3) valves on each cross. Specific requirements for valve spacing will be made at the plan review stage.

A. **Gate valves** will be used on all 2 to 12-inch lines. The design, materials and workmanship of all gate valves will conform to the most recent revision of AWWA C509-87. Gate valves will be resilient wedge non-rising stem (NRS) with two (2) internal O-ring stem seals. Gate valves will be Mueller, M & H, Kennedy, Clow R/W or Waterous Series 500.

B. **Valve Box**. All values will have a standard Armor Access Box number's SP-A111037, SP-A111051, SP-CIFULLFLGRMG, SP-CIWATERLID determined by the Water Division. If the city approves or requires the use of an Olympic 910 valve box, it will be set to grade with a 6-inch ASTM 3034 SDR 35 PVC riser from valve to box top. If valves are from valve to approximately six (6) inches from the valve box top. If valves are not set in a paved area, a 3 x 3-foot concrete pad, 4 inches thick will be set around each valve box at finished grade. An Armor Access valve box will be required for all locations of heavy traffic. In areas where the valve box is on the shoulder of the road, the ditch and shoulder will be graded before placing an asphalt or concrete pad. Valve box lids will be ductile iron, anti-kickout, and marked "WATER" (see Standard Drawing 4-12). All valve locations will be marked on the face of the adjacent curb with an "WV" embossed ¼-inch into the concrete.

4.07 Casing

Steel casing pipe will be scheduled 20 steel or equal. Pipe spacers will have 8-inch runners. Casting pipe and spacers will be sized for pipe being installed with a minimum of three (3) spacers per section of pipe. The casing pipe will then be sand-packed and sealed in accordance with the spacer manufacturer's recommendations.

4.08 Air and Vacuum Release Valve

Air and vacuum release valves (ARV) will be APCO combination air release valves. Installation will be as shown on Standard Detail 4-9.

The installation will be set at the high point of the line when required. Where possible, pipes are to be graded to prevent the need for an air release valve. Air release valves may not be required when services are in the vicinity, however, the Director of Public Works will make the final determination.

4.09 Blowoff Assembly

If a fire hydrant is not located at the end of a dead-end main, a blowoff assembly will be required. On watermains that will be extended in the future, the valve that operates the blowoff assembly will be the same size as the main and provided with a saddle block along the last length of the pipe preceding the valve, in lieu of a thrust block at the end. The working pressure rating for blowoff assemblies will be a minimum of 200psi. Installation will be as shown on Standard Drawing 4-10. To be determined by Public Works Director.

4.10 Backflow Prevention

All water system connections providing buildings or properties with domestic potable water, fire suppression or irrigation systems, will comply with the backflow prevention requirements as established by the Department of Health (DOH) and the City of Napavine Cross-Connection Control Program.

Having an approved backflow assembly(s) installed is necessary to protect the city water system and all users from any possible contamination. All backflow assemblies installed will be of a type and model pre-approved by DOG or the City of Napavine water system. A list of approved testers may be obtained from the Washington Environmental Training Resource Center (WETRC) located in Auburn, Washington.

In-premises cross-connections must have an approved backflow assembly(s) in place in accordance with the Uniform Plumbing Code (UPC). The city may require additional in-premises and/or premises protection in accordance with DOH and the City of Napavine Cross-Connection Control Plan when health hazards are determined to exist.

All assemblies must be installed in accordance with the most recent versions of the City of Napavine Cross-Connection Control Program, DOH, UPC, and the PNWS/AWWA Cross-Connection Control Manual. IN addition, all assemblies must be inspected and approved by the city's Cross-Connection Specialist (CCS). The CCS may also conduct an on-site inspection of new and/or existing backflow assemblies during testing. The city will release or issue a Certificate of Occupancy **only** after all backflow assemblies have passed a certified test.

Any person violating any provision of the City of Napavine Cross-Connection Control Plan will be subject to penalties as stated under Napavine Municipal Code.

A. **Backflow Assemblies**

The definition, abbreviations and acronyms relating to cross-connections frequently used in cross-connection control are found in the Washington State Department of Health Water System Design Manual as applies to "Group A" public water systems. Accepted backflow prevention assemblies are RPBA, RPDA, DCVA, DCDA, PVBA or SVBA of a make, model, and size that has bee approved by DOH. Assemblies on the current approved backflow prevention assemblies list developed by the University

of Southern California Foundation for Cross-Connection Control and Hydraulic Research are also approved.

B. **Installation Requirements**

Backflow prevention assemblies used for premises isolation will be installed at the expense of the user, downstream from the city's water metering device, but within six (6) feet of the meter box or **before** any other use connection, to protect the water distribution system from any potential hazard, as determined by the city. All assemblies must be installed, in accordance with the most current version of the City of Napavine Cross-Connection Control Plan, DOH requirements, UPC, and the PNWS/AWWA Cross-Connection Control Manual.

In-premise installation of backflow assemblies can be installed only with written permission by the city's CCS or may be mandated along with premises isolation when high health hazards are determined to exist by the CCS. All backflow assemblies (premises or in-premises) must be readily accessible to city personnel during regular working hours of 8:00 a.m. to 4:30 p.m. If there is a change of ownership of an in-premise backflow assembly and/or at any time all requirements are not met, the City of Napavine has the right to enforce premises isolation and will follow the procedures established in the City of Napavine Cross-Connection Control Plan. The City of Napavine must be notified within two (2) business days of the completion of a backflow assembly installation. Upon notification, the city's CCS will then inspect the installation to determine compliance with all applicable requirements.

All backflow assembly installations are also required to be tested by a Washington State DOH-certified Backflow Assembly Tester (BAT) with an annual certificate of accuracy for their testing equipment on file with the city. The test results must be sent to the city showing the backflow assembly having successfully passed the certified test. The property owner must schedule a backflow test annually.

C. **Cost of Compliance**

All costs associated with purchase, installation, inspections, testing, replacement, maintenance, parts, and repairs of a backflow assembly are the responsibility of the property owner/user.

D. **Termination of Services**

Failure on the part of any customer to correct all cross-connections in accordance with the Standards is sufficient cause for the immediate discontinuance of public water service to the premises.

4.11 Service Connection

A. All service connection sizes used for new development will be determined by industry standards and approved by the Director of Public Works and installed by the developer at the time of mainline construction. After the lines have been constructed, tested, and approved, the owner may request a water meter. The city will install a water meter only after a Water/Sewer/Storm Application has been completed, all applicable feed paid, and the system inspected and approved.

B. When water is desired for a parcel fronting an existing main but not served by an existing setter, a Water/Sewer/Storm Application must be completed and returned to the city. Upon approval of the application and payment of all applicable fees, the city will tap the main, and install the meter, box, and setter.

C. Service lines will be 200 class polypipe. All connections will be of Ford, McDonald, or Mueller 100 compression connection fittings. Service lines will be installed a minimum of 22 ½ degrees off the main. Tracer tape will be installed over all service lines.

   Service saddles will be ductile iron with double stainless-steel traps. All clamps will have rubber gasket and iron pipe threaded inlet, and iron pipe threaded or approved compression outlet connections.

   Corporation stops will be all U.S. brass and will be Ford, Mueller, or A.Y. McDonald with iron pipe (IP) threads conforming to AWWA C800. Stainless steel inserts will be used with pack joints or Mueller.

D. Master meters will not be allowed for service to more than one building. An approved backflow prevention system must be installed in conjunction with any mater meter, in accordance with the requirements outlined in this chapter.

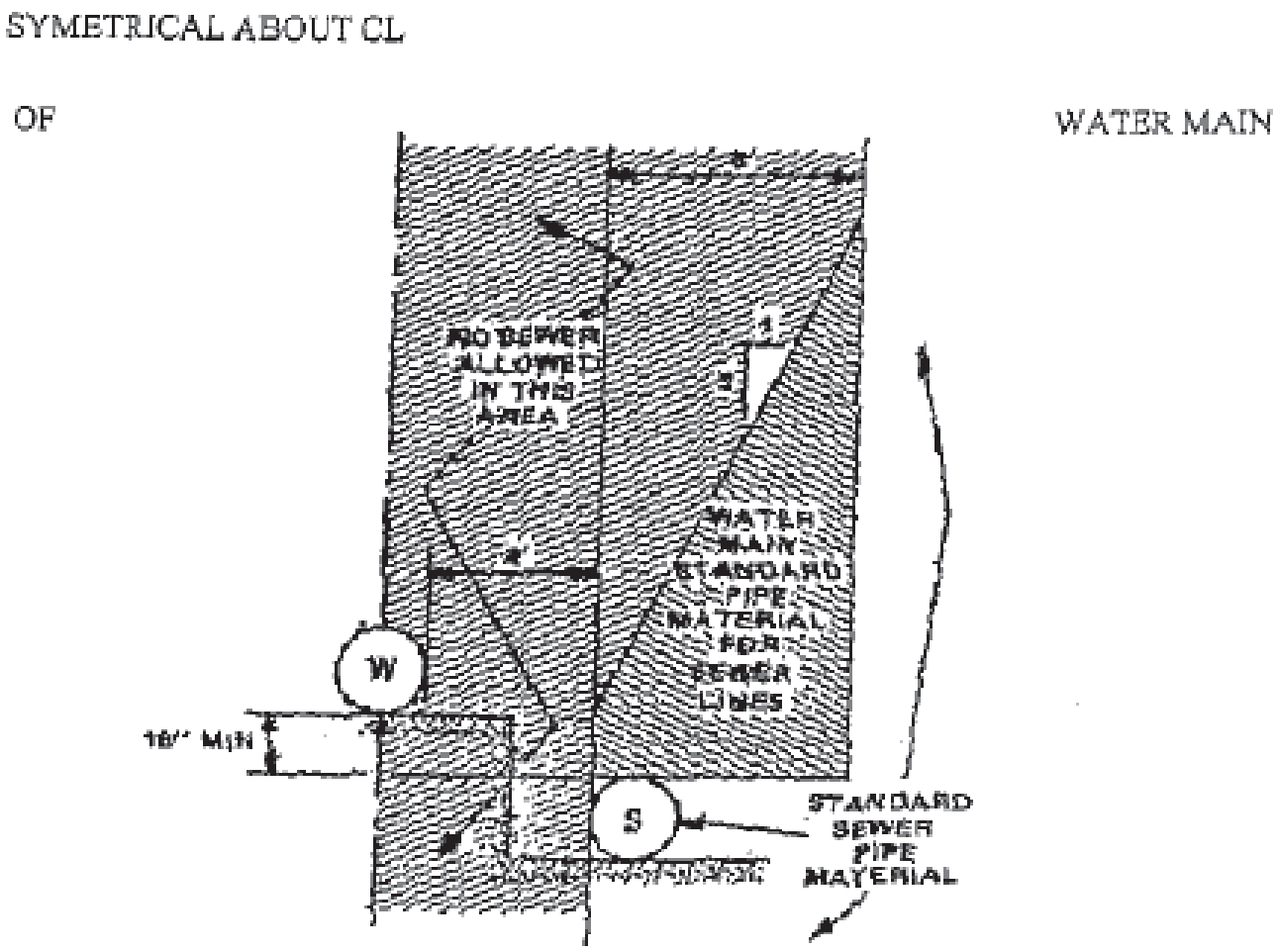
4.12 Marking Service Lines

The location of all service lines will be marked on the face or top of the cement concrete curb with a “W” embosses ¼-inch into the concrete.

4.13 Watermain/Sanitary Sewer Crossings

The contractor will maintain a minimum of eighteen (18) inches of vertical separation between sanitary and watermains – with the watermains being at the higher elevation. If the minimum vertical separation cannot be met, the standards for water/sewer separation from the DOE Guidelines as shown on the following page will apply.

The longest standard length of water pipe will be installed so that the joints will fall equidistant from any sewer crossing. Incases where minimum separation cannot be maintained, it may be necessary to utilize watermain-rated pipe for the sewer line, or to encase the water pipe and/or sewer line in pipe or concrete. No concrete will be installed unless specifically directed by the Director of Public Works.



Detail 2.4
PARALLEL CONSTRUCTION

WATERMAIN STANDARD PIPE MATERIAL – Table 1

TYPE OF PIPE		AWWA (ASTM)	STANDARD
	PIPE	JOINT	FITTINGS
DUCTILE IRON	C151 & C104	C111	C110
ASBESTOS - CEMENT	C400 (Type II) Class 200	(D1869)	C110
POLYVINYL - CHLORIDE	C900	(D3139 & F477)	C110
CONCRETE CYLINDER			C303

4.14 Irrigation

All irrigation systems will be installed with a backflow prevention assembly approved by the Department of Health and the City of Napavine. Irrigation sprinklers will be situated so as to not wet any public street or sidewalk.

4.15 Staking

All surveying and staking will be performed by an engineering or surveying firm licensed by the State of Washington and capable of performing such work. A pre-construction meeting will be held with the city **prior** to commencing staking and all staking will be inspected by the city **prior** to construction and maintained throughout construction.

The minimum staking of waterlines will be as follows:

A. Stake centerline alignment every twenty-five (25) feet, (50 feet in tangent sections) with cuts and/or fills to bottom of trench maintain the minimum required depth of cover over pipe. Centerline cuts are not required when road grade is to finished subgrade elevation.

B. Stake location of all fire hydrants, hydrant flange elevations, tees, water meters, setters and other fixtures with cut or fill to finished grade.

4.16 Trench Excavation

A. Clearing and grubbing, when required, will be performed within the easement or public right-of-way as permitted by the city and/or governing agencies. All debris resulting from clearing and grubbing must be disposed of, by the owner or contractor in accordance with the terms of the applicable permits.

B. Trenches will be excavated to the line and depth designated by the city to provide a minimum of thirty (30) inches of cover over the pipe and to the extent practical, a maximum of forty-two (42) inches of cover over the pipe. Except for unusual circumstances were approved by the city, the trench sides will be excavated vertically, and the trench width will be excavated only to such widths as are necessary for adequate working space as allowed by the governing agency. The trench will be kept free from water until pipe assembly is complete. Surface water will be diverted so as not to enter the trench. The owner will maintain sufficient pumping equipment on the job to ensure that these provisions are carried out.

C. The contractor will perform excavation of every description and of whatever substance encountered including boulders, rocks, roots, and other obstructions. All material will be entirely removed or cut out to the width of the trench and to a depth six (6) inches below watermain grade. Where materials are removed from below watermain grade, the trench will be backfilled to grade with thoroughly compacted material that is satisfactory to the city.

   Pipe placed in the trench will be sealed with a watertight plug at the end of each dat. More frequent use of a watertight plug may be required at the discretion of the city.

D. Trenching and shoring operations will not proceed more than 100 feet in **advance** of pipe laying without approval of the city and will be in conformance with Washington Industrial Safety and Health Administration (WISHA) and Office of Safety and Health Administration (OSHA) Safety Standards. The contractor will also maintain the presence of a “competent person” as defined by the Washington State Department of Labor and Industries when any trench excavation and backfill work is being done at the project site.

E. The bottom of the trench will be finished to grade with hand tools in such a manner that the pipe will have bearing along the entire length of the barrel. The bell holes will be excavated with hand tools to sufficient size to make up the joint.

4.17 Thrust Blocking

Location of thrust blocking will be shown on plans. Thrust block concrete will be Class B poured against undisturbed earth. A plastic barrier will be placed between all thrust blocks and fittings. The city may require the use of MEGALUG restrainers, Romac retainers or restraining rods in lieu of concrete thrust blocking. See Standard Detail number 4-13 and 4-14 for thrust block locations and calculations.

4.18 Backfilling

Backfilling will not commence until the pipe installation has been inspected and approved by a representative from Public Works. Backfilling and surface restoration will closely follow installation of pipe so that not more than 100 feet is left exposed during construction hours without approval of the city.

Selected bedding material conforming to WSDOT/APWA Standard Specification will be placed and compacted around and under the watermains by hand tools to a height of six (6) inches above the top of the watermain. The remaining backfill will be compacted to 95 percent of the maximum density in traveled areas, 90 percent outside traveled area. The city will have the discretion of requiring the use of control density fill (CDF) for backfill material for road crossings.

Where governmental agencies other than the city have jurisdiction over roadways, the backfill and compaction will be done to the satisfaction of the agency having jurisdiction, but in no case will the backfilling or compaction be to a lower standard than that of the city. If suitable backfill material, as determined by the city, is not available from trenching operations, the city may require the placement of bedding and/or a gravel base conforming to the current WSDOT/APWA Standard Specifications.

4.19 Street Patching and Restoration

See Section 2B.15 and 2B.16 of these Standards for requirements regarding street patching and trench restoration.

4.20 Hydrostatic Tests

Prior to the acceptance of work, installation will be subject to a hydrostatic pressure test by the contractor. All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test will be furnished and operated by the contractor. Tests will be conducted only after all connections along the section to be tested have been made and the roadway section is constructed to subgrade.

The section of watermain being tested will be filled with water and allowed to stand under pressure for a sufficient length of time to allow air to escape and the pipe lining to absorb water. The contractor will be responsible for all costs, labor, and materials associated with the testing of the line. The contractor will pay for all water needed for testing at the current rate charged by the city.

The test will be accomplished by pumping the main up to a pressure 150psi **above** normal operating pressures but in no case will the test pressure be less than 200psi. After reaching the test pressure, the pump will be stopped for fifteen (15) minutes and then the pressure brought back up to the test pressure

again. The quantity of water used to restore the pressure will be accurately determined by pumping through a positive displacement ware meter. The meter will be approved by the Public Works Department **prior** to testing.

Acceptability of the test will be determined by using the following formula:

$$L = \frac{N \times D \times (P^{1/2})}{7400}$$

L = Allowable leakage, gallons per hour (gph)

N = Number of joints in the length of pipeline tested

D = Nominal diameter of pipe, inches

P = Average test pressure during the leakage test, psi

If the water used to restore the pressure in the system is greater than the allowable leakage determined by the formula, the main will be considered to have failed. There will not be any appreciable or abrupt lost in pressure during the fifteen (15) minute test period. Any significant loss will also be grounds for a non-passing test. Should the tested section fail to pass the pressure test as specified, the contractor will, at no expense to the city, locate and repair the defects and then re-test the pipeline. All tests will be made with the hydrant auxiliary gate valves open and pressure against the hydrant valve. After the test has been completed, each gate valve will be tested individually by closing each in turn and relieving the pressure beyond. This test will be acceptable if there is not immediate loss of pressure on the gauge when the pressure comes against the valve being checked. The contractor will verify that the pressure across the valve does not exceed the rated working pressure of the valve.

Sections to be tested will normally be limited to 1,500 feet. The Director of Public Works may require that the first section of the pipe installed by the contractor, not less than 1,000 feet in length, be tested in order to qualify the crew and the material. Pipe installation will not be continued for more than an additional 1,000 feet until the first section has been successfully tested.

Prior to calling a Public Works representative to witness the pressure test, the contractor will have all equipment ready for operation and have successfully performed the test to ensure that the pipe is in satisfactory condition.

Defective material or workmanship discovered, during a hydrostatic field test will be replaced by the contractor at no expense to the city. Whenever it is necessary to replace defective material or correct workmanship, the hydrostatic test will be re-run at the contractor's expense until a satisfactory test is obtained. Test pressure will be maintained while the installation is inspected by the city. See Section 4.10A of this chapter for testing responsibilities related to backflow prevention devices.

4.21 Sterilization and Flushing

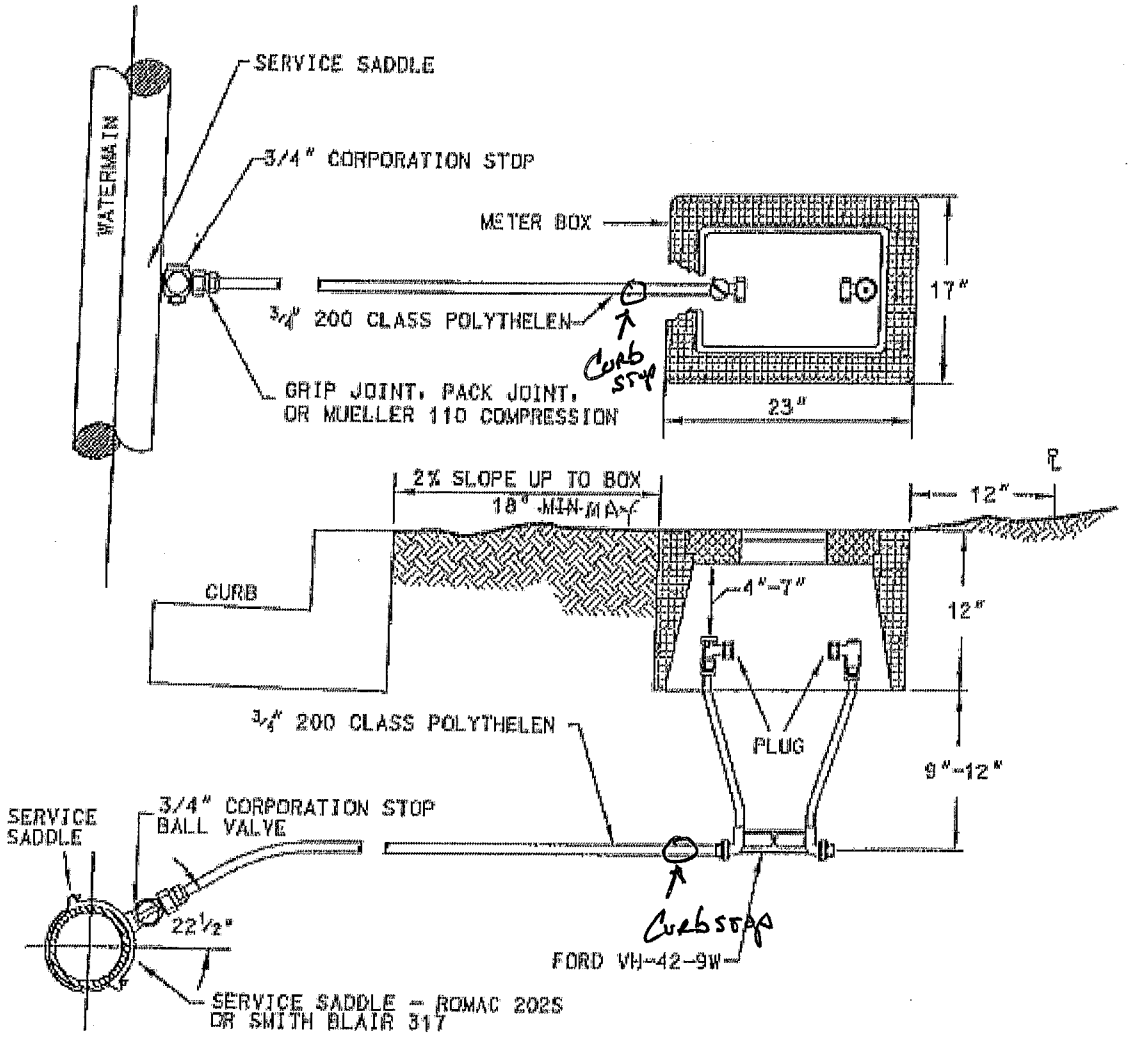
Sterilization of watermains will be accomplished by the contractor in accordance with the requirements of the Washington State Department of Health, AWWA Standards and in a manner approved by the city. At no time will chlorinated water from a new main be flushed into a body of water, including lates, rivers, streams, drainage ways, and all waters where fish or other natural water life can be expected. Any discharge into a city sewer system must be approved, in advance and in writing by the Public Works Director.

When the proper chlorine concentration has been established throughout the line, the valves will be closed and the line left undisturbed for twenty-four (24) hours. The line will then be thoroughly flushed,

and water samples taken by the city at least twenty-four (24) hours after flushing and disinfecting. Sampling collection should be scheduled with the Public Works Department at least two (2) business days in **advance**. Should the initial chlorine treatment result in an unsatisfactory bacteriological test, the procedure must be repeated until satisfactory results are obtained. The contractor will be responsible for all costs if re-testing becomes necessary. Samples can **only** be taken on Mondays and Tuesdays. Testing and sampling will take place after all underground utilities are installed and compaction of the backfill within the roadway section is complete.

WATER SERVICE – 5/8" x 3/4" SINGLE

Design 4-1



** If the city utilizes a touch read meter system, special lids may be required on new meter box installations.*

Environment	Meter Box	Lid Type*
Concrete Sidewalk	Books Series 37 or Approved Equal	Concrete
Concrete Driveway & Other Traffic Areas	Brooks Series 37 or Approved Equal	Cast Iron Traffic Cover
Earth	Carson 1419 Green	Carson 1419-C, w/ Reader Lid

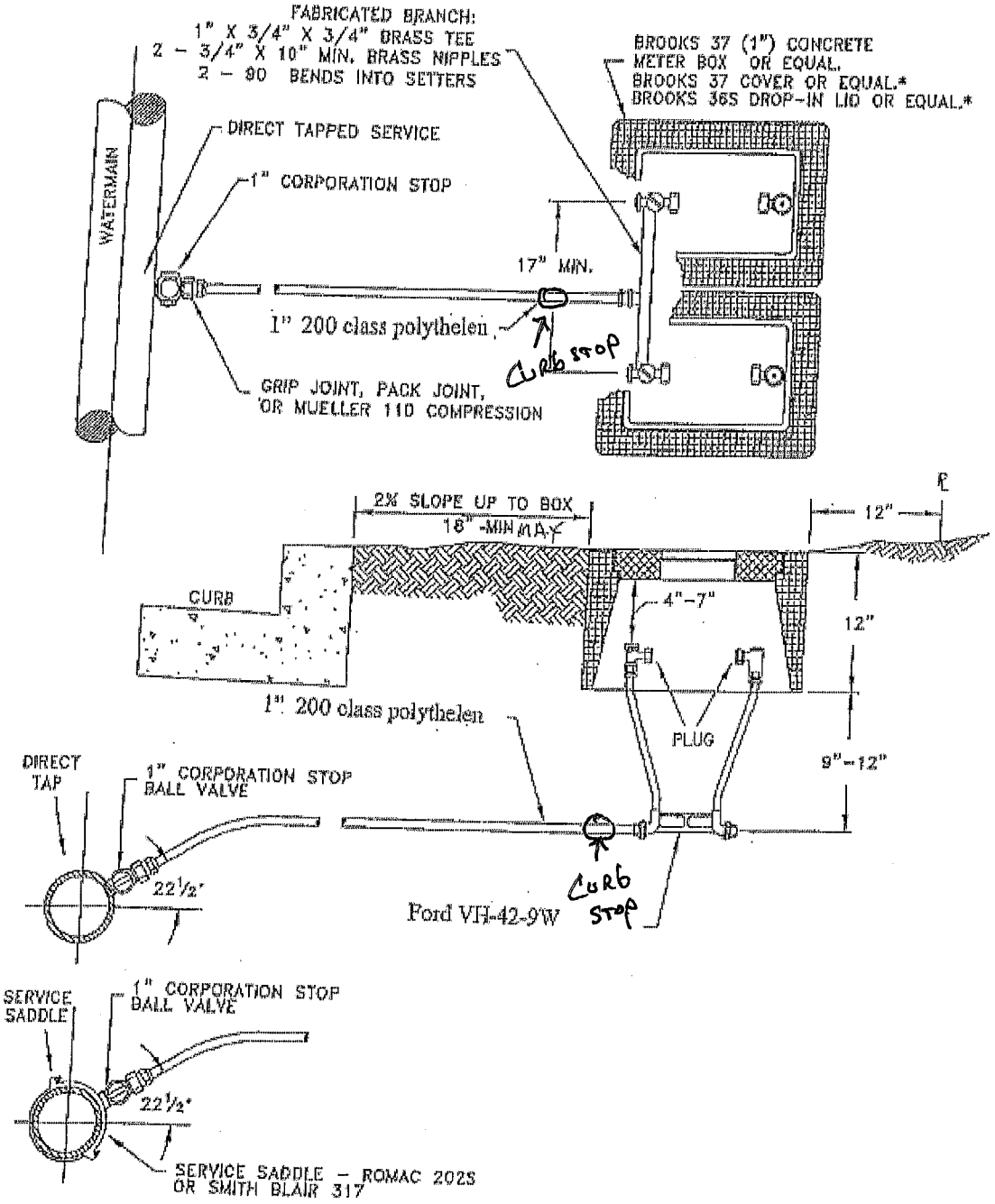
NOTES:

1. Corporation stops shall be all U.S. Brass and shall be Ford, Mueller, or A.Y. McDonald with threads conforming to AWWA C-800.
2. All service saddles shall have rubber gasket, I.P. threads, and stainless-steel double straps.

DRAWING NOT TO SCALE

WATER SERVICE – 1" DUAL

DESIGN 4-2



** If the city utilizes a touch read meter system, special lids may be required on new meter box installations.*

NOTES:

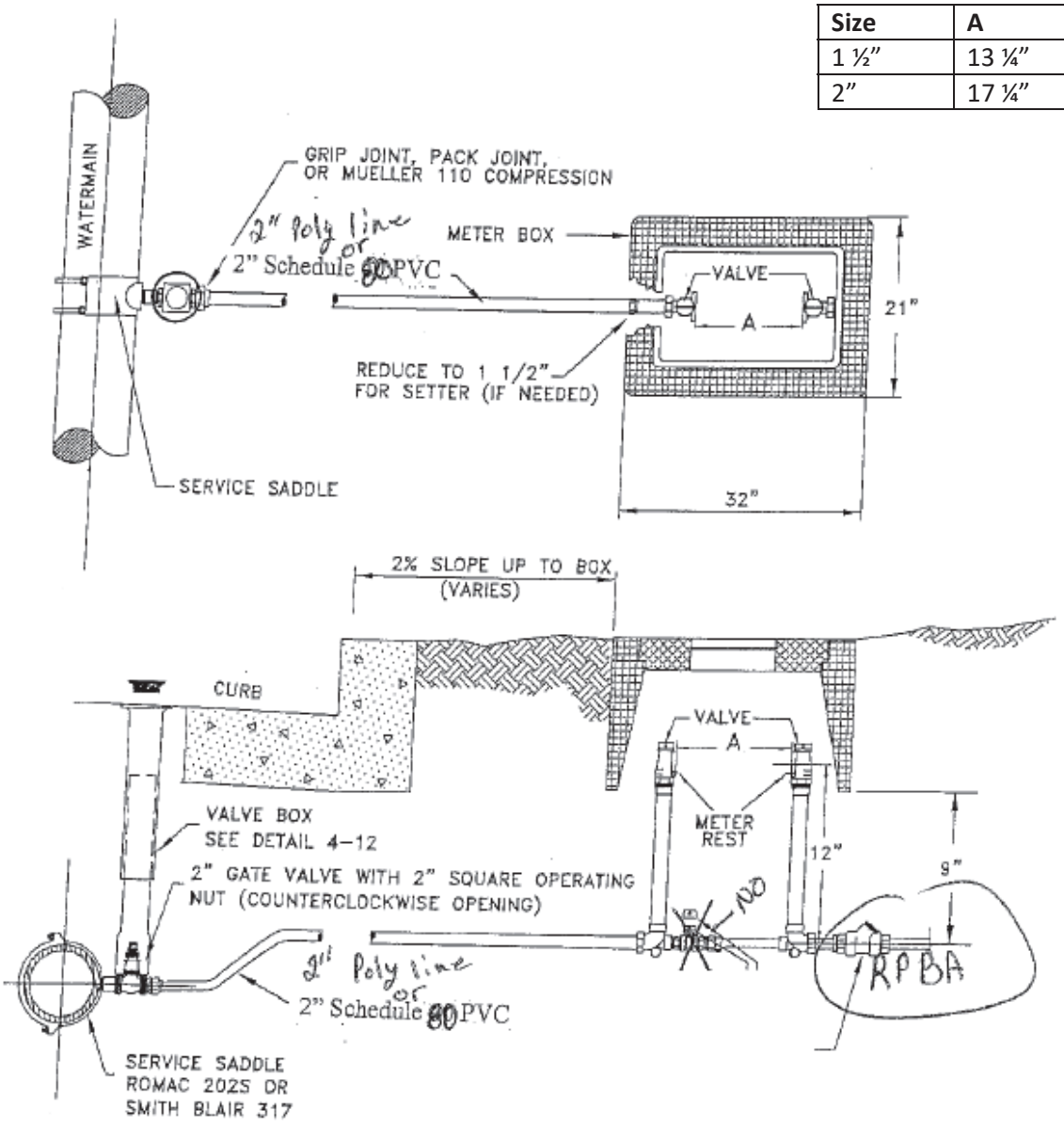
3. Corporation stops shall be all U.S. Brass and shall be Ford, Mueller, or A.Y. McDonald with threads conforming to AWWA C-800.
4. All service saddles shall have rubber gasket, I.P. threads, and stainless-steel double straps.

DRAWING NOT TO SCALE

WATER SERVICE WITH BYPASS – 1 ½”

DESIGN 4-3

Size	A
1 ½”	13 ¼”
2”	17 ¼”



NOTES:

1. All service saddles shall have rubber gasket, I.P. threads, and stainless-steel double straps.
2. City Standard for copper setters are:

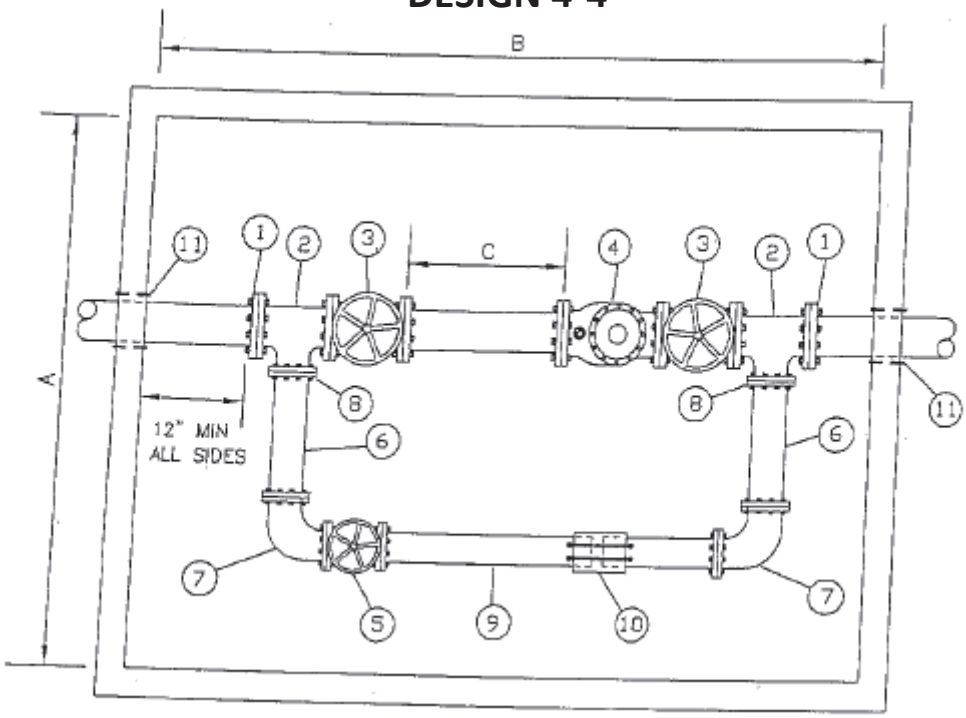
   1 ½” – Ford VVF76 -12B-13-11-16

   2” – Ford VVF77-12B-17-11-77

DRAWING NOT TO SCALE

WATER SERVICE – COMPOUD WATER METER WITH BYPASS FOR 3” – 8”

DESIGN 4-4



Meter	Minimum Dimensions “A”	“B”	“C”	Door Size	Vault Depth	Tee
3’ Compound	3’ 6’	5’ 6’	15’	3’ x 3’	5’ 0’	3’ x 11 ½’
4’ Compound	3’ 6’	8’ 0’	20’	3’ x 3’	5’ 0’	4’ x 2’
6’ Compound	3’ 6’	8’ 0’	30’	3’ x 3’	5’ 0’	6’ x 4’
8’ Compound	4’ 6’	10’ 0’	40’	4’ x 4’	5’ 0’	8’ x 6’

1. Flex x FLG Coupling
2. All – FLG Tee
3. FLG Res. Seated Gate Valve w/ Hand Wheel
4. Compound Meter
5. Gate Valve w/ Hand Wheel
6. Brass or Ductile Iron Nipples
7. 90’ Elbows (Material to be same as pipe)
8. Companion FLG
9. Brass or Ductile Iron Pipe
10. Mechanical Coupling
11. Pipe Sleeve

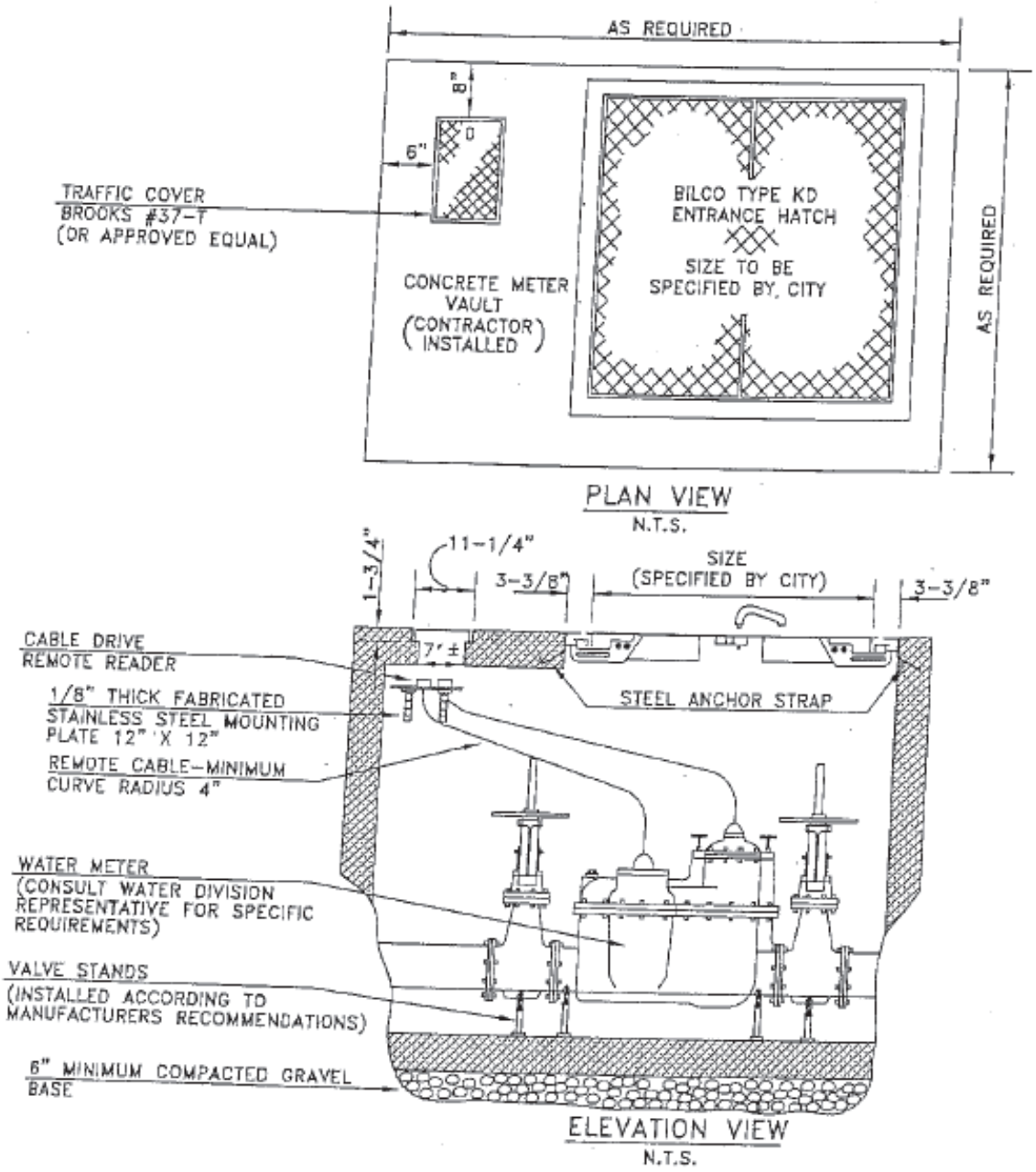
NOTES:

1. Vault Dimensions shown are inside. (Min)
2. Backflow prevention is not included as part of this detail
3. Meter and service line sizes will vary according to need.
4. All vaults will be supported by adequate footing or floor.
5. Pipe and fixtures to be set on valve stands installed according to manufacturer’s specs.
6. Remote reader until shall be located in a readily accessible area outside the vault, as approved by the city.
7. Drainage must be provided for the vault.

DRAWING NOT TO SCALE

LARGE METER VAULT

DESIGN 4-5



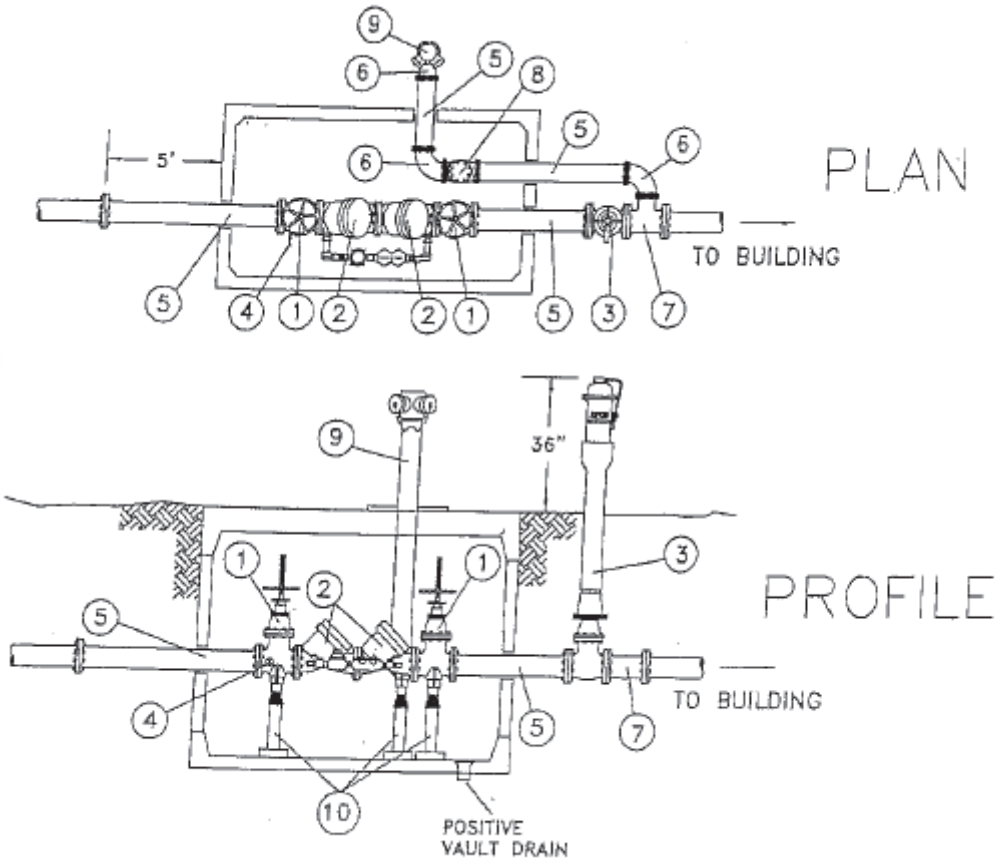
NOTES:

1. Vault shall be designed by a structural engineer licensed in the State of Washington.
2. Mounting plate to be installed by contractor so that all reading registers are visible through traffic cover and cable(s) do not interfere with access to meter.

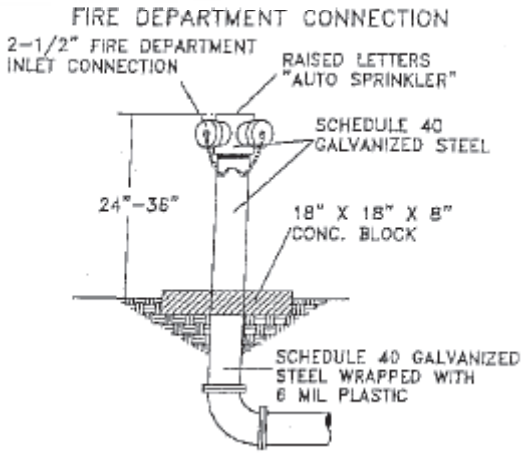
DRAWING NOT TO SCALE

FIRE DEPARTMENT CONNECTION WITH DCDA FOR SINGLE SERVICE

DESIGN
4-6



MATERIAL LIST:



1. OS & Y Resilient seated gate valve w/ handwheel FL x FL
2. Double check detector (DOH Approved) check valve FL x FL
3. Post indicator valve
4. ¾" ball valve (test cock)
5. Class 52 DI wall pipe FL x FL
6. Class 52 DI 90' Bend FL x FL
7. Class 52 DI tee FL x FL
8. Swing check valve w/ ball drip assembly
9. Fire Department connection
10. Valve stands
11. Where piping passes through concrete wall provide 2" clearance w/ waterproof mastic or flexible

GENERAL NOTES:

A. Pipe from vault to building shall be class 52 DI.

B. Tamper switches shall be installed on 1 and 3 connected to building fire alarm system.

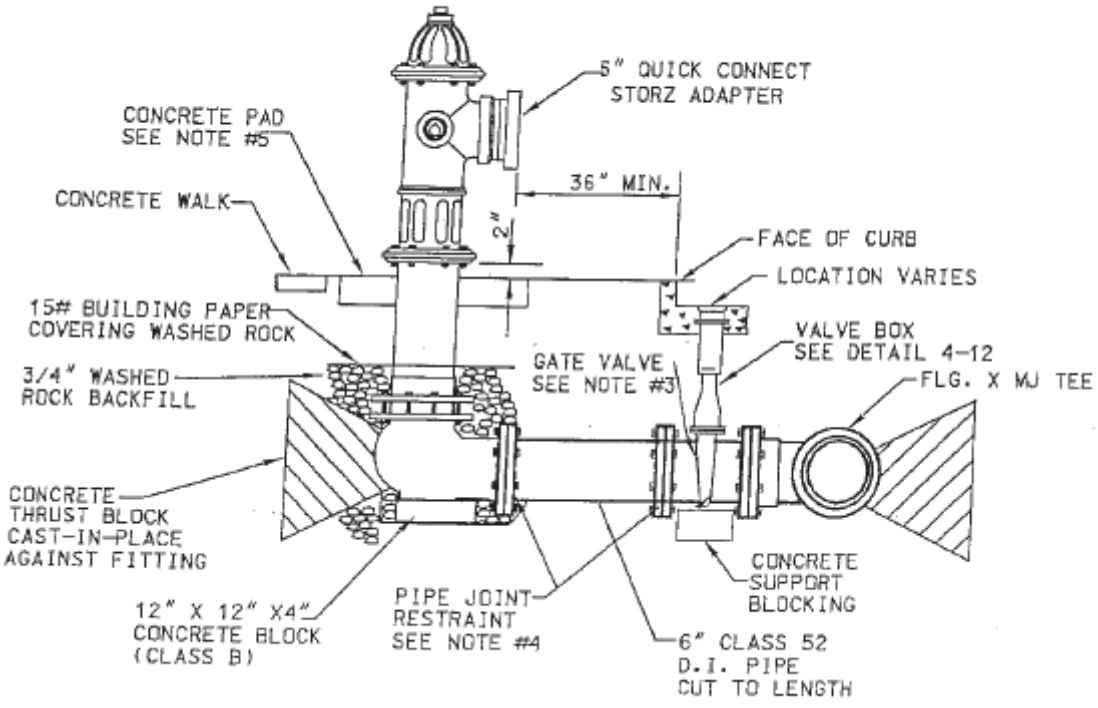
C. Install plugs on all test cocks. Finger tighten.

D. All piping shall be a minimum of 4" DIA. As per NFPA13.

DRAWING NOT TO SCALE

FIRE HYDRANT

DESIGN 4-8



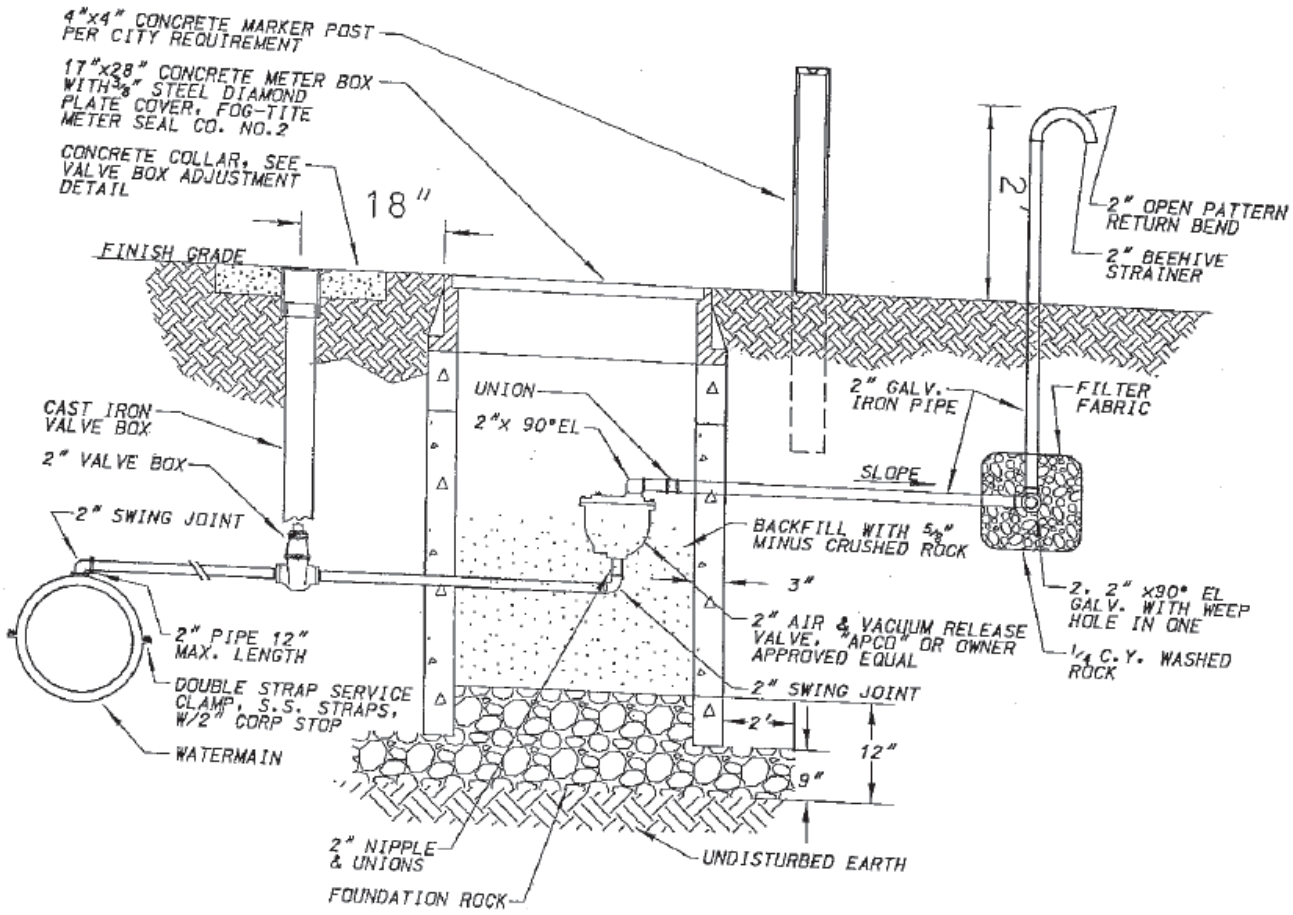
NOTES:

1. Hydrants shall be located within the street right-of-way with a minimum three-foot radius unobstructed working area.
2. Hydrant shall be M & H reliant style 929.
3. Gate valves shall be resilient wedge NRS with O-ring seals. Valve ends shall be mechanical joint by ANSI flanges. Valves shall conform to AWWA 509-80. Valves shall be Mueller, M&H, Kennedy, Clow R/W, or Waterous Series 500.
4. Each mechanical pipe joint shall be restrained using Romac grip rings., Magalug Series 1106 joint restraint, or ¾" DIA. Galvanized or coated steel restraining rods.
5. A 4' x '4 x 8" deep concrete pad will be poured around the hydrant.
6. Hydrant shall be painted sunburst yellow high-grade enamel after installation.
7. Minimum hydrant bury shall be 30".

DRAWING NOT TO SCALE

AIR AND VACUUM RELEASE ASSEMBLY

DESIGN 4-9(a)



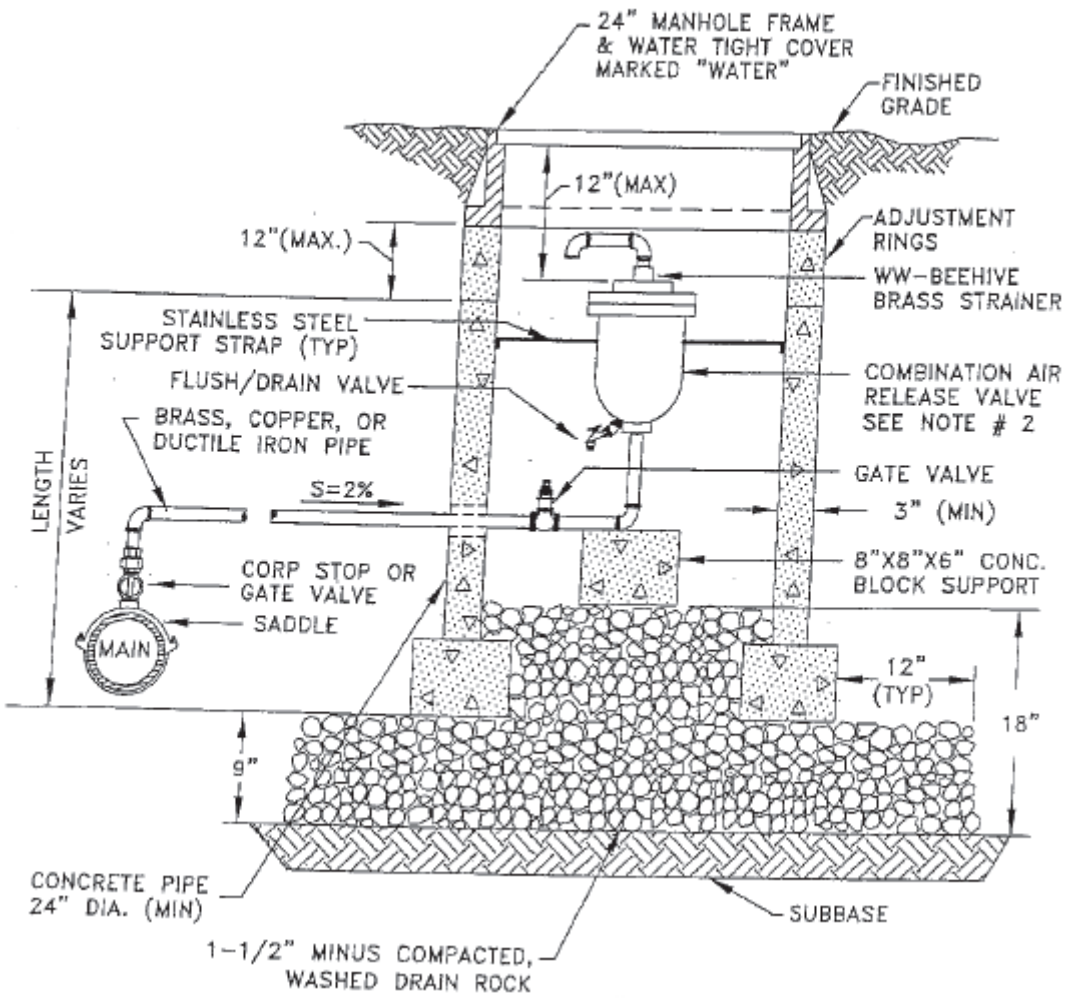
NOTES:

1. Gate valve: AWWA resilient seal, THRD x THRD with operating nut.
2. All pipe between double strap saddle and inlet side of combination air and vacuum assembly shall be brass.
3. Tap main at system high point. Location to be approved by the city.

DRAWING NOT TO SCALE

AIR AND VACUUM RELIEF VALVE

DESIGN 4-9(b)



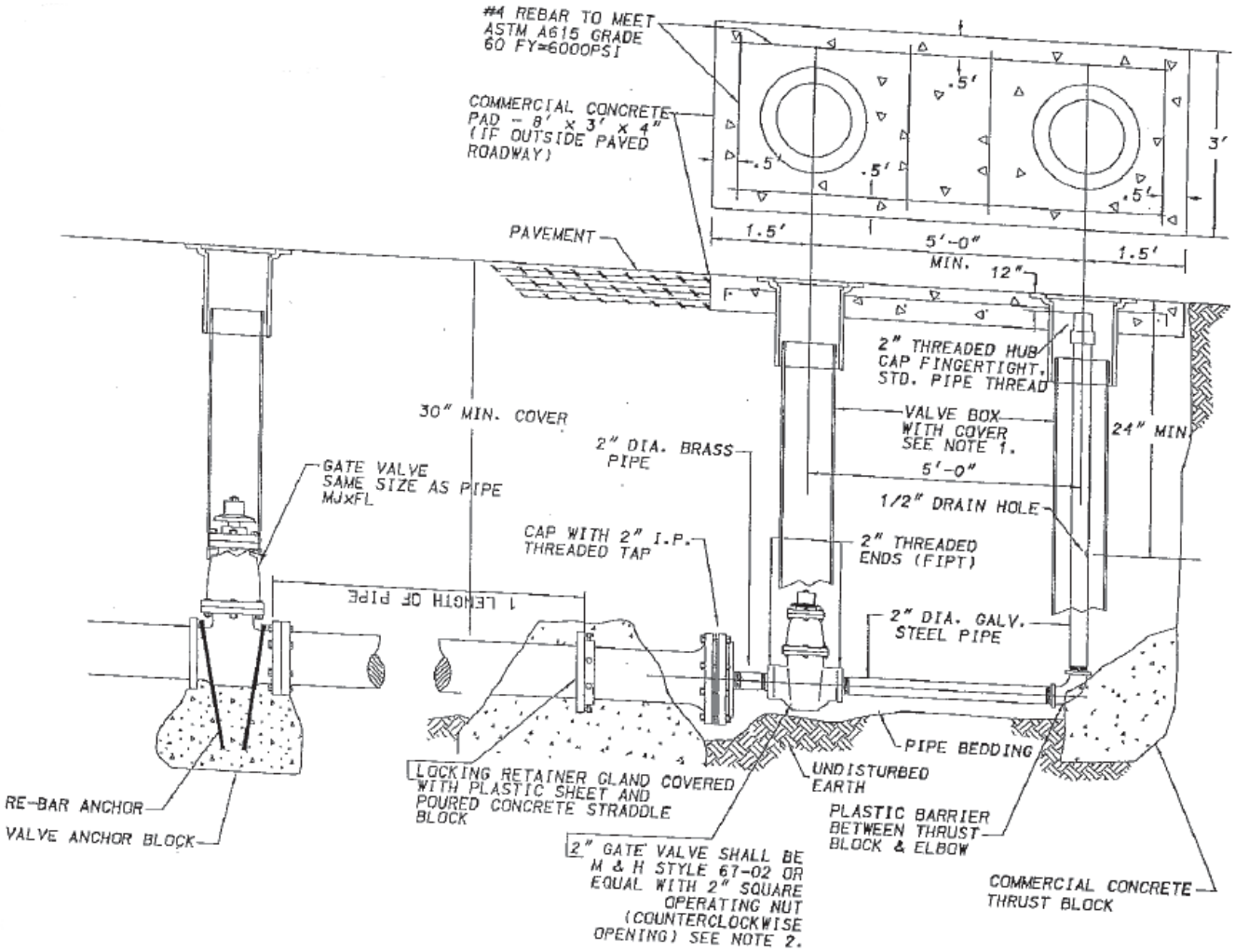
NOTES:

1. Valve assembly shall be set at the high point of the line.
2. Combination A.V./A.R. valve shall be APCO 140 Series, as dictated by the size of the water main.
3. A minimum of one 4" adjustment ring must be provided in traffic area settings.
4. Adjustment rings and manhole ring to be grouted, water tight.
5. All fittings will be brass, copper, or ductile iron depending on the type of pipe used.
6. Enclosure will be designed to withstand traffic loads when set in traffic areas.

DRAWING NOT TO SCALE

2” BLOWOFF ASSEMBLY

DESIGN 4-10



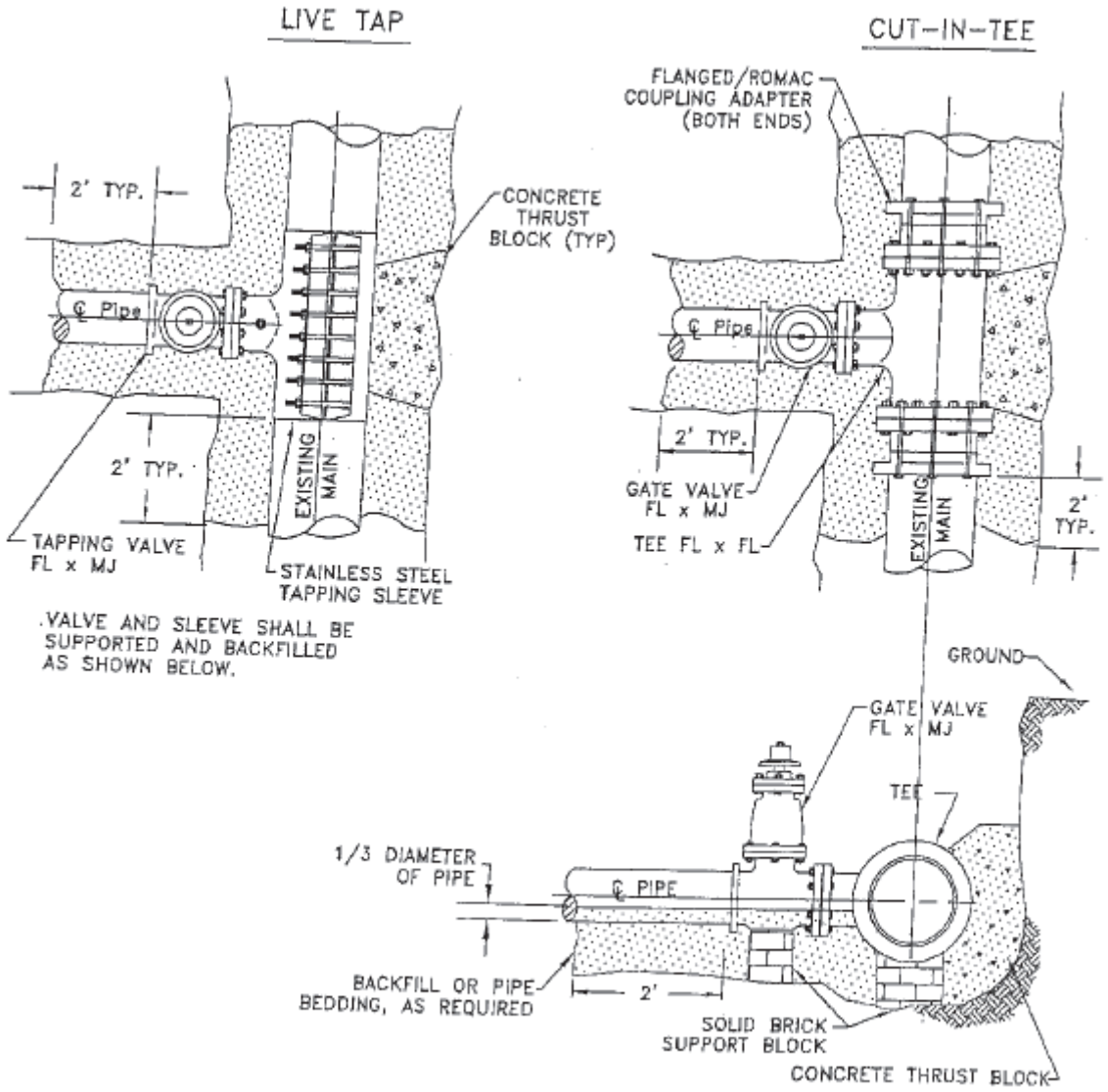
NOTES:

1. Valve box and cover shall be per detail 4-12.
2. On watermains which may be extended in the future, the valve which operates the blowoff assembly shall be the same size as the main and provided with a concrete thrust block as approved by the Director of Public Works.

DRAWING NOT TO SCALE

CONNECTION TO EXISTING MAIN

DESIGN

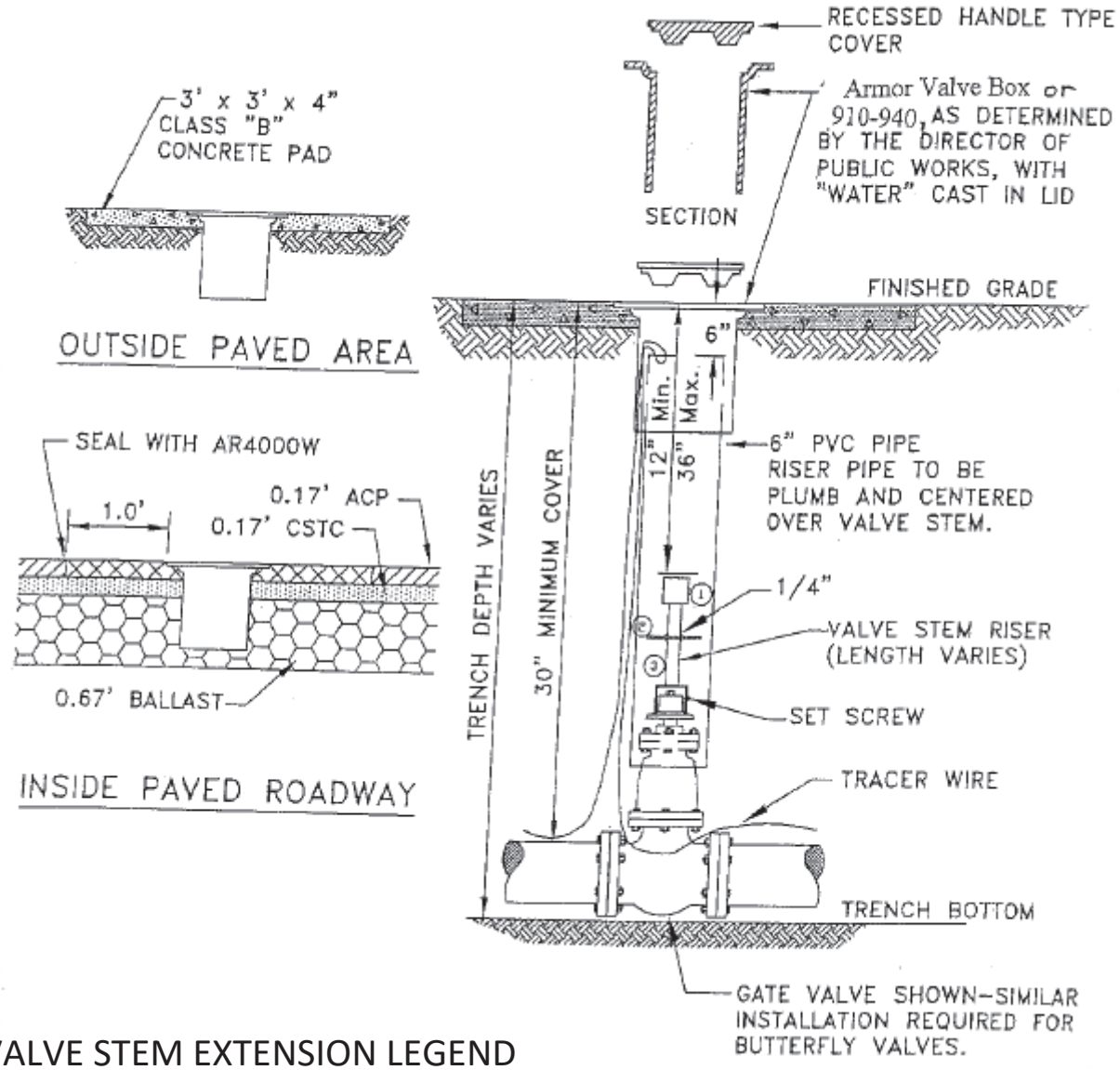


NOTES:

1. 11 Mil plastic or construction fabric shall be wrapped around pipe and fittings before thrust block and backfill are poured.
2. Support valve and sleeve continuously through installation

DRAWING NOT TO SCALE

VALVE BOX



VALVE STEM EXTENSION LEGEND

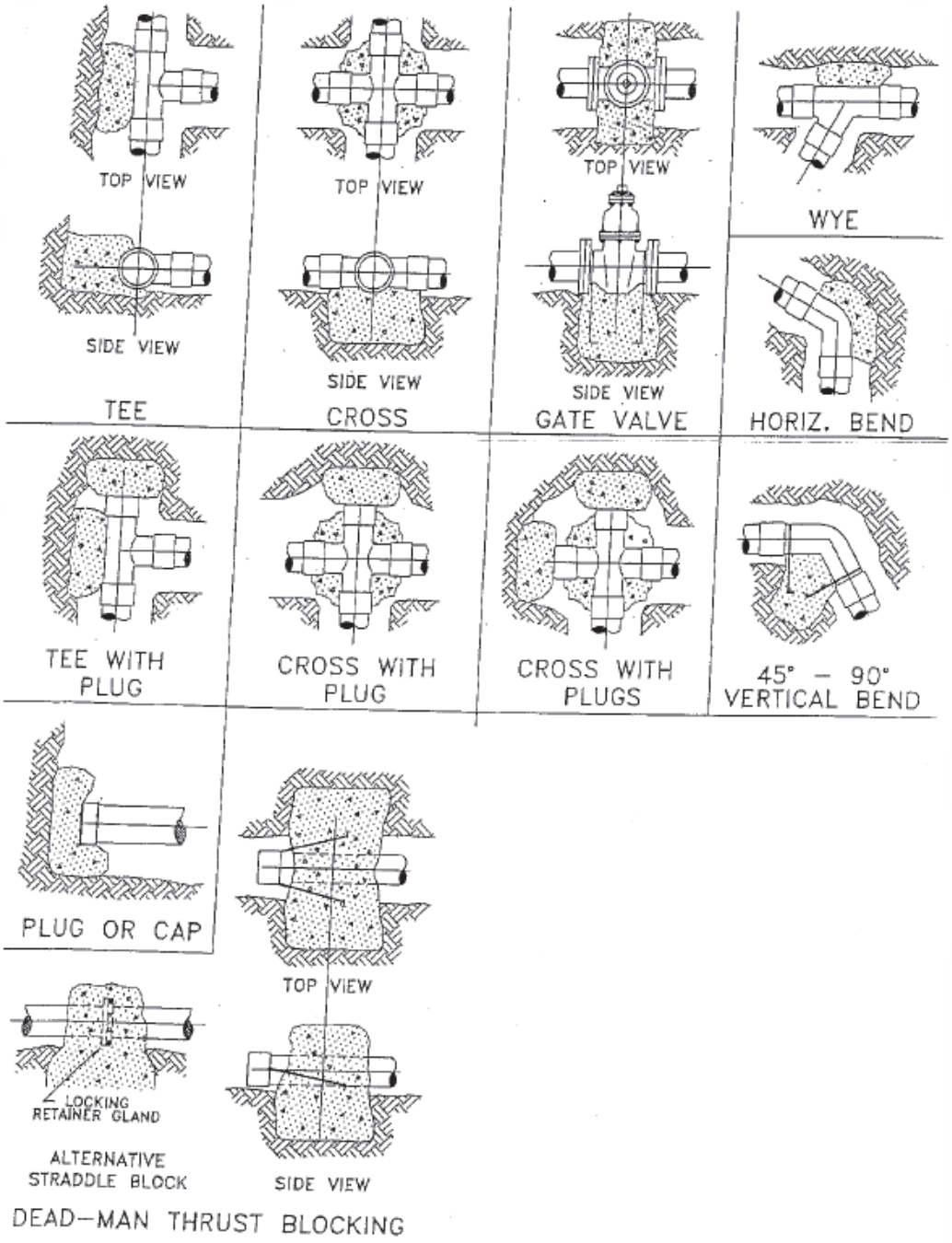
1. Valve operating nut or 1 7/8" x 1 7/8" x 2 high grade steel welded to guide plate.
2. 3/16" thick x 5 1/5" DIA steel guide plate welded to riser shaft.
3. 2" x 2" x 3/16" square structural steel tubing to fit operating nut. Length as required.

NOTES:

1. Weld all around, as specified above.
2. In traffic lanes, Olympic Foundry 940 valve box shall be required.
3. All valves must have 14 gauge coated copper tracer wire tied off at valve body, extended within one foot of the surface, as shown.

DRAWING NOT TO SCALE

STANDARD BLOCKING DETAIL



NOTES:

1. Concrete thrust blocking to be poured against undisturbed earth.
2. Plastic barrier shall be placed between all thrust blocks and pipe and/or fittings.
3. Anchor rebar shall be #5 minimum depth of embedment shall be 30” min for pipe up to 12” diameter and 36” for pipe greater than 12” diameter.
4. All standard blocking and thrust criteria, as listed on Detail 4-14, shall apply.
5. Plugs to be located a minimum of 5’ from tee, WYE, or cross on valve.

DRAWING NOT TO SCALE

THRUST LOADS

Thrust at fittings in pounds at 200 pounds per square inch of water pressure.

Pipe Diameter	90’ Bend	45’ Bend	22 ½’ Bend	11 ¼’ Bend	Dead End or Tee
4”	3,600	2,000	1,000	500	2,600
6”	8,000	4,400	2,300	1,200	5,700
8”	14,300	7,700	4,000	2,000	10,100
10”	22,300	12,100	6,200	3,100	15,800
12”	32,000	17,400	8,900	4,500	22,700
14”	43,600	23,600	12,100	6,100	30,800
16”	57,000	30,800	15,700	7,900	40,300

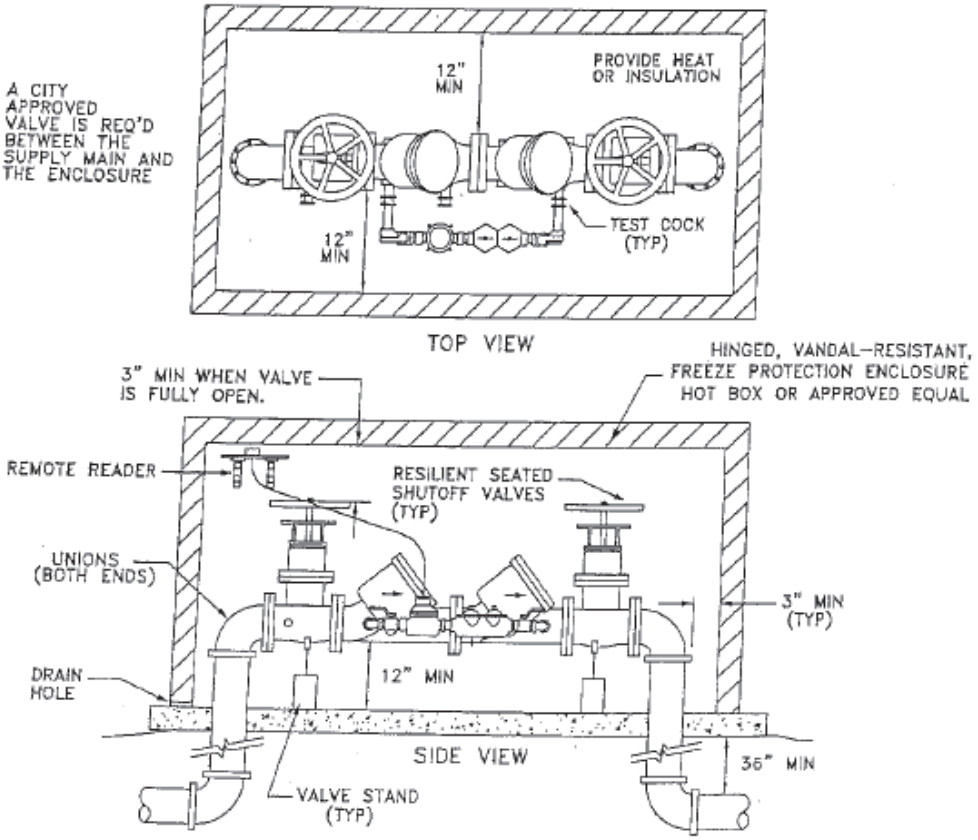
NOTES:

1. Blocking shall be cement concrete class “B” poured in place against undisturbed earth. Fittings & pipe shall be isolated from concrete thrust block with plastic or similar material.
2. To determine the bearing area of the thrust block in square feet (S.F.):
3. Areas must be adjusted for other pipe size, pressures, and soil conditions.
4. Blocking shall be adequate to withstand full test pressure as well as to continuously withstand operating pressure under all conditions of service.

SAFE SOIL BEARING LOADS

SOIL	**POUNDS PER SQUARE FOOT**
Much, Pear	0
Soft Clay	1,000
Sand	2,000
Sand & Gravel	3,000
Sand & Gravel Cemented with Clay	4,000
Hard Shale	10,000

STANDARD DOUBLE CHECK DETECTOR ASSEMBLY 3” OR LARGER

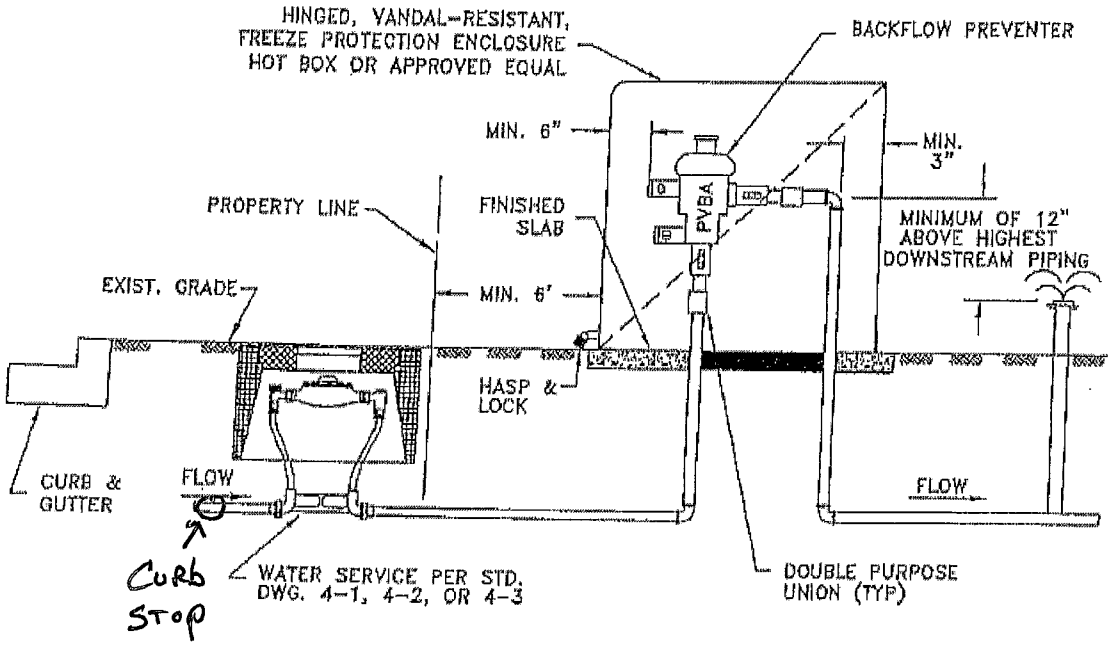


ABOVER GROUND INSTALLATION

NOTES:

1. Double check detector check valve assembly shall be Washington State Department of Health approved model.
2. Backflow assembly shall be an approved model with four (4) test cocks and a resilient seated shut off valve mounted to each end.
3. The backflow assembly shall be tested after installation and prior to acceptance by a certified backflow assembly tester, annual testing is required thereafter. Test results shall be sent to the Chehalis Water Division.
4. All pipe, valve, and fitting joints from the supply main shall be flanged and restrained.
5. The water line shall be disinfected, flushed, and pressure tested prior to installing the backflow assembly.
6. The backflow assembly shall be protected from freezing and flooding.
7. Seal pipe entrance and exit, through enclosure, so as to be watertight.
8. All enclosures shall be pre-approved by the city prior to installation.
9. Enclosures shall be installed at property line on owners property.
10. Enclosures shall have a minimum of 3’ clearance from all structures.
11. Valve stands shall be installed according to manufacturers recommendations.

½" – 2" PVBA/SVBA BACKFLOW PREVENTER

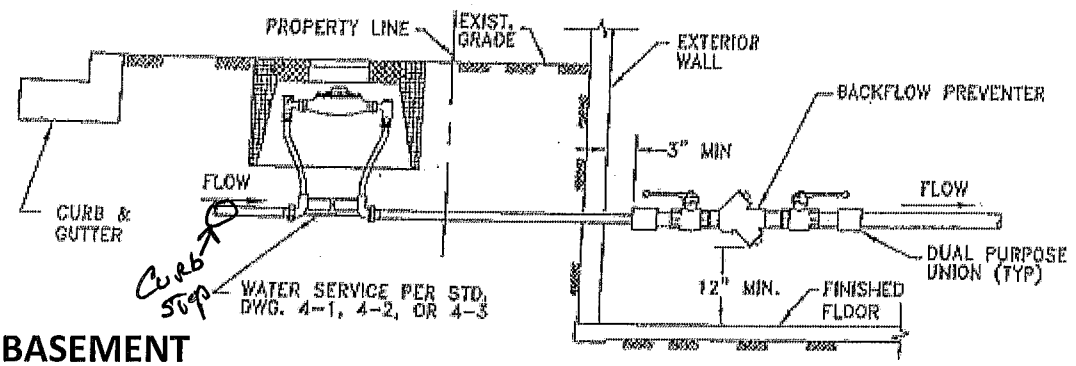


NOTES:

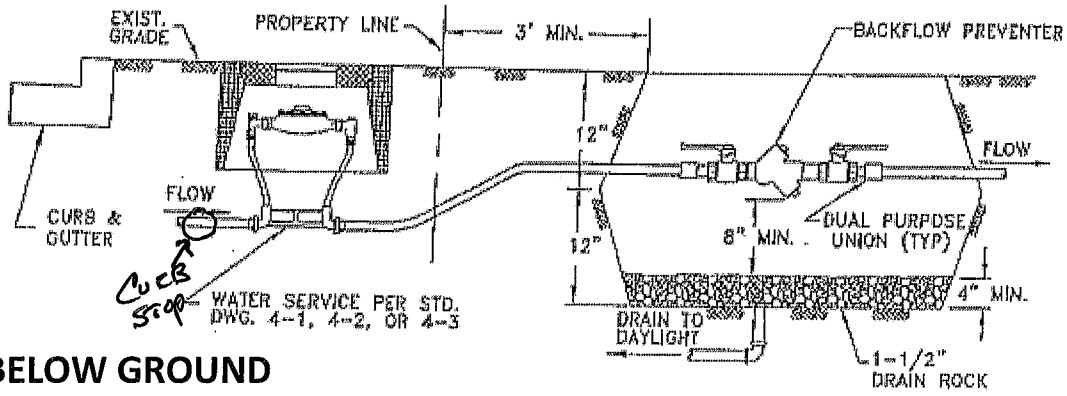
1. Backflow assembly shall be Washington State Department of Health approved model.
2. The backflow assembly shall be tested after installation and prior to acceptance by a certified backflow assembly tester. Annual testing is required thereafter. Test results shall be sent to City of Napavine Public Works.
3. All materials to be brass or copper as approved by the Director of Public Works.
4. The backflow assembly shall be protected from freezing and flooding.
5. Finish slab shall be sloped to drain.
6. All vaults shall be pre-approved prior to installation.

DRAWING NOT TO SCALE

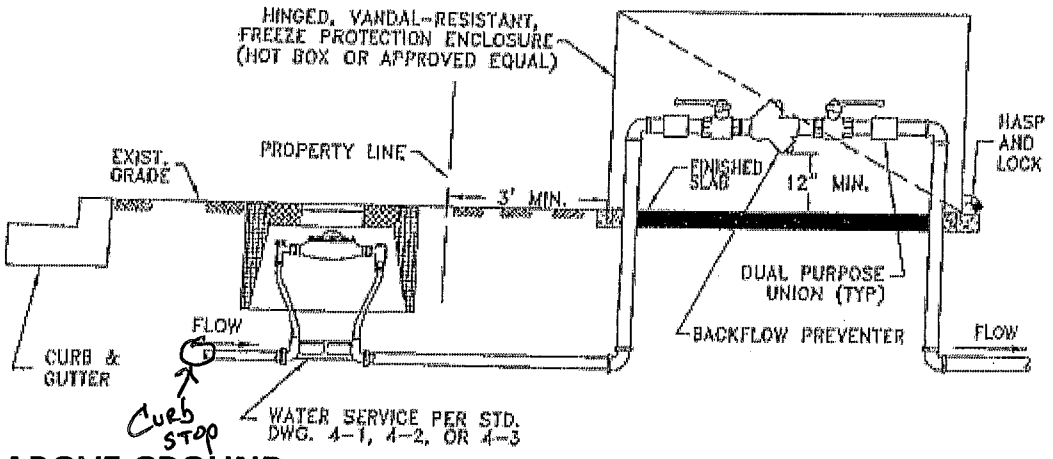
½" – 2 DOUBLE CHECK BACKFLOW PREVENTER



IN BASEMENT



BELOW GROUND



ABOVE GROUND

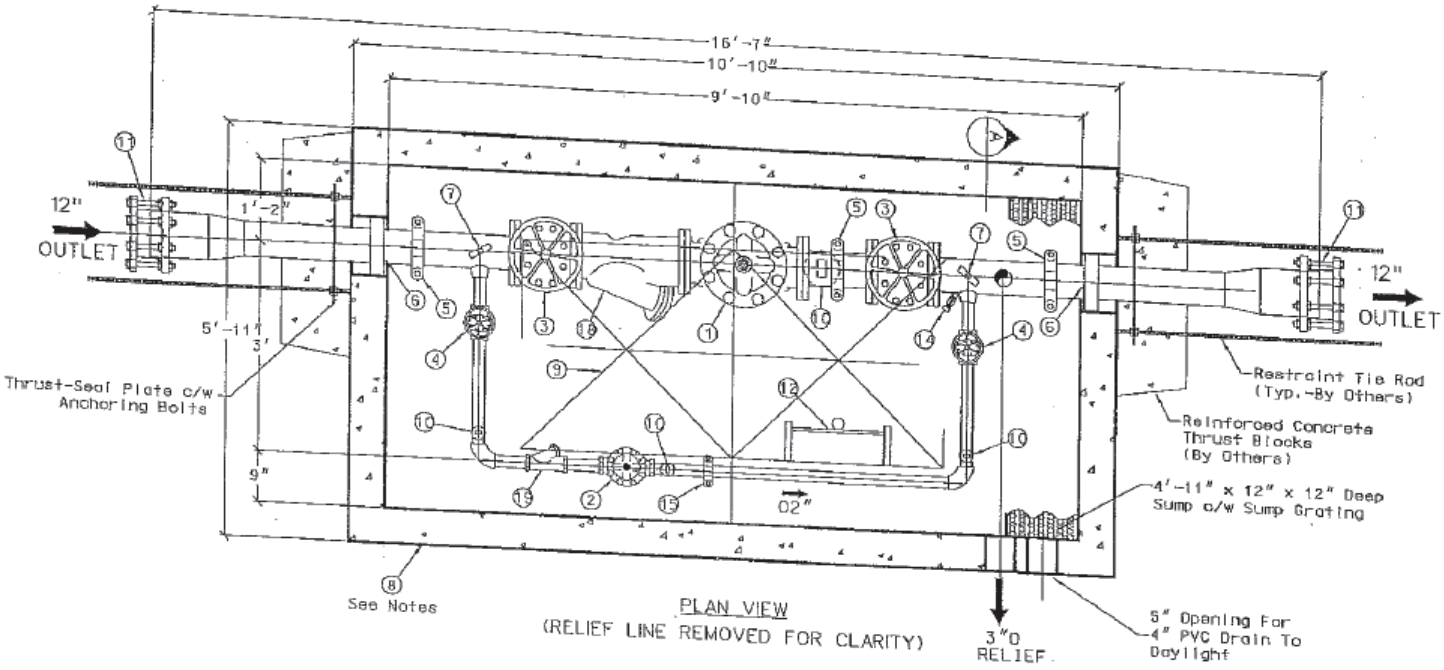
NOTES:

1. Backflow assembly shall be a Washington State Department of Health approved model.
2. All materials to be brass or copper as approved by the Director of Public Works.

DRAWING NOT TO SCALE

PRESSURE REDUCING STATION

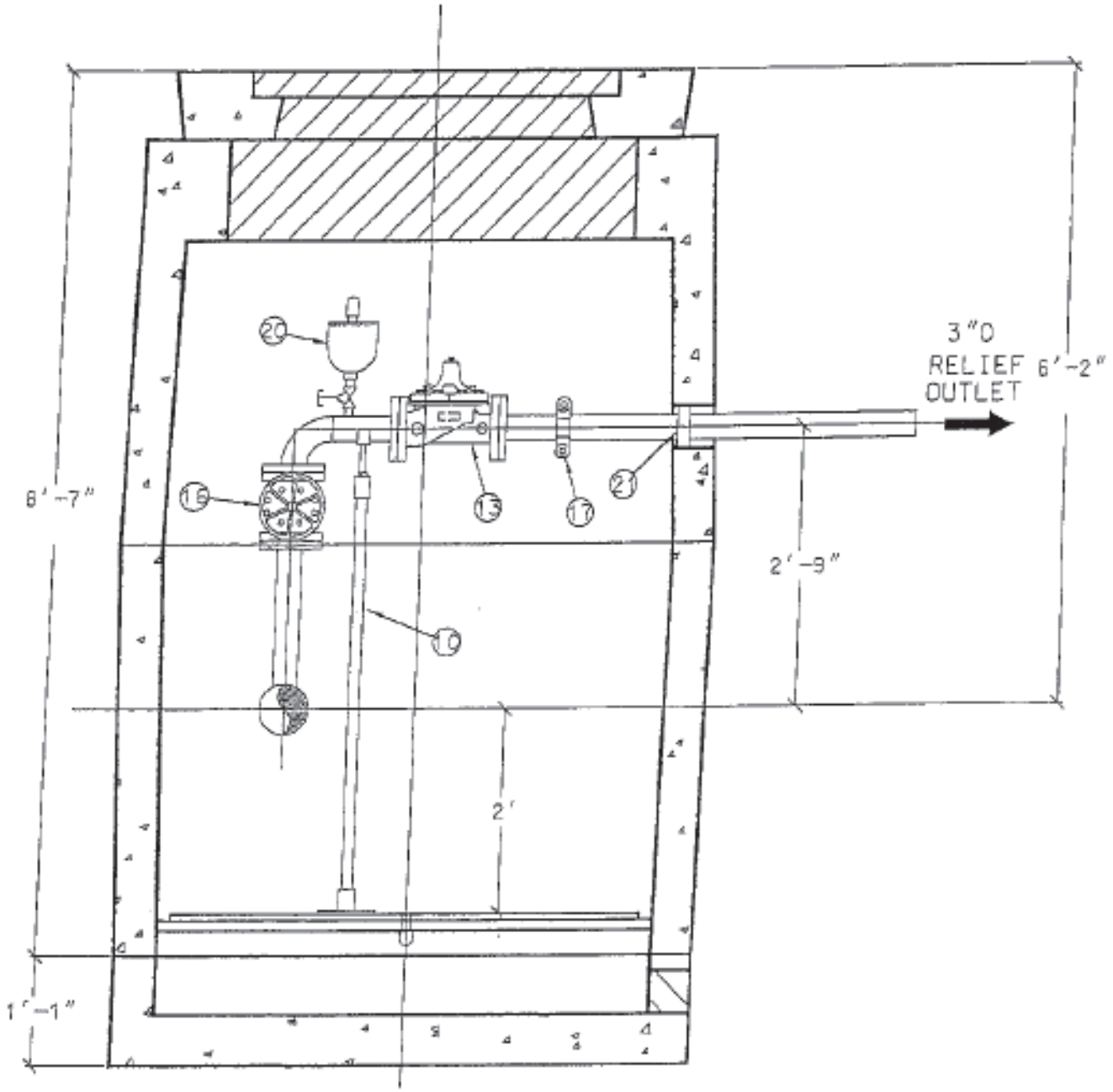
Sheet 1 of 3



DRAWING NOT TO SCALE

PRESSURE REDUCING STATION

Sheet 2 of 3



A SECTION

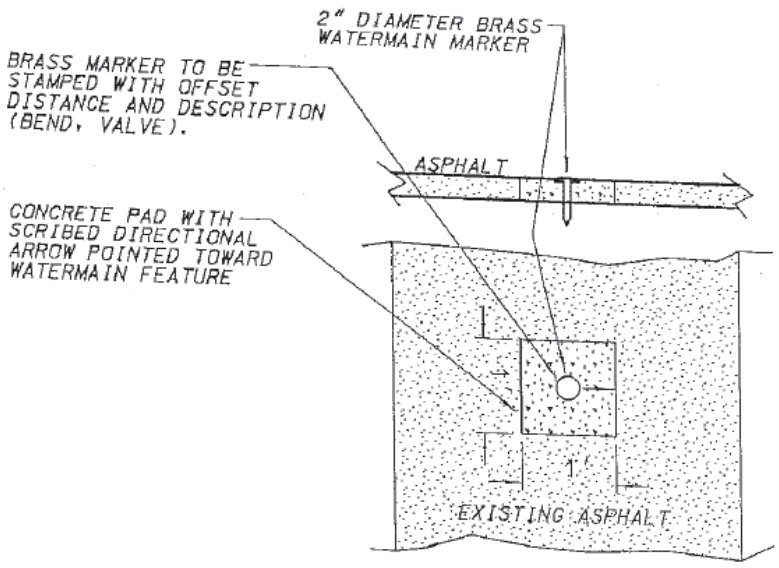
DRAWING NOT TO SCALE

PRESSURE REDUCING STATION

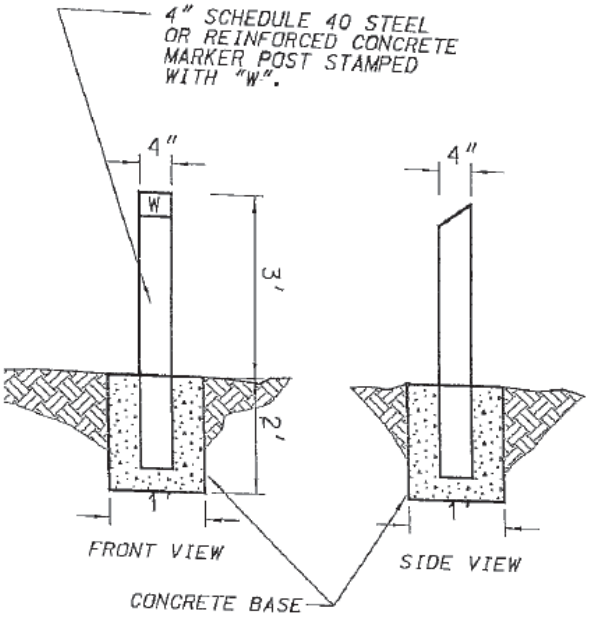
Sheet 3 of 3

1. 6” CAL-VAL 90G-01 YBC Pressure reducing calve C/W X101 position indicated DI body bronze trim - #150 flanged
2. 2” CLA-VAL 90G-01YBCS Pressure reducing valve C/W X101 position indicator, DI body bronze trim – threaded
3. 6” Mueller A2360-6W41 W55 RW NRS gate valve C/W handwheel – threaded
4. 2” Mueller A2360-6W41 W55 RW NRS gate valve C/W handwheel – threaded
5. 6” Victaulic #07 coupling
6. 6” pipe seal assembly
7. 4” 0-200 PSI pressure gage isolating valve
8. #10565 precast concrete vault C/W white interior & black exterior sealant
9. 36” x 72” aluminum double door hatch
10. Adjustable pipe supports
11. 6” Smith Blair ST xDI transition coupling
12. Aluminum ladder with safety post
13. 3” CAL-VAL 50-01 YB pressure relief valve DIBT - #150 flanged
14. ¾” hose bib assembly
15. 2” Victaulic #07 coupling
16. 3” Mueller A2360-6W41 W55 RW NRS gate valve C/W handwheel - #125 flanged
17. 3” Victaulic #07 flanged adapter
18. 6” cast iron WYE strainer C/W blowdown valve - #125 flanged
19. 2” cast iron WYE strainer C/W blowdown valve – threaded
20. 1” APCO model 142C.1 combination air valve C/W vent pipe
21. 3” pipe seal assembly

WATERMAIN MARKER DETAIL



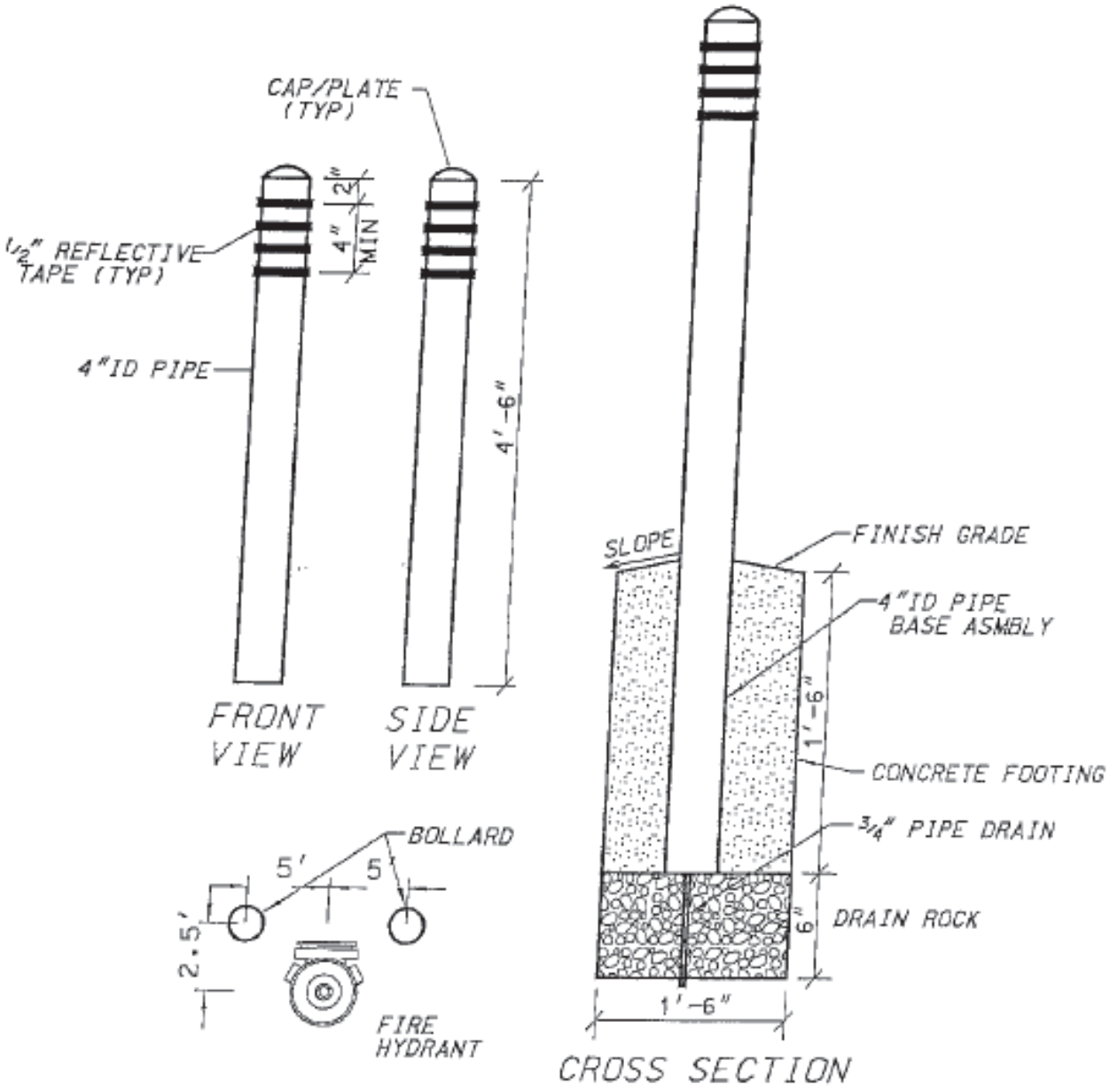
PAVEMENT MARKER



ABOVE GROUND MARKER POST

DRAWING NOT TO SCALE

BOLLARD DETAIL



DRAWING NOT TO SCALE

CHAPTER 5 – SANITARY SEWER

5A General Considerations

5A.01 General

Sanitary sewerage refers to wastewater derived from domestic, commercial, and industrial pretreated waste to which storm, surface and ground water are not intentionally admitted. Pretreatment will follow all the requirements as set forth by city ordinances and Public Works Department policies.

Any extension of the City of Napavine Sanitary Sewer System must be approved by the Public Works Department and must be consistent with the City of Napavine Comprehensive Plan, City of Napavine General Sewer Plan, Department of Ecology, and Department of Health requirements.

Within the corporate city limits where public sewer is available it must be used. Connection is not required provided that the sewage from the structure originates more than 200 feet from the public sewer, except in the case of private residential or commercial developments where the developed property abuts a right-of-way in which a public sewer is located or where a service connection is otherwise provided. In this case, connection of all structures generating sewage will be required to connect to the public sewer regardless of distance.

Anyone who wishes to extend or connect to the city sewer system will contact the Public Works Department for a Water/Sewer/Storm Application. If a sewer line extension is being requested, a written request that specifically lists and details the line extension must be submitted to the Public Works Department. After the Water/Sewer/Storm Application is returned to the Public Works Department along with a written request and/or any other information as may be required or requested, city staff will determine costs or estimated costs and/or address council and other approvals as may be required.

See Chapter 1, Section 1.02 for definitions of specific sewers. Maintenance of the building sewer will be the responsibility of the property owner while the remaining sewer lateral will be the city's responsibility.

5A.02 Marking Side Sewers

The location of all side sewers will be marked on the face or top of the cement concrete curb with an "S" embossed ¼-inch into concrete.

5A.03 Sanitary Sewer/Watermain Crossings

See Chapter 4.13 for requirements regarding sewer and water separation.

5A.04 Staking

All surveying and staking will be performed by an engineering or surveying firm licensed by the State of Washington and possessing the appropriate business license(s) to perform such work.

A pre-construction meeting will be held with the Public Works Department **prior** to commencing staking. All construction staking will be inspected by the city **prior** to construction. Staking will be maintained throughout construction.

The minimum staking of sewer lines will be as follows:

A. Centerline alignment must be staked with cuts and/or fills to flow at twenty-five (25) and fifty (50) feet from each manhole or structure and ever fifty (50) feet thereafter, unless more frequent staking is required for construction at the discretion of a Public Works representative.

B. Manholes must be staked with hubs to include invert elevations of all pipes and top of rim elevations to finished grade.

C. Location of valves, fixtures and septic tank will be staked for force main and STEP systems.

5A.05 Trench Excavation

See Chapter 4, Section 4.16 for requirements regarding trench excavation.

5A.06 Backfilling

See Chapter 4, 4.18 for requirements regarding backfilling.

5A.07 Street Patching and Restoration

See Chapter 2, Section 2B.15 and 2B.16 for requirements regarding street patching and trench restoration.

5.A.08 Testing

Prior to acceptance and approval of construction, the following tests will apply to each type of construction.

A. **Gravity Sewer**

1. After the pipes have been cleaned, and **prior** to acceptance of the project, the gravity sewer line will be subject to a low-pressure air test per WSDOT/APWA Standards. The contractor will furnish all equipment and personnel for conducting the test under the observation of a representative from the Public Works Department. The testing equipment will be subject to approval of the Public Works Department.

   Prior to calling a Public Works representative to witness the test, the contractor will have all equipment ready and have successfully performed the test. The air test for acceptance will be made after trench is backfilled and compacted and the roadway section is completed to sub-grade.

   All wyes, tees, and end of side sewer stubs will be plugged with flexible joint caps, or acceptable alternates, securely fastened to withstand the internal test pressures. Such plugs or caps will be readily removable, and their removal will provide an opening suitable for a lateral connection or extension that conforms to these Standards.

2. Testing of the sewer main will include a television inspection by the contractor, conducted under the direct supervision of a Public Works representative. Failure to have a Public Works representative present will invalidate the test and the test will be repeated at the contractor's expense. Television inspections will be done after the air test has passed, the manhole has been channeled and **before** the roadway is paved. Immediately **prior** to the television inspection, enough water will be run down the line to come out the lwer manhole. A sediment trap will be installed in the downstream manhole **prior** to flushing the line. The sediment trap and all the material it collects will be removed **before** the line is placed into service. A copy of

the video and a written report will be submitted to the Public Works Department. Acceptance of the line will be made after the tape has been reviewed and approved by the Public Works Department inspector. Any connection to an existing system will need to be televised as well.

The city may televise the new sewer line during periods of high groundwater within the first year after acceptance of the line. Any conditions resulting in inflow and infiltration (I&I) will be considered a system failure that will be repaired by and at the expense of the contractor.

3. A vacuum test of all manholes is required **prior** to acceptance. The structure will be tested in accordance with ASTM-C 1244-93. This test method covers procedures for testing cast-in-place or pre-cast concrete manhole sections, using the vacuum test method to demonstrate the integrity of the installed materials and construction procedures.

   Testing will be in the following manner:

   a. All lift holes and pipes entering into the manhole will be plugged, taking care to securely brace each plug from being drawn into the structure.

   b. The test head will be placed at the top portion of the structure in accordance with the manufacturer's recommendations.

   c. A vacuum of ten (10) inches of mercury will be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. With the valves closed, the time will be measured for the vacuum to drop by one (1) to nine (9) inches. The manhole will pass the vacuum test if the time is greater than the time shown in TABLE 1 below.

Table 1 – Minimum Test Times for Various Manhole Diameters

Depth	**Diameter in inches**								
Feet	30	33	38	42	48	54	60	66	72
Time in Seconds									
8	20	20	20	20	20	23	26	29	33
10	20	20	20	21	25	29	33	36	41
12	20	20	21	25	30	35	39	43	49
14	20	21	25	30	35	41	48	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	89	81	91	101	113
30	42	45	53	63	74	87	98	108	121

   TABLE 1 gives allowable time in seconds, i.e., test section is acceptable If vacuum does not drop below nine (9) inches until <u>after</u> the times shown below have expired.

   d. If the manhole fails the initial test, necessary repairs will be made by an approved method. The structure will then be re-tested until satisfactory test is obtained.

e. If the manhole joint is displaced during the vacuum test, the manhole will be disassembled, the seal replaced, the structure reassembled, and re-tested until compliance is obtained.

f. Testing can be done either before or after backfill operations around the structure; however, if during backfill operations it is found that the structure has be disturbed and it is suspected that the integrity of the joint has been compromised, re-testing will be required.

g. All other requirements stipulated in Section 7-05 of the most recent edition of the Washington State Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction, that has been adopted by the city, will also be adhered to for final acceptance of the manhole structure.

4. A mandrel test in accordance with Section 7-17.3(4)H of the WSDOT/APWA Standard Specifications will be performed by and at the expense of the contractor on all sewers except laterals (as defined in Chapter 1 of these Standards) when televising reveals a possible defect or belly in the pipe.

5. Any time that testing reveals problems that lead to repairs by the contractor, the city may require a complete re-testing of the entire system. The re-test will be required to ensure that the integrity of the system was not compromised during the repair work.

B. **Force Main**

1. **Prior** to roadway paving and final acceptance of the project, the pressure and service lines will be subjected to a hydrostatic pressure test of 100 lbs per square inch for fifteen (15) minutes and any leaks or imperfections which develop under said pressure will be remedied by the contractor. No air will be allowed in the line. The main will be tested between valves. Insofar as possible, no hydrostatic pressure will be placed against the opposite side of the valve being tested. The pressure test will be maintained while the entire installation is inspected.

   The contractor will provide all necessary equipment and will perform all work connected with the tests. Tests will be made after all connections have been made. This is to include any and all connections as shown on the plan. The contractor will perform all tests to assure that the equipment to be used for the test is adequate and in good operating conditions and the air in the line has been released before requesting a Public Works representative to witness the test.

2. A water test for all wet wells in accordance with the manhole

3. The contractor must provide verification of operating parameters such as pump operation, alarms, and electrical inspection. Inspections are to be conducted in the presence of a Public Works representative. The final verification will be documented in a written report that will be submitted to the city for review and approval **prior** to acceptance of all STEP systems.

5A.09 Design Standards

The General Notes on the following pages will be included on all plans dealing with sewage system design. In addition, the specific notes with gravity sewer and STEP systems will be included when these utilities are part of the project.

General Notes (Sanitary Sewer Main Installation)

1. All workmanship and materials will be in accordance with City of Napavine Standards and the most recent copy of the State of Washington Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT/APWA).

2. All approvals and permits required by the City of Napavine will be obtained by the contractor **prior** to the start of construction.

3. If construction is to take place in the County right-of-way, the contractor will notify the County and obtain all the required approval and permits.

4. A pre-construction meeting will be held with a Public Works Department representative **prior** to the start of construction.

5. The Public Works Department will be notified a minimum of two (2) business days in **advance** of a tap connection to an existing main. A Public Works representative will be present at the time of the tap.

6. The contractor will be fully responsible for the location and protection of all existing utilities. The contractor will verify all locations **prior** to construction by calling the Utilities Underground Location Center at 1-800-424-5555 a minimum of two (2) business days **prior** to any excavation.

7. All sewer mains will be field staked for grades and alignment by a licensed engineering or surveying firm qualified to perform such work. Staking will be maintained throughout construction.

8. All pipe and services will be installed with continuous tracer tape placed twelve (12) to eighteen (18) inches under the proposed finished subgrade. The maker will be of plastic non-biodegradable, metal core or backing marked “SEWER” that can be detected by a standard metal detector. If visibility cannot be maintained between structures along the straight alignment of a sewer, toning wire will be installed above the sewer line at a depth no greater than 48 inches. Tape will be Terra Tape “D” or an approved equal. In addition, STEP mains, force mains and curvilinear sewers will be installed with toning wire taped to the top of the pipe to prevent movement during backfill.

   If toning wire is required, it will be UL listed, type UF, 14-gauge copper. The wire will be laid loosely enough to prevent stretching and damage. The wire will be wrapped to a manhole or cleanout rings on gravity sewer or valve body on STEP mains.

   A 1-lb magnesium anode will be buried with the pipe every 1,000 linear feet maximum for cathodic protection of the wire. Toning wire splices and connections to anodes will join wires both mechanically and electrically and will employ epoxy resin or heat-shrink tape insulation. Toning wire will be tested **prior** to acceptance of the pipe system. A written notice from the contractor to the city two (2) business days **prior** to testing is required. On a curvilinear sewer, the wire will be brough up, bared and wrapped three (3) times around the manhole ring. The tape and wire will be furnished and installed by the contractor.

9. Bedding of the sewer main and compaction of the backfill material will be required in accordance with the above specification. (See General Note 1)

10. All manholes and cleanouts outside the paved area will be installed in accordance with Standard Drawings 5.3 and 5.5.

11. When temporary street patching is allowed by the city, cold mix asphalt will be placed to a maximum depth of one (1) inch. The contractor will be responsible for maintenance as required by the city.

12. Erosion control measures conforming to the most recent version of the City of Napavine Stormwater Management Plan and Chapter 3 of these Standards will be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.

13. Provide traffic control plan(s) in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) as required.

14. It will be the responsibility of the contractor to have a copy of the approved construction plans on-site at all times. “Approved” plans are typically signified by the signature of the Director of Public Works.

15. Any changes to the design will first be reviewed and approved by the developer’s project engineer and then the Director of Public Works **prior** to implementation.

16. **Prior** to backfill, all mains and appurtenances will be inspected and approved by a Public Works representative. Approval does constitute final acceptance of the sewer line. The contract will retain responsibility to repair all deficiencies and failures revealed during all required testing for acceptance and throughout the duration of the warrant. It is the contractor’s responsibility to notify the Public Works Department in **advance** of all required inspections. Any main or appurtenance backfilled **prior** to inspection will be re-excavated for inspection a no cost to the city.

GRAVITY SEWER

1. Gravity sewer mains will meet the following:

   PVC pipe will conform to ASTM P 3034 SDR 35, ASTM F 794 or ASTM F 679 Type 1 with joints and gaskets conforming to ASTM 3212 and ASTM F 477.

2. Pre-cast manholes will meet the requirements of ASTM C 478. Manholes will eb Type 1-48" as specified on the plans. Joints will be rubber gasket conforming to ASTM C 443 and will be grouted from the inside. Lift holes will be grouted from the outside and inside of the manhole (see General Note 1).

3. Side sewer services will be PVC, ASTM D 3034 SDR 35 with flexible gasket joints. Side sewer connections will be made by a saddle tap to an existing main, (see Standard Drawing 5-12), or a sanity tee from a new main connected above the spring line of the pipe. Side sewer services will be installed according to applicable Standard Detail(s).

4. All side sewer locations will be marked on the face of the curb with an "S" embossed ¼-inch into the concrete.

5. All lines will be high velocity cleaned, televised, and subjected to a low-pressure air test per current WSDOT/APWA Specifications **after** backfilling, but **prior** to paving (see General Not 1). Hydrant flushing of lines is not an acceptable cleaning method. Testing of the sanitary sewer main will include television inspecting of the main by and at the expense of the contractor in the presence of a Public Works representative. Immediately **prior** to television inspecting, enough water will be run down the line to come out the lower manhole and the line is flushed clean. A copy of the video will be submitted to the Public Works Department. Acceptance of the line will be made after the tape has been reviewed and approved by the inspector. A test of all manholes in accordance with these Standards is also required. Testing will take place after all underground utilities are installed and compaction of the roadway subgrade is completed.

STEP SYSTEM

1. All buried power for STEP systems will be installed according to all current and applicable electrical codes.

2. All buried power for STEP systems will be installed with continuous tracer tape installed twelve (12) inches above the buried power. The marker will be plastic non-biodegradable metal core backing marked "POWER". Tape to be furnished by the contractor.

3. All STEP mains will be hydrostatically tested at 100 PSIG for fifteen (15) minutes according to the methods for hydrostatic testing of waterlines in the most recent version of the WSDOT/APWA Specifications. All materials and labor are to be provided by the contractor. In addition, all STEP mains will be pigged in the presence of a Public Works representative, **prior** to placing the STEP main in service.

5B GRAVITY SEWER

5B.01 General

All sewers will be designed as a gravity sewer whenever physically and/or economically feasible or as outlined in the City of Napavine General Sewer Plan.

5B.02 Design Standards

The design of any sewer extension/connection will conform to these Standards, Department of Ecology's "Criteria of Sewage Works Design" and any applicable standards as set forth herein.

The layout of extensions will provide for the future continuation of the existing system as determined by the city. See Section 1.16 for utility extension information.

New gravity sewer systems will be designed on the basis of an average daily per capita flow of sewage of not less than 100 gallons per day. See the following DOE Table on Design Basis for Sewage. This figure is assumed to cover normal infiltration, but an additional allowance will be made where conditions are unfavorable. Generally, laterals and sub-main sewers should be designed to carry, when running full, not less than 400 gallons daily per capita contributions of sewage. When deviations from the foregoing per capita contributions of sewage. When deviations from the foregoing per capita rates are used, a description of the procedure used for sewer design will be submitted to the Public Works Department for review and approval.

Discharge Facility	Design Units	Flow* (gpd)	DOD (lb/day)	SS (lb/day)	Flow Duration(hr)
Dwellings	Per person	100	0.2	0.2	24
Schools w/ showers & cafeteria	Per person	16	0.04	0.04	8
Schools w/o showers w/ cafeteria	Per person	10	0.025	0.025	8
Boarding Schools	Per person	75	0.2	0.2	16
Motels @65 gal/persons (rooms only)	Per room	130	0.26	0.26	24
Trailer Courts @ 3 persons/trailer	Per trailer	300	0.6	0.6	24
Restaurants	Per seat	50	0.2	0.2	16
Interstates or through highway restaurants	Per seat	180	0.7	0.7	16
Interstate rest areas	Per person	5	0.01	0.01	24
Service Stations	Per vehicle serviced	10	0.01	0.01	16
Factories	Per person per 8-hour shift	15-35	0.03 – 0.07	0.03 – 0.07	Operating Period
Shopping centers	Per 1,000 sq ft of ultimate floor space	200-300	0.01	0.01	12
Hospitals	Per bed	300	0.6	0.6	24
Nursing Homes	Per bed	200	0.3	0.3	24
Homes for the aged	Per bed	100	0.2	0.2	24
Doctor's office in medical center	Per 1,000 sq ft	500	0.1	0.1	12
Laundromats, 9 – 12 machines	Per machine	500	0.3	0.3	16
Community colleges	Per student & facility	15	0.03	0.03	12
Swimming pools	Per swimmer	10	0.001	0.001	12
Theaters, drive-in type	Per car	5	0.01	0.01	4
Theaters, auditorium type	Per seat	5	0.01	0.01	12
Picnic areas	Per person	5	0.01	0.01	12
Resort camps, day and night, with limited plumbing	Per campsite	50	0.05	0.05	24
Luxury camps with flush toilets	Per campsite	100	0.1	0.1	24

* Includes normal infiltration

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5B.03 Main Line – Gravity

A. **Sewer Mains** will be sized for the ultimate development of the tributary area. Nothing will preclude the city from requiring the installation of a larger sized main if the city determines a larger size is needed to meet the requirements for future service.

The minimum size for mains will be eight (8) inch inside diameter. The minimum size for a lateral will be four (4) inches.

B. Sewer mains will be constructed using materials conforming to the following:

1. PVC pipe six (6) to fifteen (15) inches diameter must meet either ASTM D 3034, SDR 35 solid wall pipe, or ASTM F 794 for solid seamless profile pipe; or
2. PVC pipe 18 to 27 inches diameter will conform to ASTM F679 Type 1 only/
3. All joints for the PVC pipe will conform to ASTM D 3212 with rubber gaskets conforming to ASTM F 477.

C. **Gravity sewer** will maintain a minimum depth of five (5) feet, unless otherwise approved, to provide gravity service to adjoining parcels and future areas to be served, adequate headroom within manholes for maintenance personnel and vertical clearance between water and sewer lines. Actual depth will be determined by slope, flow, velocity and elevation of existing system.

D. All sewer lateral connections to the main will be made with a sanitary tee connection. A cleanout will be provided at the edge of the right-of-way as shown in Standard Drawing 5-10. The direct connection of sewer laterals to interceptors is strictly prohibited. All new mains connecting to existing mains will require the installation of a new manhole if not made at an existing manhole. The city may require wyes at the upper extremity of a sewer line.

E. **Slope** All sewers will be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second based on Mannings Formula using and “n” valve of 0.013. Use of other practical “n” values may be permitted by the Public Works Department if deemed justifiable on the basis of research or field data submitted. The following are minimum slopes, however, slopes greater than these are desirable.

Sewer Size (Inches)	Minimum % Slope (Feet per 100’)
8	0.40 (0.0040 Ft/Ft)
10	0.28 (0.0028 Ft/Ft)
12	0.22 (0.0022 Ft/Ft)
14	0.17 (0.0017 Ft/Ft)
15	0.15 (0.0015 Ft/Ft)
16	0.14 (0.0014 Ft/Ft)
18	0.12 (0.0012 Ft/Ft)
21	0.10 (0.0010 Ft/Ft)
24	0.08 (0.0008 Ft/Ft)
27	0.07 (0.0007 Ft/Ft)
30	0.06 (0.0006 Ft/Ft)
36	0.05 (0.0005 Ft/Ft)

Under special conditions, slopes slightly less than is required for the 2.0 feet per second velocity, may be permitted by the Director of Public Works. Such decreased slopes will only be considered where the depth of flow will be thirty (30) percent of the diameter or greater for design average flow.

Whenever such decreases slopes are proposed, the design engineer will furnish the city with the plans and computations of the depth of flow at minimum, average, and daily or hourly rates of flow. Larger pipe will not be allowed to achieve lesser slopes. Sewers will be laid with uniform slope between manholes.

F. Gravity sewers will be designed with a straight alignment between manholes.

5B.04 Connections to Existing System

A. At connection to the existing system, all new sewer connections will be physically plugged until all tests have been completed and the city approves the removal of the plug.

B. Connection of new pipelines to existing manholes will be accomplished by using core-drilled holes. The transition of connecting channels will be constructed so as not to interrupt existing flow patterns. All connections will utilize Kor-N-Seal fittings. Manholes that contain knockouts will not be permitted for use as part of the city sewer collection system.

C. Connection of a pipeline to a system without an existing manhole available will be accomplished by pouring a concrete base and setting manhole sections. The existing pipe will not be cut into until approval is received from the city.

D. Connections to manholes requiring a drop will follow the criteria as outlined in Section 5B of this Chapter.

E. Connections where an existing stub-out is not available or where a new building sewer is the same size as the existing main will be accomplished by the installation of a new manhole.

F. Taps will be done by use of a core drill and will not be allowed to protrude into the existing main. A city inspector will be notified two (2) business days **prior** to any tap of a city sewer and will be present to witness the tap. The inspector will collect all tapping cores from the contractor or will be informed of the cores were washed into the sewer.

5B.05 Manholes

Pre-cast manholes will meet the requirements of ASTM C 478 with either a pre-cast base or a cast-in-place base made from 3,000 psi structural concrete. Manholes will be Type 1, 48-inch diameter minimum. The minimum clear opening in the manhole frame will be twenty-four (24) inches. Joints will be rubber gasket conforming to ASTM C 443 and will be grouted from the inside. Lift holes will be grouted from the outside and inside of the manhole.

Manholes constructed of other materials may be approved by the Director of Public Works provided they meet the requirements of 2.318 of Department of Ecology's "Criteria for Sewage Works Design". Material specifications need to be submitted for review **before** an alternate material will be considered. See Standard Drawings 5-1 and 5-2 for details.

Eccentric manhole cone will be offset so as not to be located in the tire track of a traveled lane.

Manhole frames and covers will be cast iron casting marked "SEWER" conforming to the requirements of ASTM A-30, Class 25, and will be free of porosity, shrink cavities, cold shuts, cracks, or any surface defects which would impair serviceability. Repairs of defects by welding or by the use of smooth-on or similar material will not be permitted. Manhole rings and covers will be machine-finished or ground-on seating surfaces so as to assure non-rocking fit in any position

and interchangeability. Manholes located in areas subject to inflow will be equipped with an approved watertight manhole insert.

Where lock-type castings are called for the casting device will be such that the cover may be readily released from the ring and all movable parts will be made of non-corrosive materials and otherwise arranged to avoid possible binding. The locking device will be made of a non-corrosive material or properly coated to protect against corrosion. All casting will be coated with bituminous coating **prior** to delivery to the job site.

Safety steps, will be fabricated of polypropylene conforming to an ASTM D-4101 specification, injection molded around a ½-inch ASTM A-615 grade 60 steel reinforcing bar with anti-slip tread. Steps will project uniformly from the inside wall of the manhole. Steps will be installed to a form a continuous vertical ladder with rungs equally spaced on 12-inch centers.

Manholes will be placed at standard maximum 400-foot intervals, and at changes in direction, grade or pipe size. Slope through the manhole will be 1/10th of one-foor from invert in to invert out unless otherwise approved by the Director of Public Works.

Where a smaller sewer joint joins a larger on, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results in to place the 80 percent depth point of both sewers at the same elevation. Pipe material will be consistent between manholes.

Straight grades between invert out of last manhole and connection to existing are preferred over drops whenever possible. Care must be taken when designing steep grades so as not to create a situation of excessive velocity or excavation. Grade changes associated with “sweeps” will not be allowed. The angle between the line(s) entering a manhole and the line leaving will be no less than 90 degrees.

An outside drop connection will be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert will be filleted to prevent solids deposition. Outside drop structures will be constructed per Standard Drawing 5-4.

All manholes that are to be owned and maintained by the city will be accessible at all times to operations, maintenance equipment and vehicles. All weather access drives may be required to provide a sufficient driving surface for city vehicles, at the discretion of the Director of Public Works.

5B.06 High Velocity Protection

Where velocities greater than fifteen (15) feet per second are expected, special provisions such as thrust blocking and specific piping materials will be made to protect against displacement and hydrogen sulfide gas.

5B.07 Cleanouts

Cleanouts are not an acceptable substitute for manholes; however, they may be used in lieu of manholes at the end of 8-inch diameter lines of not more than 150 feet in length. Location of clean out for building

sewer is governed by sewer ordinances as included in the Napavine Municipal Code and the Uniform Plumbing Code as adopter by the city.

All cleanouts in a right-of-way will be extended to grade and a 3-foot square x 4-inch-thick concrete pad will be installed around all cleanouts that are not in a pavement area. See Standard Drawing 5-5.

5B.08 Sewer Service to Private Properties

A building sewer refers to the extension from a building's discharge plumbing (two (2) feet outside of the building) to the edge of pavement or curb line and will have no other common sewers discharging into it. Building sewers will be a minimum diameter of four (4) inches for residential service and six (6) inches for all other services. Maintenance of the building sewer is the responsibility of the property owner.

A sewer lateral refers to the extension from the building sewer at the end of pavement or curb line to the sewer main. Sewer laterals will be a minimum diameter of six (6) inches. Maintenance of the sewer lateral is the responsibility of the city. Each property will be served by an individual sewer lateral. In addition, e3ach unit of a duplex will be served by separate laterals.

Prior to connection or installation of building sewer or sewer laterals, a Side Sewer Permit must be obtained from the Public Works Department. Materials and design criteria for a building sewer are covered by the Uniform Plumbing Code (UPS) as adopted by the city. Inspection of the sewer lateral and building sewer from two (2) feet outside the structure to the sewer main, the responsibility of the Public Works Department.

In order to avoid the possibility of backup in the sewer lateral from head pressures in the sewer main, the Director of Public Works may require that a backwater valve be installed at the property owner's expense. Operation and maintenance of the backwater valve will be the responsibility of the property owner.

5C LIFT STATIONS

5C.01 General

All lift stations will be designed to serve the appropriate basin as identified in the most recent version of the City of Napavine Sanitary Sewer Plan.

5C.02 Design Standards

The design of any lift station will conform to City Standards, Department of Ecology's "Criteria for Sewage Works Design", and applicable standards as set forth here in Sections 1.01 and 1.11. Each lift station will be evaluated for buoyancy resistance using site-specific soil and groundwater information.

The following equipment, features and special modifications are standard requirements for all permanent wastewater lift stations constructed as part of the city's wastewater lift stations constructed as part of the city's wastewater conveyance system. The following requirements are minimum standards are not all inclusive:

A. **General**

1. The proponent of the lift station is required to provide the City of Napavine with a site located outside of the right-of-way. The land will be deeded to the city and will have sufficient area dimensions that allow for easy and safe access to the lift station.

2. A concrete slab, six (6) inches in depth, will surround the lift station well(s), with a minimum of two (2) feet of side exposure for all openings. The slab will be installed at ground level.

3. An access road, with easement, that will support 20,000 lb. axle loads throughout the year, will be provided from the nearest public road to the station to allow for maintenance of the station.

4. Station entry access will be keyed to match all other city lift stations.

5. Entry lid to the station wet well will be located as close as practical to the access drive. The lift stations will be accessible at all times to operations and maintenance equipment and vehicles.

6. Safety guards will be provided for all exposed drivelines and couplings.

7. Spare parts will be provided as recommended by the manufacturer, with a minimum of one (1) impeller, one (1) compete set of seals, filters and one (1) set of volute gaskets. Four (4) complete sets of O&M manuals, and a list of the nearest dealers for spare parts and repair will be provided. All replacement parts will be readily available from a distributor in the U.S.A.

8. The lift station will include at least two (2) pumps, each one size to handle all of the flow that the station will accept.

9. The pumps, motor, and wet well will be in compliance with current engineering practice. They will be fully compatible as an assembly and will be engineered for the specific service area.

10. All hardware and other basic mechanical parts (not including piping and valves) internal to the wet well will be stainless steel, including float hangers, anchor bolts, cable systems, etc.

11. The station will be designed to include an isolation valve located in the discharge line between the station and the pumping bypass port, no less than twelve (12) pipe diameters from the dry well.

12. City water will be provided to the station for hose down and pump seal supply. An approved backflow prevention device will be provided on the water supply line outside the dry well to protect the public water system. The backflow device will be tested and certified by a licensed cross-connection control specialist (CCS) prior to acceptance of the system.

13. A 100-amp minimum 480/277-volt 3-phase 4-wire main service will be provided as per plans. The service will be sized to accommodate the requirements of the pump station.

14. All electrical equipment will be enclosed in a freestanding, vandal proof, all-weather enclosure NEMA 3R or better.

15. A minimum 100-amp, 480/240-volt, 3-phase emergency power hookup will be provided as necessary to serve the pump station. The transfer switch will be sized to accommodate the load with a 100-amp minimum.

16. Overhead lights will be operated with a manual switch.

17. Wiring will be THHN stranded copper.

18. Lift station telemetry will be compatible with the system in use by the city at the time of proposed construction. The telemetry will transmit and receive signals through a phone line. The system will be installed entirely by the contractor. The telemetry will be enclosed in a

NEMA 1 enclosure within the electrical cabinet. The Public Works Department will have final approval authority over the telemetry system that will be used.

19. Conduit will be galvanized, or of a non-corrosive material as approved by the city, except conduit that penetrates a wet well or corrosive environment will be coated rigid PVC.
20. Pump motors will be 3-phase, 480 or 240-volt, and provided with elapsed time meters.
21. Pump control system will be Milltronics Hydroranger 200 with xrs-s/xrs-5c transducers.

    The Public Works Department will have final approval authority over the
22. Lift stations will be designed to accommodate a confined space entry davit, as utilized by the Public Works Department. An appropriate bracket unit will be included with the station at the wet well entry lid to support the city's confined space entry equipment.
23. The lift station will include the following alarm and station status points, as applicable

Wet Well Level	**Pump #2**
Low Wet Well	**Run**
High Wet Well	**Auto**
Dry Well Flood	**Off**
Seal Pressure	**Seal Failure**
Pump #1	**VFD #2 Failure**
Run	**AC Power Failure**
Auto	**Generator Run**
Off	**Generator Fail**
Seal Failure	**Intrusion**
VFD #1 Failure	**Fire**

24. Provide for a minimum of 45 seconds pump run time per pump cycle and a maximum of 10 (10) pump starts per hour.
25. Plans and specifications must be submitted to the Public Works Department and approved in writing **prior** to ordering a package lift station.

B. **Wet Well/Dry Well**

1. The dry well will be vented with an exhaust fan to meet state safety standards.
2. Wet well will be equipped with a permanent, attached, full-depth, internal, galvanized access ladder. The ladder will be galvanized or of a non-corrosive material as approved by the city.
3. Entry lid to the station dry well will be constructed of the rust proof coating or fiberglass.
4. Dry wells will be provided with an automatic sump pump plumbed to lift station wet well.
5. Dry wells will be provided with dehumidifier equipment appropriately sized to remove moisture from the dry well.

C. **Submersible**

1. Lift stations will be designed so as not to require entry into the wet well for any by emergency needs.

2. Provide pump removal system made with stainless steel pipe guide rails. Cable guide pump removal systems will not be considered.

3. Control panel and all other electrical enclosures will be mounted on stainless steel Unistrut.

4. Water service to the station will be provided through a frost-free hydrant set within ten (10) feet of the wet well hatch. The hydrant will be located so as not to create a hazard to pedestrians or traffic. They Public Works Department will have final approval authority over the hydrant location.

5D PRESSURE SEWER (FORCE MAIN)

5D.01 General

Low pressure systems, i.e., force mains, may be considered for situations where high groundwater table or topography make gravity sewer impractical. STEP systems are addressed separately in Chapter 5E.

5D.02 Design Standards

The design of any sewer extension/connection will conform to City Standards, Department of Ecology's "Criteria of Sewage Works Design", and any applicable standards as set forth herein and in Section 1.03 and 1.11.

The layout of extensions will provide for the future continuation of the existing system as determined by the city. In addition, main extensions will be extended to and across the side of the affected property fronting the main.

The system will be designed at full depth of flow on the basis of an average daily per capita flow as shown on the Table in Section 5B.02. A coefficient of friction of 120 will be used for the Hazen-Williams "C" valve.

New sewer systems will be designed by methods in conjunction with the basis of per capita flow rates. Methods will include the use of peaking factors for the contributing area, allowances for future commercial and industrial areas, and modification of per capita flow rates based on specific data. Documentation of the alternative method used will be provided along with plans. Applicable General Notes in Section 5B.02 will be included on all plans dealing with pressure sanitary design.

5D.03 Force Main

A. **Material**. Force mains up to twelve (12) inches will be ductile iron AWWA C151 Class 50 or PVC C900 with ductile iron fittings and gasket joints. For fourteen (14) to twenty-four (24) inch mains, pipe will be ductile iron C151 Class 50 or PVC C905 with ductile iron fittings and gasket joints. A more rigid pipe may be required where unlimited trench widths occur. All ductile iron pipe and fittings will be epoxy coated or PE lined and designed for use with corrosive materials.

B. **Depth**. Force mains will have a minimum thirty-six (36) inches of cover to top of pipe. See Chapter 4 Section 4.13 for Sanitary Sewer/Watermain Crossing requirements.

C. **Velocity**. The minimum velocity allowed is two (2) feet per second (fps) at average dry weather flow. Two (2) fps is required to maintain solids in suspension although three (3) fps is desired to scour settled solids. Maximum velocity allowed will be eight (8) fps.

D. **Locate**. Force mains will include toning wire, cathodic protection and tracer tape installed in accordance with requirements herein.

5D.04 Air/Vacuum Valves

Air release valves and air/vacuum valves will be located at the high points of the line within a manhole or approved vault that provides eighteen (18) inches of clearances on all sides between the assembly of the wall(s). Air release valves will be fitted with an activated carbon canister to prevent the release of disagreeable odors to the surrounding area. Grades will be designed to minimize the need for air/vacuum valves when practical. Vehicular access to the valve is required for maintenance.

5D.05 Force Main Drain

Provisions to drain a force main to facilitate repairs or to temporarily remove a force main from service will be provided. This may be accomplished through the use of a valved tee connection to a drain line at its low point with isolation valves on both sides of the tee along the main. A manhole will be set over the force main at the valved tee to provide a sump for the wastewater to be drained into.

5D.06 Thrust Blocking

Location of thrust blocking will be shown on plans. Thrust block concrete will be Class B, 3,000 psi, poured against undisturbed earth. A plastic barrier will be placed between all thrust blocks and fittings.

See Standard Details 4-13 and 4-14 in Chapter 4 of these Standards. Restraining joint systems may be allowed in lieu of thrust blocking when designed by a licensed engineer and approved by the Director of Public Works. Restraining joint brand, type, and size will be specified on the plans.

5D.07 Force Main Termination

Hydrogen sulfide (H_2S) odors and the buildup of sulfuric acid (H_2SO_4) occur in the operation of a force main. To mitigate these conditions, some type of control method(s) will be used. This may include chemical addition at the pump station and/or the re-aeration of the wastewater at or near the terminus. The means of re-aeration will be approved by the Director of Public Works.

The outfall manhole (point of connection where force main discharges into gravity sewer) and the next downstream manhole on the gravity sewer will be protected against corrosion. The means of protection will be approved by the Director of Public Works and may include spray-on coatings and PVC linings. If a PVC lining is used, it will cast into the wall and floor of the manhole. No exposed concrete will be permitted.

5D.08 Pigging Ports

A pipeline pig is a projectile that is forced through the inside of a pipe to clean pressure pipeline. A pigging port is used as a point to send or retrieve the pig. Pigging ports will be located outside of paved areas but within the right-of-way as shown in Standard Drawing 5-15.

Pigging ports may be required:

A. At a change in pipeline size;

B. At the end of a dead-end;

C. No farther apart than every 3,000 feet.

These locations are subject to review and approval by the Public Works Department.

5E STEP SYSTEM

5E.01 General

A **Septic Tank Effluent Pump (STEP)** system is a facility consisting of a tank or tanks for settling and digesting wastewater solids, and a pressure piping system for conveying the supernatant liquid into the sewer system. Only sanitary wastewater sources will be strictly excluded. A STEP system may be installed to serve residential locations where approved by the city. A proposed site plan is required for each STEP system. Any new single-family subdivision designed with STEP sewers will include an easement on the face of the plat for access to all lots.

Operations and maintenance of the public portion of the STEP system will be the responsibility of the city only after the system has been inspected and approved and an easement is granted to the city and the warranty period of one year has expired. The public portion of the STEP system is defined as the STEP main and other components that are common or shared by all customers connected to the system as well as those portions of the individual service lines located under city streets and curbs. Operation and maintenance of the tank, pump, pump controls and service lines located outside of city streets will be the responsibility of the property owner.

All STEP system customers are required to pump their tank(s) and have the pump system inspected every four (4) years unless conditions dictate a more frequent schedule. The inspection is to be conducted by a licensed plumbing contractor qualified to perform such work. The customer will provide the city with proof of having the pumping and inspection work accomplished. They city will maintain the records of the pumping and inspection work for each STEP customer on the city sewer system. If a STEP customer fails to have the scheduled pumping and inspection conducted, the city may elect to have the work performed. All costs associated with this work will be billed to the customer through their regular utility bill.

Power will be provided and paid for by the STEP customer. The customer will be responsible for taking corrective actions in a timely manner whenever an alarm is activated, or maintenance and repairs become necessary. All sewer piping, drains, and plumbing between the street curb or edge of pavement and the building being served will be the responsibility of the customer. The customer will be responsible to curtail water usage during times of STEP system malfunction until such problems are corrected. The city will not accept responsibility for damages resulting from plumbing backups or other problems associated with STEP system facilities or plumbing that the customer is responsible for.

Currently, only the Orenco STEP Pump System shown in Standard Drawing 5-7 has been approved by the City of Napavine. However, other suppliers of STEP system components will be considered if equal to the Orenco product. The specifications must be submitted to the Public Works Department for review and approval **prior** to inclusion with a proposed STEP system.

The outfall manhole where the STEP system main discharges into the gravity sewer and the next downstream manhole will be lined to protect them against corrosion. The means of protection will be approved by the Director of Public Works and may include spray-on coatings and PVC linings. If a PVC lining is used, it will be cast into the wall and floor of the manhole. No exposed concrete will be permitted.

5E.02 Design Standards

The design of any STEP sewer system will conform to the City Standards and any applicable standards as set forth in Sections 1.03 and 1.11.

The layout of extensions will provide for the future continuation of the existing system as determined by the city. In addition, STEP mains will be extended to and through the side of the affected property fronting the main. Individual service boxes will be located at or near the center of each lot, at least ten (10) feet from city water meter.

Pump and pipeline sizing will conform to the criteria as set forth in the most recent version of the Napavine General Sewer Plan. Also, the applicable General Notes in Section 5A.09 will be included on any plans dealing with STEP system design.

5E.03 Pipe

A. **Mainline**. The minimum pipe size used is 2-in inside diameter. This is based on maintenance requirements rather than flow. Pipe will be PVC Class 200, ASTM D2241, SDR 21 with rubber gasket joints. Gaskets will comply with ASTM D 1869. STEP mains will have a minimum thirty-six (36) inches of cover to top of pipe. See Chapter 5A.03 for Sanitary/Watermain Crossing requirements.

B. **Service Line**. Service connection pipe will be minimum 1-inch diameter, Schedule 8- PVC water pipe, solvent welded connection located at 90 degrees to the mainline, when possible. Solvent cements and primer for joining PVS pipe and fittings will comply with ASTM D 2564 and will be used as recommended by the pipe and fitting manufacturers.

   Service will have a minimum twenty-four (24) inches of cover over the top of the pipe. Pressure services crossing over any waterline will follow DOE requirements.

C. **Building Sewer**. The gravity building sewer between the building and the tank will be designed and installed in accordance with the Uniform Plumbing Code as adopted in the Napavine Municipal Code.

D. All pipe will be installed with continuous tracer tape set twelve (12) to eighteen (18) inches under the proposed finished grade. The marker tape will be marked “SEWER” and will be plastic, non-biodegradable, metal core, or backing that can be detected by a standard metal detector. Tape will be Terra Tape “D” or approved equal. **In addition** to tracer tape, 14-gauge coated copper wire will be wrapped around the pipe, and the brought up and tied off at the valve boxes.

   A 1-lb magnesium anode will be buried with the sewer line every 1,000 linear feet for cathodic protection of the wire. Toning wire splices and connection to anodes will join wires both mechanically and electrically and will employ epoxy resin or heat shrink tape insulation. Furnishing and installing the tracer wire and anodes will be incidental to pipe installation.

5E.04 Fittings

All pipe fittings will have a minimum working pressure rating equal to the pipe to which they are connected. Fittings will be PVC 1120, rubber joint complying with ASTM D-1784, D-2466, or D2467, for pipe large than 1-inch, Solvent weld fittings for 1-inch pipe will be socket type Schedule 40 and will comply with ASTM D 1784 and ASTM D 2466.

5E.05 Valves

A. **Ball and Gate Valves**. All 1-inch valves will be PVC ball valves with pre-loaded EPDM stem seals, micro-finished PVC ball and self-adjusting polyethylene ball seat to compensate for wear and prevent over-tightening. Valves will be designed for use with corrosive fluids, for low torque manual operation, and for a working pressure of 150psi. All 1-inch valves will be LT-1000-S as manufactured by KBI (King Brothers Industries) or GF500 as manufactured by George Fisher Signet, Inc.

   All 2-inch and larger valves will be resilient wedge gate M&H style 820 or Waterous Series 500 plug valves with an epoxy coating to resist corrosion. A ball or gate valve will be located at every intersection and at a maximum of every 500 feet. Valves may be installed in conjunction with required pigging ports.

B. **Air/Vacuum Valves**. Air release and air/vacuum values will be located at the high points of the line. Profiles for each pipe run will be submitted with the hydraulic grade line for both static and dynamic flow conditions to show where the critical points are for air release valves. Vehicular access to air/vacuum is required for maintenance.

   Because the air released by these valves will contain hydrogen sulfide, the valves and their enclosures have to be constructed of corrosion resistant materials. The valve vaults will also have insulated lids to prevent freezing. The air released from the valve will be quite odoriferous, thus, each vent will be equipped with an odor control system such as activated carbon filters impregnated with sodium hydroxide.

C. **Check Valves**. Check valves used on service lines will be a tee or wye pattern swing check, PVC. It will have a working pressure of 150psi. Valves will be designed for use with corrosive fluids. A check valve will be installed at the end of the service stub-out at the property line to be installed in a valve box located at or near the center of the lot at least ten (10) feet from any water meter. Check valves will be King Brothers Industries, KSC or approved equal.

D. **Pressure Sustaining Valve Assembly**. Pressure sustaining valves are sometimes required in the design of STEP systems to keep the pipeline full during periods of low or no flow or when siphoning conditions exist.

   The pressure-sustaining valve will maintain inlet pressure at a pre-established set point, as determined by the city. It will open as pressure starts to increase above the set point and close as pressure falls below the set point. In the open position, flow will entre the valve in a direction axial to the pipe, turn radially outward through a slotted grillwork, and then inward to the former inlet axial direction. The valve will be constructed of two (2) parts: a 316 stainless steel body and an elastomeric liner or control element. The valve will be roll Seal Valve as manufactured by the Roll Seal Valve Company, Inc., or approved equal.

E. **Pressure Sustaining Valve Vaults** will be pre-cast, reinforced concrete vaults with spring assisted hinged galvanized steel doors that open to a minimum of 36” by 60” clear opening and will be marked “SEWER”. The entire unit will be rated for h-20 traffic load and have extensions as needed.

F. The **Pressure Tank** will consist of a steel tank containing a sealed-in-place heavy-duty diaphragm that separates air from the water. The portion of the tank where water is stored will be coated with an FDA approved fusion bonded polymeric lining material that isolates water from the metal tank and protects the tank from corrosion. The tank will be suitable for direct bury or continuous operation in a damp environment. The tank will be similar in all respects to an Aqua-Air, V-45B as manufactured by A.O. Smith, Consumer Products Division, Inc., or approved equal.

G. **Valve Box Lids** will be marked “SEWER” so they can quickly be distinguished from valves in the water system.

H. All **Service Connect Boxes** will be Carson Model 1419 with hinged bolt down covers and 1419E extension box as required or approved equal.

5E.06 Pigging Ports

Pigging ports may be required as noted in Section 5D.08.

5E.07 Step System Septic Tank

Tanks for single-family residential use will be rectangular, pre-cast concrete, single chamber and designed by a registered structural engineer. Fiberglass or polyethylene tanks will not be allowed. Dual chamber tanks may be required in certain instances as determined by the Director of Public Works.

Tank liquid volumes will be sized as follows:

A. Up to 4-bedroom house, 1,000 gallons

B. 5-to-6-bedroom home/duplex, 1,500 gallons

Tank sizes for applications other than those noted will be approved by the city.

All tanks will be manufactured to accept pump assemblies or effluent filters and have a pre-cast grove 1-inch wide by ½-inch deep. 30 inches in diameter, to allow positive attachment of the riser. The manufacturer will provide the structural design and certification for the city to review. The design or analysis will be in accordance with accepted engineering practice. Tanks less than four (4) feet in depth will be designed for the following loading conditions:

A. Top of tank 400 lbs. per square foot (psf).

B. Lateral load of 62.4 psf.

C. The tank will be designed to support a 2,500-lb wheel load.

D. The tank will be designed to withstand hydrostatic loading equal to the maximum depth of bury, in addition to the soil loading. Maximum depth of bury will be measured from the ground elevation to the invert of the sewer line entering the tank.

   Deeper installations, if required by local conditions, will require special consideration, as will tanks located where a vehicle might be driven over them. Traffic bearing tanks will be designed to withstand an H-20 live load with a minimum soil cover of eighteen (18) inches.

   All tanks will be guaranteed in writing, by the tank manufacturer for a period of two (2) years from date of delivery to the project. Manufacturer’s signed guarantee will accompany delivery.

   Systems installed on a site where an existing septic tank exists may not use the existing tank. The existing tank must be removed or abandoned per Department of Health and/or Lewis County requirements.

   Concrete materials and construction will meet the requirements of Section 6-02 of the most recent edition of WSDOT/APWA Standard Specification for Road, Bridge, and Municipal Construction.

Walls, bottom and top of reinforced-concrete tanks will be designed across the shortest dimension using one-way slab analysis. Stresses in each face of monolithically constructed tanks may be determined by analyzing the tank cross-section as a continuous fixed from. The walls and bottom slab will be poured monolithically. Concrete will achieve a minimum twenty-eight (28) day compressive strength of 5,000psi. The concrete mis will not be modified unless the mix design is reviewed and approved by the city.

Reinforcing steel will be ASTM A-615, Grade 60, fy = 60,000 psi. Details and placement will be in accordance with ACI 315 and ACI 318.

Tanks will be protected, by applying a heavy cement-base waterproof coating., Thoroseal or equal, on both the inside and outside surfaces.

Tanks will be manufactured and furnished with 18-inch diameter access openings of the size and configuration shown on the Standard Drawings. Modification of completed or existing tanks will not be permitted for structural, warranty, and liability reasons. Tanks will be furnished without concrete access hole lids. In order to demonstrate water tightness, tanks will be tested **prior** to acceptance. Each tank will be tested at the factory, by filling with water to the base of the riser and letting it stand. After 24 hours the tank will be refilled to the soffit and the exfiltration rate will be determined by measuring the water loss during the next two (2) hours. The two (2) hour water loss will not exceed one (1) gallon.

The tank will not be moved from the manufacturing site to the job site until it has cured for seven (7) days and has reached two-thirds of the design strength.

Tanks will be bedded on six (6) inches of sand or pea gravel. Sides will be compacted in two (2) foot lifts to the same or greater density than the surrounding area.

After the tanks have been set in place and the riser installed, but **prior** to backfilling, each tank will be tested by filling the tank two (2) inches above the base of the rise for a 2-hour period. Water loss will not exceed one (1) gallon.

Tanks installed where groundwater levels are above tank bottom require precautions to prevent flotation. In general, tanks will immediately be filled with water and will not be pumped down more than three (3) feet below top.

Tank excavation will be backfilled with select material free of boulders and compacted to a dry density equal to or greater than that of the adjacent, undisturbed soil. Finish grading, cleanup, and restoration will be completed **prior** to final acceptance by the city.

5E.08 Tank Riser

Outlet risers will be 30-inch diameter fiberglass or ribbed PVS as manufactured by Orenco Systems, Inc., or approved equal. Outlet riser will be a minimum of eighteen (18) inches high or as otherwise shown on the engineering drawings. Outlet risers will be factory equipped with the following:

A. Two, 1 or 1 ¼ - inch diameter (IPS) neoprene grommets, one of the pump discharges installed 8 to 10-inches from the top of the riser, and one of the splice box conduit.

B. A PVC splice box, with 4 cord grips and one 1-inch outlet fitting, Orenco Model No. SB41 or approved equal.

A lid will be furnished with each rise. It will be a latching type and will be constructed of fiberglass with an aggregate finish. Riser and lid combination will be able to support a 2,500 lb. wheel load. This does not

imply that PVC risers are intended for traffic areas. All valves and unions will be no more than twelve (12) inches deep in riser.

Each riser will be bonded to the top of the concrete tank with a two-part epoxy that will be supplied with the riser by the manufacturer. The epoxy will be applied in accordance with the manufacturer's recommendations. A generous bead of epoxy will be laid completely around the bottom of the tank. After the riser is in place, a generous fillet will be run completely around the inside base. The epoxy will be allowed a minimum of four (4) hours curing time at 64 degrees Fahrenheit, otherwise a greater time will be required based on the manufacturer's recommendations, **before** backfilling is placed over tank. Epoxy will be placed in an adequate amount to properly bond with the riser components. Care will be exercised during the curing period to avoid dislodging the riser or disrupting the watertight seal between the riser and tank.

5E.09 Pumping Equipment

Pumps will be stainless steel, thermoplastic, or coated inside and out with baked-on epoxy paint, UL listed for use in effluent. All pumping systems will be Orenco Systems Model OSI S 4000 Series high head pumping assemblies or approved equal comprised of:

A. **Standard Vault**: 15" x 48" PVC Vault and Flow Inducer, Orenco Model No. SV 1548FI with eight (8) 1-3/8-inch diameter inlet holes or approved equal.

B. **Hose and Valve Assembly** includes one 1-inch diameter flexible PVC hose with quick-disconnect fittings and PVC ball valve, Orenco Model No. HV 100 Bfc or approved equal.

C. **Mercury Switch Float Assembly**, Model MF-ABR or approved equal, with three (3) mercury floats mounted on a PVC stem which attaches to vault and will be wired to the control panel in accordance with manufacturer's color coding, using #14 AWG THHN Standard as a minimum.

D. **Pump**: OSI High Head, 1/3 hp or ½ hp, 115V, single phase Model 8 OSI 03 HH or 8 OSI 05 HH, with eight (8) foot cored and 1/8-inch bypass orifice for effluent application or approved equal.

   All pumping systems will be installed in accordance with the manufacturer's recommendations. Pumps will be accessible for operation and maintenance from ground level.

5E.10 Controls and Alarms

All STEP systems will be wired to a dedicated 20-amp breaker that supplied power to the STEP system control box only. This is required to avoid damage or overload to system and appliances. The customer is responsible for the operation and maintenance of the breaker feeder wires that serve the STEP system. All buried power will be installed with continuous tracer tape set twelve (12) inches above the buried power. The marker tape will be plastic non-biodegradable, metal core backing marked "Power".

Float Switch positions on the PVC 3 float assembly are to be set at the following levels:

A. "High level alarm" at nine (9) inches below underside of tank top.

B. "On" at 3-1/2-inches below "high level alarm" and "off" in same float as "on" set 3-1/2 inches below "on".

C. "Redundant off" with "low level alarm" set four (4) inches below "off".

Control panels will be Orenco Systems Model S-IRODS (redundant off with disconnect assembly) or approved equal with the following features:

A. Rating: 1 HP/115 VAC, 2 HP/230 VAC, single phase, 60 Hz. Motor start contact will be rated for 25 FLA, single phase, 60 Hz.

B. Audible alarm, panel mount with a minimum of 80db sound pressure at twenty-four (24) inches continuous sound. Alarm will be located within sight from the tank, when practical.

C. Oil-tight visual alarm, red lens, with push-to-silence feature.

D. Automatic audio-alarm reset.

E. A 15-amp motor rated toggle switch, single-pole, double-throw with three (3) positions: manual (MAN), center (OFF) and automatic (AUTO).

F. NEMA 4X-rated fiberglass enclosure with gasket, hinged cover, and locking latch.

G. Alarm circuit will be wired separately from the pump so that if the internal pump overload switch is tripped, the alarm will still function.

H. A 20-amp power disconnect assembly toggle switch to de-energize entire control panel, to permit servicing panel without access to the customer's breaker switches. The pump control panel will be mounted on the side of the house nearest the tank and pump, preferably on a portion of the structure not intended for occupancy. The control panel will be located within sight of the tank in all cases and of the street where practical. The panel will be between four (4) and five (5) feet above finished grade.

I. There will be a dedicated 20-amp circuit breaker serving the pump control panel.

J. Control panel will contain hour meter and event counter bases so the meter and counter may be moved from one installation to another.

5F GREASE TRAP/GREASE INTERCEPTOR

5F.01 General

Acceptable grease traps or grease interceptors will be required for all restaurants, commercial kitchens, industrial processing facilities or other facilities where fats, oils, or grease (FOG) could be otherwise discharged to the sanitary sewer system. Such equipment will be operated and/or maintained by the owner or operator of such facilities so as to eliminate the discharge of these substances to the sanitary sewer system. Grease traps and interceptors will be designed in accordance with the most recent edition of the Uniform Plumbing Code (UPC) as well as these Standards.

Grease traps and grease interceptors are placed on "gray" water drain lines from fixtures that discharge high concentration levels of FOG. They are generally installed on premises that have kitchens and/or food preparation facilities for large number of people. These facilities include restaurants/food services, hotels/motels, schools, and institutions.

The purpose of a grease trap or a grease interceptor is to provide a place for the wastewater to reach a semi-quiescent state and cool sufficiently, allowing the liquefied FOD to solidify and be retained through separation **before** the wastewater reaches the sanitary sewer system. The retained FOG is regularly cleaned and/or pumped out. The maintenance frequency varies with each facility and will be established by a representative from the Wastewater Division.

A. **Grease Trap –** A Grease trap is a device designed to retain FOG from a source of up to four (4) fixtures. Grease traps are usually located fear the fixture being served, inside the facility. The connection of dishwashers to grease traps will be avoided when practical. The maximum liquid temperature through a grease trap will be 90 degrees Fahrenheit. A dump valve may be required to ensure the liquid temperature standard is maintained, at the discretion of the Director of Public Works.

All grease traps will be regularly maintained by the customer at a frequency as determined by the facility characteristics. A maintenance log will be kept on-site for recording all maintenance activity. At a minimum, the log will contain date of maintenance and/or inspection, work performed, and name of individual who performed service.

B. **Great interceptor –** A Grease interceptor consists of a tank with a minimum liquid volume of 750 gallons and serves multiple fixtures of a facility. Grease interceptors are general located outside the facility they serve and are buried underground.

   Interceptors will be watertight and constructed of materials not subject to excessive corrosion. Appropriate tank materials include concrete, coated metal, and fiberglass.

   Plans for grease interceptors will include dimensions, structural reinforcing, structural calculations, and other pertinent data as determined by the Director of Public Works. Interceptors will be designed by a professional engineer licensed in the State of Washington.

5F.02 Location

Grease traps and interceptors will be located in such a manner as to be easily accessible for cleaning, pumping and sampling. In addition, they will be as close as practical to the fixtures discharging into them. In general, an appropriate location is under a kitchen sink (for traps) or immediately outside the facility served (for interceptors).

5F.03 Design

The following considerations will be factored into the design of a grease trap or interceptor:

A. Capacity of the trap or interceptor

B. Appropriate baffling at both the inlet and outlet

C. Accessibility for cleaning and maintenance

D. Isolation from insects, rodents, and pests

E. Sufficient liquid travel time between inlet and outlet to ensure separation of the FG prior to discharge from the unit

F. Flow control fittings will be installed on the inlet side of smaller traps to protect against overloaded and surges from the fixtures

G. Venting of outdoor interceptors is not required where siphoning, of the contents is presented by providing appropriately sized outlets

5F.04 Capacity

A. **Grease Interceptor**

   The size of a grease interceptor will be determined by using the following formula:

   MPH X WE X RT X SF = Vol

   MPH = number of meals served per peak hour, or seating capacity (whichever is applicable)

   WR = cumulative waste flow rate, based on the fixtures

- with dishwasher = 6 gallons

- without dishwasher = 5 gallons

- single service kitchen (i.e., no reusable dishes or flatware) = 2 gallons

- garbage disposal = 1 gallon

RT = Retention times

- commercial kitchen = 2.5 hours

- single service kitchen = 1.5 hours

SF = storage factor

- 8-hour operation = 1

- single service kitchen = 1.5

- 16-hour operation = 2

- 24-hour operation = 3

Vol = minimum interceptor liquid volume in gallons

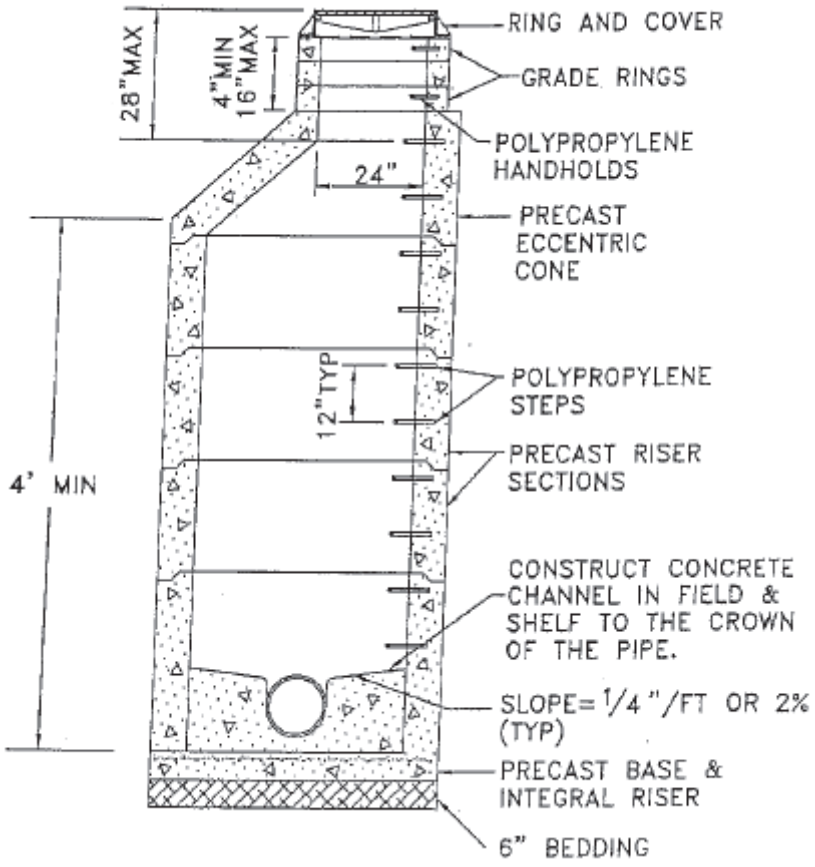
B. **Grease Trap**

The capacity of a grease trap will be determined by using the following table:

Number of Fixtures	Required Flow Rate (gpm)	Grease Retention (lbs)
1	20	40
2	25	50
3	35	70
4	50	100

Table of Drawings

TYPICAL MANHOLE

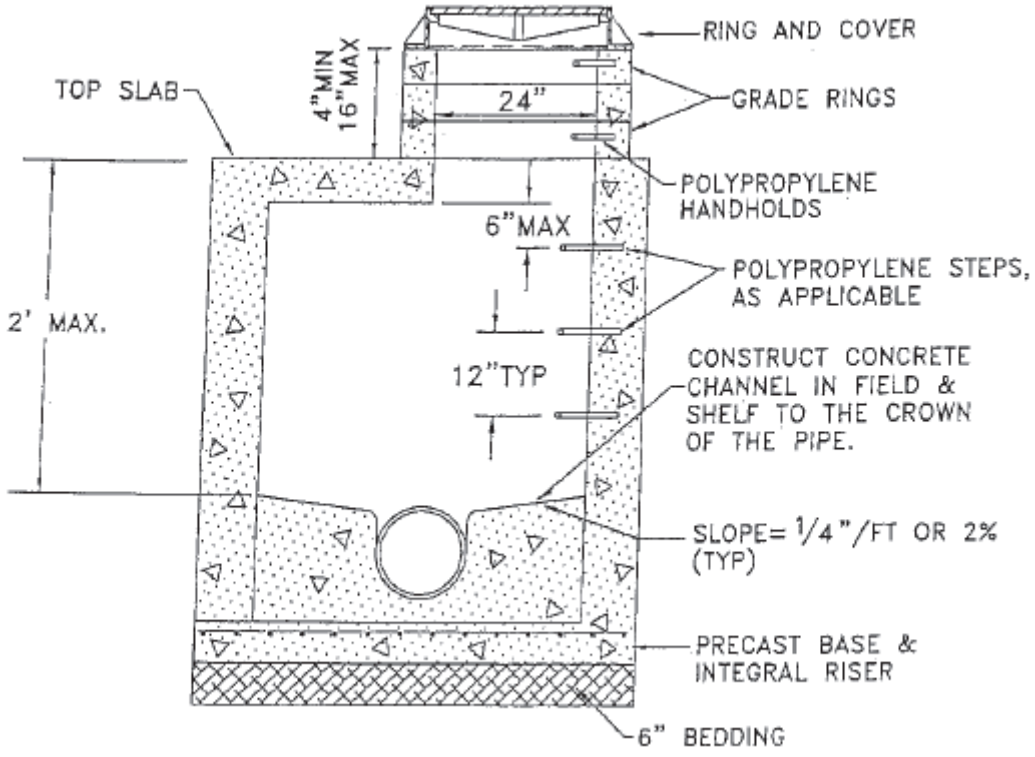


NOTES:

1. Precast manholes shall meet the requirements of ASTM C478. Joints shall be rubber gasketed conforming to ASTM C443 and shall be grouted from the inside and outside. Lift holes shall be grouted from the outside and inside of the manhole.
2. Steps in manhole shall have 6" minimum clearance. Handholes in adjustment section shall have 3" minimum clearance. The first step or handhold shall be a maximum of 12" from the top of the cover.
3. Connection to manhole shall be made by Kor-N-Seal Boot, unless an alternative connection method is specifically approved and authorized by the Public Works Director.
4. Non-reinforced concrete in channel and shelf shall be class 3000.
5. See Detail 5-3 for manhole collar installation.
6. A sewer guard shall be installed in any manhole subject to flooding.

DRAWING NOT TO SCALE

SHALLOW MANHOLE



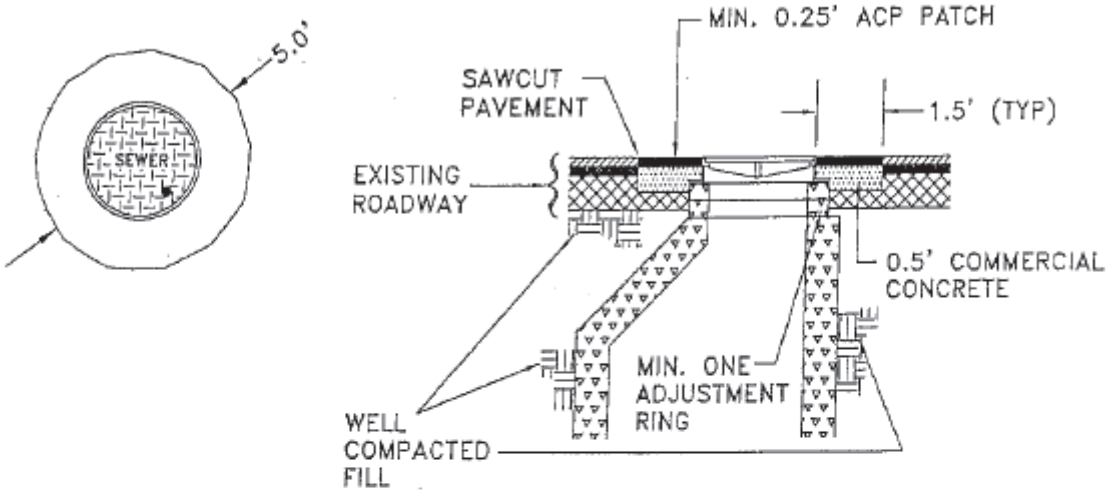
NOTES:

1. Precast manholes shall meet the requirements from ASTM C478. Joints shall be rubber gasketed conforming to ASTM C443 and shall be grouted from the inside and outside. Lift holes shall be grouted from the inside and outside of the manhole.
2. Steps in manhole shall have 6” minimum clearance. Handholes in adjustment section shall have 3” minimum clearance. The first step or handhold shall be a maximum of 12” from the top of the cover.
3. Connection to manhole shall be made by Kor-N-Seal Boot, unless an alternative connection method is specifically approved and authorized by the Public Works Director.
4. Non-reinforced concrete in channel and shelf shall be class 3000.
5. See Detail 5-3 for manhole collar installation.
6. A sewer guard shall be installed in any manhole subject to flooding.

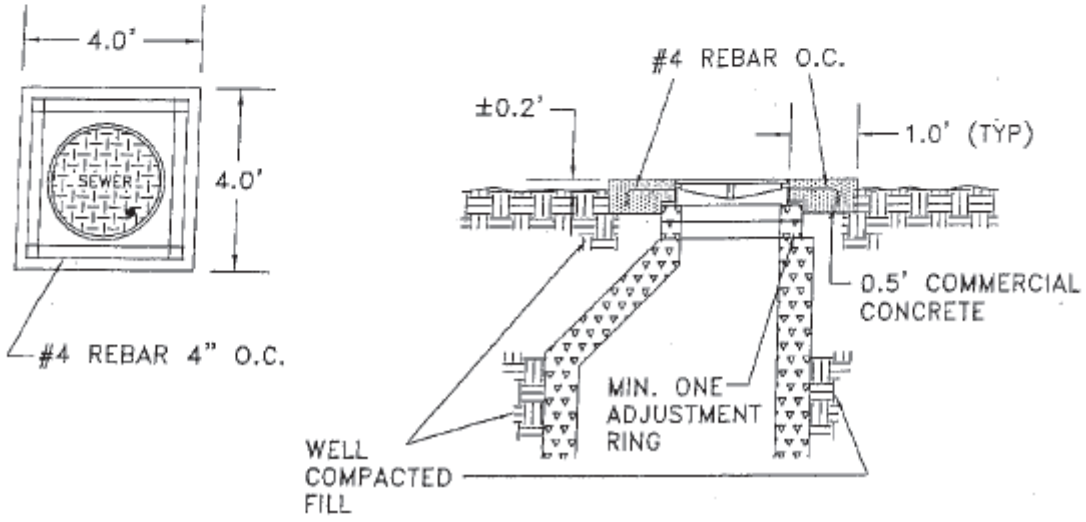
DRAWING NOT TO SCALE

MANHOLE COLLAR

MANHOLE IN ASPHALT



MANHOLE OUTSIDE ASPHALT

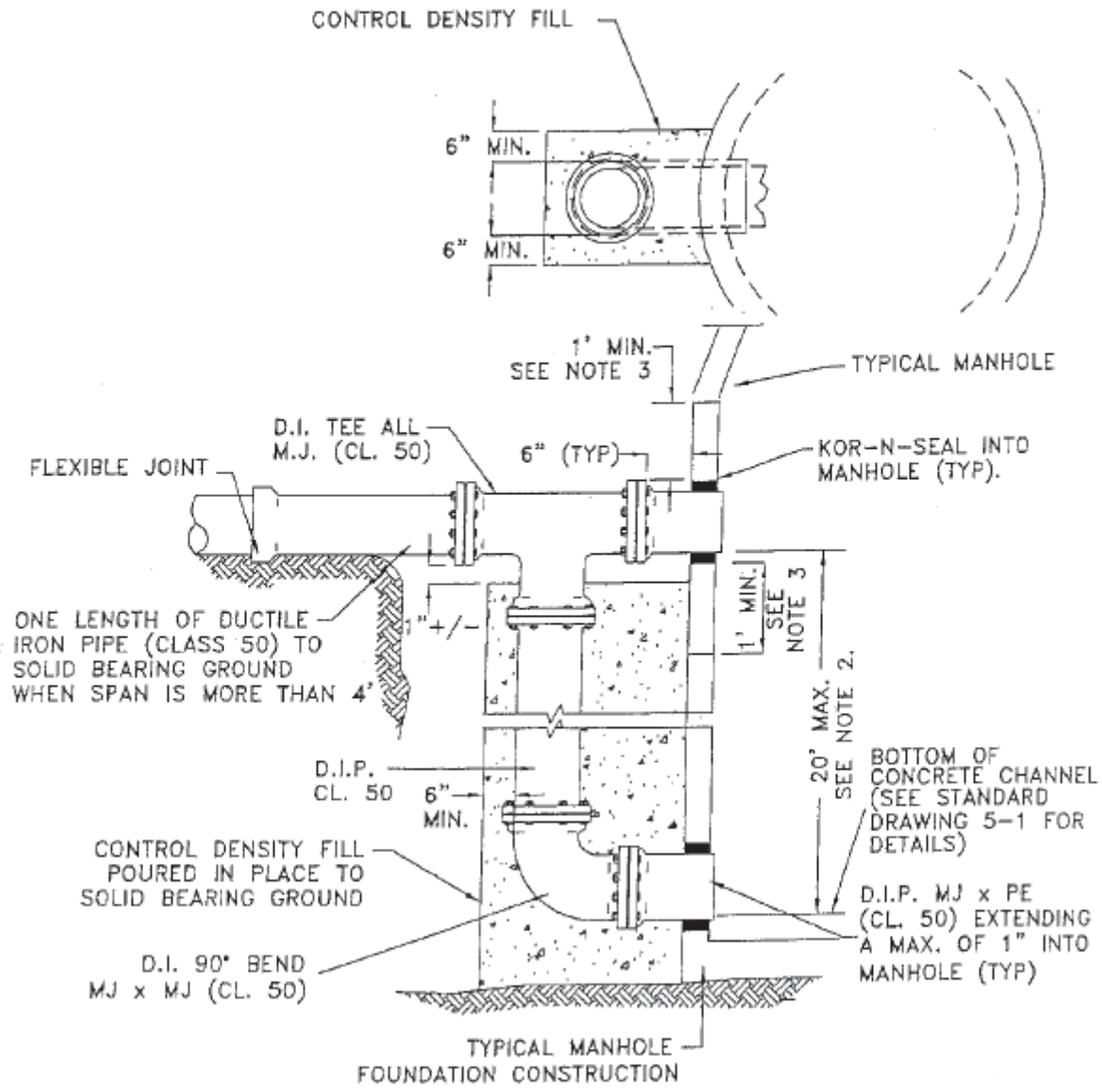


NOTES:

1. On manhole outside asphalt add reinforcing steel as shown above. Deformed bar to meet ASTM A615 Grade 60 FY = 60,000psi
2. Single opening in lid for use of manhole hook is required.
3. Joint between each adjustment ring including where frame & MH cone meet rings, shall include activated Oakum or approved equal.

DRAWING NOT TO SCALE

DROP CONNECTION

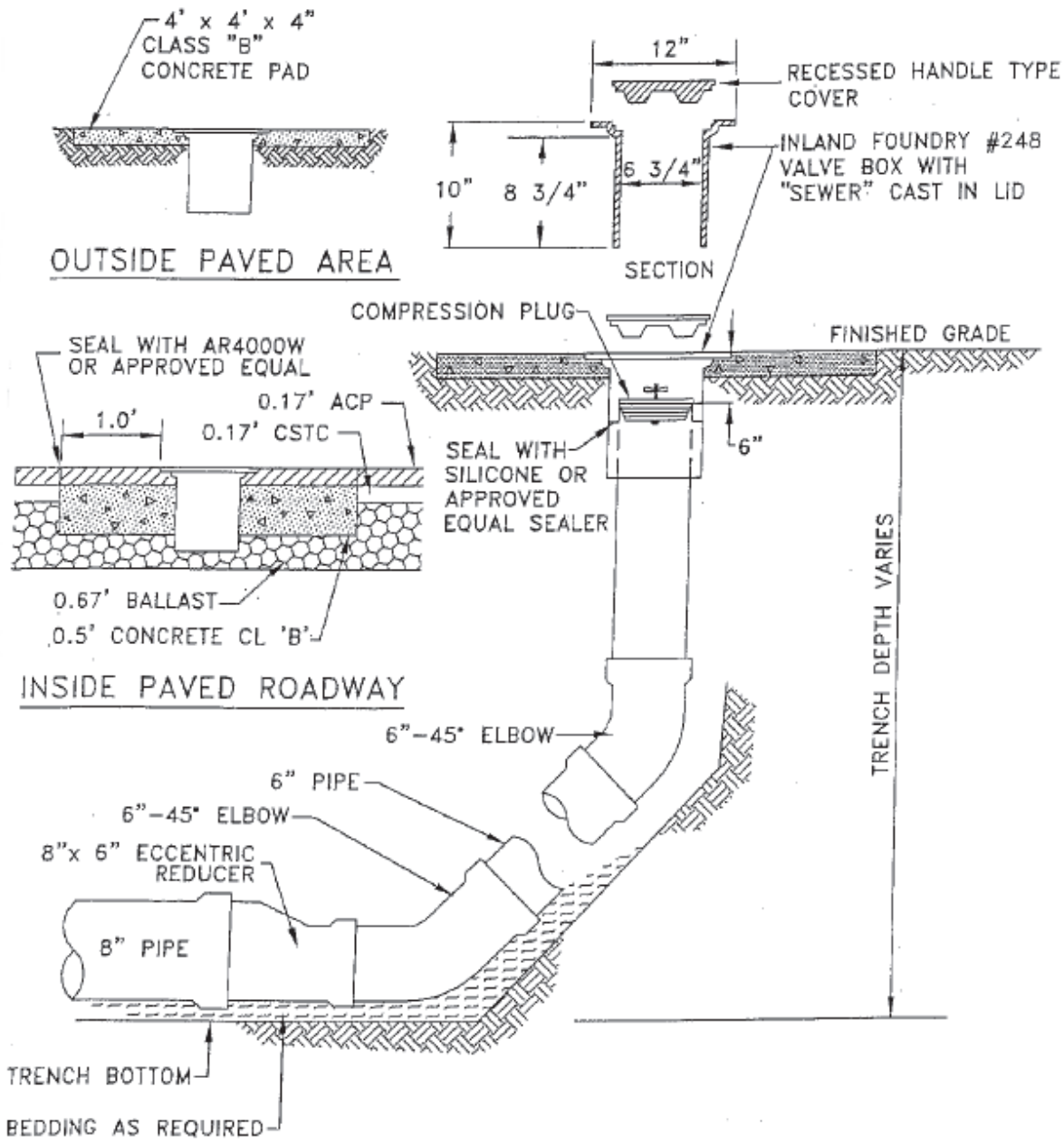


NOTES:

1. The interior of all ductile iron shall be coated with epoxy or TNEMEC 66.
2. Depths over 20’ may be allowed if mega-lug joints are used.
3. Maintain a minimum of 1’ between manhole joints and tee.
4. Minimum pipe size = 8”.

DRAWING NOT TO SCALE

CLEANOUT

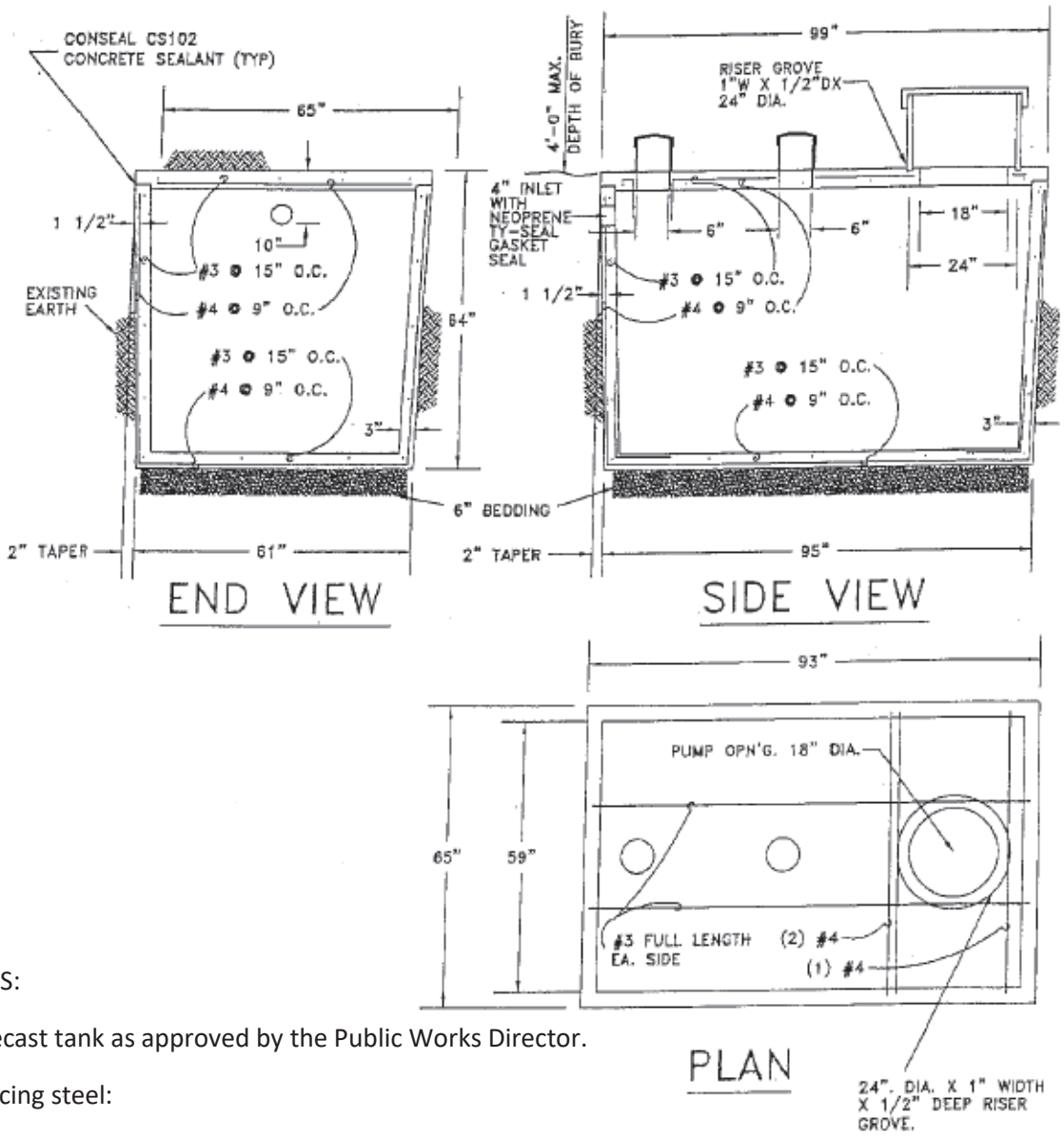


NOTES:

1. All sewer pipe shall be ASTM 3034 SDR 35.
2. Silicone sealant shall not interfere with removal of the plug.

DRAWING NOT TO SCALE

1,000 GALLON STEP SYSTEM SEPTIC TANK



GENERAL NOTES:

1. Use precast tank as approved by the Public Works Director.
2. Reinforcing steel:

   Deformed bar ASTM A615 Grade 60 FY = 60,000psi
3. Concrete: F'C = 5,000psi Compressive strength at 28-day test. Maximum aggregate size ¾"
4. Loading:

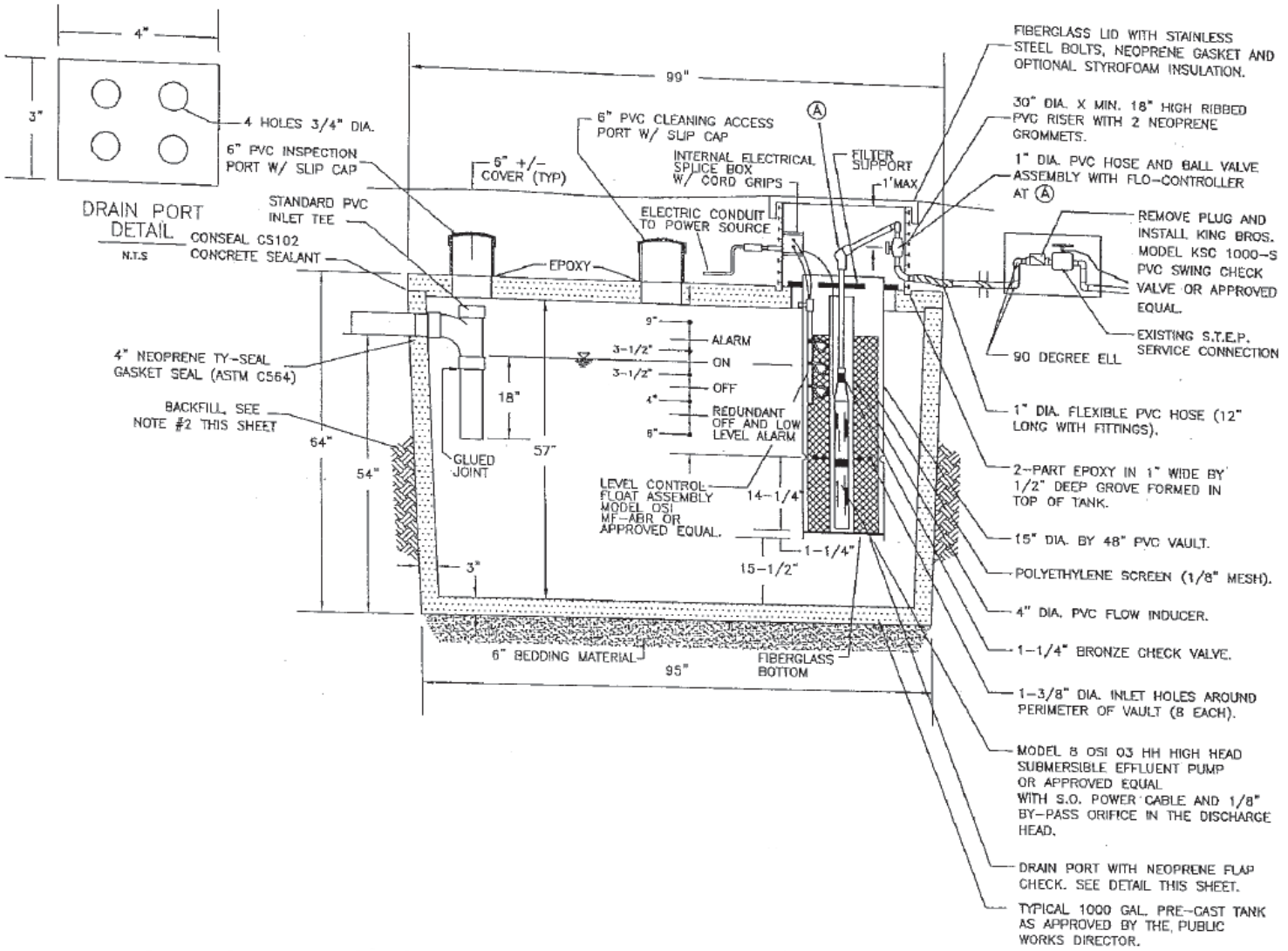
   Top Slab:
   - 1,000psf wheel load
   - 400psf soil load

   Lateral Load:
   - 62.4pcf hydrostatic

   Soil Bearing:
   - 1,000psf assumed
5. This tank is not designed to withstand an H-20 live load.
6. See Section 5#.07 for specific details on tank design.

DRAWING NOT TO SCALE

1,000 GALLON STEP SYSTEM SEPTIC TANK



STEP SYSTEM

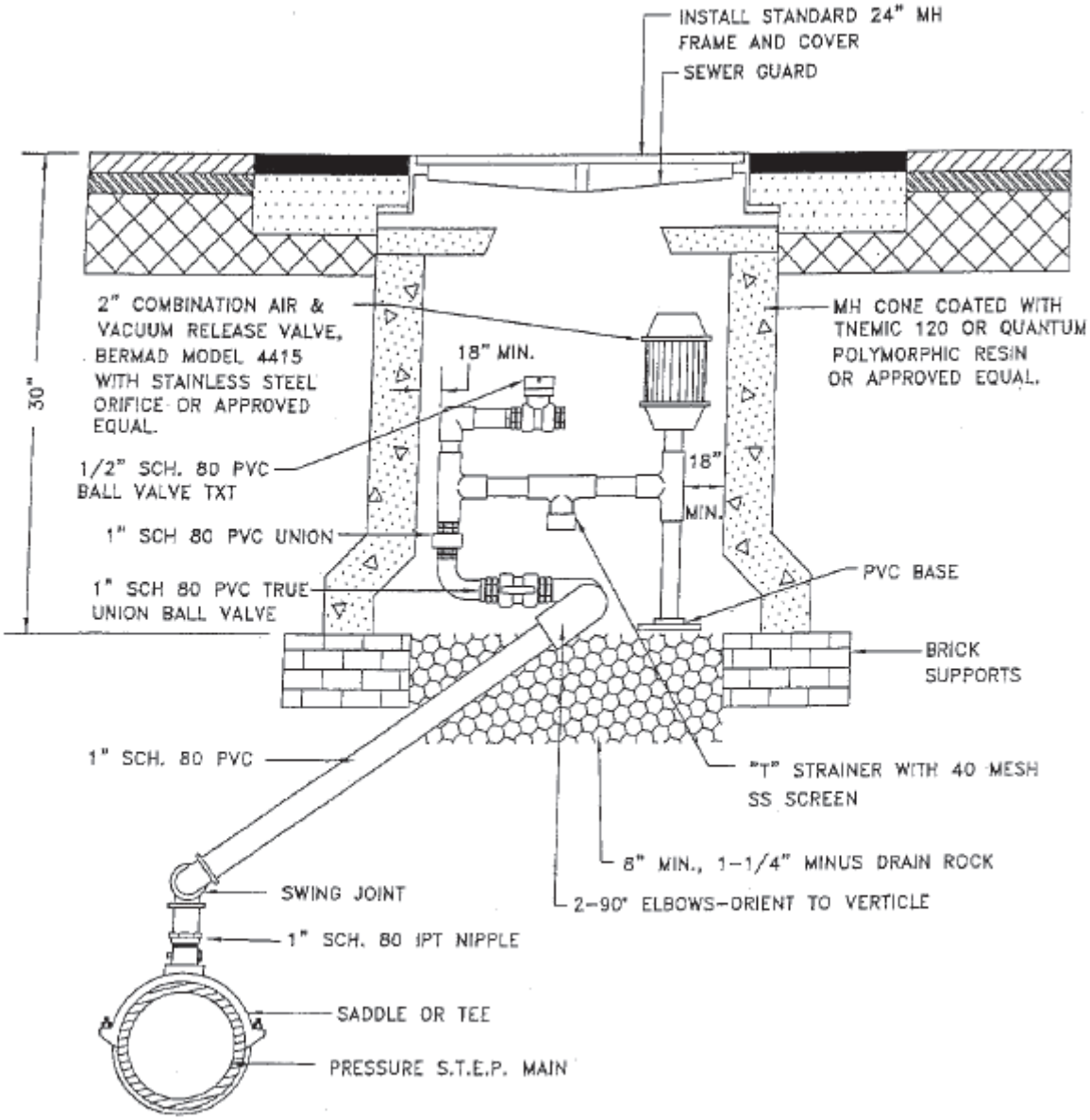
(Step Tank Effluent Pump System)

NOTES:

1. Tank shall be bedded on 6” sand or pea gravel.
2. Backfill against side shall be compacted in 2” lifts to the same or greater compaction than surround area.
3. Lifting strap shall be provided if the top of the filter is greater than 2’ below the top of the access lid.
4. All Fasteners within tank shall be stainless steel.

DRAWING NOT TO SCALE

STEP SYTEM AIR RELEASE ASSEMBLY

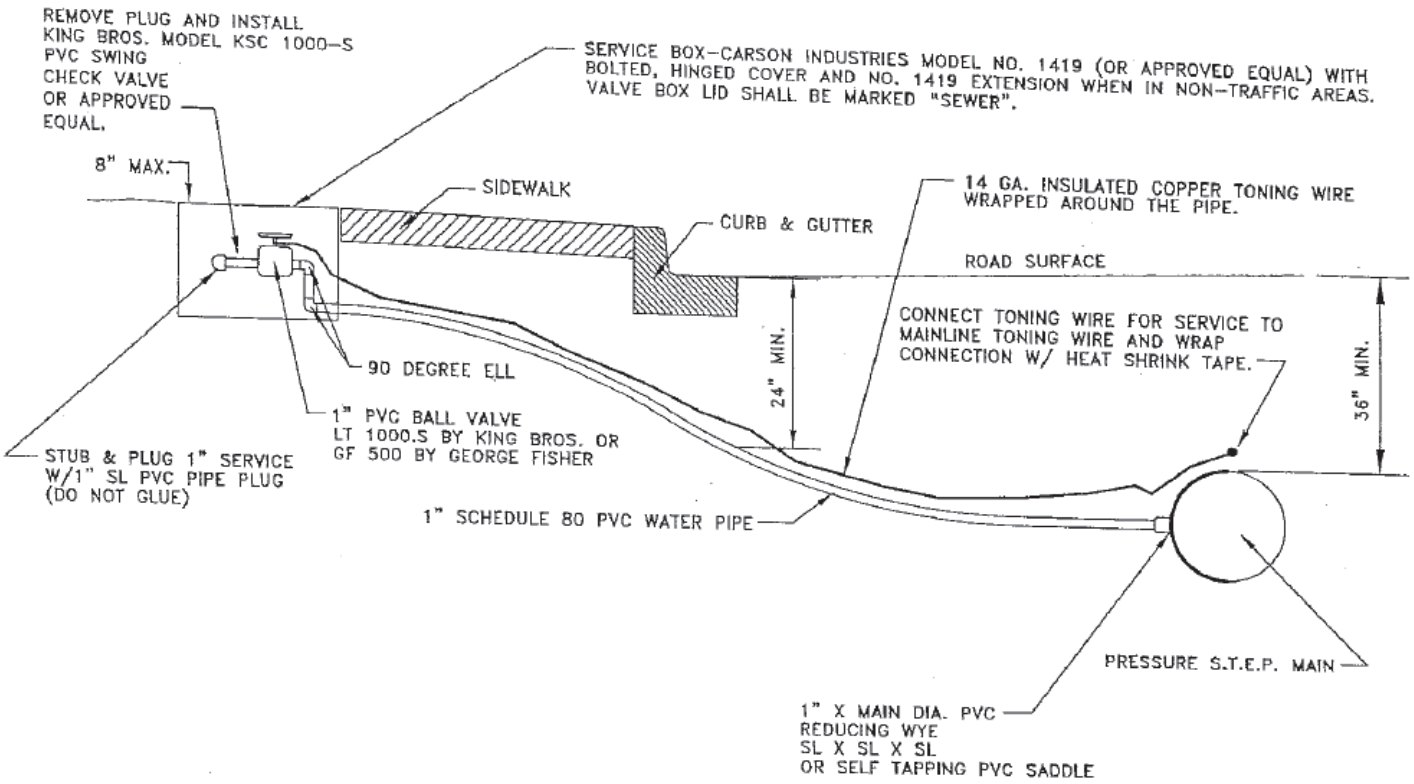


NOTES:

1. Locate air release assembly in sidewalk when possible.
2. All fasteners shall be stainless steel.

DRAWING NOT TO SCALE

STEP SYSTEM SERVICE CONNECTION

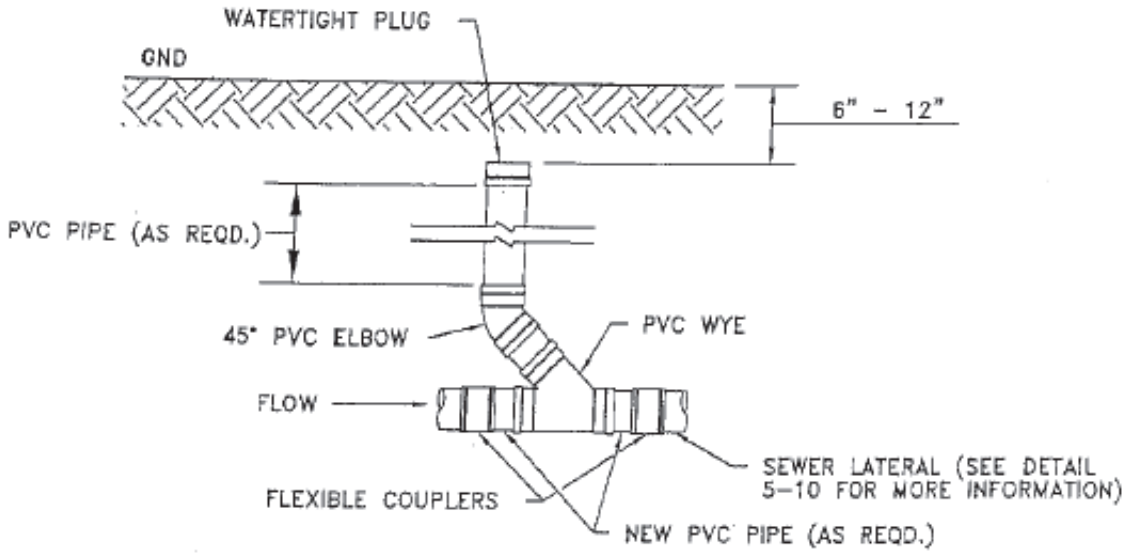


NOTES:

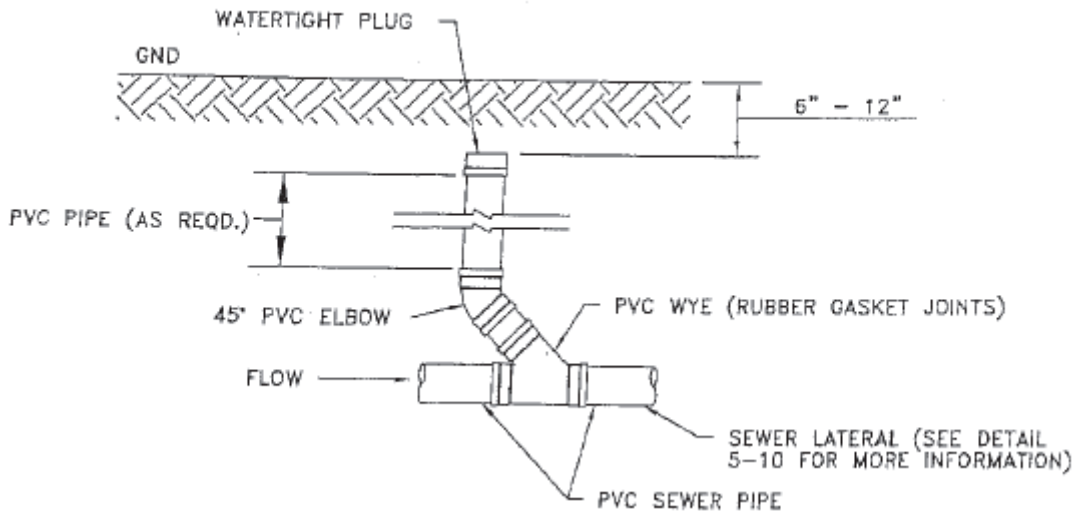
All pipe and fittings to be schedule 80 PVC.

DRAWING NOT TO SCALE

SIDE SEWER CLEANOUT



CLEANOUT DIAGRAM FOR RETROFITTING EXISTING SERVICE



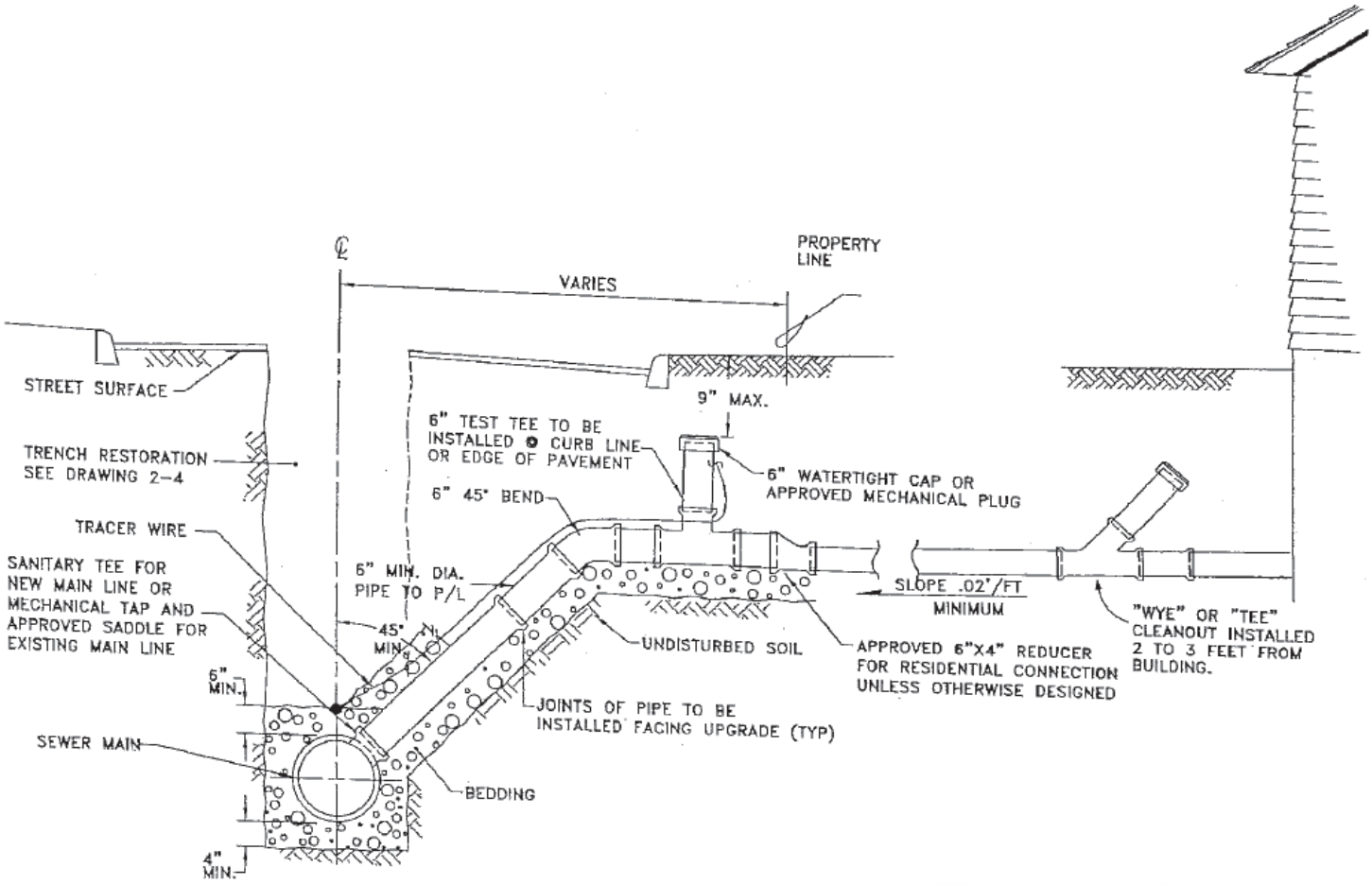
CLEANOUT DIAGRAM FOR NEW SERVICES

NOTES:

1. All joint connections shall be rubber gasketed.
2. Sanitary tees may be used for depths less than 3', upon approval of the Public Works Director.

DRAWING NOT TO SCALE

SANITARY SEWER LATERAL SERVICE CONNECTION

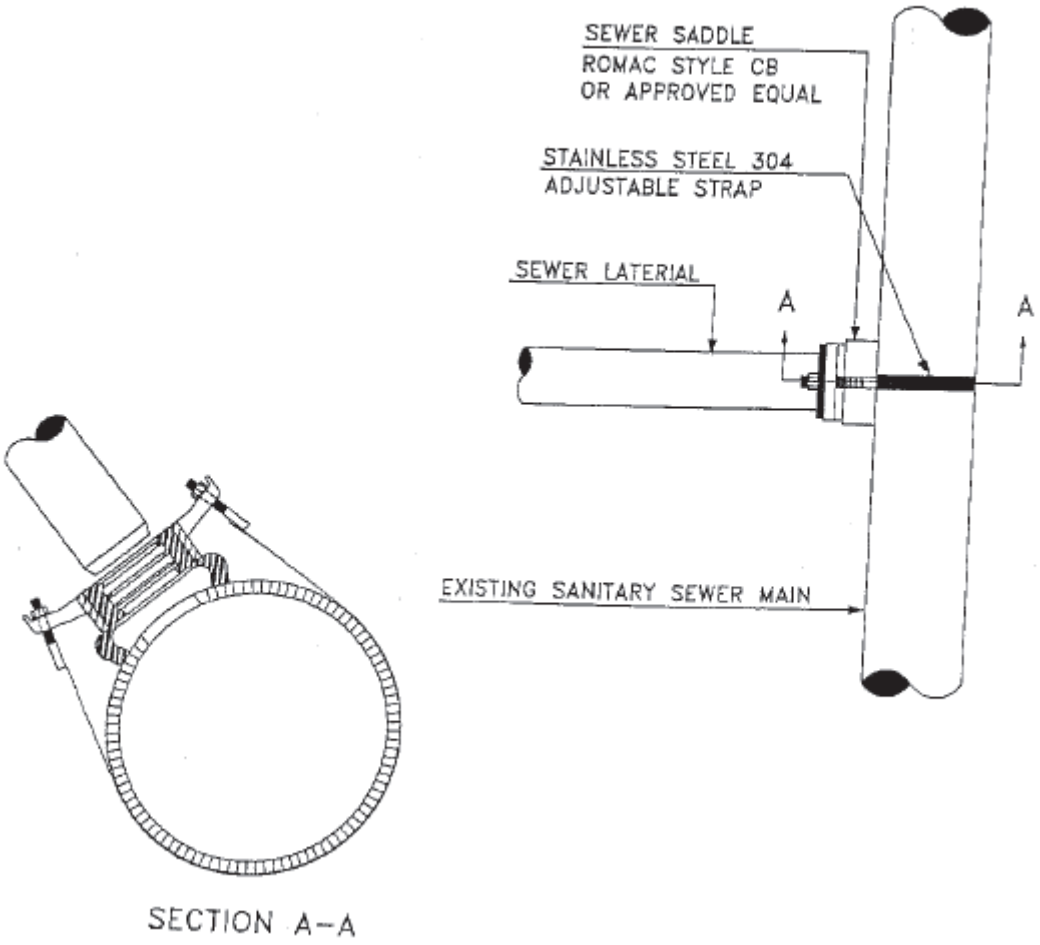


NOTES:

1. Side sewer pipe to be PVC ASTM D3034.
2. All joints and connections to be rubber gasketed type conforming to ASTM D3212.
3. Bedding and grade shall be established prior to pipe being placed in trench.

DRAWING NOT TO SCALE

SANITARY SEWER SADDLE TAP

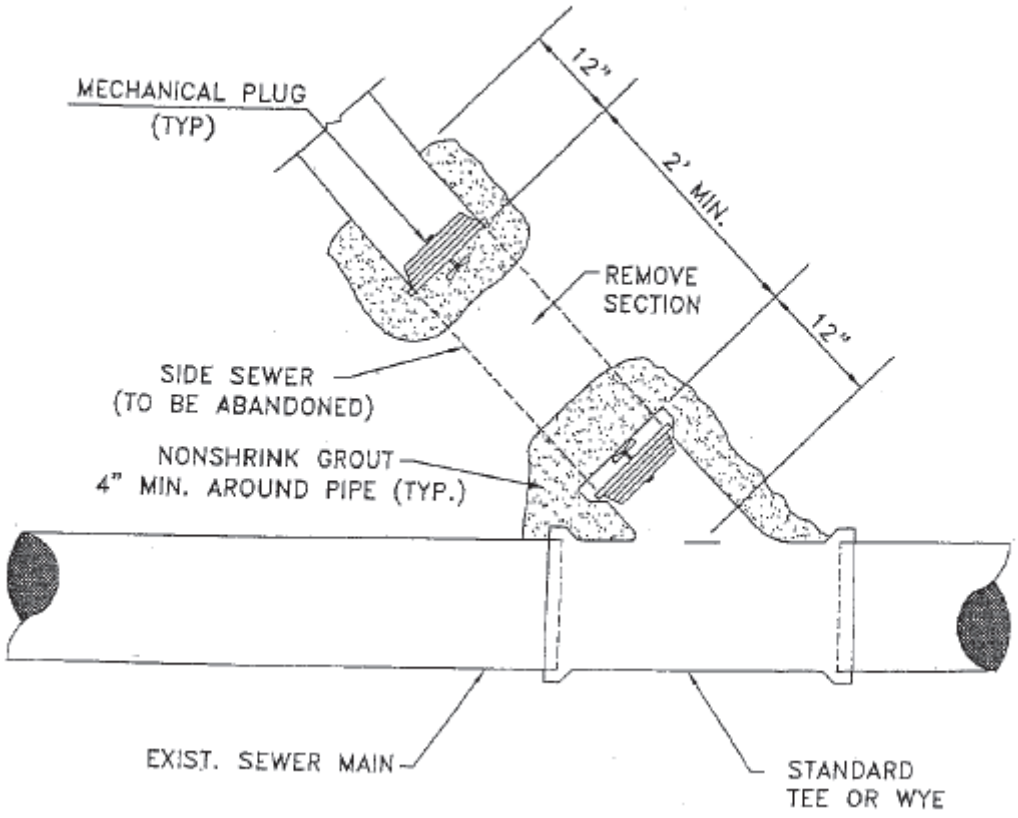


NOTES:

1. Bolts, nuts, washer, and ½" N.C. roll thread are to be Teflon coated.
2. The stainless band shall be 3 ½" minimum width,
3. Excess strap goes between pipe and band.
4. All fasteners are to be stainless steel.
5. Pipe must be cored (drilled) with a hole saw of approved diameter. Core hole must be inspected and approved.

DRAWING NOT TO SCALE

SIDE SEWER PLUG

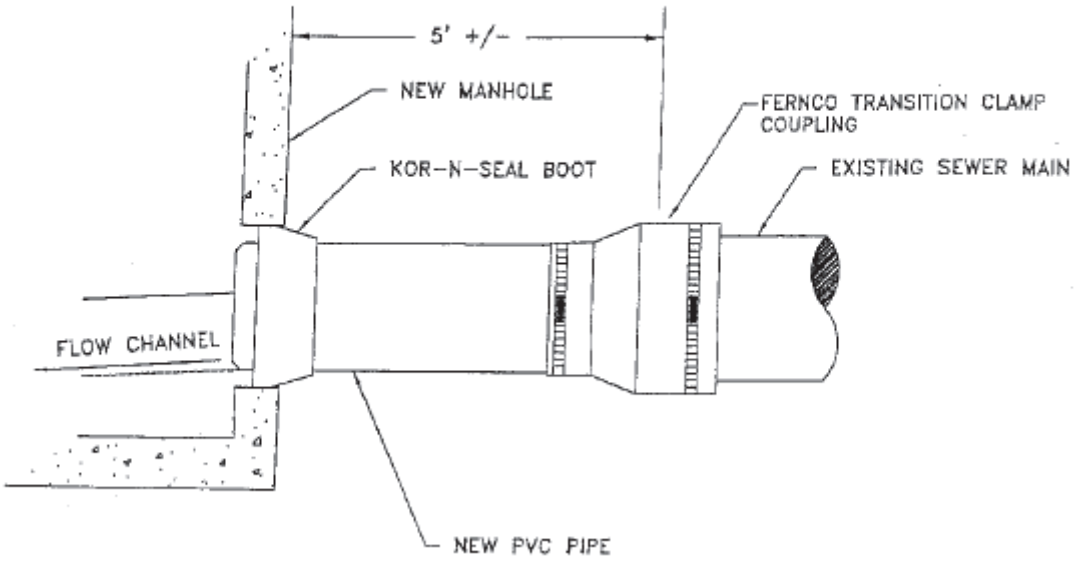


NOTES:

This detail shall apply to side sewer which are to be abandoned.

DRAWING NOT TO SCALE

SEWER MAIN CONNECTION



NOTES:

1. All fasteners and clamps are to be stainless steel.
2. New section of pipe is to be installed at approximately the same slope as the existing line.
3. Avoid creating “bellies” or “sags” with the new section of line.

DRAWING NOT TO SCALE