Town of Friday Harbor Engineering Design Standards

Adopted by the Town Council of Friday Harbor
by Resolution 2724 on April 7, 2022

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Section 1
Overview

1.0 OVERVIEW

1.1 Purpose and Scope

A. These Standards are intended as guidelines for applicants in preparing their plans and for the Town's review. These Standards shall apply to all improvements within the existing and proposed public right-of-way, for all improvements intended for maintenance by the Town, and for all other improvements for which the Friday Harbor Municipal Code (FHMC) requires approval.

B. These Standards establish uniform requirements to promote the public safety, welfare, convenience, aesthetics and economical maintenance of public and private improvements.

C. These Standards shall govern the design of new construction and improvements to all streets, sewer, stormwater, water lines and other utilities installed in the Town of Friday Harbor.

D. These Standards are minimum design standards. Where minimum values are stated, greater values should be used where practical; where maximum values are stated, lesser values should be used where practical. It is expected that land surveyors, engineers, architects, and landscape architects will exercise best efforts to ensure that the project is designed in a manner consistent with the intent of these Standards.

E. These Standards do not prohibit innovative efforts which could achieve the intent and purpose of these Engineering Design Standards through an alternative solution. Town staff shall review proposed alternatives and make a recommendation to Town Council. The Town shall have authority to grant a variance from the requirements of the Engineering Design Standards.

F. If any part of these Standards is found to be invalid, all other non-conflicting parts shall remain in effect.

1.2 Definitions

A. The following definitions apply to terms and abbreviations used throughout this manual. Additional terms applicable to specific aspects of design are defined at the beginning of other sections.

1. ***Applicant***: An individual or firm applying for design approval from the Town for a project.
2. ***APWA:*** The American Public Works Association.
3. ***AWWA:*** The American Water Works Association.
4. ***CDP:*** The Town of Friday Harbor's Community Development and Planning Department.
5. ***Design Engineer:*** The Developer's engineer that is a Washington State licensed engineer.
6. ***Design Variance:*** A grant of relief from the requirements of this section that permits construction in a manner that would otherwise be prohibited by these design standards.
7. ***Developer:*** Any Person or any entity who under takes to improve residential or non-residential property or subdivide any property. Refers to the owner (or financial

sponsor) of a privately funded project. May also be taken to mean the owner's consulting architect, engineer or other agent.

8. ***Downtown Core:*** The area described in FHMC 17.08.125.
9. ***Director:*** The Town of Friday Harbor's Public Works Director.
10. ***FHMC:*** Town of Friday Harbor Municipal Code.
11. ***Half Street:*** Street construction along edge of a development, utilizing a portion of the regular width of right-of-way and permitted as an interim facility pending construction of the other half of the street by the adjacent owner.
12. ***ITE:*** Institute of Transportation Engineers.
13. ***MUTCD:*** The U.S. Department of Transportation Manual on Uniform Traffic Control Devices.
14. ***Owner:*** The legal owner of the property on which a project is to be constructed.
15. ***Planting Strip:*** Hard surfaced or landscaped areas between travel or parking lanes and sidewalks. Planting Strips improve safety by separating vehicles and pedestrians.
16. ***Private Project:*** A project which is to be constructed on privately-owned property.
17. ***Private Streets:*** Streets which meet Town ordinances that are not controlled or maintained by the Town, and which serve no more than 4 users.
18. ***Public Project:*** A project which is to be constructed within the public right-of-way or public property.
19. ***Public Works:*** The Town of Friday' Public Works Department.
20. ***RCW:*** Revised Code of Washington.
21. ***SEPA:*** State Environmental Policy Act.
22. ***Specifications:*** Defined as the most current versions of the following documents:
    a. WSDOT Standard Specifications for Road, Bridge and Municipal Construction, latest edition.
    b. Washington State MUTCD, latest edition adopted by the State of Washington.
23. ***Standards:*** The Town of Friday Harbor Engineering Design Standards.
24. ***Standard Plans:*** The Town of Friday Harbor Standard Plans set forth herein.
25. ***SWMMWW:*** Washington State Department of Ecology's Stormwater Management Manual for Western Washington, dated July 2019.
26. ***Town:*** Town of Friday Harbor.
27. ***Washington Administrative Code (WAC):*** Current administrative regulations created by the State of Washington to carry out the laws passed by the State Legislature.
28. ***WSDOT:*** Washington State Department of Transportation.
29. ***WSDOT Standard Plans:*** The latest version of WSDOT Standard Plans Manual 21-01.

1.3 Improvements not covered by Engineering Design Standards

A. Any improvements not covered by these Engineering Design Standards shall meet or exceed the design, detail, workmanship, and materials in accordance with the current editions of the following publications:

1. WSDOT Standard Specifications for Road, Bridge, and Municipal Construction (M 41-10).
2. WSDOT Standard Plans (M21-01).
3. WSDOT Design Manual.
4. WSDOT Hydraulics Manual.
5. AWWA Standards.
6. WSDOH Water System Design Manual.

7. U.S. Department of Transportation Manual on Uniform Traffic Control Devices (MUCTD).
8. A Policy on Geometric Design of Highways and Streets (AASHTO).
9. Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG). (Published by the U.S. Architectural and Transportation Barriers Compliance Board).
10. Washington State Department of Ecology Criteria for Sewage Works Design,
11. City and County Design Standards for the Construction of Urban and Rural Arterials and Collectors, Washington State. (WSDOT Local Agency Manual, Chapter 42.)

1.4 Design Variance Requests

A. Design variance requests may be considered by the Town. Generally, a decision will be based upon serving the public's best interest and evidence that the request can meet the following criteria:
   a. The request will achieve the intended result in a comparable or even superior design and a better quality of improvement;
   b. The request will not adversely affect safety or operation;
   c. The request will not adversely affect maintainability;
   d. The request is permitted under federal, state, and local laws;
   e. Uniform code compliance in conformance with the intent of these Standards, including appearance; and
   f. Economic consideration of the request.

B. To request a variance from these Design Standards, the Applicant shall submit a "Request for Design Variance" to the CDP. The Design Variance shall state the standard(s) to be varied, including the proposed variance(s) and the reason(s) for the request. Additional supporting information, plans or design data prepared by a professional engineer, licensed in the State of Washington should be included as needed or requested. Town staff will review the proposal and determine a recommendation to deny, grant, or grant with modifications. Town staff will present the recommendation for Town Council consideration. Town Council shall make their decision based upon the fulfillment of the criteria.

C. Design variances shall be approved prior to construction. To the extent known, the variance should be proposed at the preliminary design stage and included for consideration during plan review and public hearing.

1.5 Pre-Development Meeting

A. A Pre-Development Meeting is an opportunity for the Applicant to present the project and receive comment from various departments on adopted codes, policies, or laws of the Town of Friday Harbor. No development approvals are granted at the meeting.

B. Pre-Development Meeting must be scheduled with the CDP.

C. The following items are required for the Pre-Development Meeting:

   1. Completed Pre-Development Meeting application
   2. A pdf electronic file and two hard copies of the proposed site plan, to scale, depicting the following, as applicable:
      a. Property lines

b. Existing and proposed buildings, parking areas and other site improvements
c. Proposed driveways
d. Proposed connections to public sewer, storm drainage, and water

3. A pdf electronic file and two hard copies of the proposed building plans showing reasonable detail to assist Town staff in making recommendations to the Applicant.
4. For additional information regarding the Pre-Development Meeting contact the CDP.

D. See the Town's Fee Schedule for fees associated with the Pre-Development Meetings.

1.6 Applicant's Responsibility

A. Applicants are responsible to acquire all permits and licenses necessary for the completion of the project. The Town of Friday Harbor will not be held responsible, financially or otherwise, for any delay or additional expenses the Applicant may incur due to Town requests for and review of, information necessary to issue permits and licenses.

B. The Town makes no warranty or representation concerning review of the information, plans and documents submitted by Applicant. The Applicant is solely responsible, as a condition of permit issuance, to ensure that all design and construction is: (a) based upon reasonably acceptable engineering practices; (b) performed with due care and caution and (c) suitable for its intended purpose. Through review of information, plans and documents, the Town does not intend to create a special duty or relationship with the Applicant, Owner or others concerning the project.

1.7 Material Acceptance

A. For public utilities or infrastructure construction, the Applicant shall provide the Town with a list of all materials used on the project prior to initiating construction. The materials shall meet Town specifications through supplier's verification, and materials testing reports or reports from an accredited materials testing lab.

B. All reports, materials verifications and other documents submitted to the Town for acceptance shall be stamped and signed by a Professional Engineer licensed in the State of Washington.

1.8 Amendments to Engineering Design Standards

A. The Town Council has the authority to approve all amendments to these Engineering Design Standards. Noted errors or suggested revisions to these Standards should be addressed to the Town.

1.9 Environmental Checklist - See FHMC Title 18.04

1.10 Transportation Analysis

A. The Traffic Impact Analysis Outline is provided at the end of this section (Attachment 1.1). Specific scoping for the traffic analysis shall be determined by the Town either at the Pre-Development Meeting or during project review.

B. Specific locations to be included in the analysis, boundaries of the study area, etc., will be determined by the Town.

C. Trip generation shall be based on the current edition of the ITE Trip Generation Manual using the average trip rate. The regression equations will be used when average trip rates are not available. Trip generation for unusual land uses which are not found in the ITE Trip Generation Manual shall be estimated from similar types of uses, field studies of similar uses, or based on number of employees, deliveries, expected clientele, etc., as appropriate.

D. Level of service calculation shall be conducted using methodologies presented in the current edition of the ITE Highway Capacity Manual. Level of service for intersections should be expressed in terms of stopped delay per vehicle. Worksheets/computer printouts of the capacity analysis should be included in the traffic impact analysis.

E. Level of service calculations will typically be required at the major intersections which will be impacted by 10 or more total peak hour trips from the proposed development.

F. The Town's adopted level of service is "D". Appropriate mitigation shall be proposed to maintain this level of service upon completion of the development. Exceptions to level of service "D" will be considered by the Town at those locations where the potential mitigation (such a traffic signal) is not reasonable or desirable.

G. The applicant shall be responsible for the cost of the Traffic Impact Analysis, the review of the Traffic Impact Analysis, and any mitigation required to maintain the level of service of the affected transportation facilities.

H. Based on the Traffic Impact Analysis, the Director may require additional street improvements or facilities as a condition of project approval.

1.11 Relationship to Other Town Ordinances

Project review shall include an analysis of the proposed project to determine compliance with the FHMC.

ATTACHMENT 1.1

TRAFFIC IMPACT ANALYSIS OUTLINE

The following describes a general outline for use in the preparation of traffic impact analyses for the Town of Friday Harbor. This outline is not intended to be all inclusive nor will all items be applicable for all types of development. The Town of Friday Harbor reserves the right to request additional information for unique or unusual developments.

I. INTRODUCTION/PROJECT DESCRIPTION

Elements to be included as part of narrative or as figure(s).

- Project name and proponent - Location of project
- Vicinity map
- Proposed uses, if known (e.g., names of stores)
- Project magnitude (square footage, number of units, etc.)
- Access locations
- Current and proposed zoning
- Description of current use of property
- Reduced copy of site plan (if available)
- Roadways/intersections to be impacted and reviewed in the analysis
- Horizon year of project (completion and occupancy); state phasing and time-frame if applicable
- Parking (if applicable)

II. INVENTORY OF EXISTING CONDITIONS

Elements to be included as part of narrative or as figure(s).

- Description of impacted streets in the area (number of lanes, width, pedestrian facilities, speed limit, lighting, etc.)
- Daily traffic volumes (if available), or estimated from peak hour counts
- Peak hour counts (as appropriate)
- Accident history (when required by the Town)
- Capacity analyses at critical intersections
- Transit service

III. DEVELOPMENT IMPACTS

Elements to be included as part of narrative or as figure(s).

- Trip generation
- Trip distribution/assignment
- Capacity analyses (with and without the project) at critical locations for the horizon year

- Projected daily traffic volumes and peak hour volumes (with and without the project) for the horizon year
- Need for turn storage lanes at access(es) (if appropriate)
- Other concerns (if applicable, such as cut-through traffic in residential areas)

IV. CONCLUSIONS/RECOMMENDATIONS

- Brief summary of above analyses with recommendations

V. MITIGATION

- Appropriate mitigation shall be proposed for those locations which fall below level of service “D” or a discussion of why mitigation would not be appropriate. Capacity analyses should typically be included for mitigated locations.

VI. OTHER

- Unusual developments may require analysis of off- peak hours, the AM peak hour, weekends, or ability to serve large trucks, for example, if deemed necessary by the Town. Studies performed as part of an EIS document may also require additional analysis.

One pdf electronic file and two hard copies of the traffic impact analysis shall be submitted to the Town.

Section 2
Project Application and Certification

2.0 PROJECT APPLICATION AND CERTIFICATION

The review process outlined below must be followed for all privately-developed utility and street projects that will be dedicated to the Town.

2.1 Purpose and Scope

A. Construction may not begin prior to Town approval of all applicable project permits, including the approval of utility and infrastructure plans.

B. Project permit application fees are assessed based on the current Town Fee Schedule.

C. The following summarizes the civil review process for development that includes the construction of public infrastructure:

1. All non-single family residential development is subject to FHMC 15.06 Site Plan Review. It is recommended to complete the site plan review process prior to submitting project permits for construction.

2. Conceptual drawings shall be submitted at the time of site plan review or land division applications.

3. All civil design plans shall be submitted and approved prior to the issuance of any construction project permits.

4. The Applicant shall submit a complete "Application to Construct" form with its initial construction plan submittal to the Town.

5. For any plan review submittal, or re-submittal, the Town shall be provided with a pdf electronic file and two hard copies of the construction plans, the Stormwater Site Plan, and the SWPPP. Partial submittal will be returned to the Applicant without review comments. After receiving the plan sets and reports, the CDP will respond in writing and include the plan review fee being charged for the project. Applicant is responsible to pay for all plan review fees in accordance with the Town's Fee Schedule.

6. Following review of the plans and reports, the Town will return a request for more information comment letter, to include a red line check of plans. The red line must be returned to the Town along with a set of corrected plans. A letter indicating how each of the review comments was addressed or a reason for not making the changes must be included with the resubmittal. If the red lines are not returned, or changes are not properly addressed, the review of plans will be delayed and/ or additional plan review fees may be charged.

7. Once the project plans and reports are complete, and all other Town requirements relating to the project have been completed, CDP will provide an approval letter and a set of plans with the Town's approval stamp signed. The Applicant will be responsible to distribute copies of the approved plans. A set of Town approved plans are required to be on the project site during construction. Approval of the plans shall not relieve the Owner or Applicant from any liability related to portions of the design which are not in conformance with these Standards or do not follow standard engineering practice.

8. The approval of the plans shall expire one year from the approval date shown on the plans. Upon expiration, the approvals may be extended for an additional year. The Town has the right to require the Applicant to revise the plans to reflect any current updated Standards prior to issuance of any extensions.

9. The Town provides review services only; it does not design the project for the Applicant. The Town reserves the right to increase plan review fees and/or refuse to review any project which is not designed in accordance with the Town of Friday Harbor's Engineering Design Standards.

10. The Applicant is responsible for the costs of all inspections, including Town inspections, material testing, and third party inspections. Town inspections will be charged in accordance with the Town's Fee Schedule.

2.2 Plan Permit Conditions

A. The issuance of a project permit shall not be construed to be a permit for, or an approval of, any design(s) which are not in conformance with these Standards or do not follow standard engineering practice, or be construed as an approval of any violation of the provisions of any other ordinance of the Town. Project permits presuming to give authority to violate or cancel the provisions of these Standards or other ordinances of the Town or do not follow standard engineering practices shall not be valid.

B. The issuance of a permit based on construction documents and other data shall not prevent the Town from requiring the correction of errors in the construction documents and other data.

C. At the discretion of the Town, any errors or omissions in the approved plans or information used as a basis for such approvals may constitute grounds for withdrawal of any approvals and/or stoppage of any or all permitted work. It shall be the responsibility of the Applicant or the Design Engineer to show cause why such work should continue, and make such changes in plans that may be required by the Town before the plans are re-approved.

2.3 Infrastructure Project Submittal Requirements

A. The Applicant shall fill out and submit with the construction plan submittal Attachment 2.1 CIVIL PLAN CHECKLIST.

B. Required for all projects:

1. Vicinity Map.
2. An index of plan sheets.
3. Title blocks including project name, street name, sheet limits (station numbers), type of improvement and whether improvements are public or private.
4. All design plans shall be prepared, stamped, and signed by a professional engineer licensed in the State of Washington. Plans shall include the Design Engineer's address and phone number.
5. All used symbols and line types shall be described in a legend to be located on a separate sheet at the beginning of the plan set or on each individual sheet.

6. Font and lettering shall be legible to be easily read and understood by the reviewer. Submitted plans not meeting these criteria will be returned to the Design Engineer to correct before the review process is started.
7. Road alignments with 100' stationing. Stationing at each point of curve, tangent and intersection with appropriate ties to existing road surveys and stationing, section corners, quarter corners, and horizontal control.
8. All existing utilities.
9. North Arrow.
10. Section, township, and range.
11. The datum used and all benchmarks shall refer to established control. The vertical datum shall be NAVD 88 and the horizontal datum shall be NAD83/91.
12. Right of way lines, width of proposed road, intersecting roads, and existing road improvements with dimensions.
13. All topographic features within right of way or future right of way limits and sufficient area beyond to resolve questions of setback, slope, drainage, access onto abutting property, and road continuations.
14. Identification of all roads and adjoining subdivisions.
15. Utility sheets shall be a minimum scale of 1"=40'. A larger scale of 1"=20' may be required for urban arterial streets where detail is sufficiently dense to cause a "cluttered" drawing at a smaller scale.
16. Section and lot lines.
17. Easements – Provide dimensions and purpose for any proposed easements. Show recording information, purpose and width for any existing easements.
18. Other data necessary for the specific project.

C. Profile Elements (For drawings where a "profile" design is required).

1. Profile elements shall include the following:
    a. Original ground line at 100' stations and at significant ground breaks and topographic features based on field measurement accurate within 0.1' on unpaved surface and 0.01' on paved surface.
    b. A final road and storm drain profile. The stationing shall be the same as the horizontal plan, reading from left to right. It shall include stationing of points of curve, tangent, length and point of intersection of vertical curves, with elevations to 0.01'.
    c. On a grid of numbered lines, a continuous profile shall be shown for both existing and proposed improvements.
    d. Grade and vertical curve data, all profiles.

D. Sewer

1. Required for all projects
    a. Plan/profile and detail sheet(s) using design and drafting standards detailed in these Standards.
    b. Show service connection lines from public sewer lines to the property line of the lot to be serviced.
2. May be required
    a. Study showing adequate capacity in line for project flow.
    b. Easements with recording numbers.

E. Stormwater

1. Required for all projects
    a. Plan/profile and detail sheet(s) for design using design and drafting standards detailed in these Standards.
    b. Grading and drainage plan showing finished contour elevations.
    c. The Stormwater Site Plan, stamped by a Washington State licensed engineer. The Stormwater Site Plan shall be prepared in accordance with the 2019 Stormwater Management Manual for Western Washington.
    d. Show all existing and proposed drainage features, showing direction of flow, size, and kind of each drainage channel, pipe, and structure and other requirements as specified in these Standards.
    e. Erosion and sediment control plan (ESC) with BMPs identified for stormwater control during and after construction. The erosion and sediment control plan is required for any project prior to issuance of any permits for the project. The ESC plan shall meet the requirements of the 2019 Stormwater Management Manual for Western Washington.
2. Based on the location and scope of the project, the Director may require additional studies. In most cases where stormwater facilities are proposed, a geotechnical report will be required.
3. May be required:
    a. Easements with recording numbers.

F. Water

1. Required for all projects
    a. Plan/profile and detail sheet(s) using design and drafting standards detailed in these Standards.
    b. Show service connection lines from public water main.
    c. Fire Marshal approval.
2. May be required
    a. Easements with recording numbers.
    b. Hydraulic study showing adequate fire flows and domestic service.

G. Street

1. Required for all projects
    a. Details including typical cross sections for all street plans and a detail for street restoration.
    b. Profiles for curbed roads shall show the tops of both curbs and the centerline clearly labeled.
    c. Signing and striping/channelization plan. Street sign type and placement must be clearly located on the plan. Both existing and proposed signs shall be included.
    d. Monuments are to be placed at every intersection, on the roadway centerline at the end of every plat, and at the center point of each cul-de-sac. The location of the monuments shall be clearly marked on the plan and plat.
    e. Bearings on the road centerline, keyed to an associated plat map.
    f. Curve data including radius, delta, arc length, and semi-tangent length, on all road centerlines and curb returns.
    g. All found and referenced survey monuments.
    h. Beginning, middle, and ending elevations of curb returns.

i. Pavement section design by a Washington State Licensed Engineer.

j. A traffic distribution letter shall be required for projects that generate more than 80 trips per day or peak traffic of 10 trips or more. The letter must be certified by a Washington State licensed engineer.

k. An impact traffic analysis maybe be required for projects that generate more than 80 trips per day or 10 peak trips day. The analysis shall be certified by a Washington State licensed engineer. Traffic Impact Analysis outline is provided in Section 1, Attachment 1.1.

H. Traffic Control

1. Prior to construction a project traffic control plan may be requested by the Town. The approved plans are subject to change by the Director as needed to accommodate traffic conditions in the field. During an emergency situation the Contractor may change the traffic control plan but if not in an emergency any changes proposed by the Contractor must be submitted to CDP for re-review. The Applicant will be responsible to ensure the approved traffic control plan is setup prior to construction, the traffic control is implemented as per the plan approved by the Director, and is maintained during the course of the project.

2.4 Warranty Bond

A. Prior to construction, the Applicant shall provide the Director with a copy of the Engineers Estimate or Bid Tabs for the construction activities associated with the project.

B. The Applicant shall provide the Town with a warranty bond in the amount specified by the Director. The term of the warranty bond shall be for 2 years from the date the Town provides the Notice of Substantial Completion. The bond must automatically renew until the warranty deficiencies have been corrected. Once all deficiencies have been completed at the end of the warranty period the Director shall issue a letter authorizing the release of the warranty bond.

2.5 Construction Certification

Construction for all private projects is initiated and coordinated through the CDP. Construction drawings shall be turned into final “As-built” record drawings.

A. Introduction

1. The procedures for construction certification are to foster consistent high quality projects and to facilitate the subsequent transfer of ownership of the finished improvement to the Town.

B. Project Coordination

1. Prior to the start of construction the Applicant will identify a Project Coordinator. The Project Coordinator shall be responsible for managing the day-to-day operations of the project including traffic control, Town requests, project safety, and overall coordination. The Project Coordinator shall be the contact for Town personnel.

C. Project Inspection/Certification

1. Prior to the start of construction the Applicant will identify the Project Engineer. The Project Engineer shall be a licensed Professional Engineer in the State of Washington. This Engineer or his/her representative shall be responsible to verify the project was constructed according to the Town's Standards and the construction methods resulted in a high quality product. An outline of Construction Phase Services the Applicant is to provide is presented in Attachment 2.2 within this document.
2. Town staff will make site visits intermittently during the construction of the project to verify progress and will periodically discuss inspection activities with the Project Coordinator.
3. The Project Engineer may be the Project Coordinator.

D. Project Reporting

1. The Project Engineer will submit to CPD a weekly progress report. This will include a narrative of the construction completed this week, daily inspection reports and any field testing reports.
2. Prior to project acceptance the Project Engineer will submit a certification to CDP. All lab and field testing reports shall be included. Test reports that show failing tests must have follow-up test reports that are acceptable. Any nonconforming issues shall be fully documented to include resolution. Construction as-builts shall be provided by the Project Engineer and submitted to CDP. The record drawings shall also be submitted as per Section 2.5.I.

E. Construction Complaints

1. Complaints from citizens regarding the project shall be documented by the Project Coordinator and resolved. Town personnel shall be notified of such complaints.

F. Utility Inspections

1. On all public and private utility construction for development, inspections will be performed by the Project Engineer or designated representative. The inspection shall include the items listed below. However, the listing provided below is not intended to be all inclusive. It will be the responsibility of the Project Engineer to determine additional inspection activities that may be needed for a specific project in order to report substantial conformance of the project with the Town's Standards.
    a. Conformance of all construction materials with Town Standards shall be verified prior to installation.
    b. Utility trenches shall be inspected for proper dimensions and pipe zone clearances prior to placement of pipe.
    c. The placement and compaction of the pipe zone material and bedding shall be inspected.
    d. The pipe joints shall be inspected visually for proper insertion.
    e. Horizontal alignment and grade of the pipe shall be checked for conformance to the Standards prior to backfilling of the trench.
    f. Tees/taps and stubs shall be inspected for correct installation prior to backfilling of the trench.

g. Accurate measurements shall be made and recorded to facilitate the reestablishment of utility service tee/tap locations and stub end locations. The placement of the required stub markers shall be verified.
h. Manholes and vaults shall be inspected for proper materials, location, assembly, and installation.
i. Trench backfill operations shall be observed and compaction tests shall be performed. Minimum requirements for backfilling shall be as set forth in Attachment 2.3 within this document.
j. Minimum material sampling and testing frequencies as listed in Attachment 2.3 Minimum Sampling and Testing Frequencies shall be completed.
k. All public and private utility lines that connect to the Town's public system shall be tested until passing results have been approved by Town staff. The testing shall be performed by the Contractor (except as noted below) and observed by Town staff. The Project Coordinator shall schedule and provide notice to the Town a minimum of 2 business days. The Town may require additional time for notification of the testing.
l. All sewer testing shall follow completion of acceptable trench backfilling. Sewer line testing shall include low pressure air testing of the lines, mandrel testing and television inspection (see Attachment 2.4 for TV Inspection Protocol of Sewer).
m. Waterline testing will be performed after the pipeline has been backfilled sufficiently to prevent movement under pressure. Prior to connecting the new lines to the existing system, the new lines and services must pass pressure testing and bacteria testing. The Project Coordinator must obtain approval from the Water Department prior to making the connection to the existing system.
n. Daily inspection reports shall be prepared, summarizing construction activities, contractor work force and work period, testing results, problems encountered, and other pertinent information.
o. The Project Coordinator or the Project Engineer shall notify Public Works 2 business days in advance of starting construction of the new utilities and shall provide a generalized schedule for the progress of the work. Town personnel will make occasional site visits to inspect the work and to ensure the Project Engineer is properly performing inspection. If it is discovered during the Town inspection of the project that the Contractor is performing substandard work or the level of inspection by the Project Engineer is not satisfactory the Town will inform the Project Coordinator or Applicant and if the problem is not corrected immediately the Town will either revoke the permit or provide full time inspection by Town forces at the option of the Director. The Applicant will bear the cost of all inspections, material testing, and third party inspections required to certify the project, which includes the Town's full- time inspection as may be required by the Director. Public Works shall have access to all construction inspection records and reports.

G. Changes During Construction

1. Changes during construction that materially affect the scope of the project and/or the individual lots, plans must be submitted for review by the Town. Minor changes do not need to be reviewed by the Town, but must be documented in the daily and weekly inspection reports.

2. When changes to the design are necessary, the Applicant shall be responsible for coordinating the proposed design changes with the Design Engineer. The Design Engineer shall forward the proposed plan change, together with related calculations, to the CDP for review and acceptance prior to construction.

H. Project Acceptance of Complete Construction (Refer to Attachment 2.5 Project Acceptance Flow Chart)

1. At the completion of the project the Project Engineer shall make a final inspection to determine if the project is in substantial conformance with the approved construction documents or there are deficiencies in the work.
2. Once all deficiencies are corrected to the satisfaction of the Project Engineer a final inspection with the Project Engineer and Public Works staff shall be scheduled.
3. Once Public Works is satisfied, with the work as determined in the final inspection meeting, the Project Engineer shall submit a certification package, as described in Attachment 2.6, with a letter requesting final acceptance of the project. If the Town finds the project complete, a Notice of Substantial Completion shall be sent to the Project Engineer and the warranty period shall start. Any remaining work shall be completed pursuant to an agreed schedule with the Applicant responsible to correct damage done by a third party (e.g., utility companies, builders, landscapers, etc.).
4. If the certification package is incomplete or otherwise unacceptable, the Project Engineer shall be required to provide the missing documents before the Town will issue the Notice of Substantial Completion. The Town will review the completed certification package and issue a Notice of Substantial Completion, the Town will provide the applicant with copy, if appropriate. Once the Town authorizes Substantial Completion the warranty period shall commence.

I. Record Drawings

1. During construction the Project Engineer (or Surveyor) shall record any changes to the Town approved plans. The approved plans should be modified to show all changes made during construction. The modified plans shall be labeled "Record Drawings" and stamped and signed by the Engineer and have the following statement: "I have reviewed the construction of this project's improvements and to my knowledge find it to be in substantial conformance with the accepted plans and the Town of Friday Harbor's Standards except as noted."
2. The completed record drawings shall be submitted to CDP as an electronic PDF file and in a CAD.dwg file, compatible with the Town's current system. The CAD drawing shall include two existing local monuments, surveyed to correspond with the project's coordinate system.

2.6 Penalties

A. Failure to comply with the plan review procedure outlined above may be cause for withholding or withdrawing approval of plans, forfeiture of bond or non-acceptance of work by the Town.

ATTACHMENTS

Attachment 2.1- Civil Plan Checklist
Attachment 2.2 – Construction Phase Services Outline
Attachment 2.3 – Minimum Sampling and Testing Frequencies
Attachment 2.4– TV Inspection Protocol of Sewer
Attachment 2.5 – Project Acceptance Flow Chart
Attachment 2.6 – Final Certification Checklist – Sample

ATTACHMENT 2.1 – CIVIL PLAN CHECKLIST

SUBMITTAL ITEMS

(__) Plan Review Application
(__) Plans
(__) Geotechnical Report
(__) Sanitary Sewer Calculations
(__) Stormwater Site Plan Hydraulic Study
(__) Easements and/or Dedication Deeds
(__) Specifications

GENERAL STANDARD ITEMS

(__) Vicinity Map
(__) Legend (APWA Standard Symbols)
(__) North Arrow
(__) Scale Bar
(__) Datum-Bench Mark Elevation and Location (vertical datum shall be NAVD 88 and horizontal datum shall be NAD 83/91)
(__) Title Block
  (__) Title:
  (__) Design By:
  (__) Drawn By:
  (__) Date:
  (__) Checked By:
  (__) Sheet Number of Total Sheets:
(__) Section, Township and Range (every plan/profile sheet)
(__) Engineers Stamp (signed and dated)
(__) Project Title (cover sheet)
(__) Utility System Map (showing all proposed utilities on one drawing)
(__) General Notes – All Projects DWG U-0
(__) Revision Block
(__) Approval Block

APPROVED FOR CONSTRUCTION

BY: _____ DATE: _____
TOWN REPRESENTATIVE _____

APPROVAL EXPIRES: _____

CIVIL PLAN STANDARD ITEMS

(__) Centerline and Stations (Stationing every 100 feet)
(__) Edge of Pavement and Width
(__) Right-of-Way and Easements
(__) Proposed Survey Monumentation Locations and Details
(__) Sidewalk and Width
(__) Roadway Sections

(__) Existing Utilities (above and below ground)
(__) Adjacent Property Lines, Ownership, Parcel Number, and Street Address
(__) Identify Street Names, Right-of-Way, Lots
(__) Identify/Match Existing Sheet Numbers and Station
(__) Easements, Width and Type
(__) Define Survey Baseline
(__) Stations for Structures
(__) Flow Direction Arrows

PROFILE STANDARD ITEMS

(__) Profile Grades (decimal FT/FT.)
(__) Existing Ground
(__) Scale (horizontal and vertical)
(__) Stationing
(__) Vertical Elevation Increments
(__) Existing Utilities (if available)

WATER

Plan View:

(__) System Map (1"=300') showing existing and proposed with line size, valves, and hydrants
(__) Existing Utility Conflicts
(__) Fixtures (need horizontal and vertical control)
  (__) Fire Hydrants (at all intersections)
  (__) Blowoff (at end of line)
  (__) Vacuum and Air Release Valve When Required
(__) Tees, Crosses, Elbows, Adapters and Valves Need Coupling Type, Meter Locations
(__) Valves (2 each tee, 3 each cross)
(__) Fire Department Connection
(__) Thrust Blocking Required at all Fittings Including In-Line Valves
(__) Distance from Sewer
(__) Service to Each Lot (include open tracts)

Profile View:

(__) Existing Utility Crossings
(__) Show Fixtures (tees, crosses, hydrants)
(__) Show Valves and Couplers
(__) Size of Water Main
(__) Length of Water Main in LF
(__) Cover Over Pipe
(__) Grades

Misc.:

(__) Detail Sheet
(__) General Notes – Water (DWG W-0)

STORM SEWER

Drainage Report:
(__) Cover Sheet
(__) Table of Contents
(__) Section 1 – Proposed Project Description
(__) Section 2 – Existing Conditions
(__) Section 3 – Infiltration Rates/Soils Report
(__) Section 4 – Wells
(__) Section 5 – Fuel Tanks
(__) Section 6 – Subbasin Description
(__) Section 7 – Analysis of the 100-Year Flood
(__) Section 8 – Aesthetic Considerations for Facilities
(__) Section 9 – Downstream Analysis
(__) Section 10 – Covenants, Dedications, Easements
(__) Section 11 – Homeowners – Articles of Incorporation
(__) Project Engineers Certificate
(__) Facility Summary Form
(__) Engineer's Estimate

Erosion Control Plan Report:
(__) Section 1 – Construction Sequence and Procedure
(__) Section 2 – Trapping Sediment
(__) Section 3 – Permanent Erosion Control and Site Restoration
(__) Section 4 – Geotechnical Analysis and Report
(__) Section 5 – Inspection Sequence

Maintenance Report:
(__) Required Type and Frequency of Long-Term Maintenance Organization
(__) Frequency of Sediment Removal
(__) Cleaning of Catch Basins
(__) Vegetation Control
(__) Annual Cost Estimate of Maintenance

Site Map:
(__) Existing Topography at Lease 50 Feet Beyond Site Boundaries
(__) Finished Grades
(__) Existing Structures within 1,000 Feet of Project Boundary
(__) Utilities
(__) Easements, Both Existing and Proposed
(__) Environmentally Sensitive Areas
(__) 100-Year Flood Plain Boundary
(__) Existing and Proposed Wells within 1,200 Feet of Proposed Retention Facility
(__) Existing and Proposed Fuel Tanks
(__) Existing and Proposed On-Site Sanitary Systems within 100 Feet of Detention/Retention Facilities
(__) Proposed Structures Including Roads and Parking Surfaces
(__) Lot Dimensions and Areas
(__) Proposed Drainage Facilities and Sufficient Cross-Sections and Details to Build

Plan View – Conveyance System:
(__) Station and Number at Each Manhole/Catch Basin
(__) Manhole/Catch Basin Type and Size
(__) Manhole/Catch Basin Rim Elevation
(__) Flow Direction with Arrow on Pipe/Channel
(__) Type and Size of Pipe
(__) Length of Pipe in Linear Feet

Profile View – Conveyance System:

(__) Station and Number at Each Manhole/Catch Basin
(__) Rim Elevation
(__) Invert In and Out
(__) Length of Pipe in Linear Feet
(__) Grades (FT/FT)
(__) Design Velocity

Erosion Control Drawing:

(__) Soil Types
(__) Locations of Soil Pits and Infiltration Tests
(__) Construction Entrance Detail
(__) Silt Fence and Traps
(__) Mulching and Vegetation Plan
(__) Clearing and Grubbing Limits
(__) Existing and Finished Grade
(__) Details and Locations of all BMPs Recommended
(__) Location and Details of Temporary Sediment Ponds

Misc.:

(__) Detail Sheet
(__) General Notes – Storm

STREET

Plan View:

(__) Station PC, PT, PI and Intersections
(__) Curve Information Delta, Radius, Length and Tangent
(__) BCR and ECR (Begin Curb Radius, End Curb Radius)
(__) Identify All Field Design Situations
(__) Monuments at Each Intersection
(__) Typical Sections
(__) Pavement Marking Details with Station and Offset
(__) Sidewalks
(__) Driveway Approach
(__) Handicap Ramps-Detail and Type
(__) Lighting
    (__) Station and Offset to Fixtures
    (__) Pole Type, Including Manufacturer and Model Number
    (__) Mounting Height, Arm Length, Anchor Bolt Size and Pattern
    (__) Power Source
        (__) Wire Size, Type, Conduit
        (__) Line Loss Calculations
    (__) Luminaire Type, Lamp Wattage
    (__) Location of Service Disconnects
    (__) J-Box Location (include station and offset)

Profile View:

(__) Vertical Information VPI, BVC, EVC, Low Point, High Point
(__) Show Grades in Decimal Form with (+ or -) Slope
(__) Super Elevated Roadways
    (__) Detail-Show Transitions
    (__) Special Detail Showing Gutter Flowing Adequately

Misc.:

(__) Detail Sheet
(__) Curb Returns Showing Ramps Meeting ADA Requirements, Flow Line Spot Elevations and Direction of Flow
(__) Street and Lighting General Notes
(__) Signing-Temporary and Permanent
(__) Channelization
(__) Location of Cluster Mailboxes
(__) Pavement Design, Stamped by Licensed Engineer

ATTACHMENT 2.2 – CONSTRUCTION PHASE SERVICES

Required items to be completed by the Project Engineer:

I. Specific Certification Inspections

A. Roads
- Erosion Control.
- Drainage Improvements/Testing.
- Embankment Placement/Density Control.
- Trenching Backfill/Density Control.
- Subgrade Line and Grade/Density Control.
- Surfacing Line and Grade/Density Control.
- Curbs and Sidewalks Line and Grade/Material Quality.

B. Utility Pipe
- Full time inspection initially, until the on-site inspector has verified the contractor's methods are within acceptable standards for trench excavation, pipe zone material placement, pipe installation, and trench backfill. Once the on-site inspector can certify the contractor's method inspection time may be reduced but testing frequencies, as per Attachment 3, must be adhered to. In no case shall the on-site inspection be reduced to below half time.

II. Review and approval of changes to approved plans including approval through the Public Works Department if necessary.

III. Record keeping and weekly reporting to the Town.

IV. Project acceptance of construction (see Attachment 3).

V. As-built survey/record drawings and side sewer reports.

VI. Certification report.

Required Items to be completed by Applicant's designated Project Engineer:

I. Pre-Construction meeting.

II. Oversight of Construction staking (all curb, curb and gutter, and roadway alignment and grade shall be staked by a Washington State licensed surveyor).

III. General project administration, coordination, and scheduled monitoring.

IV. Traffic and dust control.

V. Coordinate erosion control inspection as required by the Washington State Department of Ecology.

VI. Response to construction complaints and resolution of complaints.

VII. Coordinate Documentation by a Washington State licensed surveyor.

ATTACHMENT 2.3 – MINIMUM SAMPLING AND TESTING FREQUENCIES

Earthwork

Item	Location	Test	Testing Frequency
Undisturbed Native Soil	Structures	In Place Density[3]	Two random tests in building footings and two tests on subgrade within building line.
		Moisture Density Relationship (Modified Proctor)	One test and any time material type changes.
Fills and Backfills	Structures (adjacent to)	In Place Density[3]	One test per structure Backfills per 2,000 sq. ft. taken 12 inches below finished Grade.
		Moisture Density Relationship (Modified Proctor)	One test and any time material type changes.
Subgrades	Site	In Place Density[3]	One test per lift per 2,500 sq. ft.
		Moisture Density Relationship (Modified Proctor)	One test and any time material type changes.
Embankments or Borrow	Any	In Place Density[3]	One test per lift per 500 cubic yards placed.

Trenching

Item	Test	Testing Frequency
Pipe Bedding	Gradation[1]	One for each material source.
	Moisture Density Relationship (Modified Proctor)	One test and any time material changes
Trench Backfill	Gradation[1]	One for each material source.
	In-Place Density[1][2][3][4]	One every 500 feet of trench and every 2 feet in depth of backfill material.
	Moisture Density Relationship (Modified Proctor)[3]	One prior to start of backfilling operations, one every 20 densities and any time material type changes.

Aggregate Materials

Item	Test	Testing Frequency
Crushed Surfacing Base Course	Gradation, SE and Fracture	1 – 2,000 TN.
	Density[1]	One test on every lift on material placed at a frequency of 250 square yards of completed area.
	Moisture Density Relationship (Modified Proctor)	One test and any time material changes
Crushed Surfacing Top Course	Gradation, SE and Fracture	1 – 2,000 TN.
	Density[1]	One test on every lift on material placed at a frequency of 250 square yards of completed area.
	Moisture Density Relationship (Modified Proctor)	One test and any time material changes

Hot Mix Asphalt

(Testing will be completed by the Town. Applicant shall reimburse the Town for testing cost.)

Item	Test	Testing Frequency
HMA Project Quantity ≤ 800 tons	Rice Density	1 – project.
HMA Project Quantity > 800 tons	Rice Density, Gradation, Asphalt Binder Content and Percent Air Voids (Va)	1 – 1,000 TN.[5]

Hot Mix Asphalt Aggregate[9]

Item	Test	Testing Frequency
Aggregate	SE, Fracture	1 – 2,000 TN.
Blend Sand	SE	1 – Project.
Mineral Filler	Sp. G and PI	Certificate.

PCC Paving

Item	Test	Testing Frequency
Course Aggregate[7]	Gradation	1 – 1,000 CY.
Fine Aggregate[7]	Gradation	1 – 1,000 CY.
Combined Aggregate[7]	Gradation	1 – 1,000 CY.
Air Content[10]	Air	Each Day; First truck and each load until two successive loads meet specification.

Item	Test	Testing Frequency
Cylinders	Compressive Strength (28 Day)	1 – 500 CY.
Beam	Flextural Strength (14 Day)	1 – 500 CY.
Core	Density Thickness	1 – 500 CY. 1 – 500 CY.
Cement[6]	Chemical and Physical Certification	

PCC Structures (All PCC except PCC Paving)

Item	Test	Testing Frequency
Course Aggregate[7][8]	Gradation	1 – 1,000 CY.
Fine Aggregate[7][8]	Gradation	1 – 1,000 CY.
Combined Aggregate[7][8]	Gradation	1 – 1,000 CY.
Consistency[10]	Slump	Each Day; First truck and each load until two successive loads meet specification.
Air Content[10]	Air	Each Day; First truck and each load until two successive loads meet specification.
Cylinders (28 Day)[8]	Compressive Strength	1 – 50 CY.
Cement[6][8]	Chemical and Physical Certification	
Grout	Compressive Strength	1 set/day.

(1) All acceptance tests shall be conducted from in-place samples.

(2) Additional tests shall be conducted when variations occur due to the Contractor's operations, weather conditions, site conditions, etc.

(3) All compaction shall be in accordance with the Compaction Control Test of WSDOT Specification Section 2-03.3(14)D. The nuclear densometer, if properly calibrated, may be used for the required testing frequency and procedures. The densometer shall be calibrated and is recommended for use when the time for complete results becomes critical.

(4) Depending on soil conditions, it is anticipated that compaction tests will be required at depths of two feet above the pipe and at each additional two feet to the existing surface plus a test at the surface.

(5) A minimum of three samples, on a random basis, shall be taken and tested.

(6) Cement may be accepted by the Town based on the Manufacturer's Mill Test Report number indicating full conformance to the Specification.

(7) The frequency for fine, course, and combined concrete aggregate samples for PCC Paving and PCC Structures shall be based on the cubic yard (CY) of concrete.

(8) Commercial concrete will be accepted with Certificate of Compliance.

(9) Hot mix asphalt aggregate tests are not required for HMA that has a project quantity of $\leq$ 400 tons.

(10) Project Engineer representative to witness each test.

ATTACHMENT 2.4 – TOWN OF FRIDAY HARBOR PROTOCOL FOR TELEVISION INSPECTION OF SEWER

In the interest of developing a consistent methodology for the coordination and review of television inspections, the following steps have been established:

1. PRE-PAVING TELEVISION INSPECTION

a) The applicant shall inspect the new sanitary sewer by use of a television camera prior to installation of the roadway base. At least 1 week prior to the desired pre-paving television inspection, the Project Engineer shall notify the Wastewater Treatment Department.

b) Prior to the television inspection the applicant shall clean, pressure test and mandrel test the pipe. The applicant shall be responsible for flushing and cleaning the pipelines in preparation for the inspection, plugging upstream manholes and managing wastewater flows in order to complete the inspection. In addition, manholes will need to be accessible by the TV van. Backfill must be in placed around the cone sections of the manholes.

c) The television inspection requirements shall include the provision of:

A color DVD television camera with a pan and tilt capacity in order to view all main lines, lateral lines, and structures including channels.

A dye solution to be introduced in sufficient quantity to travel from the structure that is the highest point of inspection to the downstream terminus of the inspection limits. Red or purple dye shall be used for PVC pipe and green dye for ductile iron and concrete pipe.

A 1-inch reference ball shall be mounted to the camera in order to drag along the bottom of the pipe during the entire inspection procedure.

Linear measurement references to be measured from the center of the beginning structure to the center of the next inline structure and include the direction of flow. The locations of lateral pipes and all distinctive pipe conditions shall be referenced to the centerline of the beginning structure. All structure references shall utilize the designated structure reference numbers shown on the Plans.

d) The following television inspection information shall be provided to the Wastewater Treatment Department:

A clear DVD which encompasses the limits of the inspection area and including all reference data as described herein. A tape reference time and date for the start of each run shall also be indicated.

A written report shall be provided corresponding to the taped inspection and including all reference data as described herein. The report shall consist of a written narrative of all distinctive pipe conditions including ponding areas in excess of 1/4 inch.

2. REVIEW OF PRE-PAVE TELEVISION INSPECTION

a) The Wastewater Treatment Department will review the TV inspection and written report submitted by the Project Engineer. The written report shall identify any required repairs. Bellies greater than 1/4 inch are considered a deficiency.
b) The TV inspection video shall be made available to the Contractor if requested.

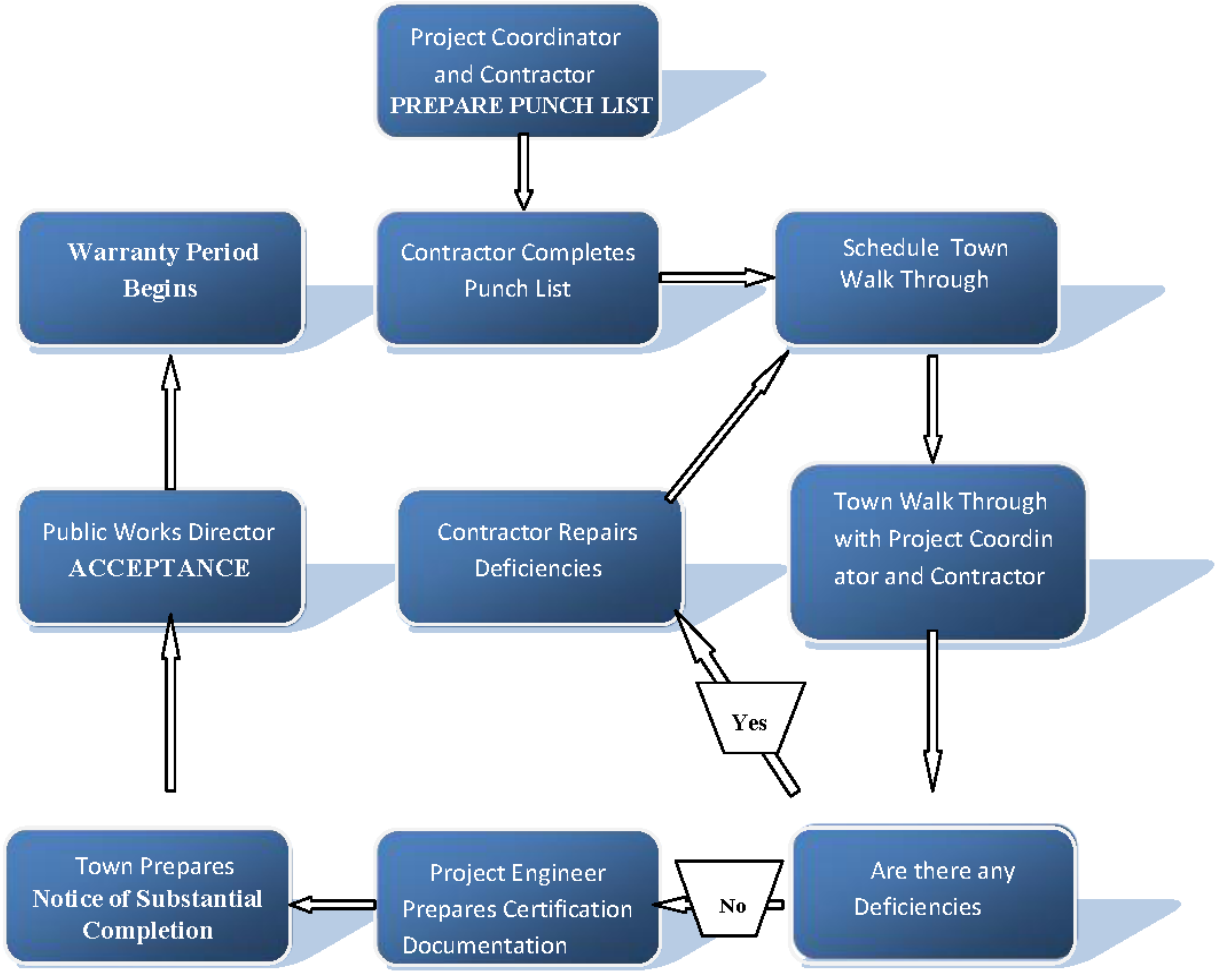
3. TV ACCEPTANCE

a) If the Wastewater Treatment Department identifies any deficiencies the Contractor shall make the repairs, as necessary, at their own cost.
b) Once the Contractor completes the repairs the applicant shall re-TV the lines.
c) The Wastewater Treatment department shall report to the Public Works Director once they find the sewer line acceptable.

4. CONNECTION TO THE NEW SEWER MAIN

a) No service connection shall be allowed until the new sewer lines have been accepted by Public Works.
b) For acceptance the sewer lines shall pass pressure test, mandrel test and TV inspection.

ATTACHMENT 2.5 – PROJECT ACCEPTANCE FLOW CHART



ATTACHMENT 2.6 – FINAL CERTIFICATION CHECKLIST – SAMPLE

Project:

Certificate Head Letter:

- Statement of intent to certify the project
- PE Stamp and Signature

Record Drawings Electronic Drawings

- PE Stamp and Signature
- Lettered certification statement

Project Documents:

- Daily Inspection Reports:
- Field Reports:
- Inspection of Asphalt Paving:
  - 100% On-site inspection during paving
- Compaction Reports:
  - Sewer trench lifts
  - Water trench lifts
  - Utility trench lifts
  - Embankment
  - Subgrade
  - Crushed Rock Lifts
- Material Documents: Field and Laboratory Tests:

	Field Test		Lab Test	
Concrete:		(Slump, Air Content, Temp)		(Break Test)
Sub-Grade:		(Compaction)		(Gradation, Proctor)
Crushed Rock:		(Compaction, Depth)		(Gradation, Proctor
Asphalt:		(Compaction, Thickness		(Rice, Gradation, Oil Content)

- On Site Inspections of Drainage Items:
  - Erosion Control Measures:
  - Drywells:
  - Gutter Inlets:
  - Culverts:
  - Sidewalk Vaults:
  - Drainage Ditches:
  - Swale Volume:
  - Other:
- Incoming / Outgoing Correspondence:

(This is a guideline of required documents, but not limited to, for final certification.)

Section 3
General Utilities

3.0 GENERAL UTILITIES

Design of utilities shall be performed by a professional engineer licensed in the State of Washington. All utility installations shall be designed in accordance with the industry standards, codes, and regulations applicable to the type of utility including applicable environmental and erosion control regulations. The Project General Notes, Dwg. U-0, shall be placed on all project plans that are constructed within the Town's rights-of-way and not funded by the Town.

3.1 Standard Utility Locations Within the Right-of-Way

Utilities within the existing or proposed right-of-way shall be installed in the following locations:

Utility	Designated Side of Center Line
Sanitary Sewer	5 ft. south or west
Water	5 ft. north or east
Storm Drainage	south or west
Telephone	north or east
Power	north or east
Cable	north or east

Dwg. U-1 and U-3 show the typical utility locations.

Where existing utilities or storm drains are in place, new utilities shall conform to these Standards as nearly as practical and yet be compatible with the existing installations. Exceptions may be approved by the Town when necessary to meet special requirements only if the public's best interest is served.

3.2 Underground Utility Installation

A. Buried Utilities

1. All buried utilities installed within the public right-of-way shall have the minimum cover shown on Dwgs. U-2, U-4, and U-5 unless written approval by the Town is secured prior to actual construction.

2 All dry utilities shall be installed in conduit within the right-of-way. Piping used as conduit shall be appropriately sized and shall be at least Schedule 40 PVC where other regulations do not exist and/or take precedence.

B. Trenching Requirements

1. All final asphalt cuts will be made by sawcutting; wheel or jackhammer cuts will not be allowed unless the entire street is to be overlaid. Pavement cutting wastes shall not be discharged to the Town's storm drainage system.

2. Backfill
   a. All backfill under asphalt and concrete pavement shall be suitable native material or crushed surfacing top course for trench backfill meeting WSDOT Standard Specifications.
   b. All backfill under asphalt paving will be placed horizontal layers not more than 6 inches and each layer will be mechanically compacted using vibratory compactors capable of attaining the required compaction. Minimum compaction for all trenches under asphalt and concrete pavement shall be 95 percent of the Standard Proctor Density. Minimum density for all other

areas within the public right-of-way shall be 90 percent of the Standard Proctor Density. See Dwg. U-2 for trench requirements.

C. Utility Cuts on Streets

1. No pavement or surface treatments shall not be cut for a period of 5 years after the pavement has been constructed or resurfaced. Untrenched construction techniques such as pushing, jacking or boring shall be explored on all new or existing pavement crossings. In cases of emergency or construction failures or if all alternatives to pavement cutting have been exhausted, provisions to allow cutting of the pavement may be obtained if approved by the Town.

2. If the Town allows a longitudinal utility installation, on an asphalt pavement section that is less than 5 years old, a one half street 2-inch grind and overlay shall be required. For concrete pavement the entire concrete panel that is cut shall be removed and replaced.

3. If the Town allows a transverse utility installation, on an asphalt pavement section that is less than 5 years old, a standard trench patch and a minimum 150 linear foot grind and overlay shall be required. The grind and overlay shall be installed 75 linear feet on each side of the trench section or as approved by the Director. See Dwg. U-7. For concrete pavements the entire concrete panels that are cut shall be removed and replaced.

D. Restoration

(See Drawings U-6 and U-7)

1. A temporary patch of cold mix asphalt shall be installed on all asphalt cuts at the completion of the backfill and compaction process and at the end of each day during which a project is ongoing. Patches shall be maintained to conform to the original cross section and grades of the surrounding road. Required repairs to trench patches must be made within 24 hours when repairs are required to maintain the safety of the public roadway. Where applicants, their agents or employees fail to make repairs required by the Town within 24 hours, the Town may cause the repairs to be made and the total cost of those repairs together with the Town's overhead and attorney fees shall be borne by the applicant. No new permits will be issued and no work will be allowed on other existing permits while any person, company, or entity is in default of any of the provisions of this ordinance.

2. Final restoration must be completed as soon as possible using four-inch minimum thickness of HMA. All patches will be constructed using best practices and are required to meet or exceed Town's Standard Specifications for thickness of asphalt, smoothness, and compaction. Sealing of all patch edges with hot asphalt sealant following completion of each patch is required.

3. Overlay's will be constructed of HMA meeting the Town's HMA specification and will be at least 2 inches in thickness.

4. On crossings required to be opened to traffic prior to final trench restoration, steel plates may be used as approved by the Town.

E. On Proposed Streets

(e.g., New Subdivisions)

Backfill compaction for trenches within the streets not open to public travel shall be achieved throughout the entire depth of the trench by mechanical compaction as described in Section 3.2 B unless controlled density fill is placed in accordance with Section 3.2 F.

F. Controlled Density Fill

As an alternative to mechanical compaction, trench backfill above the bedding and below the pavement section base course may be accomplished by use of controlled density backfill (CDF) in a design mixture approved by the Town.

G. Testing

1. Consistent with the above and prior to placing any surface materials on the roadway, it shall be the responsibility of the applicant to provide density test reports certified by an accredited material lab. A minimum of one test shall be taken within every 500 feet of trench length and at depths up to 50 percent of trench depth, or as directed by the Town. Where the trench is shorter than 500 LF, then three tests shall be taken (beginning, middle and end). Compaction of laterals or service line trenches shall be tested where directed by the Town. Testing of CDF shall be in accordance with ASTM D4832.

2. Whichever compaction method the installer elects, the backfill below four feet must test to be not less than 90 percent maximum density and the upper four feet of backfill must test not less than 95 percent maximum density. Where this cannot be achieved, all affected backfill in the top 4 feet shall be removed and replaced by gravel base and mechanically compacted to 95 percent.

3. The Town will hire the materials lab for the testing of the HMA. The Applicant shall reimburse the Town for this testing.

H. Notification and Inspection

1. Applicants with permits for trenching in existing or proposed Town streets shall notify the Town not less than 2 business days prior to doing the work. This notification shall include:
   a. Location of the work.
   b. Documentation that utility locates have been notified.
   c. Name of accredited materials lab that will provide compaction testing.
   d. Method of compaction to be used.

2. The applicant's contractor shall notify the Town at least 1 business day prior to when compaction or testing will be completed. Failure to notify may necessitate testing or retesting by the applicant at the expense of the applicant. Furthermore, the work may be suspended pending satisfactory test results.

I. Final Utility Adjustment to Finish Grade

1. All utility covers that are located on proposed streets shall be temporarily placed at subgrade elevation prior to placing of crushed surfacing material.

2. Utility structures shall not be located within sidewalks, driveway approaches or

driveway unless specifically approved by the Town.

3. Final adjustment of all covers and access entries shall be made following paving.
   a. Sawcutting of pavement openings shall not be larger then 12 inches beyond the radius of the cover.
   b. Remove crushed surfacing material, and frame; add risers/rings, replace frame and cover no higher than the finished grade and no lower than 1/2 inch below the pavement.
   c. Final adjustment of all covers and access entries shall be completed within 14 days of final paving.

J. Final Cleanup, Restoration of Surface Drainage and Erosion Control

In addition to restoration of the street as described above, the responsible utility shall care for adjacent areas in compliance with Sections 1-04.11 “Final Cleanup” and 8-02 “Roadside Restoration” in the WSDOT Standard Specifications. In particular:

1. Streets shall be cleaned and swept both during and after the installation work.

2. Disturbed soils shall be final graded, seeded and mulched after installation of utility. In limited areas, seeding and mulching by hand using approved methods will be acceptable.

3. Ditch lines with erodible soil and subject to rapid flows may require hydroseeding, seeding, jute matting, netting, or rock lining to control erosion.

4. Any silting of downstream drainage facilities, whether ditches or pipe and catch basins, which results from the utility installation shall be cleaned out and the work site restored to a stable condition as part of site cleanup.

Section 4
Sanitary Sewers

4.0 SANITARY SEWERS

Sanitary sewers should be designed to maintain self-cleaning velocities and allow for ease of maintenance.

This section presents design guidance for construction of sewers in the public right-of-way and on private property. Design criteria for wastewater pumping stations are discussed in Section 5.0.

4.1 Definitions

A. ***Annual Average Design Flow*:** The average daily flow volumes anticipated to occur over a calendar year.

B. ***Building Drain:*** That part of the lowest piping of a drainage system which receives the sanitary discharge from piping inside the walls of a structure or building, and conveys it to a point two feet outside the outer face of a structure, wall or foundation into the side sewer or to an on-site sewage disposal system. Building drains shall not carry roof drainage, groundwater or surface runoff.

C. ***Cleanout:*** An upturned pipe which provides a means for flushing or inserting cleaning tools.

D. ***Effluent:*** Wastewater or other liquid, partially or completely treated, or in its natural state, flowing out of a reservoir, basin, treatment plant, or industrial treatment plant, or any part thereof.

E. ***Industrial Process Wastewater or Process Wastewater:*** That category of wastewater containing water carried wastes other than those traditionally derived from human or household customer sources (as defined in FHCMC 1513.0421). Process wastewater is also sometimes referred to as "non-domestic sewage". There are two subcategories of process wastewater

F. ***Interior Channel Drop:*** A planned drop of the invert elevation within a manhole to convey wastewater from the incoming pipe(s) to the outgoing sewer.

G. ***Lateral or Lateral Sewer:*** A sewer to which side or private sewers may be connected from adjacent properties.

H. ***Natural Outlet:*** Any outlet into a watercourse, pond, ditch, lake or other body of surface water or groundwater. It does not include connections to the Town of Friday Harbor Wastewater Treatment Plant, authorized on-site sewage, stormwater disposal systems, or other authorized sewage disposal mechanisms or systems.

I. ***On-Site Sewage Disposal System:*** Any system or combination of piping, treatment or other facilities that collect, store, treat, and/or dispose of sewage and effluent on the property where it originates, or an adjacent or nearby property under the ownership of the user of the system or in which the user has a recorded interest for the purpose of maintaining the system on such other property. In general, these include septic tanks, drainfields, pressure mounds, etc. The Town does not permit or maintain on-site sewage disposal systems within the Town.

J. ***Peak Flow:*** The maximum momentary load placed on a wastewater pumping station, sewer main, force main, etc.

K. ***Peak Factor:*** A value which, when multiplied by the average design flow, yields an estimate of the highest flow rate to be expected over a short period of time.

L. ***Practicable:*** Capable of being accomplished within prudent natural, social or economic constraints using readily available resources and reasonable reliable technology and practices.

M. ***Private Pump Station:*** An appurtenance of a side sewer, private sewer or on-site sewage disposal system which, alone or in conjunction with the side sewer or private sewer, conveys domestic strength sewage or effluent by lifting or pumping to another sewer.

N. ***Private Sewer***: A sewer which is not owned or maintained by a public authority, and which serves two or more users on one or more parcels, and is constructed by private contract.

O. ***Private Storm Sewer:*** A storm sewer not owned or maintained by a public authority.

P. ***Public Sewer:*** A sewer which is controlled and maintained by a public authority.

Q. ***Sanitary Sewage***: Wastewater consisting of water-carried wastes from human and household customer sources as well as water-carried wastes from some business, institutional or commercial customers which do not generate industrial process wastewater.

R. ***Sewage:*** Water-carried waste products or discharge from human beings or other wastes from residences, private or public buildings, including, but not limited to, industrial waste.

S. ***Sewer:*** A pipe, conduit, structure, or appurtenance for conveying sewage.

T. ***Sewer System:*** The entire system of component parts intended for the collection, treatment, processing and disposal of sewage from its point of origin to its ultimate point of disposal, as owned and operated by the Town.

U. ***Side Sewer (private):*** A sewer, from a single user, not directly controlled or maintained by a public authority, which begins outside the outer face of a structure wall or foundation, conveying wastewater from the building drain to a public sewer or private sewer, including any tees, taps, wyes, etc. at the connection to the public sewer.

V. ***Side Sewer Stub:*** That portion of a side sewer which is constructed along with the sewer prior to direct connection to the premises to be served.

W. ***Domestic Strength Sewage:*** Wastewater which complies with specifications designated by the Public Works Director, Town Sewer Rates and Regulations or the Friday Harbor Municipal Code as not requiring special treatment, monitoring or additional handling prior to acceptance by the Wastewater Treatment Plant, considering chemical, physical and organic content, including but not limited to B.O.D., suspended solids, and Phosphorus. Domestic strength sewage is further defined in Chapter 13 of the Friday Harbor Municipal Code.

X. ***High Strength Sewage:*** Wastewater accepted for discharge into the Wastewater Treatment Plant, but which does not meet the criteria for acceptance as domestic strength sewage, whether because of special characteristics, special treatment requirements, special monitoring or additional handling as a condition of acceptance. High strength sewage is further defined in Chapter 13 of the Friday Harbor Municipal Code.

Y. ***Storm Water:*** That category of wastewater consisting of runoff occurring during or following any form of natural precipitation and resulting from such precipitation, including snow melt.

Z. ***Storm Sewer or Storm Drain***: A sewer which conveys storm water.

AA. ***Trunk Sewer:*** A sewer that receives many tributary branches and serves a large territory.

BB. ***Underdrain:*** A drain that carries away groundwater. Also, the drain laid below a sewer through wet ground to facilitate construction.

CC. ***Wastewater:*** "Wastewater" includes anything released into the Wastewater Treatment Plant and generally includes water-carried wastes from domestic, business or commercial, or manufacturing or industrial sources. Additionally, wastewater is divided into two general classes for purposes of rates and treatment requirements (as defined herein):

1. domestic strength sewage
2. high strength sewage

4.2 Public Sewers

Design of public sanitary sewers shall be in accordance with the Town of Friday Harbor Standard Drawings, Ecology's *Criteria for Sewage Works Design*, and the following design parameters.

A. Pipe Sizes

1. Minimum pipe size for public sewers shall be 8 inches. Pipe size shall be determined based on the following design criteria:
   a. Design population density shall be based on current or future zoning, potential zoning changes and/or site specific requirements.
   b. The design criteria in the latest edition of Ecology's Criteria for Sewage Works Design, Section C Sewer shall be used in sizing the sewer system.
   c. The Town may require the Applicant to complete a downstream analysis, to include all tributaries, to verify downstream capacity.

B. Materials and Products

1. Gravity Sewer pipe shall be PVC in accordance with ASTM D3034, SDR 35.

Gravity pipe with less than 2.5 feet of cover shall conform to AWWA Standard C900, DR14.

2. Fittings – All Pipe fittings shall be PVC with gasketed joints compatible with PVC pipe. The Town will accept PVC solvent joints.

3. Pipe Bedding Material – bedding for PVC Pipe shall consist of native or import material meeting the following gradation:

Sand Sieve Size	Percent Passing
3/4"	100
3/8”	70 – 100

No. 4	55 – 100
No. 10	35 – 95
No. 20	20 – 80
No. 40	10 – 55
No. 100	0 – 10
No. 200	0 – 3

Pipe Bedding for ductile iron pipe may be Bank Run Gravel for Trench Backfill as defined in WSDOT Standard Specification 9-03.

Bedding material shall be free of topsoil or organic matter.

C. Pipe Slopes

1. All public sewers shall be designed and constructed to give mean velocities, when flowing at a depth of 0.7 times the diameter, of not less than 2.0 feet per second (fps) for the anticipated total flow at build out of the area served by the pipe. The following minimum & desired slopes shall apply:

SANITARY SEWER SIZE (INCHES)	MIN. SLOPE (V = 2.0 FPS)(FEET PER 100')	MIN. DESIRED SLOPE (FEET PER 100')
8	0.40	0.52
10	0.28	0.36
12	0.22	0.29
15	0.15	0.20
18	0.12	0.16
21	0.10	0.13
24	0.08	0.10

2. Desired slopes are 1.3 times the minimums shown above, and should be used unless impractical, particularly at the start of lines. Desirable flow conditions shall always take precedence over upsizing a pipe to maintain a shallower grade.

3. Pipe slopes greater than 0.20 ft/ft shall include a stability analysis addressing the need for anchorage subject to approval of the Public Works Director.

D. Pipe Depth

1. The minimum side sewer pipe cover is 60 inches and the side sewer slope is 0.02 ft/ft, minimum.

2. Design depth shall provide for side sewer connections which pass under adjacent water mains. Pipe cover shall provide for frost protection and structural considerations.

E. Roughness Coefficient

1. A roughness coefficient n = 0.013 shall be used for all pipe.

F. Horizontal Alignment

1. Sanitary sewers shall generally be located 5 feet south or west of the centerline of the road or alley. Detectable metallic marking tape shall be installed at 1 foot directly over the pipe to mark the pipe location as per the Town of Friday Harbor standards.

2. The maximum distance between manholes shall be 300 feet on all straight sewer lines unless otherwise approved by the Director.

3. Curvilinear sewers are not allowed without approval of the Director.

G. Vertical Alignment

1. All sewers shall be laid with uniform slope between manholes. Pipe crowns shall be matched when upsizing, subject to the minimum drops specified below. Downsizing of pipes shall be allowed only on approval of the Director. When downsizing is approved, a decrease in diameter of only one pipe size smaller shall be allowed at a manhole, and the invert elevation of the smaller (downsized) pipe shall provide the required minimum drop through the manhole.

2. A minimum interior channel drop of 0.1 feet shall be required through all manholes. Maximum interior channel drops shall be 1.5'. "Drop Manholes" shall only be allowed with the approval of the Public Works Director.

H. Manholes

1. The following design parameters shall apply to manholes in public sewers:
   a. Steps shall be positioned over the shelf having the largest footing area.
   b. Manholes shall be placed at each change of alignment, grade or pipe size, and at the intersection of two or more sewer pipes 8 inches or larger.
   c. Manhole spacing requirements are detailed above in Section 4.2-F.
   d. Manhole channel drops shall be constructed as required in Section 4.2G2.
   e. No service shall directly enter a manhole. An exception would be made for end manholes that have no chance of being used to continue a main line. The Director's approval shall be required.

I. Connection to Existing Manholes

1. Where new sanitary sewer mains are to be connected to an existing manhole, and the existing manhole does not have a usable pipe stub for extension, the existing manhole shall be core drilled not higher than 0.2 feet over the invert elevation. A Kor-n-Seal boot is to be placed on the sewer line and the connection is to be sealed with non-shrink grout inside and outside of manhole. A representative of Friday Harbor's Wastewater Treatment Department must be on-site during a connection to an existing sewer. Notify the Wastewater Treatment Department two (2) business days in advance of the connection.

J. Temporary Manholes

1. Temporary manholes shall be placed on all extensions of sewer pipes. These manholes are not required to have poured channels and are removed when the line is extended.

K. Combined Sewers

1. Combined sanitary and storm sewers are prohibited. No surface, groundwater or roof drain may be connected to a public sanitary sewer.

L. Separation of Sewers and Other Utilities

1. Unless specified otherwise, a 10-foot horizontal separation and 18-inch separation must be maintained between all sanitary sewer mains and water mains in accordance with the most recent edition of the Washington State Department of Ecology's Criteria for Sewage Works Design. See the Town's Standard Drawing W-1: Pipeline Separation.

M. Easements

1. Sewer easements shall be a minimum of 20-feet wide unless otherwise approved by the Director. Additional width may be required for deep sewers. Easements are required for all public sewer lines outside the public right-of-way. Easements must be recorded with San Juan County Auditor's Office on a final plat or a separate recorded document prior to approval of a final plat.

4.3 Side Sewers

This section provides recommended design guidelines pertaining specifically to sanitary side sewers. Connection of storm drains, roof drains, underdrains or any other type of surface or ground water collection facility to a side sewer is expressly prohibited.

A. Pipe Size and Alignment

1. Side sewer stubs from the sewer main to the right-of-way/property line shall be a minimum of 6-inches. From the right of way/property line to the building shall be a minimum of 4-inch diameter for single family residences and 6-inch diameter for all other uses. Side sewers shall be installed from the public main to the right of way or a point 10 feet behind any existing or future sidewalk or curb, whichever is greater. Side sewer connections to the public main shall be done in accordance with the Standard Drawings.

2. The building drain shall extend at least 2 feet beyond the wall of the building served. Side sewers shall drain away from the building with a minimum slope of 0.02 ft/ft (1/4 inch per foot). Vertical and horizontal curves are not recommended.

3. PVC side sewer tees shall meet ASTM D3034, SDR 26.

4. Location: Preferably double service at lot lines. Use alternate lot line from water service location. If water and sewer service are at the same lot line, keep a 10-foot separation.

B. Pipe Depth

1. All side sewers should have at least 3.5 feet of cover unless approved by the Director. Frost protection via pipe cover or insulation shall be considered in all designs.

C. Connection to Manholes and Catch Basins

1. No catch basin or surface drain may be connected to a side sewer or sewer main.

Storm drainage and sanitary sewage shall not be combined in a single sewer on private property.

D. Connection to Public Sewer Main

1. Connection to Existing Sewer Line: Where connection of new sewer main to the existing system is made between manholes, install a new standard manhole on the existing main. Service must be maintained for users above the connection. The channeling of the new manhole may be accomplished by cutting off the top half of the pipe through the manhole and constructing the channel around it in accordance with the Standard Plans. This method is subject to Town approval after examination of the existing pipe.

2. Sewer connection permits will be issued by the Land Use Department. Side sewer connections shall be in accordance with the Standard Drawings. Side sewers shall not connect directly to a manhole (see 4.2 H 1 e for exception). All connections shall be coordinated with the Public Works Department. The applicant's contractor shall perform all taps to existing sewer mains. The connection shall be observed by the Public Works Department. Notify the Public Works Department 2 business days in advance of the connection.

E. Cleanouts

1. Surface cleanouts are required at the right of way line and building connections. Cleanouts shall be provided every 100 feet and at every angle point 45 degrees or greater. Cleanouts shall only be allowed on side sewers 6 inches or less in diameter. Manholes shall be installed on all side sewers 8 inches and larger. All cleanout shall be installed per the Standard Drawings.

F. Cleaning Sewer Lines

Clean all sewer lines in a manner acceptable to the Town. Methods may include flushing, rodding, or forcing an inflatable ball through the pipe. Remove all debris so that none is flushed into the existing sewer system.

G. Sewer Leakage Testing

Leakage testing shall be by air testing, infiltration testing or exfiltration testing. The Developer is responsible for determining the groundwater level to the Town's satisfaction. The selected test shall be conducted as follows:

1. Air Testing: Test pressure shall be 3.5 psi over the groundwater head at the mid-point of the test section. The time for the pressure to drop 0.5 psi to 3.0 psi shall be greater than the following:

Pipe Size	Seconds per Linear Foot of Pipe
6-inch	0.25
8-inch	0.46
10-inch	0.72

2. Infiltration: This method is acceptable only when groundwater level is above the top of all pipe in the test section. Provide acceptable method of measuring infiltration flow. Test for one hour minimum. Maximum infiltration shall not exceed the following rates:

Allowable Leakage per 100 Feet of Pipe in Gallons/Hour

Pipe Size	Groundwater Head Over Pipe at Upper End				
	2-ft	4-ft	6-ft	8-ft	11-ft
6-inch	1.0	1.4	1.7	2.0	2.2
8-inch	1.3	1.8	2.2	2.6	2.9
10-inch	1.6	2.3	2.7	3.2	3.6

3. Exfiltration: Fill pipe to 6 feet over the crown of the pipe at the high end of the test section or to 6 feet over the groundwater level. Do not exceed 16 feet of head at the low end of the test section. Test for one hour minimum. Maximum exfiltration shall not exceed the following rates:

Pipe Size	Exfiltration Rate per 100 Feet of Pipe in Gallons/Hour
6-inch	1.7
8-inch	2.2
10-inch	2.7

4.4 Private Sewers

A. All private sewer systems connecting to the public system must meet all Town Standards and testing requirements.

4.5 Marking Tape

A. All Public and Private sanitary sewer mains and services shall be installed with detectable continuous marking tape installed one foot above the pipe. The marker shall be detectable metallic tape labeled “SEWER” and shall be furnished by the contractor.

4.6 Testing and Inspections

A. Inspection of the work by the Town and its authorized agents shall be strictly for the benefit of the Town and nothing contained herein shall be construed to relieve the Developer of his obligations.

1. The Town shall at all times have access to the work for the purpose of inspecting and testing. The Developer shall provide proper facilities for such access and for such inspection and testing. Testing of all public and private sanitary sewer manholes and piping shall be conducted after backfilling operations have been completed. All tests shall be coordinated with the Public Works Department and shall be witnessed by a Town representative. In all cases, the Contractor shall furnish all labor, materials, and equipment to make the required tests and shall bear the full cost of the required test. The Town will determine the amount of inspection time necessary to ensure compliance with the plans and specifications. In the event that test results do not conform to the accepted standards, the Contractor, at the Contractor’s expense, shall correct all deficiencies and retest until they conform to the testing requirements. Notify the Public Works Department 2 business days in advance of the testing.

2. If any work should be covered up without approval or consent of the Town, it must be uncovered for inspection at the Developer's expense.

3. The Developer shall make reasonable tests of the work at the Developer's expense upon the Town's request and shall maintain a record of such tests.

4. For a performance test to be observed by the Town, the Developer shall make whatever preliminary tests are necessary to assure that the material and/or equipment are in accordance with the specifications.

B. Low Pressure Air Test

1. All new sanitary sewer mains and service lines shall be pressure tested using the low pressure test methods outlined in the most recent edition of the WSDOT Standard Specifications for Road, Bridge and Municipal Construction.

C. Deflection Test (Mandrel)

1. Deflection testing for PVC pipe shall may be required. Testing shall be completed in accordance with the most recent edition of the WSDOT Standard Specifications for Road, Bridge and Municipal Construction, Section 7-17.3(2)G.

D. Television Inspection

1. All new sewer lines 6 inches and larger shall be inspected by the use of a television camera before final acceptance. The Contractor shall bear all costs associated with the initial inspection and any additional television inspections required after any deficiencies have been repaired. Any bellies exceeding 1/4 inch is considered a deficiency.

F. In cases where groundwater is present in sufficient quantities, infiltration tests may be required by the Director.

4.7 General Notes (Sanitary Sewer)

A. The General Notes, provided on Standard Dwg. S-0, shall be included on any plans that provide for the installation of the sewer system.

Section 5
Sewage Pump Stations

5.0 SEWAGE PUMP STATIONS

This section presents design and construction guidance of private and public sewage pump stations. The design and construction of sewage pump stations shall confirm to the Washington State Department of Ecology's *Criteria for Sewage Works Design*, latest edition, and these Standards.

5.1 Definitions

A. ***Air/Vacuum Release Valve:*** An air valve placed at the high points of a pipeline to release the air automatically and prevent the pipeline from becoming air-bound with a resultant increased head loss. The valve will also allow air into a pipeline in the event of a vacuum condition caused by a main break or surge event.

B. ***Average Design Flow:*** The average daily flow of the maximum month.

C. ***Backflow Prevention Device:*** Any effective device, method or construction used to prevent backflow into a potable water system.

D. ***Bar Screen:*** A rack composed of parallel bars, either vertical or inclined, placed in a waterway to catch debris.

E. ***Centrifugal Pump:*** A pump consisting of an impeller fixed on a rotating shaft and enclosed in a casing and having an inlet and a discharge connection. The rotating impeller creates pressure in the liquid by the velocity derived from centrifugal force.

F. ***Datum Reference:*** Point for all readings for suction lift, suction head, total discharge head (TDH) and net positive suction head (NPSH). For horizontal shaft pumps, the datum elevation is the pump centerline. For vertical shaft pumps, the datum elevation is the elevation of the entrance eye of the suction impeller.

G. ***Force Main:*** A pipeline that conveys wastewater under pressure from the discharge side of a pump to a discharge point.

H. ***Impeller:*** A rotating set of vanes designed to impel rotation of a mass of fluid.

I. ***Net Positive Suction Head (NPSH):*** The total suction head, in feet of liquid absolute, determined at the suction nozzle, less the vapor pressure of the liquid in feet absolute.

J. ***Peak Design Flow:*** The largest estimated flow rate sustained over a 60-minute period in the design year of the pump station.

K. ***Pump Station:*** A pump station that pumps wastewater to a higher elevation when the continuance of the sewer at reasonable slopes would involve excessive depths of trench (depths where repair or replacement would require special or costly construction techniques).

L. ***Static Head:*** The difference in suction and discharge water levels, does not include dynamic losses.

M. ***Submersible Pump:*** A pump that is designed to be submersible and is placed in a pit that needs pumping out. Submersible pumps push fluid to the surface.

N. ***Suction Head:*** Suction head exists when the total suction head is above atmospheric pressure. As determined on test, it is the reading of the gage at the suction of the pump converted to feet of liquid and referred to datum, plus the velocity head at the point of gage attachment.

O. ***Suction Lift:*** Suction lift exists when the total suction head is below atmospheric pressure. Total suction lift, as determined on test, is the reading of a liquid manometer at the suction nozzle of the pump converted to feet of liquid and referred to datum, minus the velocity head at the point of gage attachment.

P. ***Sump:*** A tank or pit that receives wastewater and stored is temporarily, and from which the wastewater is pumped or ejected.

Q. ***Total Discharge Head:*** The reading of a pressure gage at the discharge of the pump, when the pump is in operation, converted to feet of liquid and referred to datum, plus the velocity head at the point of gage attachment.

R. ***Total Dynamic Head (TDH):*** Also called "total head." TDH is the measure of energy increase per pound of the liquid imparted to it by the pump. Where suction lift exists, TDH is equal to the sum of the total discharge head and total suction lift, and, where positive suction head exists, TDH is the total discharge head minus the total suction head.

S. ***Velocity Head:*** The theoretical vertical height to which a liquid body may be raised by its kinetic energy. It is equal to the square of the velocity divided by twice the acceleration due to gravity (v2/2g).

T. ***Water Hammer:*** The phenomenon of oscillations in the pressure of water about its normal pressure in a closed conduit, flowing full, that results from a too-rapid acceleration or retardation of flow. Momentary pressure greatly in excess of the normal static pressure may be produced in a closed conduit by this phenomenon.

U. ***Wet Well:*** A compartment in which wastewater is collected, and; (a) to which the suction pipe of a pump is connected, or (b) in which a submersible pump is installed.

5.2 General Requirements

A. Justification for any proposed pump station is required which clearly exhibits that gravity lines are not available and not economically feasible.

B. The number of pump stations for each basin shall be optimized.

C. Sewage pumping stations and force mains are to be provided solely for the conveyance of sanitary wastes. Under no circumstances shall any roof, foundation, surface or subsurface drainage, or any other form of storm drainage be allowed to pass through the proposed facilities.

D. Private grinder pumps are only permitted under special circumstances when no other means of sewer service is available. In general, gravity sewer shall be deepened to eliminate the need for grinder pumps. Use of private grinder pumps requires approval by the Town and will be evaluated on a case-by-case basis. Applicant will need to demonstrate that there is no other feasible means of servicing lot/lots for acceptance.

E. Private pump stations shall not serve more than one property. Private pump stations are only allowed where gravity sewer exists adjacent to a property, but is not deep enough to serve all of the property. Private pump stations may be allowed where an existing condition could present a health hazard. Private pump stations shall be a Liberty packaged grinder pump. The Town may approve other domestically made packaged grinder stations with parts and service that are readily available. Submit product information for the specific unit being proposed to the Town for review and approval.

F. Private and public pump stations must meet established minimum standards provided herein. Public pump stations will only be approved on a case-by-case basis. Only public pump stations will be maintained and operated by the Town.

G. A pump station serving multiple parcels in a new development created by a short plat shall be dedicated to the Town and deemed public. Such pump stations shall be a Liberty grinder pump packages of appropriate size.

H. All pump stations serving parcels of a new development created by long plat or master planned commercial development shall be dedicated to the Town and deemed a public pump station. Each shall be site built pump stations specifically designed for the application meeting the Town requirements stated herein.

I. Due consideration shall be given to the selection of all materials used in the construction of sewage pump stations, because of the presence of hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in sewage.

5.3 Minimal Pump Station Design Requirements

A. The Project Engineer shall submit all supporting documentation, in report form, including all relevant design information needed to justify the need for the pump station and for the Town to review for adequacy of the proposed design. The design of any pump station shall conform to Washington State Department of Ecology's latest edition and applicable standards as set forth herein. The design report shall be submitted with each pump station and shall demonstrate its conformance with the Standards as outlined herein. The report is to be stamped by an engineer, licensed in the State of Washington. At a minimum the following shall be submitted.

1. The pump station design must have a minimum of two pumps
2. Design flow analysis (break down of phases if applicable) including peak sewage flow calculations.
3. All relevant elevations, such as; pump(s) off, discharge elevation, pumps(s) on, alarm elevation, max allowable storage elevation, etc. Maximum static head
5. Force main size and length
6. Pump station capacity (gpm) per each pump and multiple pumps
7. Velocity within force main
8. System head and pump curves (including compound pump curves when applicable)
9. "C" values (Hazen Williams coefficient) for force mains
10. Friction head loss (calculations)
11. Velocity head
12. Total dynamic head
13. Pump time/cycle and number of cycles per day
14. Storage available and storage required during a power outage scenario (min and max time)
15. Discussion of odor control
16. Water hammer calculations
17. Buoyancy calculations (if there is potential for high groundwater)
18. Pump station specifications (generator specifications if applicable)
19. Pump(s) specifications
20. System back up plan (i.e. storage method, alternate power source)
21. Maintenance Agreement (for private storage)

22. Wiring Schematic in addition it shall be the Project Engineer's responsibility to make all technical submittals to Washington Department of Ecology and obtain Ecology project approvals.

5.4 System Head and Pump Curves

A. System head curves with over laid selected pump curves shall be provided in each engineering design report. Data points for the system capacity curve shall be provided in tabular form and graphed with pump head capacity curve on the same axis. System capacity curves shall be plotted using the Hazen Williams coefficient values of C=100 and C=130.

B. Pump output in gpm at maximum and minimum head shall be clearly shown on system curves for each pump and combination of pumps.

C. For stations with two or more pumps operating in parallel, multiple and single operation points shall be plotted on the system head curve.

D. Pumps with the best efficiencies at all operating points shall be chosen.

E. If a station is equipped with smaller impellers during start-up to handle lower than design flows, impellers sized to handle the design flow shall also be provided.

F. Pump systems shall meet the peak flow criteria with the largest pump out of service.

5.5 Site Selection and Plan

A. Location

1. A pump station site shall be selected to serve the entire basin, considering ultimate build-out of the basin.

2. In selecting a pump station site, consideration shall be given to minimizing its aesthetic, noise, and odor nuisance potential. A buffer zone between the pump station and its surrounding environment shall be provided. Buffer zones shall be designed to allow the pump station to blend into the surrounding environment and provide noise mitigation.

3. The pump station site shall be readily accessible by maintenance vehicles during all weather conditions. The facility should be located off the traveled way of streets and alleys. The grading and hardscape immediately adjacent the pump station structure shall allow direct truck access for removal and replacement of pumps by truck mounted hoist.

4. The pump station site shall be large enough for all equipment and have sufficient parking for maintenance vehicles. The minimum pump station site shall be .25 acre.

5.6 Security/Equipment Protection

A. The pump station structures, electrical and mechanical equipment shall be designed to sustain no physical damage by the 100-year flood. The station should remain fully operational and accessible during the 25-year flood.

5.7 Design Documentation and General Requirements Standards

A. All sewage pump stations shall be submersible pump stations. Suction lift, screw type or pneumatic ejector are not allowed.

B. The design of any pump station shall conform to these Standards, Department of Ecology's *Criteria of Sewage Works Design* and applicable standards as set forth herein. In addition, the plans shall include the following;

C. An overall site drawing of the pump station showing the location of all components including elevations;

D. Electrical service size, voltage, and enclosure type and location in relation to the pump station;

E. A list of specific materials used including quantity description and manufacturer name;

F. A schematic and line diagram of the service and motor control center and pump station;

G. The electrical and control systems shall be designed to meet state and local electrical code requirements;

H. An operation and maintenance manual from the pump station contractor shall be supplied;

I. Pump operation, alarms, and electrical inspection of all pump stations is required.

J. Pumping Rate and Number of Units

1. At least two pump units shall be provided, each capable of handling the expected peak design flow.

2. Where three or more units are provided, they shall be designed to fit actual flow conditions and must be of such capacity that with any one unit out of service, the remaining units will have the capacity to handle the peak design flow.

3. When the station is expected to operate at a flow rate less than 0.5 times the average design flow for an extended period of time, the design shall address measures taken to prevent septicity due to long holding times in the wet well.

K. Grit and Clogging Protection

1. Where it may be necessary to pump sewage prior to grit removal, the design of the wet well should receive special attention, and the discharge piping should be designed to prevent grit settling in pump discharge lines of pumps not operating.

L. Pumping Units

1. Type of Pumps: See Section 5.9 Submersible Lift Stations.

2. Priming: Pumps shall be so placed that under normal operating conditions they will operate under a positive suction head.

3. Operation Controls: Provisions should be made to automatically alternate the pumps in use. Pump station controls shall be above grade and should be equipped with a secure external disconnect switch. The motors and controls shall be securely housed to the satisfaction of Public Works.

M. Flow Measurement

1. A magnetic flow meter for measuring sewage flow shall be provided at all pumping stations. Provide a separate vault for the flow meter. Vault shall meet requirements of NFPA 820.

N. Bypasses

1. Provisions may be made for controlled bypasses, if necessary to avoid excessive property or equipment damage. The controlled bypass shall be manually operation valve or plate covering the bypass discharge, and shall act as a pump connection port.

O. Alarm System

1. An alarm system shall be provided for all public and private pumping stations. Public lift stations shall facilitate a telemetry alarm to 24-hour monitoring stations or telephone alarms to Town personnel. And the Town's SCADA system. For private lift stations when telemetry is not used, an audio-visual device should be installed for external observation.

2. Alarms for high wet well, low wet well, and power failure shall be provided, as a minimum, for all pump stations. Alarms signalizing pumps and other component failures or malfunctions may also be required.

3. A backup power supply, such as a battery pack with automatic switchover features, shall be provided for the alarm system, such that a failure of the primary power source will not disable the alarm system. Test circuits shall be provided to enable the alarm system to be tested and verified as in good working order.

P. Materials Considerations

1. Consideration shall be given to the presence of hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in sewage. With the exception of the pumps, pipe and wiring, metal materials located in areas subject to such conditions shall be stainless steel (guide rails, fasteners, cable, etc.)

Q. Electrical Equipment

1. Electrical systems and components (e.g., motors, light, cables, conduits, switchboxes, control circuits) in enclosed or partially enclosed spaces where flammable mixtures occasionally may be present (including raw sewage wet wells) shall comply with the National Electrical Code and NFPA requirements for Class 1 Division 1 locations.

R. Electrical Control Panel

1. The electrical control panel for public and private lift stations shall be located in a control enclosure, cabinet or building designed to blend aesthetically with the surroundings. The electrical control panel for the public lift stations shall be provided with the minimum following items:
   a. An Allen Bradley PLC Supporting alarm outputs and SCADA access, compatible with the Town's existing system
   b. Wet well level sensor system
   c. Hand-off-automatic selector switch, each pump

d. Lag, lead and automatic pump selector switch
e. Elapse time indicator, each pump
f. Ammeter, each pump
g. Run indicator lights, each pump
h. Pilot light indicator for each and every alarm, automatic shut-down and running condition
i. Alarm reset and test button
j. Outside mounted red alarm light
k. 110 volt convenience outlet
l. Control power available indicator light
m. Alarm system per Section 5.8 O
n. Alarm horn

S. Service Wiring

1. Underground wiring shall be provided between the pump station and nearest power pole or pad mounted transformer (sectionalizer) if underground power is available.

T. Telemetry

1. Town will provide, at the applicant/subcontractor's expense, telemetry equipment for contractor's installation.

U. Lighting

1. Adequate interior and exterior lighting for the entire pump station shall be provided. Explosion proof is generally required.

V. Water Supply

1. There shall be no physical connection between any potable water supply and a sewage pumping station which under any conditions might cause contamination of the potable water supply. Potable water supply brought to the station shall comply with conditions stipulated in the Washington State Department of Health's Criteria for Accepted Cross Connection Control Assemblies. A minimum 1 inch water line with a reduced pressure backflow assembly, with a hot box enclosure, shall be installed near the pump station for station cleaning purposes. The water service line shall be provided with a frost-free hydrant, hose, rack and nozzle for pump station wash down.

W. Pump and Motor Removal

1. Provisions shall be made to facilitate removing pumps, motors, and other equipment, without interruption of system service.

X. Access

1. Suitable and safe means of access should be provided to equipment requiring inspection or maintenance. All permanent pump stations shall be provided with lockable hatches.

Y. Valves and Piping (Site-Built Stations)

1. Shutoff valves shall be placed on discharge lines of each pump in the valve vault (as applicable) for normal pump isolation. A check valve shall be placed on each

discharge line, between the shutoff valve and the pump. Pump suction and discharge piping should not be less than 4 inches in diameter except where design of special equipment allows.

a. Check valves. Check valves used on pump stations shall have adjustable tension levers and spring. It shall have a working pressure of 150 psi. Valves shall be designed for use with corrosive fluids. A check valve shall be installed in a valve vault located adjacent to the pump station's wet well. Check valves shall conform to AWWA standards. Valves shall be mounted horizontally where space permits. Suitable shutoff and check valves shall be placed on the discharge line of each pump in a wet pit pump station configuration. The check valve shall be located between the shutoff valve and the pump, and shall not be placed on the vertical portion of discharge piping. The seats of all check valves shall be removable without removing the valve itself. Suitable rising stem shutoff valves shall be placed on the discharge of each pump in a wet pit pump station configuration.
b. Valve box lids may be used for isolation valves on a force main. Valve box lids shall be specified to be marked with "SEWER" so they can quickly be distinguished from valves in the water system.
c. All station shall be 4-inch flanged ductile iron. Flexible coupling shall be used on all pump discharges. Other couplings shall be used to provide flexibility in re-assembling piping.

Z. Odor Control and Ventilation

1. The effect of odor on adjacent land use and workers shall be assessed. Every effort shall be made in site selection to reduce potential odor pollution. Wind direction, duration and intensity are all important considerations that must be evaluated.

2. Odor control shall be provided if there is no station inflow for 6 hours or, if the wet well (wet pit) detention time exceeds 6 hours.

5.8 Submersible Pump Station Requirements

A. All Town of Friday Harbor sewage pump stations shall be of the submersible pump type. Submersible pump stations shall meet the following requirements:

1. The pump and motor shall be designed and built to operate continuously while the motor casing is fully exposed above the sewage level.

2. Pumps shall be rail mounted with a quick connect discharge connection.

3. The pump shall be easily removable for inspection or service, requiring no bolt, nuts, or other fastening to be disconnected.

4. Each pump shall have both thermal and moisture sensors with automatic alarms.

5. A valve vault shall be provided outside of the wet well and shall house all check valves and shut-off valves.

6. Each pump shall be fitted with a galvanized pump lifting chain or stainless steel cable.

7. An access hatch shall be placed directly over each pump for pump liftout.

8. The pump power cables and control cables shall utilize the quick release connection currently in use on other Town pump stations.

9. Pump electrical controls and telemetry shall be enclosed in a wood enclosure of minimum size and designed to be in-obtrusive. All electrical components shall be installed in NEMA 4X rated electrical enclosures.

B. Type of Pumps

1. Pumps shall be specifically for municipal unscreened raw sewage application and shall be Vaughn chopper submersible sewage pumps. The capacity of the pump station must be sufficient to pump peak flows with the largest pump out of service. Pumps serving four or less lots shall be a Liberty packaged grinder pump station.

C. Pump Removal

1. Submersible pumps shall be readily removable and replaceable without dewatering the wet well or requiring personnel to enter the wet well. Continuity of operation and other units shall be maintained.

D. Controls

1. The control panel shall be located outside the wet well and suitably protected from weather, humidity, and vandalism.

E. Valves

1. All control valves on the discharge line for each pump shall be placed in a convenient location outside the wet well in a separate vault and be suitably protected from weather and vandalism.

F. Submergence

1. Positive provision, such as backup controls, shall be made to assure submergence of the pumping units.

G. Wet Wells

1. Wet wells shall be considered a hazardous environment. Wet wells shall be designed and constructed to be as hazard free as possible, and corrosion-resistant materials shall be used throughout. No junction boxes shall be installed in the wet well. Float cables and/or pressure transducers shall be placed in a covered chase that shall extend from the control panel to the wet well. The chase shall include a removable cover for ease of service.

2. All structural supports, fasteners and miscellaneous metals shall be 316SS. All ductile iron piping shall be coated, and all concrete shall be coated with Raven 405 system.

H. Wet Well Structures

1. Whenever practical sewage pump station wet wells shall be constructed of precast reinforced concrete or reinforced fiberglass and shall be circular. Wet wells that are installed below the groundwater table shall be adequately designed to prevent flotation without the use of hydrostatic pressure relief valves. Wet well size and depth shall be as required to accommodate the influent sewer, provide

for adequate pump suction pipe or pump submergence as recommended by the pump manufacture and to provide adequate volume to prevent the excessive cycling of pumps. Partitioning the wet well to help accommodate future growth requirements is allowed, however, the design of any partition must be approved by the Town.

2. The required wet well working volume shall be calculated to optimize pump operation to meet peak hour flow and minimum hour flow. The design engineer shall consider the diurnal nature of wastewater flow as well as the pump manufacturer's recommendations regarding pump start frequency when determining the wet well volume. Every effort shall be made to prevent wastewater in the wet well from becoming septic. The wet well shall contain adequate vertical room for level sensing adjustments above and below the design levels.

3. Primary high water alarm shall be set below the wet well influent invert. A redundant high water alarm float shall be installed above the primary high water alarm

4. Minimum inside width shall be 6 feet, however, retention time, pump configuration and access may require a larger structure.

5. Wet well access shall be through a top slab opening with a lockable aluminum hatch cover and frame. The top slab access hatch shall be sufficiently large to remove all equipment from the wet well, but in no case smaller than 36 by 36 inches. All access hatches shall be torsion assisted and all components shall be non-corrosive. Removable safety railings or grates shall be provided around the access hatch in accordance with OSHA regulations.

6. Wet well shall have sloping sides to form a hopper at the bottom of the wet well. Slopes shall be approximately 1 horizontal to 1 vertical. Square corners shall be avoided. The flat portion of the wet well floor shall be minimized.

7. Wet liquid levels shall be controlled by pressure transducers, ultra sonic, and a high level float.

5.9 Reliability and Power Supply

A. The objective of reliability is to prevent the discharge of raw or partially treated sewage to any waters and to protect public health by preventing backup of sewage and subsequent discharge to basements, streets, and other public and private property.

B. Public pump stations shall be designed to operate on 3-phase power supply. Voltage shall not exceed 480V. Consult with OPALCO for available voltages. Electrical system and components (e.g., motors, lights, cables, conduits, switch boxes, control circuits, etc.) in raw sewage wet wells/wet pits, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the NFPA 820 and National Electrical Code requirements for Class 1, Group D, Division 1 locations. In addition, electrical equipment located in the wet wells/wet pit shall be suitable for use under corrosive conditions. Each flexible cable shall be provided with separate strain relief. When such equipment is exposed to weather, it shall meet the minimum requirements of weatherproof equipment (NEMA 3R) and be located in a water resistant maintenance environment.

5.10 Emergency Power Supply

A. Provisions shall be provided to accommodate station inflow in the event of a power outage. This may be affected by (a) including an emergency power supply, or (b) construction of emergency storage. All public stations except small STEP areas shall have an emergency backup power supply.

B. Emergency Power

1. Provisions for an emergency power supply shall be made either through connection of the station to at least two independent public utility sources, or through installation of in-place internal combustion generation equipment.

C. Emergency Storage

1. Where storage is to be provided in lieu of an emergency power supply, wet well/wet pit capacity above the high level alarm should be sufficient to hold the peak flow expected during the areas maximum historic power outage but not less than twenty four hours.

5.11 Auxiliary Generating Equipment

The Town will determine on a case-by-case basis, considering time and risk of environmental violation, whether a permanent backup generator will be required. If the Town requires a permanent backup generator it shall conform to the requirements below.

A. Engine/Equipment Protection

1. The engine must be protected from operating conditions that would result in damage. Protective equipment shall be capable of shutting down the engine and activating an alarm on site. Protective equipment shall monitor for conditions of low oil pressure and overheating. Emergency equipment shall be protected from damage at the restoration of regular electrical power

2. Engine block heaters are required on water cooled units.

B. Fuel

1. Only diesel fuel generators shall be provided. Fuel storage is required to supply a minimum of 12 hours of operation at maximum design load. No buried tanks will be allowed.

C. Engine Ventilation

1. The engine shall be located above grade with adequate ventilation of fuel vapors and exhaust gases.

D. Routine Startup

1. All emergency power generating equipment shall be exercised frequently and duration shall be user programmable.

E. Engine-Driven Generating Equipment

1. The engine-generator unit size shall be adequate to provide power for pump motor starting current and for lighting, ventilation, and other auxiliary equipment necessary for safety and proper operation of the pump station. Provisions shall be made for automatic and manual start-up and load transfer. The generator

must be protected from operating conditions that would result in damage to equipment. Provisions should be considered to allow the engine to start and stabilize at operating speed before assuming the load.

F. Noise Requirement

1. Generator shall be installed with the manufacturer's highest rated sound attenuated generator enclosure. The generator with the sound attenuated enclosure shall meet the requirements of WAC 173-60.

5.12 Force Mains

A. Public force mains shall be high density polyethylene (HDPE) with a minimum diameter of 4 inches. Private force mains can be smaller diameter. Force main pipe within the pump station shall be flanged ductile iron. Alternate pipe materials will be considered in unusual terrain.

B. Minimum depth of cover for force mains shall be 3.5 feet for frost protection. Furnish locate wire (12 gauge min.) attached to the top of pipe and caution tape between pipe zone backfill and subsequent backfill.

C. Force mains shall be sized so that the velocity is between 2.5 and 6.0 feet per second. For interim design flows, force main velocity may be as low as 2.0 feet per second.

D. Velocity should not exceed 8.0 feet per second.

E. The following flow rates define various pipe capacities.

Force Main Diameter (Inches)	Min. Flow (gpm) (V=2.5 FPS)	Max. Flow (gpm) (V=8.0 FPS)
4	100	300
6	220	700
8	390	1,250
10	610	1,960
12	880	2,820

F. Force mains shall be design and tested to withstand twice the operating pressures expected for a minimum of 30 minutes. (Check water hammer). The minimum allowable test pressure shall be 100 psi. The test method shall be as prescribed for water mains.

G. Force mains shall always terminate in a discharge manhole and then gravity flow through a gravity line into the main sewer system. The force main should never be designed to allow gravity drainage of the force main itself; this means there shall always be an up-grade slope on the force main leading into the discharge manhole.

H. The maximum time required to flush the force main shall be calculated on the basis of minimum flow.

I. Force mains having steep sections (over 33%) must be designed to discharge the volume contained in that section plus 100 additional feet during each pump cycle.

J. Odor control shall be provided for the force main if the wet well plus the force main flush time exceeds 480 minutes.

K. The use of air release valves shall be restricted to installations where, in the opinion of the Engineer, there is no possible alternative. Air release valves, when permitted, shall

be located at localized high points along the force main, shall be of a type suitable for sewage service and shall be located in a manhole for purposes of maintenance.

L. Calculations showing maximum pressures within the force main, which would occur upon total power failure while pumping, shall be provided.

M. Force mains thrust restraint and backfill shall be as required for water mains, including installation of detectable warning tape (as per Section 4.5) and 10-gauge single strand copper wire attached to pipe.

N. A connection point for portable pumping equipment during emergencies (snorkel connection) shall be provided.

Section 6
Stormwater Management

6.0 STORMWATER MANAGEMENT

This section provides minimum design and construction guidance for stormwater management facilities to include erosion and sedimentation control, stormwater conveyance, stormwater quality and treatment, and control of stormwater quantity.

The criteria in this section apply to privately owned and publicly owned stormwater facilities.

6.1 Criteria

A. All design and construction of erosion and sedimentation control facilities, stormwater quality and treatment infrastructure, infrastructure to control stormwater quantity, and low impact development (LID) elements shall comply with the Washington State Department of Ecology's *Stormwater Management Manual for Western Washington*, dated July 2019 (Ecology Manual).

B. All design and construction of stormwater conveyance systems shall comply with King County's Surface Water Design Manual, dated 2021, and these Standards. The conveyance system shall be designed to fully contain the 25-year storm event with no surcharging, and to pass the 100-year storm event with no overflow or property damage. Closed conveyance system elements shall be designed to operate in an open flow, not pressure flow regime, for the 25-year design storm.

C. A downstream analysis shall be required for any project that does not provide detention facilities that limit flow off the site to pre-development conditions.

D. Projects that disturb more than one acre shall apply for and comply with the NPDES Construction Stormwater Permit, issued by the Department of Ecology.

E. Stormwater shall not be discharged to sanitary sewer pipes.

F. Stormwater generated within the proposed or existing public right-of-way shall be discharged to public facilities; it shall not be discharged to private property.

6.2 Documentation

A. The applicant shall submit a Stormwater Worksheet for each building and land use development permit (Attachment 6.1)

B. A Stormwater Site Plan, in accordance with the Ecology Manual, and storm drainage plans, stamped by a Washington State licensed engineer, shall be submitted to the Town for review unless the project is exempt from this requirement. Projects that are exempt from this requirement shall have less than 500 square feet of new plus replaced surface and the land disturbing activity is less than 5,000 square feet (See Attachment 6.1). If claiming an exemption, the applicant shall identify the applicable exemption(s) and explain how the project is eligible for the exemption(s).

C. A Stormwater Pollution Prevention Plan (SWPPP) shall be submitted to the Town for review and approval prior to any land disturbing activity. If the new plus replaced hard surface is less than 500 square feet and the land disturbing activity is less than 5,000 sf a SWPPP is not required. However, the applicant shall submit Small Project Certification (Attachment 6.2) to the Town.

6.3 Conveyance Pipe

A. Material

1. All storm sewer pipe installed in the Town shall be corrugated polyethylene pipe (CPEP) unless specifically approved otherwise by the Town. Any pipe with less than 24 inches of cover and installed in a load bearing zone shall be ductile iron. Pipe shall meet the following requirements:
   a. Corrugated polyethylene pipe CPEP up to 10-inch diameter pipe and fittings shall meet the requirements of AASHTO M252 Type S. Corrugated polyethylene pipe 12-inch to 60-inch diameter pipe and fittings shall meet the requirements of AASHTO M294 Type S. All joints for CPEP pipe shall be made with a bell/bell or bell/spigot coupling and shall conform to ASTM D3212 using elastomeric gaskets conforming to ASTM F477. All gaskets shall be factory installed on the pipe in accordance with the manufacturer's recommendations. Fittings shall be blow molded, rotational molded or factory welded.
   b. Ductile Iron, Class 50 shall conform to ANSI A 21.51 or AWWA C151 and shall be cement mortar lined. Non-restrained joints shall be rubber gasket type, push on type, or mechanical type and shall meet the requirements of AWWA C111. Cast iron fittings may be used with ductile iron pipe.
   c. PVC pipe SDR 35, Solid Wall (if approved by the Town) – 4-inch to 15-inch shall conform to ASTM D 3034 SDR 35 and 18-inch to 48-inch shall conform to ASTM F679. Joints for Solid Wall PVC pipe shall conform to ASTM D 3211 using elastomeric gaskets conforming to ASTM F477. Fittings for Solid Wall PVC pipe shall be injection molded, factory welded, or factory solvent cemented.
2. Stormwater pipe laid 16 feet and deeper shall be cement lined, ductile iron pipe, Class 50 unless otherwise approved by the Town.

B. Sizing

1. Size of the required pipe will be based on Manning's Equation with the following minimum slopes:

Pipe Diameter	Slope (min)
6"	.02 ft/ft
8"	.005 ft/ft
12" and larger	.002 ft/ft

Minimum velocity at full flow shall be 3 ft/second. If site constraints result in velocities less than 3 feet per second at full flow, impacts from sedimentation in the pipe system shall be addressed with larger pipes, closer spacing of structures, sediment basins, or other similar measures.

2. The minimum pipe diameter size for the listed pipe type shall be as follows:
   a. Main Line 12"
   b. Curb Inlet Crossing/lateral 12"
   c. Side Service 6"
   d. Perforated Drain line 4"
   e. Retaining Wall Drain 6"

The Town may, at its discretion, require the installation of a larger sized main if it is determined that a larger size would be necessary to serve adjacent areas or provide future service.

3. Downstream pipe shall be the same size or larger than upstream pipe.

C. Horizontal and Vertical Clearance

1. All storm water pipes shall be placed in accordance with Section 3: General Utilities. All pipes shall have a minimum cover of 24 inches unless otherwise approved by Town.
2. Minimum horizontal clearance between stormwater and sanitary sewer pipes shall be 5 feet and between stormwater and water pipes shall be 10 feet, unless another design alternative is specifically approved by the Town.
3. Minimum vertical clearance where stormwater and any other utilities cross shall be 12 inches between the pipes, unless an alternative design is specifically approved by the Town.
4. Storm sewer pipe, with less than 2 feet of cover, shall be encased in steel casing when crossing under a rockery or retaining wall. The steel casing shall extend beyond the footings or the rockery face for a minimum of 5 feet or for the height of the wall or rockery, whichever is greater.

D. Side Service

Side service stubs shall be provided for each individual lot, unless those lots are approved by the Town for infiltration. Side service stubs shall conform to the following:

1. Each side service stub shall be located at the lowest elevation on the lot.
2. Each side service stub shall have free-flowing positive drainage to an approved stormwater conveyance system or to an approved outfall location.
3. Side Sewer stubs shall be located with a 5' high, white 2" x 4" stake marked “STORM.” The stub out shall visibly extend above surface level and be secured to the stake.
4. Drainage easements are required for drainage systems designed to convey flows across more than one lot.
5. The side service shall be privately owned and maintained by the respective property owner.

E. Connections to Existing System

1. New storm sewer mains shall connect to existing storm sewer mains only at existing manholes or catch basins, or with a new manhole or catch basin installed on the existing sewer
2. If connecting to an existing manhole or catch basin that has access of less than the Town Standard, the existing manhole or catch basin shall be replaced to the meet the Town Standard.

F. General

1. Bends are not allowed in main lines or inlet crossings.
2. Catch basins are required for the following conditions:
   a. A change in the flow-line slope.
   b. A maximum distance of 300 feet in a main line.
   c. Change in pipe size.
   d. The joining of two or more main lines.

e. The joining of a curb inlet to the main line.
f. For a side service.
g. A change in pipe-material type.

3. Tapping tees are acceptable for side services where structures cannot be installed due to other structure conflicts, but a yard drain shall be located within 10 feet of the property line.
4. Public stormwater pipes within public right-of-way shall be located within the paved road width. If outside of the right-of-way, public stormwater pipes shall be centered in easements with a minimum width of 15 feet or two times the depth of the storm pipe, whichever is greater.
5. Building structures shall not be permitted within 10 feet of the outside of any storm drainage pipe.

6.4 Structures

A. Material

1. Catch basins shall be as shown on the Standard Drawings. WSDOT Type 1 or Type 2, as necessary. Type 1 catch basins shall have a minimum catch of 18 inches below the invert. Type 2 catch basins shall have a minimum catch of 24 inches below the invert.
2. Shall be precast concrete steel or fiber reinforcement construction.
3. Adjustment rings shall be precast concrete.
4. Grates and covers shall be ductile iron and frames cast iron. Covers shall be marked “STORM.”

B. Structure Size

Catch basin or manhole size shall be determined by pipe orientation at the junction structure. A plan view of the junction structure, drawn to scale, will be required when more than four pipes enter the structure on the same plane, or if angles or approach and clearance between pipes is of concern. The plan view must ensure a minimum distance of solid concrete wall between pipe openings of 8 inches for 48-inch and 54-inch manholes, and 12 inches for 72-inch manholes.

C. Spacing

Catch basins shall be spaced no greater than 150 feet apart on grades less than one percent, 200 feet for grades between 1 percent and 3 percent and 300 feet for grades greater than 3 percent.

D. Covers and Grates

Vaned grates shall be installed on all catch basins located within the street, gutter, or shoulder. Herringbone grates may be used in high pedestrian areas, including parking lots and crosswalks. Catch basin grates and covers shall have the bolt down capacity. Inlets should not be located directly in front of ADA ramps. Inlets should be located so as to reduce the amount of water passing in front of ADA ramps.

E. Elevation

All manholes, inlets and catch basins shall be constructed to finished grade. In areas of new and existing pavement, the grate rim elevation shall be set to promote drainage flow.

F. Access

All catch basins to be owned and maintained by the Town shall be located within 50 feet of a paved access.

6.5 Channels

The Town allows the use of open vegetated channels to convey storm water runoff when possible outside of the right of way and within easements. Any open channels proposed to be located within public rights of way shall require specific approval from the Town.

6.6 General Notes (Sedimentation/Erosion Control and Storm Sewer)

The General Notes, provided on Standard DWG. SE-0 shall be included on any plans that include land disturbing activities. The General Notes, provided on Standard Dwg. SW-0 shall be included on any plans that provide for the installation of storm sewer.

ATTACHMENT 6.1

Town of Friday Harbor
PO Box 219 / Friday Harbor / WA / 98250
(360) 378-2810 / fax (360) 378-5339 / www.fridayharbor.org

STORMWATER WORKSHEET

DETERMINING STORMWATER MANAGEMENT REQUIREMENTS: This Stormwater Worksheet should be completed and submitted with a site plan. The worksheet will determine whether a Stormwater Site Plan is required in conjunction with a building permit application or other land use approval application that involves stormwater review. The basic information will also be helpful for completing a Stormwater Site Plan, if required.

PARCEL # _____ PROJECT/APPLICANT NAME: _____

Size of parcel _____ acres Size of parcel in square feet 0 _____ ft^2

LAND DISTURBING ACTIVITY, CONVERSION OF NATIVE VEGETATION, AND VOLUME OF CUT/FILL

Calculate the total area to be cleared, graded, filled, excavated, and/or compacted for proposed development project. Include in this calculation the area to be cleared for:

Construction site for structures _____ ft^2

Drainfield, septic tank, etc. _____ ft^2

Well, utilities, etc. _____ ft^2

Driveway, parking, roads, etc. _____ ft^2

Lawn, landscaping, etc. _____ ft^2

Other compacted surface, etc. _____ ft^2

Temporary construction area on site _____ ft^2

Temporary construction area off site _____ ft^2

Total Land Disturbance 0 _____ **ft^2**

Answer the following two questions related to conversion of native vegetation:

Does the project convert 3/4 acres or more of native vegetation to lawn or landscaped areas?

☐ **Yes** ☐ **No**

Does the project convert 2-1/2 acres or more of native vegetation to pasture?

☐ **Yes** ☐ **No**

Indicate Total Volumes of Proposed:

Cut _____ **Fill** _____ **(cy)**

Definitions:

ft^2 - square feet

cy - cubic yard, 1 cubic yard = 27 cubic feet

1 acre = 43,560 ft^2

Land-disturbing activity is any activity that results in movement of earth, or a change in the existing soil cover (both vegetative and non-vegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to clearing, grading, filling, excavation, and compaction associated with stabilization of structures and road construction.

Native vegetation is vegetation comprised of plant species, other than noxious weeds, which reasonably could have been expected to naturally occur on the site. Examples include species such as Douglas fir, western hemlock, western red cedar, alder, big-leaf maple, and vine maple; shrubs such as willow, elderberry, salmonberry, and salal; herbaceous plants such as sword fern, foam flower, and fireweed.

STORMWATER CALCULATIONS – IMPERVIOUS SURFACE

Impervious surface is a hard surface that either prevents or slows the entry of water into the soil as under natural conditions prior to development. A hard surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater.

NEW		**EXISTING**	
Structures (all roof area)	_____ ft²	Structures (all roof area)	_____ ft²
Sidewalks	_____ ft²	Sidewalks	_____ ft²
Patios	_____ ft²	Patios	_____ ft²
Solid Decks (without infiltration below)	_____ ft	Solid Decks (without infiltration below)	_____ ft²
Driveway, parking, roads, etc.	_____ ft²	Driveway, parking, roads, etc.	_____ ft²
Other	_____ ft²	Other	_____ ft²
Total New	0 **ft²**	**Total *Existing***	0 **ft²**

TOTAL NEW + TOTAL EXISTING* 0 **ft²** *This amount will be used to check total lot coverage.

DEVELOPMENT v. REDEVELOPMENT

Divide the total *existing* impervious surface above by the size of the parcel and convert to a percentage. 0%

→ Does the site have >35% or more existing impervious surface?

→ no

The proposal is considered **new development**. Answer questions in **Figure 1-3.1 Flow Chart for New Development** to determine project size **(next page).**

yes

The proposal is considered **redevelopment** Answer questions in **Figure 1-3.2**. **Flow Chart for Redevelopment** to determine project size **(next page).**

Projects that must comply only with Minimum Requirement #2, Construction Stormwater Pollution Prevention, shall submit the Small Project Certification. The proponent is responsible for employing the 12 Elements to control erosion and prevent sediment and other pollutants from leaving the site during the construction phase of the project.

APPLICANT SIGNATURE By signing the Stormwater Calculation Worksheet, I as the applicant/owner attest that the information provided herein is true and correct to the best of my knowledge. I also certify that this application is being made with the full knowledge and consent of all owners of the affected property.

_____ _____

(LANDOWNER OR AUTHORIZED REPRESENTATIVE SIGNATURE) (DATE)

Figure I-3.1: Flow Chart for Determining Requirements for New Development

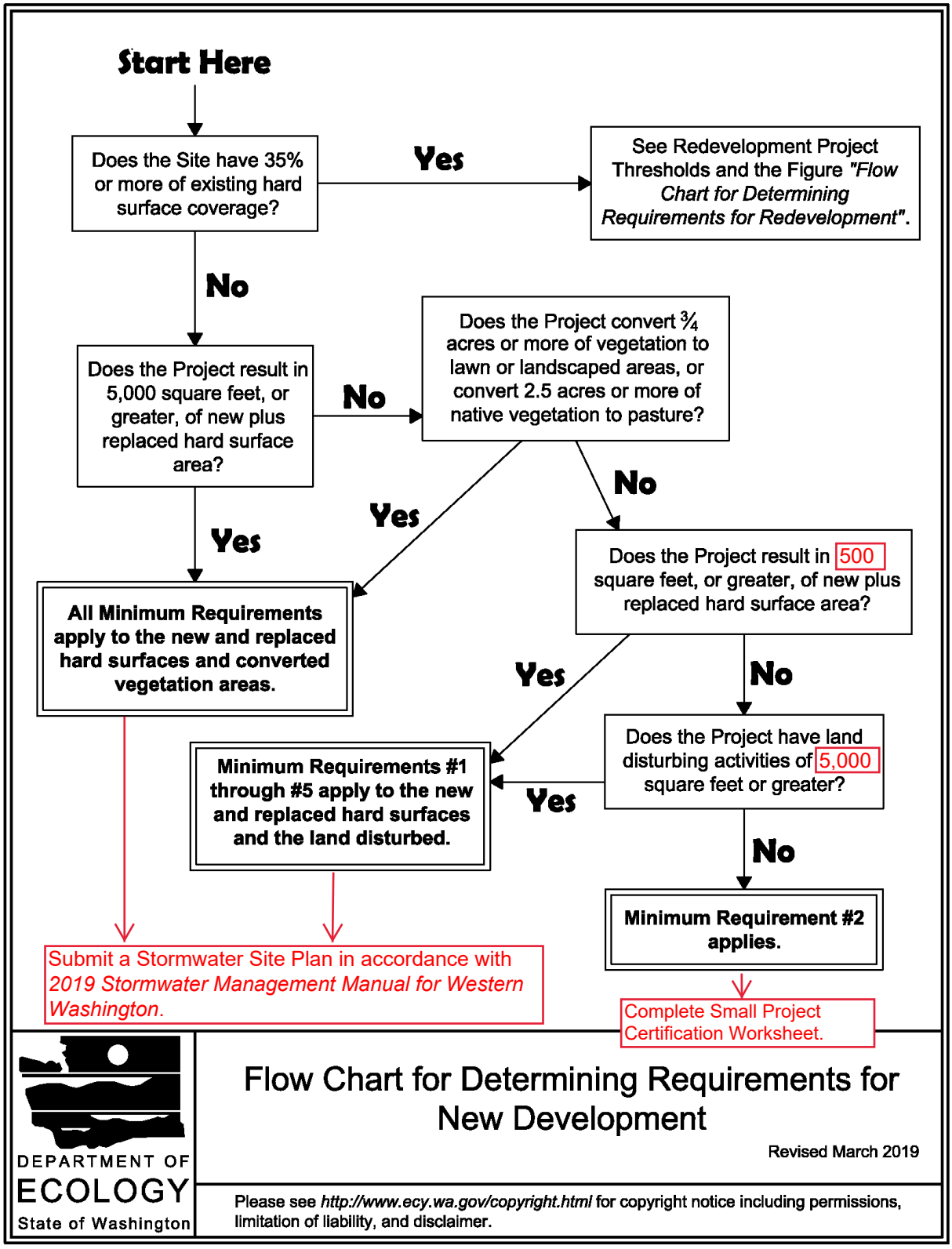
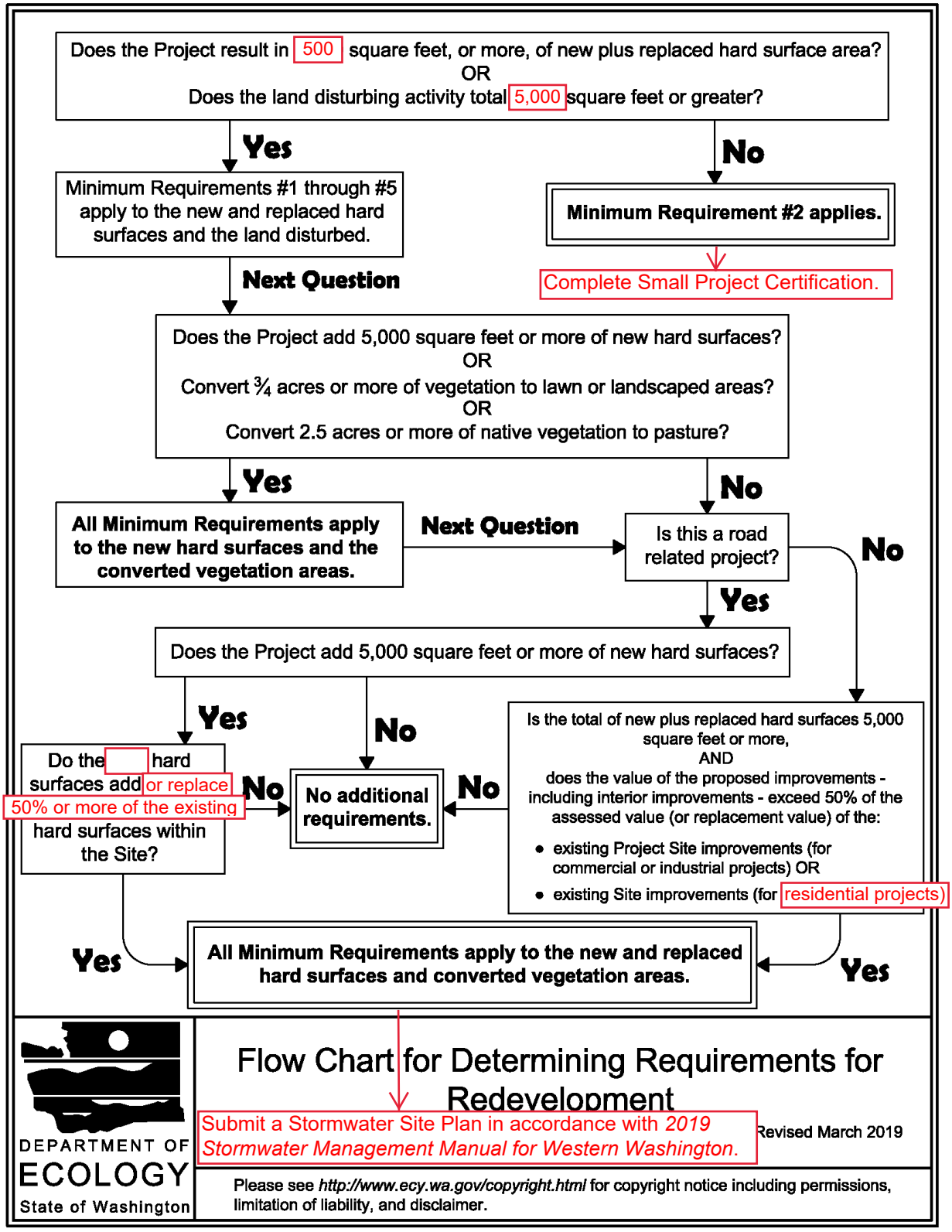


Figure I-3.2: Flow Chart for Determining Requirements for Redevelopment



ATTACHMENT 6.2

Town of Friday Harbor
PO Box 219 / Friday Harbor / WA / 98250
(360) 378-2810 / fax (360) 378-5339 / www.fridayharbor.org

Small Project Certification

This certification may only be used if you answer yes to all of the questions below (check yes or no). Otherwise, a submittal prepared by a licensed engineer may be required.

yes	no	Permanent and temporary drainage on site is designed to divert stormwater away from my on-site septic system or any neighboring on-site septic system.
yes	no	My project will not create a nuisance by allowing or causing flooding to occur on private property that is likely to or does result in damage to persons or property.
yes	no	My project will not discharge stormwater runoff into a critical area (including but not limited to: geohazard area or its 30-foot buffer, wetland or Fish and Wildlife Habitat Conservation Area).
yes	no	My proposal is a small project, which means it will create less than 2,000 square feet of new, replaced, or new-plus-replaced impervious surface area, and has less than 7,000 square feet of land-disturbing activities as defined on the Stormwater Worksheet.

I understand that my project must comply with Minimum Requirement #2 in the Department of Ecology *2019 Stormwater Management Manual for Western Washington* as amended. I have read the Construction Stormwater Pollution Prevention Fact Sheet and will implement Best Management Practices (BMPs) as applicable to my project.

Applicant Signature

By signing the small project certification, I as the applicant/owner attest that the information provided herein is true and correct to the best of my knowledge.

(landowner or authorized representative signature)	(date)

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CONSTRUCTION STORMWATER POLLUTION PREVENTION
Best Management Practices (BMPs) Fact Sheet

The applicant shall consider the twelve Construction Stormwater Pollution Prevention elements and implement applicable BMPs. There is no additional submittal required as part of the permit application.

The following twelve elements must be considered for Construction Stormwater Pollution Prevention before and during the construction phase of the project:

1. Mark Clearing Limits
2. Establish Construction Access
3. Control Flow Rates
4. Install Sediment Controls
5. Stabilize Soils
6. Protect Slopes
7. Protect Drain Inlets
8. Stabilize Channels and Outlets
9. Control Pollutants
10. Control Dewatering
11. Maintain Best Management Practices
12. Manage the Project

Each of the twelve elements is described in more detail below:

1. Mark Clearing Limits

By minimizing the limits of clearing on the site, a builder can minimize stormwater runoff and provide effective control of pollution.

2. Establish Construction Access

Much of the sediment that leaves a construction site does so on the wheels of delivery and construction vehicles that drive off a project site. Construction access must be limited to a single location and a properly constructed Stabilized Construction Entrance (BMP C105) should be included on the site.

3. Control Flow Rates

Stormwater that leaves a project site unimpeded may exceed the capacity of the existing stormwater control facilities downstream and may contain sediment that may be deposited as the velocity of the runoff decreases. Stormwater protection on a construction site should include measures to control the flow rate of runoff from the site. This can be done by installing a Sediment Trap (BMP C240) or other measure that will impede the flow of water off a construction site.

4. Install Sediment Controls

In addition to limiting the rate of stormwater flow off a construction site, measures should be put in place to treat the runoff and remove sediment. Limiting of the cleared area (Element 1) will assist in this effort, but there will be exposed soils that may move with the runoff. Suggested BMPs for controlling sediment include Straw Wattles (BMP C235), Brush Barrier (BMP C231), Gravel Filter Berm (BMP C232), and Silt Fence (BMP C233). Installation of a Sediment Trap (Element 3) is an additional sediment control feature.

5. Stabilize Soils

An additional measure that can minimize sediment transport in runoff is to stabilize soils on the site with mulch or some other covering. This will limit the amount of soil that is exposed to rainfall, thus limiting the sediment that could potentially leave the site. BMPs that could be used for this include Mulching (BMP C121), Nets and Blankets (BMP C122), and Plastic Covering (BMP C123). During periods of dry weather, dust can become a problem and sediment could be transported from the site in high winds. BMP C140 Dust Control should be followed to limit loss of soils in windy conditions.

6. Protect Slopes

If the cleared area includes slopes of 3:1 (Horizontal:Vertical) or steeper, the slopes should be protected to limit runoff. If the slopes are not protected, rills and gullies may form, transporting sediment to the lower elevations and potentially off the construction site. The slopes should be graded to minimize erosion and runoff at the downstream end of the slopes, and runoff should be collected and treated. The following BMPs could be used: Surface Roughening (BMP C130), Interceptor Dike and Swale (BMP C200), and Pipe Slope Drains (BMP C204).

7. Protect Drain Inlets

Runoff from urban construction sites often discharges into existing stormwater collection systems. Water enters the collection system through drain inlets. If there are drain inlets downstream of a construction site, they should be protected using BMP C220 Storm Drain Inlet Protection.

8. Stabilize Channels and Outlets

Any temporary on-site channels or ditches that are used to control runoff should be stabilized to prevent erosion in the channel. BMP C202 Channel Lining and BMP C209 Outlet Protection should be used.

9. Control Pollutants

The best way to control pollution is to limit the source of pollution. Construction debris should be maintained in a safe location. Vehicle maintenance on the construction site should be minimized and any spill should be promptly cleaned up. Concrete spillage should be kept to a minimum and cleaning of the concrete trucks after they have unloaded should be done in an area that will not drain off site (see BMP C151 Concrete Handling).

10. Control Dewatering

In some cases, excavation for the foundation or below-ground structures will encounter groundwater. This water must be removed (dewatered) from the excavation. Discharge of this groundwater must be treated in a manner that will not cause damage downstream due to flow rates or added pollution. There are no specific BMPs identified for this activity, but the water should be handled with care to assure that soils or other pollutants are not added to this flow.

11. Maintain BMPs

Installation of the appropriate BMPs is not adequate to completely control stormwater runoff. The BMPs that have been installed on the project must be inspected and maintained during the duration of the construction project. In addition, the temporary controls that were installed for construction should be removed within 30 days of completion of the work. Typically, once construction has been completed, the temporary facilities are not maintained, and by removing the facilities, it will ensure that these will not fail and discharge water or sediment that had been previously trapped or contained.

12. Manage the Project

Management of a project has four aspects:

1. Phasing construction to prevent transportation of runoff and sediment,
2. Limiting the work during seasons where large amounts of rainfall could be anticipated,
3. Coordination with utilities and other contractors, and
4. Inspection and monitoring.

All of these four aspects are important and must be followed to ensure a project that will have minimal impact on the environment. Volume II of the Manual contains additional BMPs that could be used on site. The applicant is encouraged to review the Manual to see if other BMPs may be applicable to, or more useful on, a particular site.

Section 7
Water

7.0 WATER SERVICE

A. The Town owns and maintains a municipal water system that services the Town and portions of unincorporated San Juan County. The Town's water service area for new connections is limited to within the Town. Connection to the Town's water system is required when mains are within 200 feet of a facility. All water improvements must be inspected before covering. Privately constructed improvements (e.g., in a new subdivision) do not become property of the Town until officially accepted by Town Council. All water system improvements and meter vault locations must be approved in advance by Town. Application for service is made at the Town Hall.

B. The applicant shall submit calculations, stamped by a Washington State licensed professional engineer, supporting the proposed water main extension meets the Town's fire flow requirements, and static and residual pressures.

C. Water service outside the Town is not available except for specific building lots whose right to connect was previously established by Ordinance.

7.1 Definitions

A. ***Air/Vacuum Relief Valve*:** An air valve placed at the high points in a pipeline to release air automatically and prevent the pipeline from becoming air-bound with a resultant increase of pressure and also permits inlet of air into an empty pipe to relieve a vacuum.

B. ***Backflow:*** A flow condition, induced by a differential in pressure that causes the flow of water or other substances in the opposite direction than intended allowing contaminants to enter the public water system.

C. ***Blocking Plate:*** A tool fabricated from metal plate to temporarily block flow through a flanged connection.

D. ***Check Valve:*** A valve provided with a hinged disk that opens in the direction of normal flow and closes with reversal of flow.

E. ***Distribution Main:*** A public water pipe comprising part of the distribution system used to deliver potable water, for customer needs which, in many cases, includes irrigation and fire protection, to the customer's individual service line(s); and to deliver water to fire hydrants for fire protection.

F. ***Distribution System:*** That portion of a public water system which conveys water from the transmission facilities to consumers.

G. ***Fire Flow:*** A water demand for a specific development to be used in the design of the water system for the project. Section 7.2 C lists the minimum fire flow requirements. The system must be designed to deliver this flow, on top of the maximum day demand, without dropping the pressure below 20 PSI, and without exceeding a velocity of 15 feet per second, in any portion of the system, whether new or existing.

H. ***Gate Valve:*** A valve in which the closing element consists of a disk which slides over the opening or cross-sectional area through which water passes, and fits tightly against it.

I. ***IFC:*** International Fire Code

J. ***Pressure Reducing Valve (PRV):*** An automatic control valve designed to reduce a higher inlet pressure to a lower constant outlet pressure regardless of fluctuating flow rates and/or varying inlet pressure.

K. ***Private Service Line:*** Is the pipe that extends from the water meter to the customer and delivers potable water for domestic needs as well as, in some cases, irrigation and fire protection.

L. ***Transmission Main:*** A large diameter public water pipe comprising part of the distribution system used to deliver large quantities of potable water over long distances from the source to a reservoir, booster pumping facility, and/or to a networked system of distribution mains. Typically, services and fire hydrants are not connected to transmission mains.

M. ***Water Service Tap & Service Line:*** The water service tap is the connection to the distribution main of a service line. The service line is the pipe which extends from the service tap to the water meter.

7.2 Water Demands

A. Average Day and Maximum Day Demands

1. The Maximum Day Demands shall be estimated in accordance with the most current edition of the Town of Friday Harbor's Water System Plan.
2. Use the gross developable acreage when calculating the demands. This demand is used for designing most systems within a well-established water grid.

B. Peak Hour Demands

1. The Peak Hour Demands shall be estimated as stated above. Use the gross developable acreage when calculating the demands. This demand is used for sizing remote systems, single feed systems, or newly developing areas.

C. Fire Flow Demands

1. The minimum fire flows list below are required. In all cases water facilities shall be provided to supply fire flows commensurate with the fire code.

   Single family residential – 500 gpm for a duration of 30 minutes

   Multifamily residential/Commercial 750 gpm for duration of 60 minutes

   Industrial: 1,000 gpm for a duration of 60 minutes

2. In sizing piping and other public water system components, the required fire flows are added to Maximum Day Demands for determining total consumptive use.

D. Hydraulic Modeling

1. On some projects, the Town will require that a hydraulic model be performed to prove that the design meets minimum standards. The determination of whether a project must be modeled is at the sole discretion of the Town. If the Town or its consultants complete modeling the Developer shall reimburse the Town for its costs.
2. Steady-state hydraulic models are allowed, provided the following conditions are met:
   a. The system reservoirs shall be modeled at the lowest elevation in their operating range.
   b. Fire-flow scenarios shall be evaluated under max-day demand conditions.
   c. The existing water system must be included in the model back to the reservoir, or to a main determined by the Town to be large enough that the project's demands would be hydraulically insignificant.
   d. Demands shall be calculated only in accordance with the method contained in the Town of Friday Harbor's Water System Plan Update. This calculation shall be included in the model submission.
   e. The datum used for elevations within the model shall be clearly referenced.
   f. The model submission shall include a map with pipe and node numbers legibly marked, and reservoirs identified as actual or representative of a tie-in to the existing water system. The map shall also include references to existing streets and features to help orient the map properly.

7.3 Water Pressure

A. Water pressures during maximum day demand conditions, with reservoirs at average water level, should be designed between 45 and 80 psi at every point in the system unless approved by the Town.

B. Residual water pressures during fire flow demand conditions shall be designed to be no less than 20 psi at every point in the system.

C. Pressures over 80 psi: If static pressures exceed 80 psi then each service line shall be required to have an approved individual pressure reducing valve set to reduce pressure on the consumer side of the valve to between 40 and 50 psi. The cost to install the pressure reducing valve shall be at the customer's expense.

D. Where the water system is expanded in such a way as to be delivering water in excess of 80 psi of static pressure, a PRV station shall be installed on the distribution line at the location necessary to reduce delivered pressures to below 80 psi.

E. Areas Served by Pressure Reducing Valves: Some areas may be supplied through pressure reducing valves in the main supply system. In areas where this is allowed, no matter what the local service pressure is, an individual pressure reducing valve is also required for each service connection.

7.4 Size of Pipe

A. Standard Sizes

B. Only the Town's standard sizes of pipes shall be allowed, unless otherwise approved. Standard sizes are 8", 10", and 12".

C. Exceptions to the above sizes are as follows:

1. In cases of a bridge crossing (existing bridge) or other conditions where a standard size would be infeasible or would limit the capacity below that needed, special consideration may be given to using non-standard sizes.
2. 6-inch piping shall only be allowed on hydrant lines which are less than 50 feet in length. All other lines shall be 8" or larger.

D. Service line sizes shall be coordinated with the Town.

E. Sizing Based on Velocity

1. The following criteria shall be used to determine the sizes of the pipes to be used:
   a. At maximum day demand, 5 fps maximum design velocity.
   b. At fire flow demand, 15 fps maximum at required fire flow.

7.5 Type of Pipe

A. All pipes shall be clearly marked with the manufacturer's name, type, class and thickness as applicable. In accordance with Safe Drinking Water Act (SDWA) 1417 (a)(1) A all pipe, pipe or plumbing fixture, and solder or any flux in drinking water system shall be lead free.

1. Mains
   a. PVC Pipe (Preferred): 6-inch through 12-inch pipe shall meet the requirements of ANSI/AWWA C-900. Pipe greater than 12-inch shall meet the requirements of ANSI/AWWA C-905. PVC pipe shall have the same outside dimensions as ductile iron pipe and shall be a minimum of SDR 18. Pipe shall be listed by Underwriters' Laboratories, Inc.
   b. Ductile Iron Pipe (By Town Approval): 6-inch through 12-inch pipe shall meet the requirements of AWWA C-151, Class 52, with a 1/16" cement mortar lining meeting the requirements of AWWA C104. Ductile iron pipe be joined by using bolted flanged joints shall be Special Thickness Class 53. Non-restrained joints shall be either rubber gasket type, push on type, or mechanical type meeting the requirement of AWWA C111.
   c. High- Density Polyethylene (HDPE) Pipe (by Town Approval): 6-inch through 12-inch pipe shall meet the requirements of AWWA C906 and ASTM D3350 having a cell classification of 345464C or better (PE3408). The pipe must be DR 11 rated for a minimum pipe pressure of 200 psi. HDPE pipe shall be butt fused welded. Pipe dimensions and workmanship shall conform to ASTM F714. Pipe shall be Ductile Iron Pipe Size (DIPS). Saddles shall be electro fusion welded.

d. Restrained Joints: The restraining of ductile iron pipe, fittings and valves shall be accomplished by the use of either a bolted or boltless system. Any device utilizing round point set screws shall not be permitted. All couplings installed underground to connect ductile iron or PVC pipe shall be manufactured of ductile iron.

2. Service Lines, including Private Service Lines
   a. Service lines shall be Type K Copper pipe, Rehau PEX pipe or high density polyethylene tubing (copper tube size) meeting the requirements of AWWA C901, SDR 11, with a minimum pressure rating of 200 psi. Refer to Standard Drawings for additional requirements.

7.6 Fittings

A. All fittings for ductile iron pipe or PVC pipe shall be ductile iron compact fittings conforming to AWWA C-153 or Class 250 Gray Iron conforming to AWWA C-110. Joints shall meet the requirement of AWWA C-111. Where possible, provide griprings or megalug joint restraints at all mechanical joints instead of thrust blocking. Thrust blocks shall be provided at ends of dead end lines, at vertical bends and opposite the lateral branch tees. Fittings shall be cement mortar lined, meeting the requirements of AWWA C104. Gaskets for flat faced or raised faced flanges shall be 1/8-inch thick neoprene having a durometer of 60 plus or minus 5 or 1/16 cloth inserted. Bolts, nuts and washers used for securing fittings shall be of similar material. Steel bolts shall meet the requirements of ASTM A307 or ASTM F568 for carbon steel or ASTM F593 or ASTM F738 for stainless steel. Nuts shall meet the requirements of ASTM A563 for carbon steel or ASTM F594 or ASTM F836 for stainless steel. Iron bolts and nuts shall meet the requirements of ASTM A536, grade -45-12.

B. All fittings for HDPE pipe shall be standard HDPE fittings, meet the HDPE pipe specifications in Section X.5 A. above, and be manufactured by injection molding or extrusion and machining. All fittings shall have the same working pressure as the pipe.

   Pipe sections shall be joined by butt fusion or electrofusion complying with ASTM D2657 and the joints shall be equal or greater in strength than the pipe. Socket fusion joints shall not be used. Class 150, ANSI B16.5 flanges shall be use for connections for flanged connections of another material. Flange backing rings used shall be cast iron, hot dipped galvanized with galvanized nuts, bolts and washers or 316 stainless steel with 316 stainless steel nuts, bolts and washers. All bolts, buried and unburied, shall be coated with Armite Anti-Seize Compound No. 609, or equal, prior to installation.

C. Bends are required where a change of direction of the water main occurs which cannot be accommodated by pipe joint deflection as provided in Section 7.15... Tees and crosses are required where lateral mains are needed as part of the project and where future needs dictate. Tees are required where fire hydrant leads are needed as part of the project and where future fire hydrant or main extension needs dictate. Reducers are needed where a change of pipe size is required. All fittings shall be mechanical joint type unless otherwise specified.

D. Thrust blocks shall be required on all bends, sized according to the soil bearing capacity.

7.7 Distance from Other Utilities

Water mains are typically installed 5 feet north or east of the street centerline. Water line locations and distances from other utilities shall meet the criteria outlined by the Washington State Department of Ecology and the Washington State Department of Health. No new utility pole shall be located within 8 feet of an existing hydrant or water line.

7.8 Depth of Pipes

Water mains shall be installed with minimum cover of 30 inches and service lines with a minimum cover of 24 inches.

More than 4 feet of cover will be permitted on a case by case basis to allow for adjustment to other previously existing utilities. Consideration shall be given to the vertical alignment of future or proposed roadways whenever known.

7.9 Laying Pipe on a Radius

A. Pipe may be laid on a radius provided the radius is a minimum of 1.33 times the minimum radius allowed by the manufacturer (75% of the manufacturer's allowable joint deflection). If pipe cannot be laid on a radius then it shall be laid on tangent sections with appropriate bends placed at approximately equal intervals around the curve.

7.10 Valves

A. Gate Valves, 6-inch to 12-inch: Gate valves shall be used on all 6-inch to 12-inch lines and shall be M&H Style 929 or Clow Medallion. The design, materials, and workmanship of all gate valves shall conform to AWWA C-515. Gate valves shall be resilient wedge non-rising stems (NRS) with two internal O-ring stem seals.

B. Valve operator shall be of the traveling nut or worm gear type, sealed, gasketed, and permanently lubricated for underground service. Valve operators shall be constructed to the standard of the valve manufacturer to withstand all anticipated operating torques and designed to resist submergence in ground water.

C. All valves installed for future extensions shall be plugged by blind flange or mechanical plug.

D. Valve Locations

1. Valve spacing shall exceed more than 800 feet in residential areas, nor more than 500 feet in commercial areas.
2. At intersections:
   One valve on each leg.
   Valve on dead end line where dead end line intersects the main water line.
   Provide ability to serve water line from alternate directions in a looped system, while isolating a section of main for maintenance, repair or continuation.

E. Air/Vacuum Relief Valves: Air/vacuum relief valves are needed at high points to allow release of air during filling the pipe with water as well as to allow accumulated air to be expelled under normal operation. Further, air valves are needed to prevent a vacuum from occurring and to allow air into the main when draining the pipe.

F. Blow-Off Valves/Assembly: If a fire hydrant is not located at the end of a dead end main, a blowoff assembly shall be required. The pressure rating for blowoff assemblies shall be 200 psi.

G. Valve Box: Valve boxes shall be installed on all buried valves. The box shall be of cast iron, two piece slip type standard design with a base corresponding to the size of the valve. The box shall be coal tar painted by the manufacturer using its standard. The cover shall have the word "WATER" cast in it.

H. All valves installed for future extensions shall be plugged by blind flange or mechanical plug.

7.11 Thrust Blocking

A. Where used, the location of all thrust blocks shall be shown on the plans. Thrust block concrete shall be have a minimum 2,500 psi strength and placed against undisturbed earth. A plastic barrier shall be placed between all thrust blocks and fittings. See the Standard Plans for thrust block location and sizing requirements/calculations.

7.12 Marking Tape and Tracer Wire

A. All pipe and services shall be installed with continuous marking tape installed 12 inches above the water main. The marking tape shall be plastic non-biodegradable, metal core or backing marked "water" which can be detected by a standard metal detector. Tape shall be Terra Tape "D" or approved equal. In addition to marking tape, install a tracer wire. Tracer wire shall be 14 gauge copper, continuous solid core, with 30 mil HDPE insulation and rated for direct burial. . The tracer wire shall be taped to the top of the pipe at 10-foot intervals, brought up the outside of the lower portion of a valve box and then inside the upper section.

7.13 Connections

A. Water Main Extensions

1. It is the policy of the Town to require any developer or owner making a main extension to bring the main to the further edge or line of the property to be served and used.

2. Mains serving more than 20 lots or three fire hydrants must be looped.

B. Water Main Connections

1. The existing water system shall remain in operation during connections. Connections shall be by tapping tee or inline valve.
2. When connecting a new water main to an existing water main restrained joints on all fittings shall be required.
3. Prior to connecting a new water main to an existing water main all pressure testing and bacteria testing shall pass before the connection is made.

4. A representative for the Town must be present during the connection. Contact the Town 48 hours prior to making the connection.
5. The Town representative may require additional thrust blocking or any pipe deflection.

C. Service Connections 2 Inch and Smaller

1. Single Parcels. No connection to the water system shall be made until all applicable fees are paid (FHMC 13.05.020). Once the applicable fees are paid the Town shall tab the main, and furnish and install the service line, meter setter, curb stops, a meter, meter box and such valves as may be required.
2. Plat Subdivisions and Roadway Reconstruction Projects. The developer shall be responsible to tap the new mains and be responsible to furnish and install the service line, meter setter, curb stop, meter box and such valves that may be required before the main is pressure tested and connected to the Town's system. Meters will not be installed until the applicable fees are paid. The Town will provide and install the meters.

D. Service Connections 3 Inch and Larger

1. No connection to the water system shall be made until all applicable fees are paid (FHMC 13.05.020). All service taps to live water mains shall be made by the Contractor and witnessed by the Town. All other work associated with the water service line, vault and meter installation shall be performed by the Contractor and will be monitored by the Town. Once the applicable fees are paid the Town shall furnish a meter.

E. Water Meters

1. All water use and service shall be through a meter. Making connection with the domestic water system, each residential, commercial or industrial building shall be considered an individual consumer and shall be supplied through a separate meter and service connection. Sub-metering for individual units within a building is permitted, when the individual meters are supplied from a separate service connection to the Town's main. The Town will not be responsible for reading of sub-meters.
2. Meters shall be placed in right of way or easements dedicated to the Town.
3. Meters shall be installed behind the sidewalk or in the planter area.
4. Meters shall not be installed in driveways, sidewalks or curb ramps unless approved by the Town. Where so approved, service lines shall be sleeved beneath the sidewalk into the meter box through a 2-inch (minimum sleeve).

F. Backflow Prevention Device

1. If required by the Town any service shall be contingent upon the installation of a backflow prevention device of a type approved by the Washington State Department of Health for the protection of the Town's water supply from cross connection. All backflow devices shall be installed, tested and monitored per the Town's Cross Connection Control Program (WAC 246-290-490).

7.14 Fire Hydrants

A. Location

1. Fire hydrant locations will be reviewed by the Town. Hydrants should be located as close to a street intersection as possible with intermediate hydrants along the street to meet area requirements. Hydrant spacing shall be as follows:

   Single-family residential zones – 400 feet maximum. In cul-de-sacs provide hydrant coverage equivalent to a block grid system. Typically, a hydrant is set 150 feet from the center of the end lot in the cul-de-sac and a second hydrant is set 400 feet from this hydrant.

   Commercial and multifamily residential zones -300 feet maximum. Hydrant maybe spaced closer if necessary to provide building coverage or to increase the number of hydrants.

2. All supply valves serving hydrants shall comply with Section 7.7.
3. Hydrants shall be located at the end of radius at intersections, 2 feet (minimum) inside of the right-of-way line.
4. Hydrants shall not be located within 5 feet of wheelchair ramps or within 3 feet of driveways.
5. Hydrants shall be installed in locations that provide clear and unobstructed access for operations and maintenance. A 3 foot clear space shall be maintained around the circumference of fire hydrants. If a hydrant must be located in areas subject to heavy traffic protection against damage from collision is needed.
6. Hydrants on a 6” line must be installed within 50’ of the main.

B. Requirements

Hydrants installed in the Town’s water system shall meet the following requirements:

1. M&H Style 929 or Clow Medallion and conform to AWWA C502. See Fire Hydrant Standard Drawing for additional requirements.
2. The bottom foot valve must have a minimal opening of 5 ¼”.
3. Hydrant shall be manufactured with operating nut and thrust nut made of bronze or stainless steel, with bearings located both above and below the thrust collar and the operating nut protected by a cast-iron weather shield. Hydrant shall have safety flanges and steel stem coupling. Nozzle section must rotate 360 degrees. Hydrant shall be manufactured with a main valve seat ring of bronze threaded into a bronze drain ring. A 360 degree drain channel shall have a minimum of two drain outlets. Hydrant bonnets, barrels, and foot pieces shall be cast iron with internal working parts of bronze or stainless steel. Hydrants shall have a minimum of two 2 ½” openings and on 4 ½” port. A Storz adapter shall be installed on all fire hydrants.
4. Thrust blocks shall be installed behind the hydrant.

7.15 Easements

A. Easements are required for all public water lines outside the public right-of-way. Water easements shall be a minimum of 15-feet wide. Additional width may be required by the Town. Easements must be recorded with San Juan County Auditor's Office on a separate recorded document prior to approval of a final plat.

7.16 Testing

A. The water main pipes and service lines shall be disinfected and tested before being placed in service. New work may be connected to the existing water system at a new or existing valve by providing a flanged connection with a blocking plate installed. All tests shall be performed by the Contractor with the blocking plate in place and shall be coordinated and witnessed by the Town. Notify the Town 2 business days prior to testing. Water for testing and disinfecting shall be obtained by the Developer by arrangement with the Town. All pumps, gauges, plugs, 2-inch blowoffs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished, installed and operated by the Contractor. The Contractor shall provide an oil-filled pressure gauge with a range of 0 to 300 psi.

B. Feed for the pump shall be from a barrel or other container, wherein the actual amount of "makeup" water can be measured periodically during the test period. All temporary connection to the existing water lines for filling or flushing new pipe lines shall be equipped with double check valve assemblies to prevent backflow into the existing waterline The section to be disinfected shall be thoroughly flushed at maximum flow prior to chlorination.

C. The pipeline shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and time allowed for the concrete to cure before testing. Where permanent blocking is not required, the developer shall furnish and install all temporary blocking and remove it after testing. The mains will be filled by the Town slowly and air expelled from the pipeline prior to starting the test. Water will be allowed to stand under pressure a sufficient length of time to allow the escape of air and allow the lining of the pipe to absorb water.

D. The pipeline shall be subjected to a hydrostatic pressure test of twice its working pressure. The test shall be accomplished by pumping the main up to the test pressure, stopping the pump for 15 minutes while things stabilize, then pumping the main up to the test pressure again and closing a valve between the pump and the pump and the line being tested. The test shall be conducted for a period of two hours.

During the test, the section being tested shall be observed to detect any visible leakage.

A clean container shall be used for holding water for pumping up the pressure on the main being tested. This makeup water shall be sterilized by the addition of chorine to a concentration of 50mg/l. The quantity of water required to restore the pressure shall be accurately determined by the pumping through a positive displacement meter approved by the Town.

E. The quantity of water lost during the test period shall not exceed the number of gallons as determined by the following formula:

$$L = \frac{SD\sqrt{P}}{266{,}400}$$

Where:

L=allowable leakage, gallons/hour
S=gross length of pipe tested, feet
D=nominal diameter of the pipe, inches
P=test pressure during the leakage test, psi

Make-up water shall be pumped from a container that will allow the amount of water pumped to be easily computed or verified.

There should be no appreciable loss of pressure during the 15-minute test intervals.

All leaks shall be repaired or defective material replaced and the test repeated as directed by the Town.

F. The Contractor shall be responsible for repair of any damage resulting from or caused by leak testing.

G. All tests shall be made with the fire hydrant auxiliary gate valves open and pressure against the hydrant valve. Each valve shall be tested by closing each in turn and relieving the pressure beyond. This test of the valve will be acceptable if there is no immediate loss of pressure on the gauge when the pressure comes against the valve being checked. The Contractor shall verify that the pressure differential across the valve does not exceed the rated working pressure of the valve.

H. Defective materials and workmanship, discovered as a result of the tests, shall be replaced. Whenever it is necessary to replace defective materials or correct the workmanship, the tests shall be rerun at the Developer's own expense, until a satisfactory test is obtained.

7.17 Disinfection

A. Before being placed into service, new water mains and repaired portions of, or extensions to, existing mains shall be chlorinated and a satisfactory bacteriological report obtained. In the event two unsatisfactory bacteriological reports are obtained on a section of pipe, the Contractor shall revise his method of disinfection and the form of applied chlorine.

B. Flushing

Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. If a hydrant is not installed at the end of the main, then a tap shall be provided large enough to develop a flow velocity of at least 2.5 fps in the water main.

Taps required by the Contractor for temporary or permanent release of air, chlorination or flushing purposes shall be provided by the Contractor as part of the construction of water mains.

Where dry calcium hypochlorite is used for disinfection of the pipe, flushing shall be done after disinfection.

The Contractor shall be responsible for disposal of treated water flushed from mains and shall neutralize the wastewater for protection of aquatic life in the receiving water before disposal into any natural drainage channel, i.e., receiving water, waters of the State, including wetlands. The Contractor shall be responsible for disposing of disinfecting solution to the satisfaction of the Town. At a minimum, chlorinated water shall be dechlorinated to a concentration of 0.1 parts per million (ppm) or less, and pH adjustment to within 6.5 – 8.5 standard units before discharging to surface waters of the State or to a storm sewer system that drains to surface waters of the State.

C. Requirement of Chlorine

Before being placed into service, new mains and repaired portions of, or extensions to, existing mains shall be chlorinated so that a chlorine residual of not less than 25 mg/l remains in the water after standing 24 hours in the pipe. The initial chlorine content of the water shall be not less than 50 mg/l.

D. Form of Applied Chlorine

Chlorine shall be applied by one of the methods which follow, to give a dosage of not less than 50 mg/l of available chlorine.

1. ***Dry Calcium Hypochlorite –*** As each length of pipe is laid, sufficient high-test calcium hypochlorite (65 to 70 percent chlorine) shall be placed inside the pipe to yield a dosage of not less than 50 mg/l available chlorine, calculated on the volume of the water that the pipe and appurtenances will contain.

   The number of grams of 70 percent test calcium hypochlorite required for a 20-foot length of pipe equals $0.238 \times d^2$, in which "d" is the diameter in inches.

2. ***Liquid Chlorine*** – A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device, or the dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine gas, or the gas itself, must provide means for preventing the backflow of water into the chlorine.
3. ***Chlorine-Bearing Compounds in Water*** – A mixture of water and high-test calcium hypochlorite (65 to 70 percent Cl) may be substituted for the chlorine gas-water mixture. The dry powder shall first be mixed as a paste and then thinned to a 1 percent chlorine solution by adding water to give a total quantity of 7.5 gallons

of water per pound of dry powder. This solution shall be injected in one end of the section of main to be disinfected while filling the main with water.

4. ***Sodium Hypochlorite*** – Sodium hypochlorite, commercial grade (12.5 percent Cl) or in the form of liquid household bleach (5 to 6 percent Cl), may be substituted for the chlorine gas-water mixture. This liquid chlorine compound may be used full strength or diluted with water and injected into the main in correct proportion to the fill water so that dosage applied to the water will be at least 50 mg/l.

E. Point of Application

The point of application of the chlorinating agent shall be at the beginning of the pipeline extension or any valved section of it, and through a corporation stop inserted in the horizontal axis of the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipeline extension. Alternate points of applications may be used when approved by the Town.

F. Rate of Application

Water from the existing distribution system, or other source of supply, shall be controlled to flow very slowly into the newly-laid pipeline during application of the chlorine. The rate of chlorine gas-water mixture or dry gas feed shall be in such proportion to the rate of water entering the newly-laid pipe that the dosage applied to the water will be at least 50 mg/l.

G. Preventing Reverse Flow

No connections shall be made between the existing distribution system and new construction other than by a flange connection with blocking plate in place and a hydrant connection with a State Department of Health approved backflow preventer installed in the connecting line.

H. Retention Period

Treated water shall be retained in the pipe at least 24 hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least 50 mg/l.

I. Chlorinating Valves, Hydrants, and Appurtenances

In the process of chlorinating newly laid pipe, valves, hydrants, and other appurtenances shall be operated while the pipeline is filled with the chlorinating agent and under normal operating pressure.

J. Chlorinating Connections to Existing Water Mains and Water Service Connections

The chlorinating procedure to be followed shall be as specified in AWWA Standard C651. All closure fittings shall be swabbed with a very strong chlorine solution at least as strong as liquid household bleach (5 to 6 percent Cl).

K. Final Flushing and Testing

Following chlorination, treated water shall be flushed from the newly-laid pipe until the replacement water throughout its length shows, upon test, the absence of chlorine. In the event chlorine is normally used in the source of supply, then the tests shall show a residual not in excess of that carried in the water supply system.

A sample tap shall be located ahead of the flushing hose for convenience and for sanitary sampling.

Before placing the lines into service, a satisfactory report shall be received from the local or State Health Department on samples collected from representative points in the new system. Samples will be collected and bacteriological tests obtained by the Water Department. Upon receiving a satisfactory test result, the line may be placed in service by removing the blocking plate, tightening the flanged connection and opening the valve at the connection point.

At a minimum, chlorinated water shall be dechlorinated to a concentration of 0.1 parts per million (ppm) or less, and pH adjustment to within 6.5 to 8.5 standard units, if necessary, before discharging to surface waters of the State or to a storm sewer system that drains to surface waters of the State.

A Town representative must be on-site to observe the flow testing and sampling. Contact the Town two business days in advance.

7.18 Final Water Main Acceptance

Prior to the Town accepting the water main the developer shall demonstrate to a Town representative that the fire flow and static and residual pressures required in Section 7.2 and 7.3 are achieved. The Town shall be provided a minimum of two business days notice to observe these tests.

7.19 General Notes (Water)

The General Notes, provided on Standard Dwg. W-0, shall be included on any plans that provide for the installation of the water systems.

7.20 Pressure Systems

A. A pressure system consists of its own pumps, reservoirs and distribution mains. In some limited instances, a system consists of pressure reducing valves to maintain water pressure.

B. As development continues and the water system is expanded, areas will be encountered which are at elevations that will require the establishment of additional pressure zones in order provide water service within appropriate water pressures. Generally this will require the construction of additional booster pumping stations and reservoirs. In some cases the use of pressure reducing valves will be the means of establishing the pressure zone. However, when considering the use of pressure reducing valves, an examination of the potential and feasibility of extending service from an established pressure zone which will provide the area within appropriate water pressures and which is supported by reservoir(s) storage will be required. If such an established pressure zone can be extended and utilized, preference in this regard will be generally the required approach.

The creation of a new pressure zone will be allowed only on approval by the Public Works Director.

7.21 Booster Pump Stations

A. General

1. Design of water booster pump stations shall be performed by a professional engineer licensed in the State of Washington. The design of water booster pump stations is an engineering matter and is not subject to detailed recommendations or requirements other than as required by these Standards. The applicant's engineer shall submit all supporting documentation, in report form, including all relevant design information needed for the Town to review for adequacy of the proposed design. The design report shall be submitted with each water booster pump station and shall demonstrate its conformance with the standards as outlined herein. Booster stations are also subject to project approval by Washington State Department of Health (DOH). The applicant's engineer is responsible for the design report and construction document submittal to DOH and for obtaining DOH approval prior to construction.
2. General construction of public and private water booster pump stations and appurtenances is required to conform to International Building Code, Uniform Plumbing Code and National Electrical Code. Further, during design and procurement of components that go into the system, many national standards are specified for minimum conformance.
3. They are as follows:
    a. ANSI - American National Standards Institute
    b. ASTM - American Society for Testing and Materials
    c. AWWA - American Water Works Association
    d. CFR - Code of Federal Regulations
    e. FSS - Federal Specifications and Standards, General Services Administration
    f. HIPS - Hydraulic Institute Pump Standards
    g. IEEE - Institute of Electrical and Electronics Engineers
    h. NEC National Electrical Code
    i. NEMA - National Electrical Manufacturers' Association
    j. NEPA - National Environmental Policy Act
    k. NFPA - National Fire Protection association
    l. OSHA - Occupational Safety and Health Administration
    m. RCW - Revised Code of Washington (Laws of the State)
    n. SEPA - State Environmental Policy Act
    o. SSPC - Steel structures Painting Council
    p. UL - Underwriter Laboratory listing
    q. WAC - Washington Administrative Code
    r. WISHA - Washington Industrial Safety and Health Administration

B. Pump Station

1. Booster pump stations shall be incorporated whenever a development needs higher pressure than is available from the existing source. Booster pump stations constructed as part of new development are part of the water distribution system and shall be dedicated back to the Town in the same manner as water main extensions. Booster pump stations shall be of a construction type and outward

appearance consistent with the neighborhood. Unless required for technical reasons the facility shall be entirely above ground, with good insulation and sound barrier. The roofing shall be long lasting (50- year life), low maintenance type with good insulation for energy conservation. Private water booster pump stations are not allowed. There shall be suction and discharge headers with easy accessibility. On the discharge side, there shall be a sufficient straight run of transmission pipe in order to incorporate a flow meter. A flow meter is required on the discharge line preferably above ground inside the building and easily accessible.

2. The pump station designer shall consider the likelihood of vandalism and break-in. The Town may require intrusion alarms wired to communicate to the water system operators through the SCADA system, if the Town considers it necessary.
3. The pump station shall have provisions for communication and connection to the Town's SCADA system via wireless signals.
4. The pump station site shall be landscaped and irrigated with timed automatic sprinklers. Preference shall be given to shrub patches rather than grass to provide screening and decrease maintenance.
5. A ventilation system is required to protect pump motors from high temperatures.
6. A heating source is required to maintain temperatures above freezing during cold weather.
7. The station shall be designed so as to ease removal of existing pumps and motors for maintenance as well as to allow installation of future pumps and motors. Easy access to the station must be provided for maintenance as well as for daily status inspection.

C. Pumps and Motors

1. The pump stations shall have at least TWO pumps to provide redundancy. The number of pumps required will generally be dictated by the capacity size of the station keeping with prudent modern design for efficiency and flexibility of operation to meet varying demands considering summer to winter average daily demand varies over a factor of two. The station shall be so designed that required maximum day demand can be met with the largest pump out of service. Size the pumps so that pump run times are maximized, rather than larger size pumps running for repeated short periods.
2. The pumps selected shall conform to hydraulic standards and the manufacturer shall conform to applicable NEMA and ANSI standards. Pump performance curve shall have smooth drooping characteristic from the cut-off head to the lowest operating head. The pumps chosen shall operate with high efficiency (75% or more) in the operating range.
3. Pump motor shall always be directly coupled and sized to meet the power required by the pump through the designed range of total pumping heads and pumping volumes. Motors shall have copper windings and operate at efficiency of 92% or above in the operating range. Motors shall be three phase squirrel cage induction motors.
4. Pumps shall not be set directly on the floor. Rather, pumps shall be mounted on concrete housekeeping pads.
5. Pumps shall be provided with mechanical seals.
6. Pump selection shall meet the following criteria:
    a. The pump performance curve shall support proper pump performance through the designed range of total pumping heads and pumping volumes while operating within the most efficient portion of the pump curve. The proper operation includes performing without cavitation and within suction heads

designed for the pump. The performance curve shall always be positive from shutoff head throughout the range of the curve. No pump shall be selected which has the potential of reaching shutoff head through possible adverse system pressure ranges.

b. Pump motor shall be sized so as not to exceed maximum rated horsepower through the designed range of the pump.
c. Wire-to-water pump/motor efficiency through the designed range of the pump shall be an important consideration when selecting such equipment.
d. Greased lubricated bearings are preferred.

7. Each pump shall be equipped with isolation valves in the suction and discharge lines and a dampened check valve or solenoid activated pilot controlled diaphragm check value. The check valve shall not slam when a pump shuts down.
8. A flow meter shall be provided on the discharge side on the pumps.

D. Electrical

1. Electrical service from the utility shall be 3 – phase, 480 volt standard. If a transformer is provided, the primary shall be connected delta and the distribution side wye with neutral grounded. A separate 240 / 120 volt station service shall be provided by the electric utility or derived from a station service transformer.
2. All station electrical shall conform to the latest National Electrical Code. All electrical components and wirings shall be UL listed as applicable, and be industrial grade.
3. Protection systems are required on electrical equipment to protect against phase-to-phase and phase-to-ground faults as well as to protect against single phasing. The booster station shall have a well-designed grounding system to which all the equipment grounds need to be connected.
4. The short circuit ratings of electrical switchgear shall be the calculated available or the industry standard, whichever is higher.
5. Above grade water booster pump stations shall have receptacles conveniently placed to ease maintenance equipment to be plugged in without extension cords. All the receptacles shall be GFI or distributed from a GFI circuit breaker installed in the station service panel. One of the duplex receptacles shall be an isolated ground type installed near the enclosure containing the SCADA Remote Terminal Unit (RTU)
6. Booster pump stations shall have good interior lighting and dusk to dawn motion sensor, tamper proof exterior lighting.
7. All the controllers and the associated protection equipment shall be centrally located in a free standing motor control center (MCC) with copper incoming bus sized adequately in order to allow future expansion. NEMA 12 enclosures are preferred. The control shall be soft-start/soft-stop with pump control and running bypass circuitry.
8. Each motor drive shall have a motor circuit protector. Further, each motor shall have an integrated protection module to detect and isolate the motor for overload, phase loss, phase reversal and ground faults, as a minimum. There shall be push button switches to turn the pump on and off locally and a selector switch (Local – Off – Remote) to switch from local to remote control. Also, there shall be LED indicator lights – red to indicate running, green as stand-by.
9. The MCC shall have indicator instrumentation for station voltage, current, power factor, and kW / kWh. Additionally, each of those meters shall incorporate an output signal 4 – 20 mA and / or pulse in order to communicate to the local RTU.

E. Auxiliary Generating Equipment

1. All booster pump stations shall have an auxiliary generator and automatic transfer switch.
2. The following general requirements shall apply to all internal combustion engines used to drive auxiliary electrical generating equipment.
3. The engine must be protected from operating conditions that would result in damage. Protective equipment shall be capable of shutting down the engine and activating an alarm on site. Protective equipment shall monitor for conditions of low oil pressure and overheating. Emergency equipment shall be protected from damage at the restoration of regular electrical power
4. Engine block heaters are required on all water cooled units.
5. Fuel storage is required to supply a minimum of 12 hours of operation at maximum design load. No buried tanks will be allowed.
6. The engine shall be located above grade with adequate ventilation of fuel vapors and exhaust gases.
7. All emergency power generating equipment shall be automatically exercised. Frequency and duration shall be user programmable.
8. The engine generator unit and automatic transfer switch size shall be adequate to provide power for pump motor starting current and for lighting, ventilation, and other auxiliary equipment necessary for safety and proper operation of the booster station. Provisions shall be made for automatic and manual start-up and load transfer. The generator must be protected from operating conditions that would result in damage to equipment. Provisions should be considered to allow the engine to start and stabilize at operating speed before assuming the load.

Section 8
Streets

8.0 STREETS

This section presents the minimum design standards for public and private streets. These Standards encourage the 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. The design shall consider the location of facilities in relation to land use, pedestrian safety, right of way width, traffic standards and safety, landscaping, drainage facilities, ease of maintenance, and the ability to provide efficient public services.

8.1 Definitions

A. ***AASHTO*** : The American Association of State Highway Transportation Officials. The abbreviation may also be used throughout these Standards to reference AASHTO's publication, "A Policy on Geometric Design of Highways and Streets."

B. ***ADA:*** Americans with Disabilities Act.

C. ***ADAAG:*** Americans with Disabilities Act Accessibility Guidelines.

D. ***Clear Sight Area:*** The corner area at an intersection or driveway which must be free of sight obstructions over 36 inches in height to provide adequate sight distance.

E. ***Clear Zone:*** The unobstructed, relatively flat area provided beyond the edge of the traveled way for the recovery of errant vehicles.

F. ***Cross Slope:*** A slope that is perpendicular to the direction of travel.

G. ***Cul-de-Sac:*** Short street having one end open to traffic and the other temporarily or permanently terminated by the vehicle turnaround.

H. ***Downtown Core:*** The area described in FHMC 17.08.125.

I. ***Driveway***: A privately maintained access to any property.

J. ***Half Street***: Street construction along edge of a development, utilizing a portion of the regular width of right-of-way and permitted as an interim facility pending construction of the other half of the street by the adjacent owner.

K. ***Monument***: A physical survey monument.

L. ***Pavement Width***: The width of a street from face of curb to face of curb.

M. ***Traveled Way***: The area of street which is intended to carry vehicular traffic.

8.2 Street Frontage Improvements

A. Requirements

All non-single family development shall install street frontage improvements prior to the issuance of a building permit for the proposed development. Land divisions of two or more lots shall install street frontage improvements prior to the issuance of final plat approval. Such improvements shall include curb and gutter, sidewalk, street storm drainage, street lighting system, utilities, landscaping, irrigation, and street widening all per these Standards. Plans shall be prepared and signed by a licensed civil engineer registered in the State of Washington. All frontage improvements shall be made along full frontage of property from centerline of right-of-way to the property line.

B. Exceptions

When the Town deems that the above such improvements cannot be accomplished due to unique circumstances of the topography of those adjacent areas required to be improved, then the provisions of FHMC Chapter 12.02 shall apply.

8.3 Streets – Private

A. All private streets within the Town limits shall be constructed in accordance with the Town Engineering Design Standards.

B. The Town of Friday Harbor will not accept private streets as public streets until such streets are bought into conformance with these Engineering Design Standards.

8.4 Right of Way

A. Street Classification shall govern right of way width and street section. Town streets are divided into four classifications: major arterial, minor arterials, local access streets, and RES (40’ RW and 50’ RW). Street classification and shall govern right-of-way, road width, and road geometrics. Below is a list of existing street classifications and minimum right of way requirements. Streets not listed are classified as Local Access Streets. New streets will be classified by the Town.

1. Major Arterials

Street Name	From	To	RW Width
Court Street	First Street	Second Street	80’
East Street	Front Street	Harrison Street	80’
First Street	East Street	Northwest Terminus	80’
Front Street	East Street	Northwest Terminus	80’
Spring Street	Waterfront	Argyle Avenue	80’
West Street	Front Street	Second Street	80’

2. Minor Arterials

Street Name	From	To	RW Width
A Street	Harrison Street	Nichols Street	60’
B Street	Harrison Street	Nichols Street	60’
Argyle Avenue	Spring Street	Town limits	40’ to 50’
Blair Avenue	Spring Street	Guard Street	45’ to 50’
Grover Street	Argyle Avenue	East terminus	60’
Guard Street	Blair Avenue	Town limits	50’ to 60’
Harrison Street	A Street	300' west of Geneste Street	60'
Market Street	Mullis Street	Nash Street	50'
Mullis Street	Spring Street	Town limits	60'
Nash Street	Caines Street	Spruce Street	50'
Nichols Street	Argyle Avenue	C Street	50' to 40'
Park Street	Blair Avenue	Guard Street	60'
Second Street	Blair Avenue	Spring Street	60'
Spring Street	Argyle Avenue	Town limits	60'
Tucker Avenue	Guard Street	Town limits	45' to 60'

3. Local Access Streets

Street Name	From	To	RW Width
A Street	Nichols Street	Web Street	40’
Caines Street	Spring Street	Argyle Avenue	40’
Culver Avenue	Guard Street	Martin Street	60’
Malcom Street	Argyle Avenue	East terminus	50'
Marguerite Street	Spring Street	Guard Street	40' to 50'
Price Street	Spring Street	Park Street	40’ to 50’
Reed Street	Blair Avenue	Second Street	40'
Rhone Street	Reed Street	East terminus	40'
Web Street	Argyle Avenue	A Street	40' to 50'

4. RES – 50' RW or More

This classification is for streets which are located within residentially zoned areas with 50' or more dedicated right of way.

Street Name	From	To	RW Width
Carter Avenue	Guard Street	Harbor Street	50’
Chinook Way	Coho Drive	South terminus	50’
Coho Drive	Chinook Way	North terminus	50’
Friday Avenue	McDonald Street	North terminus	60'
Harbor Street	Carter Avenue	Tucker Avenue	50'
John Street	Argyle Avenue	East terminus	60’
Kelsando Circle	Larson Street	Larson Street	50'
Larson Street	Guard Street	Carter Avenue	60'
Martin Street	Tucker Avenue	Culver Avenue	60'
Mason Court	Kelsando Circle	East terminus	50'
McDonald Street	Tucker Avenue	Friday Avenue	50'
Rose Lane	Argyle Avenue	West terminus	50'
Spruce Street	Argyle Avenue	Rose Lane	50'
Terra Bella Lane	Carter Avenue	West terminus	50'

5. RES – 40' RW or Less

This classification is for streets which are located within residentially zoned areas with 40' or less dedicated right of way.

Street Name	From	To	RW Width
Alder Court	West terminus	Spruce Street	40’
Beach Court	McDonald Street	Martin Street	30’
Beck Street	Geneste Street	East terminus	20’
Beck Street	Gould Street	East terminus	20'
C Street	Harrison Street	Franck Street	40'
Carter Avenue	Harbor Street	North terminus	40’
Charles Place	Hillcrest Place	Northeast terminus	24'
Franck Street	C Street	East terminus	40'
Geneste Street	Harrison Street	Beck Street	40'
Gould Street	Franck Street	South terminus	40'
Green Way	Spruce Street	East terminus	40'

Street Name	From	To	RW Width
Harrison Street	300' West of Geneste Street	Warbass Way	30'
Hemlock Court	West terminus	Spruce Street	40'
Hillcrest Place	North terminus	Lampard Road	40' to 30'
Hunt Street	Franck Street	Grover Street	40'
Jennifer Place	North terminus	Hillcrest Place	24'
Lampard Road	Town limits	Spring Street	30'
Larson Street	Carter Avenue	Tucker Avenue	40'
Linder Street	North terminus	South terminus	40'
Maple Street	Franck Street	South terminus	40'
Marble Street	Tucker Avenue	East terminus	30'
Nelson Street	Linder Avenue	East terminus	20'
Perry Place	Tucker Avenue	East terminus	35'
Scenic Place	North terminus	South terminus	40'
Tree House Place	North terminus	Hillcrest Place	24'
Vine Street	Franck Street	South terminus	40'
Warbass Way	B Street	Harrison Street	40'

B. Right-of-way requirements may be increased if additional lanes, turning lanes, bus loading zones, posted speed, bike lanes, utilities, schools or other factors are required as determined by the Town.

C. Right-of-way shall be conveyed to the Town on a recorded plat and/or by a right-of-way dedication deed.

8.5 Streets – Public

A. General

The layout of streets shall provide for the continuation of existing streets in adjoining subdivisions or of their future projection when adjoining property is not subdivided. Streets, which serve primarily to provide access to residential subdivisions, shall be designed to discourage through traffic.

B. Street Width

1. Street classification and shall govern road geometrics. Table 8-1 Minimum Street Design Standards lists the minimum pavement width for each street classification.

2. Half-Street improvements are permitted as an interim facility. Half-Streets may be used pending construction of the entire street by the property owner on the opposite side of the road. When a project has frontage on an undeveloped or gravel roadway a half street improvement will be required. This will require the full improvement of the side adjacent to the project and the addition of 12 feet of the approved road cross-section and a 2-foot gravel shoulder on the side away from the development. Half-streets must be suitable for two-way traffic.

Table 8-1

Minimum Street Design Standards

Design Standards	Major Arterial	Minor Arterial	Local Access	RES – 50' RW	RES – 40' RW
Minimum Right of Way	80'	50' to 60'	40' to 50'	50'	40'
Minimum Pavement Width	63'	38'	28'	24'	22'
Parking Lane	Both Sides	Both Sides	One Side	No	NO
Minimum/Maximum Grade	0.5% to 10%	0.5% to 10%	0.5% to 15%	0.5% to 15%	0.5% to 15%
Curb	Cement Concrete Traffic Curb and Gutter	Cement Concrete Traffic Curb and Gutter	Cement Concrete Traffic Curb and Gutter	Cement Concrete Traffic Curb and Gutter	Cement Concrete Traffic Curb and Gutter
Sidewalks	Both Sides: 8' Wide	Both Sides: 6' to 8'	40' RW - 5' One Side 50' RW - 5' Both Sides	Both Sides: 5' Wide	Both Sides: 5' Wide
Planter Strip	N/A	0 - 4'-6" as determined by Town	5'	5'-6"	5'
Cul-De-Sac Radius (pavement width)	N/A	N/A	45' turnaround radius (55' right-of-way radius)	45' turnaround radius (55' right-of-way radius)	45' turnaround radius (55' right-of-way radius)
Intersection Curb Radius	30'	30'	25'	25'	25'
Design Speed (mph)	30	30	25	25	25
Minimum Centerline Radius for Normal Grown	335'	335'	200'	200'	200'
Stopping Site Distance	AASHTO Manual Criteria	AASHTO Manual Criteria	AASHTO Manual Criteria	AASHTO Manual Criteria	AASHTO Manual Criteria
Street Section	Dwg. No. ST-1	Dwg. No. ST-2 Dwg. No. ST-3	Dwg. No. ST-4	Dwg. No. ST-5	Dwg. No. ST-6

Note: Existing land locked parcels may be accessed by a private easement with a minimum width of 20 feet.

C. Turnarounds

1. Cul-de-sac: Streets designed to have one end permanently closed shall be no longer than 400 feet. At the closed end, there shall be a widened “bulb” having a minimum paved radius of 45 feet. The minimum right of way radius for the bulb section shall be 55 feet. The Town may require an off street walk or emergency vehicle access to connect a cul-de-sac at its terminus with other streets, parks, schools, or other pedestrian generators.
   a. Unless otherwise approved by the Director, cul-de-sacs shall be designed to drain out to the adjacent street.
   b. Cul-de-sac profiles shall be established to provide minimum one percent grades at all places along the gutter lines.

2. Temporary Dead Ends: Where a street is temporarily terminated, turn around provisions must be provided where the road serves more than six lots or is longer than 150 feet. The turnaround may be a cul-de-sac or a hammerhead with a minimum distance on both sides at the centerline intersection of 60 feet to facilitate emergency vehicle turn-around. Curbing is not installed in the temporary cul-de-sac. All temporary turnarounds shall be surfaced with an all-weather surface. Removal of the temporary cul-de-sac bulb or hammerhead shall be the responsibility of the developer who extends the road.

D. Intersections

1. Traffic Control: Traffic control will be as specified in the MUTCD or as modified by the Town as a result of traffic engineering studies.

2. Intersection Design: Street intersections shall be laid out so as to intersect, as nearly as possible, at right angles. Angle of intersection shall be between 85 and 95 degrees (measured 10 feet beyond the street classification right of way). For safe design, the following types of intersection features should be avoided:

   Intersections with more than four intersecting streets;

   Intersections adjacent to sign obstructions.

3. Intersection Spacing: Spacing between adjacent intersecting streets, whether crossing or "T" should be as follows:

Highest Classification Minimum Centerline Involved Is	Offset Should Be
Major Arterial	300 feet
Minor Arterial	300 feet
Local Access	150 feet
RES	150 feet

4. Curb: Curb radius for each street classification is indicated in Table 8-1 "Minimum Street Design Standards." When streets with different classifications intersect, the higher street classification standard shall apply. Deviations to this may be allowed at the direction of the Director as a result of a traffic engineering study.

5. Approaches: On sloping approaches at an intersection, landings shall be provided with grade not to exceed one foot difference in elevation for a distance of 30 feet approaching any street measured from nearest right-of-way line (extended) of intersecting street.

E. Sight Distance for Intersections

1. Sight Distance Triangle: The sight distance triangle is a clear sight area formed by extending two lines of specified length as shown on the Sight Distance Standard Plans. The area within the triangle shall be subject to restrictions to maintain a clear view on the intersection approaches.

2. Vertical Clearance Area: The vertical clearance area within the sight distance triangle shall be free from obstructions to a motor vehicle operator's view between a height of 3 feet and 10 feet above the existing surface of the street.

3. Exclusions: Sight obstructions that may be excluded from these requirements include: utility poles, regulatory signs, trees trimmed from the base to a height of 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 which are so planted and trimmed as to leave at all seasons a clear and unobstructed cross view, buildings constructed in conformance with the provisions of appropriate zoning regulations and preexisting buildings at the time of enactment of these Engineering Design Standards.

F. On-Street Parking

1. On-street parking shall be provided as required on Table 8-1 “Minimum Street Design Standards.”

G. Bulbs

1. Bulbs as shown in the Standard Plans shall be installed on all Major Arterials, Minor Arterials, and Local Access Streets unless waived by the Town.

H. Horizontal Curves

1. Horizontal curves are to be determined in accordance with normal civil engineering procedures, considering design speeds, sight distances, roadway crown, building proximity, and vertical grades. The centerline radius shall not be less than shown on Table 8-1.

2. The maximum superelevation on horizontal curves shall be four (4) percent. The minimum horizontal curve radii shall be determined per AASHTO Design for Low Speed Urban Streets.

3. Pavement widening on horizontal curves to accommodate large vehicles shall be considered per AASHTO Chapter III - Elements of Design, Table III-23.

I. Tapers

1. The standard taper length for narrowing or offsetting of a lane shall be based on the design speed, per the MUTCD.

J. Vertical Curves

1. Vertical curves shall comply with AASHTO.

K. Vertical Clearance

1. All streets, cul-de-sacs, and turnarounds must have a minimum clearance of 16.5 feet.

L. Pavement Markings

1. Design plans for pavement markings shall be submitted to the CDP for review and acceptance prior to construction. Plans shall include all existing and proposed striping, show the full width of the street, and show existing conditions beyond the proposed development. Any existing markings that are to be removed shall be clearly designated.

2. All crosswalks and stop bars shall be thermoplastic. All other pavement markings shall be painted.

3. All pavement markings shall conform to the MUTCD specifications.

M. Monuments

1. Prior to any construction within Town rights-of-way, the Applicant shall employ a Washington State Licensed Surveyor to conduct a thorough search for all survey monuments. Any found monuments shall be referenced in accordance with current applicable state laws. A copy of the references shall be submitted to CDP.

2. If placing new or replacing existing monuments is required the Applicant shall do so in accordance with current applicable state laws.

3. At a minimum, monuments shall be installed at the following locations:
   a. At center of each cul-de-sac;
   b. At point of intersection of all streets;
   c. On the roadway centerline at the end of every plat.

4. The location of the monuments shall be clearly marked on the construction plans and final plat.

N. Pavement Design

1. All streets in the Town shall be paved with HMA or cement concrete. A pavement design must be performed for all streets.

2. The pavement design shall meet the requirements in the latest publication of the AASHTO Guide for Design of Pavement Structures. A soils report, signed and stamped by a soils engineer licensed by the State of Washington, shall be based on actual soils tests and submitted with the plans. One soil sample per each 500 LF of centerline with three minimum per project representative of the roadway subgrade shall be taken to determine a statistical representation. Soil tests shall be performed by an accredited materials laboratory.

3. The structural pavement calculations, soil sample locations, lab results, design criteria and recommendations are to be included in a report prepared by Washington State Licensed Engineer. All design factors used are to be listed in the report, including traffic loads projected to occur over the life of the pavement.

O. Hot Mix Asphalt (HMA)

All HMA shall meet the Town's HMA Specification. See Attachment 8-1.

8.6 Curbs and Gutters and Sidewalks

A. General

1. Sidewalks and curbs and gutters and planting strips shall be required as shown on Table 8-1 "Minimum Street Design Standards" and the Standard Plans. Since these are minimum standards, they may be modified by the Town should the Town determine circumstances require increased widths.

B. Curbs and Gutters

1. Integral cement concrete traffic curb and gutter shall be constructed per the Standards Plans on all new construction. Curbs shall be constructed on 4 inches of crushed surfacing top course compacted to 95 percent of the maximum dry density. Special drainage issues may require the use of other curbing with gutter grading, upon approval of the Director. When repairing or replacing existing sections of curb, the type of curb constructed may match the adjacent curb.

C. Sidewalks

1. Curbs and sidewalks shall be constructed within the Town right-of-way on all streets and within private road easements. The required sidewalk construction or repair shall be on all sides of private property parcels adjacent to Town streets whenever any permit is issued for new construction or for substantial improvements to a parcel, or any improvements resulting in a change of occupancy classification. The Director will determine if existing sidewalks are in need of repair. Locations of sidewalk placement or repair shall be included on plans submitted to the Town for review.

2. Sidewalks shall be constructed with in accordance with the Standard Plans. Sidewalks shall be constructed on 4 inches of Crushed Surfacing Top Course compacted to 95 percent of the maximum dry density.

3. All utility vaults placed within the sidewalk shall be approved by the Town. All lids placed within the sidewalk shall be non-slip.

4. In the event the Town has raised or lowered an existing street so that the sidewalk does not match the new proposed sidewalk level, the Town shall be responsible for the costs associated with reconstruction of the new sidewalk.

D. Curb Ramps

1. Curb ramps shall be designed in accordance with the requirements of ADAAG, and the Standard Plans.

8.7 Planting Strips and Street Trees

A. Planting Strips

1. Planting strips shall be the width shown on Table 8-1 and on the Standard Plans unless otherwise directed by the Town. The planting strip shall be a minimum of 4.5 feet wide.

2. When development occurs on sites with existing street trees, the following items shall be addressed as part of the project:
   a. All dead or diseased trees must be removed and replaced at the discretion of the Director.
   b. Trees that are missing shall be replaced at the discretion of the Director.
   c. Broken or missing irrigation systems shall be repaired or replaced.
   d. Tree grates that are not flush with the surrounding sidewalk shall be raised or lowered as necessary to prevent a tripping hazard.
   e. No new utility pole location shall be established closer than 10 feet to an existing tree.

B. New Street Trees

1. Tree selection shall be species listed in Table 8-2 and coordinated with the Town. Trees shall be a minimum of 2" caliber measured 6-inches above the root crown. Approval shall be obtained from the Director prior to planting tree(s) in the Town right of way.

Table 8-2

Tree Species Permitted within Right of Way

Botanical Name	Common Name
Cercis canadensis	Eastern Redbud
Styrax japonica	Japanese Snowbell
Acer truncatum x platinoides	warrened"/Pacific Sunset Maple
Parrodia persica	Persian Ironwood
Acer griseum	Paperbark Maple
Magnolia stellata	Star Magnolia
Ginkgo biloba	Princeton Sentry
Ginkgo biloba Magyar	Magyar ginkgo
Stewartia psuedocamellia	Japanese stewartia
Cercis siliquastrum	Judas tree

2. When locating street trees, the following specific criteria shall apply:
   a. Street Trees shall be planted in the center of the planting strip.
   b. Street trees installed in planting strips or sidewalk cutouts shall be located so as to not interfere with street signs, lighting poles, and utilities, and shall accommodate ADA pedestrian requirements.
   c. Minimum horizontal distances from the centerline of a tree to other structures or improvements in the planting strip shall be as follows:
      1) 10 feet to edge of driveway;
      2) 20 feet to street light luminaire;
      3) As required to provide an adequate clear sight triangle;
      4) 5 feet to underground duct or pipe;
      5) 10 feet to hydrants and utility poles.
   d. Spacing of street trees will be 30 feet unless approved otherwise by the Director.
   e. If trees are to be planted in an area with no planting strip, the following criteria shall apply:
      1) A permanent, hard walking surface at least 5-feet wide shall be provided between the tree well and any structure or obstruction.
      2) Sidewalk cuts in concrete for tree planting shall be at least 48" x 48" to allow air and water to the root area.
      3) In cases where the existing walk cannot meet the four foot width requirement after tree planting, additional sidewalk width must be added within street right of way or easement, or the tree position must be modified.
   f. Trees shall be planted in accordance the Tree Planting Standard Plan.

8.8 Driveways

A. General

1. Driveways shall be construct in accordance with the Standard Plans.
   a. Joint-use driveways serving two adjacent parcels may be built on their common boundary upon formal written agreement by both property owners and approval of the Town. The agreement shall be a recorded easement for both parcels of land specifying joint usage.
   b. Driveways serving non-residential uses shall not be approved where backing onto the sidewalk or street will occur. Driveways serving residential uses where backing onto the sidewalk or street will occur, shall be approved by the Public Works Director.
   c. Driveway aprons shall not extend into the street further than the face of the curb.
   d. The angle between any driveway and the street shall be not less than 45°.
   e. Driveway edges shall be parallel.
   f. Grade breaks, including the tie to the roadway, shall be constructed as smooth vertical curves. The maximum change in driveway grade shall be 8 percent within any 10 feet of distance on a crest and 12 percent within any 10 feet of distance in a sag vertical curve. The grades of all driveway approaches are to be approved by the Town.
   g. All standard driveways shall be constructed of Concrete Cement, and shall be at least 6-inches thick, over a 4-inch crushed surfacing top course, unless alternative materials are approved by the Public Works Director. Driveways shall be subject to the same testing and inspection requirements as curb, gutter, and sidewalk construction.
   h. Maintenance of driveway approaches shall be the responsibility of the owners whose property they serve.
   i. Driveways giving direct access onto arterials may be denied if alternate access is available.
   j. Driveways should be situated as far away from intersections as practicable.
   k. Driveways shall not be located within 20 feet of a crosswalk.
   l. Driveway shall not be located so as to conflict with power poles, street lights, fire hydrants, traffic regulating devises or other above-ground facilities, and shall not create a hazard to pedestrians or motorists as determined by the Town.
   m. All abandoned driveway areas on the same frontage shall be removed and the curbing and sidewalk or shoulder and ditch section shall be properly restored, at the Applicant's expense.
   n. Right turn tapers, left turn pockets and acceleration lanes may be required in light industrial and commercial zoned areas as directed by the Town as a result of a traffic engineering study.
   o. Deviations of these standards may be permitted by the Town as a result of a traffic engineering study.

B. Private Intersection

A private intersection opening shall be used in lieu of a conventional driveway approach where all the following criteria as determined by the Town are met.

1. Projected driveway usage is greater than 2,000 vehicles per day; and
2. Where traffic signalization is required by a traffic study; and
3. A minimum 100-foot long travel lane is provided between the street and any turning

or parking maneuvers within the development; and

4. The opening is at least 150 feet from any other intersection opening; and

5. The opening is at least 150 feet away from any other driveway on the property frontage under control of the applicant; and

6. Easement dedication for traffic control devices.

C. Width and Number of Access Points for All Driveways

1. Driveway width shall not exceed the maximum widths indicated in Table 8-3.

2. A wider driveway width may be approved by the Town as a result of a traffic engineering study.

Table 8-3

Driveway Widths

Property Frontage	Number of Driveways	Maximum Driveway Width
Residential Use		
Less than 120 feet	1	12'
Equal or Greater than 120 feet	2	12'
Non-Residential Use		
Less than 60 feet	1	24'
Equal or Greater than 60 feet and Less than 120 feet	1	30'
Equal or Greater than 120 feet	2	24'

8.9 Signing

A. General

The Applicant is responsible for providing all traffic control and street name signs. Traffic control signing shall comply with the provisions of the MUTCD. All signs (regulatory, warning, street name, etc.), including poles and hardware, shall be installed and paid for by the Applicant.

B. Street Signs

1. All existing and proposed street signs required as part of street design shall be shown on the plans submitted and approved by the Town. The plans shall include all existing and proposed signs, show the full width of the street, include any signs on the opposite side of the street, and show existing conditions beyond the proposed development.

2. All traffic control devices, including, but not limited to regulatory signs, warning signs, and guide signs shall adhere to the MUTCD.

C. Sign Posts

1. Refer to the Standard Plans for street sign post construction requirements.

D. Street Names and Address Number

1. Street Names

The Applicant shall submit proposed new street names to the Town during the preliminary plat process. The Town will insure that the name assigned to a new street is consistent with policies of the Town.

2. Address Number

An address number will be assigned to all new buildings at the time the building permit is issued. It is then the Applicant's responsibility to see that the building numbers are placed clearly and visibly at the main entrance to the property or at the principal place of ingress.

8.10 Mailboxes

A. During construction, existing mailboxes shall be accessible for the delivery of mail or, if necessary, moved to a temporary location. Temporary relocation shall be coordinated with the U.S. Postal Service. The mailboxes shall 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.

B. The responsibilities for location and installation of mailboxes in connection with the construction or reconstruction of Town streets are as follows:

The Town will require:

1. Street improvement drawings to show clearly the designated location or relocation of mailboxes, whether single or in clusters.

2. Any necessary widening or reconfiguration of sidewalks with suitable knock-outs or open strips for mailbox posts or pedestals.

3. Drawings to bear a statement on the first sheet that the Collection Box Unit (C.B.U.) mailbox locations as shown on these drawings have been coordinated with the serving post office at Friday Harbor, Washington as a prerequisite to plan approval.

4. Locations of mailboxes in accordance with the Standard Plans.

C. Mailboxes and Collection Box Units shall be installed by the Applicant in accordance with the Standard Plans.

8.11 Walls

A. Wall installations in the public right-of-way will be discouraged, and every effort should be made by the Design Engineer to grade the property in such a way as to avoid the installation of walls. If a wall is determined to be necessary, consideration shall be given to the design and placement of the wall to maximize the clear area, including placement of the wall outside of the right-of-way on private property. Any wall constructed within the roadway clear area shall have the appropriate barrier protection provided as approved by the Director. A chain link fence or aluminum hand railing shall be required at the top of a new or reconstructed wall if the height of the exposed face of the wall exceeds 30 inches. For walls less than 30 inches, the Director may require a fence or other protection.

B. Retaining Walls

1. For all retaining walls, a structural wall of acceptable design shall be used. Geotechnical design criteria shall be provided by a geotechnical engineer. Plans and specifications for each retaining wall to be located within the Town road right-of-way shall be designed, stamped, and signed by an engineer.

   Any retaining wall constructed for a roadway fill section shall provide a minimum 1-foot setback from any portion of the wall to the right-of-way to allow for wall maintenance and inspection activities.

2. Rock Walls

   Rock Walls may be used for the containment of cut slopes or fill embankments up to a maximum wall height of 4 feet (including one foot of embedment) if stable and appropriate soil conditions exist.

3. Modular Block Walls

   Modular Block Walls may be installed as shown in the Standard Plans for exposed wall heights of less than 4 feet.

8.12 Illumination

A. General

1. All new streets and street improvements shall provide street lighting in accordance with these Standards.

2. All public street light designs shall be prepared by an engineering firm capable of performing such work. The engineer shall be licensed by the State of Washington.

3. The Applicant shall submit a street lighting plan and illumination calculations to Town for review and approval.

B. Design Criteria

1. Design shall be completed in accordance with the Illuminating Engineering Society Roadway Lighting Manual ANSI/IES RP-8-14.

2. The lighting criteria for streets is provided Table 8-4 “Lighting Design Criteria.” The Applicant shall complete illumination uniformity and light level calculations using AGI32 software.

3. All new lighting systems shall be connected to a metered service. The Applicant shall coordinate the service location with Orcas Power and Light Cooperative (OPALCO). The stainless steel service cabinet shall be Milbank CP 3B11115A22.

4. The light standard shall be HAPCO Model RTA25D7B4M16-01 unless the Town directs otherwise. The mounting height of the luminaire is 25 feet.

5. The luminaire shall be CREE Model BXSP_B_HT_3ME_A_40K_UL_SV_N-Q9.

6. A photocell shall be placed on one luminaire to control the lighting system.

7. All conduits shall be schedule 80 PVC.

8. Street light junction boxes shall conform to WSDOT Standard Plan J-40.10, Type 1.

Table 8-4

Lighting Design Criteria

	Min. Avg. Light Level	Maximum Uniformity Ratio
Non-Residential Streets	0.6	6:1
Residential	0.3	10:1

Attachment 8-1 Hot Mix Asphalt Specification

5-04.1 Description

This Work shall consist of providing and placing one or more layers of plant-mixed hot mix asphalt (HMA) on a prepared foundation or base in accordance with these Specifications and the lines, grades, thicknesses, and typical cross-sections shown in the Plans.

This work also consists of adjusting castings to grade per the details in the Contract Plans.

HMA shall be composed of asphalt binder and mineral materials as may be required, mixed in the proportions specified to provide a homogeneous, stable, and workable mixture.

5-04.2 Materials

Materials shall meet the requirements of the following WSDOT Standard sections:

Asphalt Binder	9-02.1(4)
Cationic Emulsified Asphalt	9-02.1(6)
Anti-Stripping Additive	9-02.4
HMA Additive	9-02.5
Aggregates	9-03.8
Recycled Asphalt Pavement	9-03.8(3)B
Mineral Filler	9-03.8(5)
Recycled Material	9-03.21
Portland Cement	9-01
Sand	9-03.1(2).
(As noted in 5-04.3(5)C for crack sealing)	
Joint Sealant	9-04.2
Foam Backer Rod	9-04.2(3)A

The following local materials shall be considered acceptable for use as aggregate:

1. Crushed surfacing top course per Section 9-03.9(3).
2. Black sand per Section 9-03.1(2)B Class 1.

The Contractor shall be required to furnish mineral materials in the amounts required for the designated mix. Mineral materials include coarse and fine aggregates, and mineral filler.

5-04.2(2) Mix Design – Obtaining Project Approval

No paving shall begin prior to the approval of the mix by the Public Works Director.

- The mix provided for this work shall be a 1/2" dense mix with stripping agent using PG 64-22 asphalt binder at a proportion between 5.8 and 6.2 percent. Mix designs that have been successfully used on Town Projects for new construction within the past 2 years will be accepted.

5-04.3 Construction Requirements

5-04.3(1) Weather Limitations

Do not place HMA for wearing course on any traveled way beginning October 1st through March 31st of the following year without written concurrence from the Engineer.

Do not place HMA on any wet surface, or when the average surface temperatures are less than those specified below, or when weather conditions otherwise prevent the proper handling or finishing of the HMA.

Minimum Surface Temperature for Paving

Compacted Thickness (Feet)	Wearing Course	Other Courses
Less than 0.10	55 degrees F	45 degrees F
0.10 to .20	45 degrees F	35 degrees F
More than 0.20	35 degrees F	35 degrees F

5-04.3(2) Paving Under Traffic

When the Roadway being paved is open to traffic, the requirements of this Section shall apply.

The Contractor shall keep intersections open to traffic at all times except when paving the intersection or paving across the intersection. During such time, and provided that there has been an advance warning to the public, the intersection may be closed for the minimum time required to place and compact the mixture. In hot weather, the Engineer may require the application of water to the pavement to accelerate the finish rolling of the pavement and to shorten the time required before reopening to traffic.

Before closing an intersection, advance warning signs shall be placed and signs shall also be placed marking the detour or alternate route.

During paving operations, temporary pavement markings shall be maintained throughout the project. Temporary pavement markings shall be installed on the Roadway prior to opening to traffic. Temporary pavement markings shall be in accordance with Section 8-23.

All costs in connection with performing the Work in accordance with these requirements, except the cost of temporary pavement markings, shall be included in the unit Contract prices for the various Bid items involved in the Contract.

5-04.3(3) Equipment

5-04.3(3)A Mixing Plant

Plants used for the preparation of HMA shall conform to the following requirements:

1. **Equipment for Preparation of Asphalt Binder** – Tanks for the storage of asphalt binder shall be equipped to heat and hold the material at the required temperatures. The heating shall be accomplished by steam coils, electricity, or other approved means so that no flame shall be in contact with the storage tank. The circulating system for the asphalt binder shall be designed to ensure proper and continuous circulation during the operating period. A valve for the purpose of sampling the asphalt binder shall be placed in either the storage tank or in the supply line to the mixer.

2. **Thermometric Equipment** – An armored thermometer, capable of detecting temperature ranges expected in the HMA mix, shall be fixed in the asphalt binder feed line at a location near the charging valve at the mixer unit. The thermometer location shall be convenient and safe for access by Inspectors. The plant shall also be equipped with an approved dial-scale thermometer, a mercury actuated thermometer, an electric pyrometer, or another approved thermometric instrument placed at the discharge chute of the drier to automatically register or indicate the temperature of the heated aggregates. This device shall be in full view of the plant operator.

3. **Heating of Asphalt Binder** – The temperature of the asphalt binder shall not exceed the maximum recommended by the asphalt binder manufacturer nor shall it be below the minimum temperature required to maintain the asphalt binder in a homogeneous state. The asphalt binder shall be heated in a manner that will avoid local variations in heating. The heating method shall provide a continuous supply of asphalt binder to the mixer at a uniform average temperature with no individual variations exceeding 25 degrees F.

Also, when a WMA additive is included in the asphalt binder, the temperature of the asphalt binder shall not exceed the maximum recommended by the manufacturer of the WMA additive.

4. **Sampling and Testing of Mineral Materials** – The HMA plant shall be equipped with a mechanical sampler for the sampling of the mineral materials. The mechanical sampler shall meet the requirements of Section 1-05.6 for the crushing and screening operation. The Contractor shall provide for the setup and operation of the field testing facilities of the Contracting Agency as provided for in Section 3-01.2(2).

5. **Sampling HMA** – The HMA plant shall provide for sampling HMA by one of the following methods:

   a. A mechanical sampling device attached to the HMA plant.

   b. Platforms or devices to enable sampling from the hauling vehicle without entering the hauling vehicle.

5-04.3(3)B Hauling Equipment

Trucks used for hauling HMA shall have tight, clean, smooth metal beds and shall have a cover of canvas or other suitable material of sufficient size to protect the mixture from adverse weather. Whenever the weather conditions during the work shift include, or are forecast to include, precipitation or an air temperature less than 45 degrees F or when time from loading to unloading exceeds 30 minutes, the cover shall be securely attached to protect the HMA.

The Contractor shall provide an environmentally benign means to prevent the HMA mixture from adhering to the hauling equipment. Excess release agent shall be drained prior to filling hauling equipment with HMA. Petroleum derivatives or other coating material that contaminate or alter the characteristics of the HMA shall not be used. For live bed trucks, the conveyer shall be in operation during the process of applying the release agent.

5-04.3(3)C Pavers

Asphalt pavers shall be self-propelled mechanical spreading and finishing equipment, provided with a screed or strike-off assembly capable of distributing the material to not less than the full width of a traffic lane. Screed action shall include any cutting, crowding or other practical action which is effective on the mixture without tearing, shoving or gouging, and which produces a surface texture of uniform appearance. The screed shall be adjustable to the required section and thickness. The paver shall be provided with a suitable full width compacting

device. Pavers that leave ridges, indentations or other marks in the surface shall not be used unless the ridges, indentations or other marks are eliminated by rolling or prevented by adjustment in operation.

The asphalt paver shall operate independently of the vehicle being unloaded or shall be capable of propelling the vehicle being unloaded in a satisfactory manner. The load of the haul vehicle shall be limited to that which will ensure satisfactory spreading. While being unloaded the haul vehicle shall be in contact with the machine at all times and the brakes on the haul vehicle shall not be depended upon to maintain contact between the vehicle and the machine.

No portion of the weight of hauling or loading equipment, other than the connection, shall be supported by the asphalt paver, and no vibrations or other motions of the loader, which could have a detrimental effect on the riding quality of the completed pavement, shall be transmitted to the paver.

Sufficient personnel shall be provided to properly operate the paver. Unless fully automatic a person shall be provided to operate each wing as well as an operator to drive the unit. The paver operator shall not also operate any of the rollers.

If the paving machine in use is not providing the required finish, the Engineer may suspend Work as allowed by Section 1-08.6. Any cleaning or solvent type liquids spilled on the pavement shall be thoroughly removed before paving proceeds.

5-04.3(3)D Rollers

At a minimum three rollers consisting of the following shall be used for each asphalt paver to compact all asphalt concrete and asphalt concrete base:

One steel-tired 2 axle tandem breakdown roller weighing not less than 8 tons;

One steel-tired, 2 axle vibratory roller weighing not less than 4 tons and;

One steel tired tandem finish roller.

The 2 axle tandem breakdown roller shall have rolling wheels with a diameter of 40 inches or more.

Each roller shall have a separate operator. Rolling equipment shall be self-propelled and reversible. The minimum number, weight and type of rollers required may be reduced or modified for low rates of production when alternative equipment is approved by the engineer.

Rollers shall be equipped with pads and water systems which prevent sticking of asphalt mixtures to the pneumatic-tired or steel-tired wheels. A parting agent, which will not damage the asphalt mixture, as determined by the Engineer, may be used to aid in preventing the sticking of the mixture to the wheels.

Pneumatic-tired rollers when used, shall be the oscillating type having a width of not less than 4 feet with pneumatic-tires of equal size, diameter and having treads satisfactory to the Engineer. Wobble-wheel rollers will not be permitted. The tires shall be spaced so that the gaps between adjacent tires will be covered by the following tires.

The tires shall be inflated to 90 psi, or a lower pressure as designated by the Engineer, and maintained so that the air pressure will not vary more than 5 psi from the designated pressure. Pneumatic-tired rollers shall be constructed so that the total weight of the roller can be varied to produce an operating weight per tire of not less than 2,000 pounds. The total operating weight of the roller shall be varied as directed by the Engineer.

5-04.3(4) Preparation of Existing Paved Surfaces

When the surface of the existing pavement or old base is irregular, the Contractor shall bring it to a uniform grade and cross-section as shown on the Plans or approved by the Engineer.

Preleveling of uneven or broken surfaces over which HMA is to be placed may be accomplished by using an asphalt paver, a motor patrol grader, or by hand raking, as approved by the Engineer.

Compaction of preleveling HMA shall be to the satisfaction of the Engineer and may require the use of small steel wheel rollers, plate compactors, or pneumatic rollers to avoid bridging across preleveled areas by the compaction equipment. Equipment used for the compaction of preleveling HMA shall be approved by the Engineer.

Before construction of HMA on an existing paved surface, the entire surface of the pavement shall be clean. All fatty asphalt patches, grease drippings, and other objectionable matter shall be entirely removed from the existing pavement. All pavements or bituminous surfaces shall be thoroughly cleaned of dust, soil, pavement grindings, and other foreign matter. All holes and small depressions shall be filled with an appropriate class of HMA. The surface of the patched area shall be leveled and compacted thoroughly. Prior to the application of tack coat, or paving, the condition of the surface shall be approved by the Engineer.

A tack coat of asphalt shall be applied to all paved surfaces on which any course of HMA is to be placed or abutted. Tack coat shall be uniformly applied to cover

the existing pavement with a thin film of residual asphalt free of streaks and bare spots at a rate between 0.02 and 0.10 gallons per square yard of retained asphalt. The rate of application shall be approved by the Engineer. A heavy application of tack coat shall be applied to all joints. For Roadways open to traffic, the application of tack coat shall be limited to surfaces that will be paved during the same working shift. The spreading equipment shall be equipped with a thermometer to indicate the temperature of the tack coat material.

Equipment shall not operate on tacked surfaces until the tack has broken and cured. If the Contractor's operation damages the tack coat it shall be repaired prior to placement of the HMA.

The tack coat shall be CSS-1, or CSS-1h emulsified asphalt. The CSS-1 and CSS-1h emulsified asphalt may be diluted once with water at a rate not to exceed one part water to one part emulsified asphalt. The tack coat shall have sufficient temperature such that it may be applied uniformly at the specified rate of application and shall not exceed the maximum temperature recommended by the emulsified asphalt manufacturer.

5-04.3(4)A Crack Sealing

5-04.3(4)A1 General

When the Proposal includes a pay item for crack sealing, seal all cracks 1/4 inch in width and greater.

Cleaning: Ensure that cracks are thoroughly clean, dry and free of all loose and foreign material when filling with crack sealant material. Use a hot compressed air lance to dry and warm the pavement surfaces within the crack immediately prior to filling a crack with the sealant material. Do not overheat pavement. Do not use direct flame dryers. Routing cracks is not required.

Sand Slurry: For cracks that are to be filled with sand slurry, thoroughly mix the components and pour the mixture into the cracks until full. Add additional CSS-1 cationic emulsified asphalt to the sand slurry as needed for workability to ensure the mixture will completely fill the cracks. Strike off the sand slurry flush with the existing pavement surface and allow the mixture to cure. Top off cracks that were not completely filled with additional sand slurry. Do not place the HMA overlay until the slurry has fully cured.

The sand slurry shall consist of approximately 20 percent CSS-1 emulsified asphalt, approximately 2 percent portland cement, water (if required), and the remainder clean Class 1 or 2 fine aggregate per section 9-03.1(2). The components shall be thoroughly mixed and then poured into the cracks and joints until full. The following day, any cracks or joints that are not completely filled shall

be topped off with additional sand slurry. After the sand slurry is placed, the filler shall be struck off flush with the existing pavement surface and allowed to cure. The HMA overlay shall not be placed until the slurry has fully cured. The requirements of Section 1-06 will not apply to the portland cement and sand used in the sand slurry.

In areas where HMA will be placed, use sand slurry to fill the cracks.

In areas where HMA will not be placed, fill the cracks as follows:

1. Cracks 1/4 inch to 1 inch in width – fill with hot pressure fed sealant.

2. Cracks greater than 1 inch in width – fill with sand slurry.

Hot Pressure Fed Sealant: For cracks that are to be filled with hot poured sealant, apply the material in accordance with these requirements and the manufacturer's recommendations. Furnish a Type 1 Working Drawing of the manufacturer's product information and recommendations to the Engineer prior to the start of work, including the manufacturer's recommended heating time and temperatures, allowable storage time and temperatures after initial heating, allowable reheating criteria, and application temperature range. Confine hot poured sealant material within the crack. Clean any overflow of sealant from the pavement surface. If, in the opinion of the Engineer, the Contractor's method of sealing the cracks with hot pressure fed sealant results in an excessive amount of material on the pavement surface, stop and correct the operation to eliminate the excess material. Pouring sealant is not an acceptable method.

5-04.3(4)A2 Crack Sealing Areas Prior to Paving

In areas where HMA will be placed, use sand slurry to fill the cracks.

5-04.3(4)A3 Crack Sealing Areas Not to be Paved

In areas where HMA will not be placed, fill the cracks as follows:

a. Cracks 1/4 inch to 1 inch in width - fill with hot pressure fed sealant.

b. Cracks greater than 1 inch in width – fill with sand slurry.

5-04.3(4)B Vacant

5-04.3(4)C Pavement Repair

The Contractor shall excavate pavement repair areas and shall backfill these with crushed surfacing top course and HMA in accordance with the details shown in the Plans and as marked in the field. The Contractor shall conduct the excavation operations in a manner that will protect the pavement that is to remain. Pavement not designated to be removed that is damaged as a result of the Contractor's operations shall be repaired by the Contractor to the satisfaction of the Engineer at no cost to the Contracting Agency. The Contractor shall excavate only within one lane at a time unless approved otherwise by the Engineer. The Contractor shall not excavate more area than can be completely finished during the same shift, unless approved by the Engineer.

The Contractor shall excavate to the depth noted on the Plans. Should additional depth be required to expose a firm and unyielding subgrade it will be paid for under "Unsuitable Foundation Excavation, Incl. Haul". The Engineer will make the final determination of the excavation depth required. The minimum width of any pavement repair area shall be 40 inches unless shown otherwise in the Plans. Before any excavation, the existing pavement shall be sawcut or shall be removed by a pavement grinder. Excavated materials will become the property of the Contractor and shall be disposed of in a Contractor-provided site off the Right of Way or used in accordance with Sections 2-02.3(3) or 9-03.21.

Asphalt for tack coat shall be required as specified in Section 5-04.3(4). A heavy application of tack coat shall be applied to all surfaces of existing pavement in the pavement repair area.

Placement of the crushed surfacing top course backfill shall be as specified in Section 4.04.

Placement of the HMA backfill shall be accomplished in lifts not to exceed 0.35-foot compacted depth. Lifts that exceed 0.35 foot of compacted depth may be accomplished with the approval of the Engineer. Each lift shall be thoroughly compacted by a mechanical tamper or a roller.

5-04.3(4)D Temporary HMA and Temporary Cold Mix

During the course of construction, it may be necessary to provide improved temporary vehicle and/or pedestrian access within the project limits. Such temporary access shall be provided by temporarily patching trench crossings or other areas with temporary HMA and temporary cold mix (EZ Street or Contracting Agency approved equal), until such time as the permanent surface restoration is installed. Locations shall include those areas specifically indicated on the Plans, directed by the Engineer or as further specified herein. This material will be furnished, placed, compacted, and removed and wastehauled at various locations

throughout the project. The trenches and/or subgrade shall be thoroughly compacted and brought to a smooth grade prior to placing the material. It shall be placed, maintained (daily), and removed and wastehauled by the Contractor. Typical compacted depth will be 4 inches. Temporary HMA and temporary cold mix shall also be used around castings, after grinding, to provide a transition until final lift of HMA paving is installed.

5-04.3(5) Producing/Stockpiling Aggregates and RAP

Aggregates and RAP shall be stockpiled according to the requirements of WSDOT Standard Specification Section 3-02. Sufficient storage space shall be provided for each size of aggregate and RAP. Materials shall be removed from stockpile(s) in a manner to ensure minimal segregation when being moved to the HMA plant for processing into the final mixture. Different aggregate sizes shall be kept separated until they have been delivered to the HMA plant.

5-04.3(5)A Vacant

5-04.3(6) Mixing

After the required amount of mineral materials, asphalt binder, recycling agent and anti-stripping additives have been introduced into the mixer the HMA shall be mixed until complete and uniform coating of the particles and thorough distribution of the asphalt binder throughout the mineral materials is ensured.

When discharged, the temperature of the HMA shall not exceed the optimum mixing temperature by more than 25 degrees F as shown on the reference mix design report or as approved by the Engineer. Also, when a WMA additive is included in the manufacture of HMA, the discharge temperature of the HMA shall not exceed the maximum recommended by the manufacturer of the WMA additive. A maximum water content of 2 percent in the mix, at discharge, will be allowed providing the water causes no problems with handling, stripping, or flushing. If the water in the HMA causes any of these problems, the moisture content shall be reduced as directed by the Engineer.

Storing or holding of the HMA in approved storage facilities will be permitted with approval of the Engineer, but in no event shall the HMA be held for more than 24 hours. HMA held for more than 24 hours after mixing shall be rejected. Rejected HMA shall be disposed of by the Contractor at no expense to the Contracting Agency. The storage facility shall have an accessible device located at the top of the cone or about the third point. The device shall indicate the amount of material in storage. No HMA shall be accepted from the storage facility when the HMA in storage is below the top of the cone of the storage facility, except as the storage facility is being emptied at the end of the working shift.

Recycled asphalt pavement (RAP) utilized in the production of HMA shall be sized prior to entering the mixer so that a uniform and thoroughly mixed HMA is produced. If there is evidence of the recycled asphalt pavement not breaking down during the heating and mixing of the HMA, the Contractor shall immediately suspend the use of the RAP until changes have been approved by the Engineer. After the required amount of mineral materials, RAP, new asphalt binder and asphalt rejuvenator have been introduced into the mixer the HMA shall be mixed until complete and uniform coating of the particles and thorough distribution of the asphalt binder throughout the mineral materials, and RAP is ensured.

5-04.3(7) Spreading and Finishing

The mixture shall be laid upon an approved surface, spread, and struck off to the grade and elevation established. HMA pavers complying with Section 5-04.3(3) shall be used to distribute the mixture. Unless otherwise directed by the Engineer, the nominal compacted depth of any layer of any course shall not exceed the following:

HMA Class 1"	0.35 feet
HMA Class 3/4" and HMA Class 1/2" wearing course	0.30 feet
other courses	0.35 feet
HMA Class 3/8"	0.15 feet

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the paving may be done with other equipment or by hand.

When more than one job mix formula (JMF) is being utilized to produce HMA, the material produced for each JMF shall be placed by separate spreading and compacting equipment. The intermingling of HMA produced from more than one JMF is prohibited. Each strip of HMA placed during a work shift shall conform to a single JMF established for the class of HMA specified unless there is a need to make an adjustment in the JMF.

5-04.3(8) Vacant

5-04.3(9) Vacant

5-04.3(10) HMA Acceptance

5-04.3(10)A HMA Compaction

A pass shall be one movement of a roller in either direction. A coverage shall be as many passes as are necessary to cover the entire width being paved. Overlap between passes during any coverage, made to ensure a compaction without

displacement of material in accordance with good rolling practice, shall be considered to be part of the coverage being made and not part of subsequent coverages started.

Rolling shall commence at the lower edge and shall progress toward the highest portion, except that when compacting layers which exceed 0.25 foot in compacted thickness, and if directed by the Engineer, rolling shall commence at the center and shall progress outwards.

Asphalt concrete and asphalt concrete base shall be compacted as follows:

Initial or breakdown compaction shall consist of a minimum of 3 coverages of a layer of asphalt mixture and shall be performed with a 2 axle or 3 axle tandem roller weighing not less than 8 tons. Where the thickness of the layer of asphalt mixture is less than 0.15-foot, fewer coverages than specified above may be ordered by the Engineer if necessary to prevent damage to the layer being compacted.

The initial or breakdown compaction shall be followed immediately by additional rolling consisting of 3 coverages with a 2 axle vibratory roller weighing at least 4 tons. Coverages with the second roller shall start when the temperature of the mixture is as high as practicable, preferably above 180 F, and shall be completed while the temperature of the mixture is at or above 150 F.

Each layer of asphalt concrete and asphalt concrete base shall be compacted additionally without delay by a final rolling consisting of not less than one coverage with a steel tired finish roller. Except as otherwise provided for low rates of production, a separate finish roller will be required. A vibratory roller may be used as the finish roller provided that the vibratory roller meets the requirements for a finish roller and is operated with the vibratory unit turned off.

Rolling shall be performed so that cracking, shoving or displacement will be avoided.

Rolling, where 3 axle tandem rollers may be used as specified in this Section shall be under the control of the Engineer, but in general no 3 axle tandem roller shall be used in rolling over a crown or on warped sections when the center axle is in the locked position.

The completed surfacing shall be thoroughly compacted, smooth and free from ruts, humps, depressions or irregularities. Any ridges, indentations or other objectionable marks left in the surface of the asphalt concrete by blading or other equipment shall be eliminated by rolling or other means. The use of any equipment that leaves ridges, indentations or other objectionable marks in the asphalt

concrete shall be discontinued, and acceptable equipment shall be furnished by the Contractor.

When a straightedge 12 feet long is laid on the finished surface and parallel with the center line, the surface shall not vary more than 0.01 foot from the lower edge of the straightedge. The transverse slope of the finished surface shall be uniform to a degree such that no depressions greater than 0.02 foot are present when tested with a straightedge 12 feet long laid in a direction transverse to the center line and extending from edge to edge of a 12-foot traffic lane.

Pavement within 50 feet of a structure or approach slab may deviate from a 12-foot straightedge by 0.02 in the center line direction.

5-04.3(10)B Quality Control

As near to the commencement of paving as practical the Contractor shall submit to the Town's material laboratory a representative sample of HMA for determination of theoretical maximum density (TMD) via the Rice method. This TMD will be used for initial calibration of nuclear test gages to be used during paving.

The Town will provide on-site inspection of HMA placement and compaction.

The HMA used on the job will be sampled at three locations and additional Rice densities taken and averaged as verification of the initial nuclear gage calibration. The lower acceptable limit of compaction shall be 91 percent based on the average theoretical maximum density obtained from the three samples taken from the mix used on the job.

The completed work shall be a smooth, tight, uniform texture without voids, rock pockets or being subject to excessive tracking under traffic when cooled.

5-04.3(11) Reject Work

5-04.3(11)A Reject Work General

Work that is defective or does not conform to Contract requirements shall be rejected. The Contractor may propose, in writing, alternatives to removal and replacement of rejected material. Acceptability of such alternative proposals will be determined at the sole discretion of the Engineer.

5-04.3(11)B Rejection by Contractor

The Contractor may, prior to sampling, elect to remove any defective material and replace it with new material. Any such new material will be sampled, tested, and evaluated for acceptance.

5-04.3(12) Joints

5-04.3(12)A HMA Joints

5-04.3(12)A1 Transverse Joints

The Contractor shall conduct operations such that the placing of the top or wearing course is a continuous operation or as close to continuous as possible. Unscheduled transverse joints will be allowed and the roller may pass over the unprotected end of the freshly laid mixture only when the placement of the course must be discontinued for such a length of time that the mixture will cool below compaction temperature. When the Work is resumed, the previously compacted mixture shall be cut back to produce a slightly beveled edge for the full thickness of the course.

A temporary wedge of HMA constructed on a 20H:1V shall be constructed where a transverse joint as a result of paving or planing is open to traffic. The HMA in the temporary wedge shall be separated from the permanent HMA by strips of heavy wrapping paper or other methods approved by the Engineer. The wrapping paper shall be removed and the joint trimmed to a slightly beveled edge for the full thickness of the course prior to resumption of paving.

The material that is cut away shall be wasted and new mix shall be laid against the cut. Rollers or tamping irons shall be used to seal the joint.

5-04.3(12)A2 Longitudinal Joints

The longitudinal joint in any one course shall be offset from the course immediately below by not more than 6 inches nor less than 2 inches. All longitudinal joints constructed in the wearing course shall be located at a lane line or an edge line of the Traveled Way. A notched wedge joint shall be constructed along all longitudinal joints in the wearing surface of new HMA unless otherwise approved by the Engineer. The notched wedge joint shall have a vertical edge of not less than the maximum aggregate size or more than ½ of the compacted lift thickness and then taper down on a slope not steeper than 4H:1V. The sloped portion of the HMA notched wedge joint shall be uniformly compacted.

5-04.3(13) Surface Smoothness

The completed surface of all courses shall be of uniform texture, smooth, uniform as to crown and grade, and free from defects of all kinds. The completed surface

of the wearing course of the following sections of Roadway shall not vary more than 1/4 inch from the lower edge of a 10-foot straightedge placed on the surface parallel to centerline:

1. roads less than 45 mph

The completed surface of the wearing course of all other sections of Roadway shall not vary more than 1/8 inch from the lower edge of a 10-foot straightedge placed on the surface parallel to centerline.

The transverse slope of the completed surface of the wearing course shall vary not more than 1/4 inch in 10 feet from the rate of transverse slope shown in the Plans.

When deviations in excess of the above tolerances are found that result from a high place in the HMA, the pavement surface shall be corrected by one of the following methods:

1. Removal of material from high places by grinding with an approved grinding machine; or

2. Removal and replacement of the wearing course of HMA; or

3. By other method approved by the Engineer.

Correction of defects shall be carried out until there are no deviations anywhere greater than the allowable tolerances.

Deviations in excess of the above tolerances that result from a low place in the HMA and deviations resulting from a high place where corrective action, in the opinion of the Engineer, will not produce satisfactory results will be accepted with a price adjustment. The Engineer shall deduct from monies due or that may become due to the Contractor the sum of $500.00 for each and every section of single traffic lane 100 feet in length in which any excessive deviations described above are found.

All utility castings and monuments within the existing and/or new pavement area shall be referenced by the Contractor prior to any pavement removal or planing. The Contractor shall keep a record of such references, and submit a copy to the Contracting Agency.

Existing structures and new structures shall be adjusted to the finished grade as shown on the Plans and as further specified herein. Existing boxes, rings, grates, covers, and lids shall be reset in a careful and workmanlike manner to conform to the required grades.

The new and existing utility castings and monuments shall be adjusted to grade in the following manner:

As soon as the street has been paved past each structure or casting, the asphalt concrete mat shall be scored around the location of the structure or casting. After rolling has been completed and the mat has cooled, it shall be cut along the scored lines. The structure or casting shall then be raised to finished pavement grade and the annular spaces filled as indicated on the Plans. The Contractor shall install the pavement to give a smooth finished appearance. All covers, lids, frames, and grates shall be thoroughly cleaned.

After pavement is in place, all new pavement joints shall be sealed with a 6-inch-wide strip of hot asphalt sealer. A sand blanket shall be applied to the surface of the hot asphalt sealer immediately after the placement of the sealer to help alleviate the tracking of the asphalt. The sealer shall meet the requirements of Section 9-04.2(1) of the Standard Specifications.

5-04.3(14) Planing (Milling) Bituminous Pavement

The planing plan must be approved by the Engineer and a pre-planing meeting must be held prior to the start of any planing. See Section 5-04.3(14)B2 for information on planning submittals.

Locations of existing surfacing to be planed are as shown in the Drawings.

Where planing an existing pavement is specified in the Contract, the Contractor must remove existing surfacing material and to reshape the surface to remove irregularities. The finished product must be a prepared surface acceptable for receiving an HMA overlay.

Use the cold milling method for planing unless otherwise specified in the Contract. Do not use the planer on the final wearing course of new HMA.
Conduct planing operations in a manner that does not tear, break, burn, or otherwise damage the surface which is to remain. The finished planed surface must be slightly grooved or roughened and must be free from gouges, deep grooves, ridges, or other imperfections. The Contractor must repair any damage to the surface by the Contractor’s planing equipment, using an Engineer approved method.

Repair or replace any metal castings and other surface improvements damaged by planing, as determined by the Engineer.

A tapered wedge cut must be planed longitudinally along curb lines sufficient to provide a minimum of 4 inches of curb reveal after placement and compaction of

the final wearing course. The dimensions of the wedge must be as shown on the Drawings or as specified by the Engineer.

A tapered wedge cut must also be made at transitions to adjoining pavement surfaces (meet lines) where butt joints are shown on the Drawings. Cut butt joints in a straight line with vertical faces 2 inches or more in height, producing a smooth transition to the existing adjoining pavement.

After planing is complete, planed surfaces must be swept, cleaned, and if required by the Contract, patched and preleveled.

The Engineer may direct additional depth planing. Before performing this additional depth planing, the Contractor must conduct a hidden metal in pavement detection survey as specified in Section 5-04.3(14)A.

Gutter panels, curbs, or utility structures damaged as a result of planing operations shall be replaced by the Contractor at their own expense. No additional monies will be due the Contractor for damage to curbs, gutters, or utility structures, all costs of which shall be borne by the Contractor.

5-04.3(14)A Pre-Planing Metal Detection Check

Before starting planing of pavements, and before any additional depth planing required by the Engineer, the Contractor must conduct a physical survey of existing pavement to be planed with equipment that can identify hidden metal objects.

Should such metal be identified, promptly notify the Engineer.

See WSDOT Standard Specification Section 1-07.16(1) regarding the protection of survey monumentation that may be hidden in pavement.

The Contractor is solely responsible for any damage to equipment resulting from the Contractor's failure to conduct a pre-planing metal detection survey, or from the Contractor's failure to notify the Engineer of any hidden metal that is detected.

5-04.3(14)B Paving and Planing Under Traffic

5-04.3(14)B1 General

In addition, the requirements of WSDOT Standard Specification Section 1-07.23 and the traffic controls required in Section 1-10, and unless the Contract specifies otherwise or the Engineer approves, the Contractor must comply with the following:

1. Intersections

a. Keep intersections open to traffic at all times, except when paving or planing operations through an intersection requires closure. Such closure must be kept to the minimum time required to place and compact the HMA mixture, or plane as appropriate. For paving, schedule such closure to individual lanes or portions thereof that allows the traffic volumes and schedule of traffic volumes required in the approved traffic control plan. Schedule work so that adjacent intersections are not impacted at the same time and comply with the traffic control restrictions required by the Traffic Engineer. Each individual intersection closure or partial closure, must be addressed in the traffic control plan, which must be submitted to and accepted by the Engineer, see Section 1-10.2(2).

b. When planing or paving and related construction must occur in an intersection, consider scheduling and sequencing such work into quarters of the intersection, or half or more of an intersection with side street detours. Be prepared to sequence the work to individual lanes or portions thereof.

c. Should closure of the intersection in its entirety be necessary, and no trolley service is impacted, keep such closure to the minimum time required to place and compact the HMA mixture, plane, remove asphalt, tack coat, and as needed.

d. Any work in an intersection requires advance warning in both signage and a number of Working Days advance notice as determined by the Engineer, to alert traffic and emergency services of the intersection closure or partial closure.

e. Allow new compacted HMA asphalt to cool to ambient temperature before any traffic is allowed on it. Traffic is not allowed on newly placed asphalt until approval has been obtained from the Engineer.

2. Temporary centerline marking, post-paving temporary marking, temporary stop bars, and maintaining temporary pavement marking must comply with Section 8-23.

3. Permanent pavement marking must comply with WSDOT Standard Specification Section 8-22.

4. Roadways Open to Traffic

When the roadway being paved is open to traffic, the following requirements shall apply:

The Contractor shall keep roadways open to traffic at all times except where paving is in progress. During such time, and provided that there has been an advance warning to the public, only that specified section of road being paved may be closed for the minimum time required to place and compact the HMA. Adjacent travel lanes and shoulder shall be left open for traffic during these times. In hot weather, the Engineer may require the application of water to the pavement to accelerate the finish rolling of the pavement and to shorten the time required before reopening to traffic.

Before temporarily closing a portion of the road, advance-warning signs shall be placed and signs shall also be placed clearly alerting the driver of temporary lane closures.

During paving operations, temporary pavement markings shall be maintained throughout the project. Temporary pavement markings shall be installed on the roadway prior to opening to traffic and shall be in accordance with WSDOT Standard Specification Section 8-23.

All costs in connection with performing the Work in accordance with these requirements shall be included in the unit contract prices for the various bid items involved in the Contract.

5-04.3(14)B2 Pre-Paving and Pre-Planing Briefing
(March 21, 2018 G&O GSP)

At least 2 Working Days before the first paving operation and the first planing operation, or as scheduled by the Engineer for future paving and planing operations to ensure the Contractor has adequately prepared for notifying and coordinating as required in the Contract, the Contractor must be prepared to discuss that day's operations as they relate to other entities and to public safety and convenience, including driveway and business access, garbage truck operations, transit operations and working around energized overhead wires, school and nursing home and hospital and other accesses, other contractors who may be operating in the area, pedestrian and bicycle traffic, and emergency services. The Contractor, and Subcontractors that may be part of that day's operations, must meet with the Engineer and discuss the proposed operation as it relates to the submitted planing plan and paving plan, approved traffic control plan, and public convenience and safety. Such discussion includes, but is not limited to:

1. General for both Paving Plan and for Planing Plan:

   a. The actual times of starting and ending daily operations.

   b. In intersections, how to break up the intersection, and address traffic control and signalization for that operation, including use of peace officers.

   c. The sequencing and scheduling of paving operations and of planing operations, as applicable, as it relates to traffic control, to public convenience and safety, and to other contractors who may operate in the Project Site.

   d. Notifications required of Contractor activities, and coordinating with other entities and the public as necessary.

   e. Description of the sequencing of installation and types of temporary pavement markings as it relates to planning and to paving.

   f. Description of the sequencing of installation of, and the removal of, temporary pavement patch material around exposed castings and as may be needed.

   g. Description of procedures and equipment to identify hidden metal in the pavement, such as survey monumentation, monitoring wells, street car rail, and castings, before planning, see Section 5-04.3(14)B2.

   h. Description of how flaggers will be coordinated with the planing, paving, and related operations.

   i. Description of sequencing of traffic controls for the process of rigid pavement base repairs.

   j. Other items the Engineer deems necessary to address.

2. Paving – additional topics:

   a. When to start applying tack and coordinating with paving.

   b. Types of equipment and numbers of each type equipment to be used. If more pieces of equipment than personnel are proposed, describe the sequencing of the personnel operating the types of

equipment. Discuss the continuance of operator personnel for each type equipment as it relates to meeting Specification requirements.

c. Number of JMFs to be placed, and if more than one JMF how the Contractor will ensure different JMFs are distinguished, how pavers and MTVs are distinguished if more than one JMF is being placed at the time, and how pavers and MTVs are cleaned so that one JMF does not adversely influence the other JMF.

d. Description of contingency plans for that day's operations such as equipment breakdown, rain out, and Supplier shutdown of operations.

e. Number of sublots to be placed, sequencing of density testing, and other sampling and testing.

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Utilities

GENERAL NOTES (ALL PROJECTS NOT FUNDED BY TOWN)

1. A PRE-CONSTRUCTION CONFERENCE WITH THE TOWN OF FRIDAY HARBOR PUBLIC WORKS DEPARTMENT SHALL BE HELD PRIOR TO THE START OF CONSTRUCTION. THE OWNER REPRESENTATIVE, ENGINEER, AND CONTRACTOR SHALL ATTEND.

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ALL NECESSARY PERMITS AND EASEMENTS PRIOR TO CONSTRUCTION.

3. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH TOWN OF FRIDAY HARBOR STANDARDS AND THE MOST CURRENT EDITIONS OF THE WASHINGTON STATE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.

4. AN APPROVED COPY OF THE PLANS SHALL BE ON SITE WHENEVER CONSTRUCTION IS IN PROCESS. ANY CHANGES TO THE APPROVED PLANS SHALL BE REVIEWED AND APPROVED BY THE ENGINEER AND THE TOWN OF FRIDAY HARBOR.

5. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UTILITY LINES. THE ENGINEER HAS SHOWN THE APPROXIMATE LOCATIONS OF EXISTING UTILITIES THAT HAVE BEEN OBTAINED FROM AVAILABLE RECORDS AND ARE SHOWN FOR CONVENIENCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF EXISTING UTILITIES SHOWN AND FOR DISCOVERY OF POSSIBLE ADDITIONAL UTILITIES NOT SHOWN SO AS TO AVOID DAMAGE OR DISTURBANCE. THE UNDERGROUND UTILITY LOCATION SERVICE SHALL BE CONTACTED (#-811) FOR FIELD LOCATION PRIOR TO ANY CONSTRUCTION. THE OWNER OR HIS REPRESENTATIVE SHALL BE CONTACTED IF A UTILITY CONFLICT EXISTS. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT UTILITY LOCATES ARE MAINTAINED THROUGHOUT THE LIFE OF THE PROJECT.

6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ADEQUATE TEMPORARY TRAFFIC CONTROL DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL SUBMIT A TRAFFIC CONTROL PLAN TO THE TOWN OF FRIDAY HARBOR AT LEAST FIVE (5) BUSINESS DAYS PRIOR TO STARTING ANY WORK IN THE RIGHT OF WAY. ALL TRAFFIC CONTROL PLANS AND DEVICES SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES: (MUTCD).

7. THERE SHALL BE NO CONSTRUCTION ON SATURDAY, SUNDAY, OR HOLIDAYS OBSERVED BY THE TOWN OF FRIDAY HARBOR.

8. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE TOWN OF FRIDAY HARBOR PUBLIC WORKS DEPARTMENT IN THE EVENT OF DISCOVERY OF POOR SOIL, STANDING GROUNDWATER OR DISCREPANCIES FROM THE PLANS IN GRADES, LOCATION AND CONSTRUCTION OF UTILITIES, STRUCTURES AND OTHER EXISTING CONDITIONS.

9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING RECORD DRAWINGS OF ALL CONSTRUCTION NOT INSTALLED ACCORDING TO THE APPROVED PLANS.

10. ALL SEDIMENTATION/EROSION CONTROL FACILITIES SHALL BE IN OPERATION PRIOR TO INITIATING CONSTRUCTION. ALL SEDIMENTATION/EROSION CONTROL FACILITIES SHALL BE MAINTAINED OR REPLACED UNTIL THE PROJECT IS COMPLETE.

11. NO DISTURBED SOIL SHALL REMAIN UNSTABILIZED FOR MORE THAN TWO DAYS. SOILS SHALL BE STABILIZED AT THE END OF THE SHIFT BEFORE A HOLIDAY OR WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST.

12. AT NO TIME SHALL MORE THAN ONE FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND DISPOSING OF THE SEDIMENT.

13. THE CONTRACTOR SHALL REMOVE MATERIAL DROPPED, WASHED OR TRACKED FROM VEHICLES ONTO THE TOWN RIGHT OF WAY OR INTO THE STORM DRAINAGE SYSTEM. DEBRIS SHALL NOT BE WASHED INTO THE STORM DRAINAGE SYSTEM.

NO SCALE

APPROVAL

Wayne Haefele, P.E.

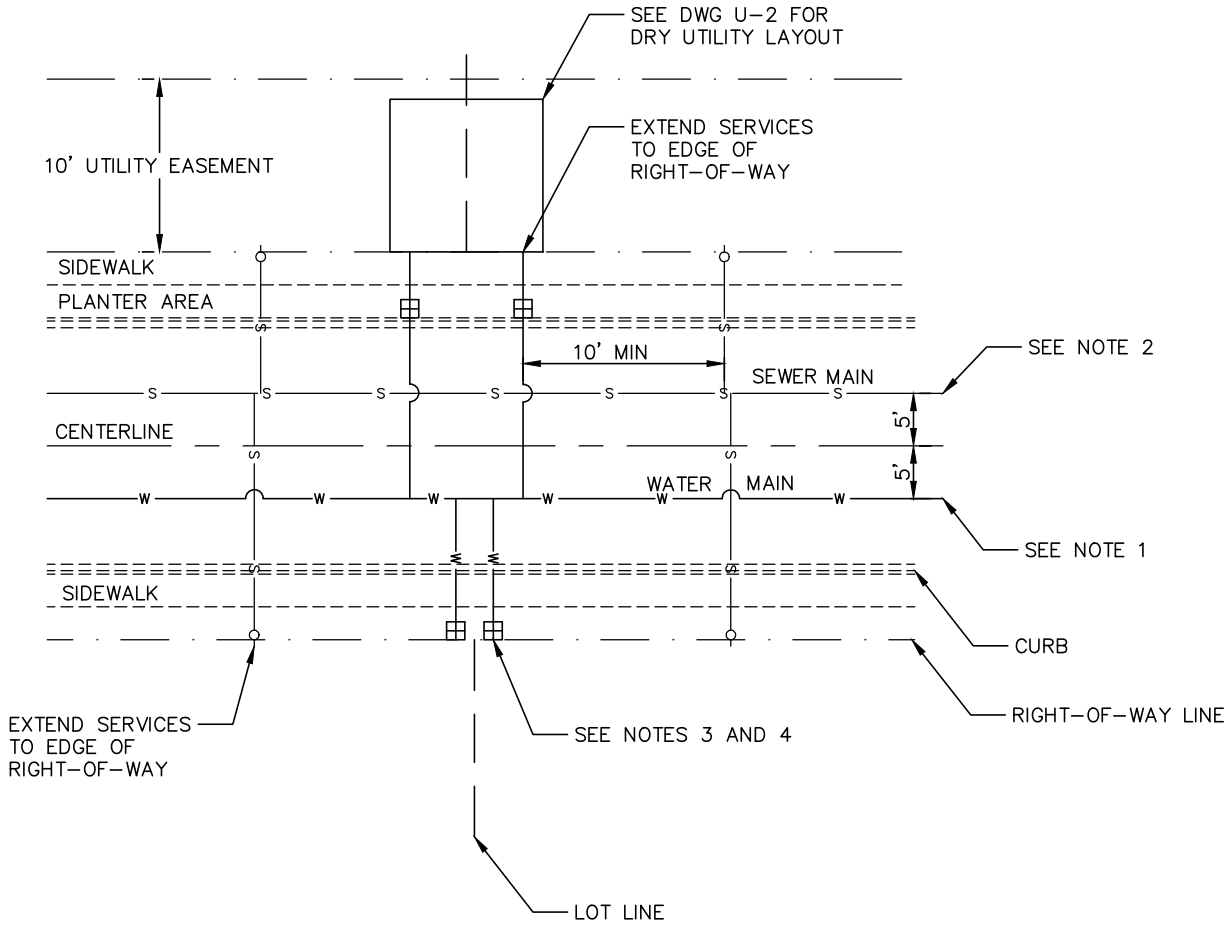
PUBLIC WORKS DIRECTOR

DATE

GENERAL NOTES

DRAWING NO. **U-0**

REV:



NOTES:

1. WATERLINES ARE NORMALLY PLACED NORTH OR EAST OF THE CENTERLINE.
2. SEWER LINES ARE NORMALLY PLACED SOUTH OR WEST OF THE CENTERLINE.
3. METERS SHALL BE PLACED IN RIGHT OF WAY OR EASEMENTS DEDICATED TO THE TOWN.
4. METERS SHALL NOT BE INSTALLED IN DRIVEWAYS, SIDEWALKS, OR ASPHALT UNLESS APPROVED BY TOWN.

w — WATER METERS TO BE INSTALLED BEHIND SIDEWALK OR IN PLANTER AREA.

s — EXTEND SANITARY SIDE SEWER AND WATER SERVICES TO EDGE OF RIGHT-OF-WAY.CLEANOUT SHALL BE PLACED AT THE RIGHT-OF-WAY.

NO SCALE

APPROVAL

Wayne Haefele, P.E.

PUBLIC WORKS DIRECTOR

DATE

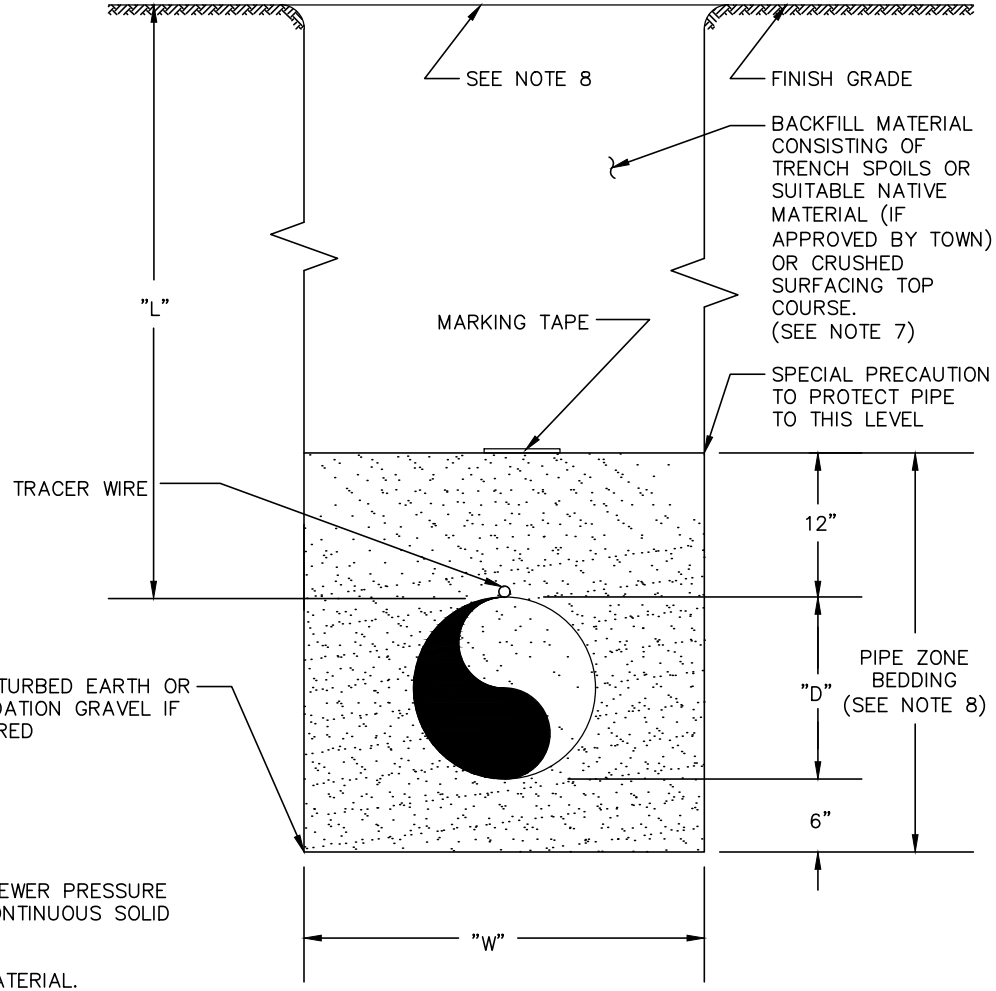
TYPICAL UTILITY LOCATIONS

DRAWING NO. U-1

REV:

"W" – TRENCH WIDTH
PIPES 15" OR LESS = PIPE O.D. + 30 INCHES PIPES 18" OR GREATER= 1.5xPIPE O.D.+18 INCHES

MINIMUM PIPE COVER AND PIPE SIZE		
	MINIMUM PIPE COVER "L"	MINIMUM PIPE DIAMETER "D"
WATER MAINS	36 INCHES	8 INCH
WATER SERVICES	24 INCHES	3/4 INCH
SEWER MAINS	60 INCHES	8 INCH
SEWER SERVICES	36 INCHES	6 INCH
SANITARY SEWER PRESSURE MAINS	48 INCHES	VARIES
STORM SEWER UNDER ROADWAY	24 INCHES	12 INCH
STORM SEWER – DUCTILE IRON	18 INCHES	12 INCH
POWER, PRIMARY	30 INCHES	–
POWER, SECONDARY	24 INCHES	–
TELEPHONE	24 INCHES	–
CATVA	24 INCHES	–



NO SCALE

NOTES:

1. ALL TRENCHES SHALL MEET WAC CHAPTER 296–155 FOR CONSTRUCTION WORK.
2. BEDDING MATERIAL SHALL BE PLACED UNDER ALL PIPE PRIOR TO PLACING PIPE.
3. WIRE SHALL BE TAPED AT 10–FOOT INTERVALS TO THE TOP OF ALL WATER AND SEWER PRESSURE MAINS, AND WATER SERVICE LINES. TRACER WIRE SHALL BE 14 GAUGE COPPER, CONTINUOUS SOLID CORE, 30MIL HDPE INSULATION RATED FOR DIRECT BURIAL.
4. PIPES SHALL BE MECHANICALLY RESTRAINED IN FILL OR PREVIOUSLY DISTURBED MATERIAL.
5. CLAY OR BENTONITE DAMS SHALL BE INSTALLED ACROSS THE TRENCH AND TO THE FULL DEPTH OF THE GRANULAR MATERIAL IN ALL AREAS OF STEEP SLOPE, STREAM CROSSING, AND WETLANDS TO PREVENT MIGRATION OF WATER ALONG THE PIPELINE. ENGINEER TO DESIGN SPACING OF DAMS AND DRAINAGE RELIEF.
6. ALL CONSTRUCTION AND MATERIALS SHALL MEET THE SPECIFICATIONS AND BE APPROVED BY THE TOWN.
7. TRENCH COMPACTION SHALL BE 95% MAXIMUM DENSITY IN TRAFFIC AREAS AND 90% MAXIMUM DENSITY IN NON–TRAFFIC AREAS.
8. PIPE ZONE BACKFILL SHALL BE PLACED IN LOOSE LAYERS AND COMPACTED TO 90% MAXIMUM DENSITY.
9. FOR SURFACE RESTORATION IN ROAD SECTIONS, SEE STANDARD DWG U–6 AND U–7
10. ALL MJ FITTINGS IN WATER SYSTEM REQUIRE EITHER A ROMAC INDUSTRIES GRIP RING ACCESSORY PACK OR TUF GRIP TLD FOR DUCTILE PIPE OR TLP FOR PVC PIPE.

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

Wayne Haefele, P.E.

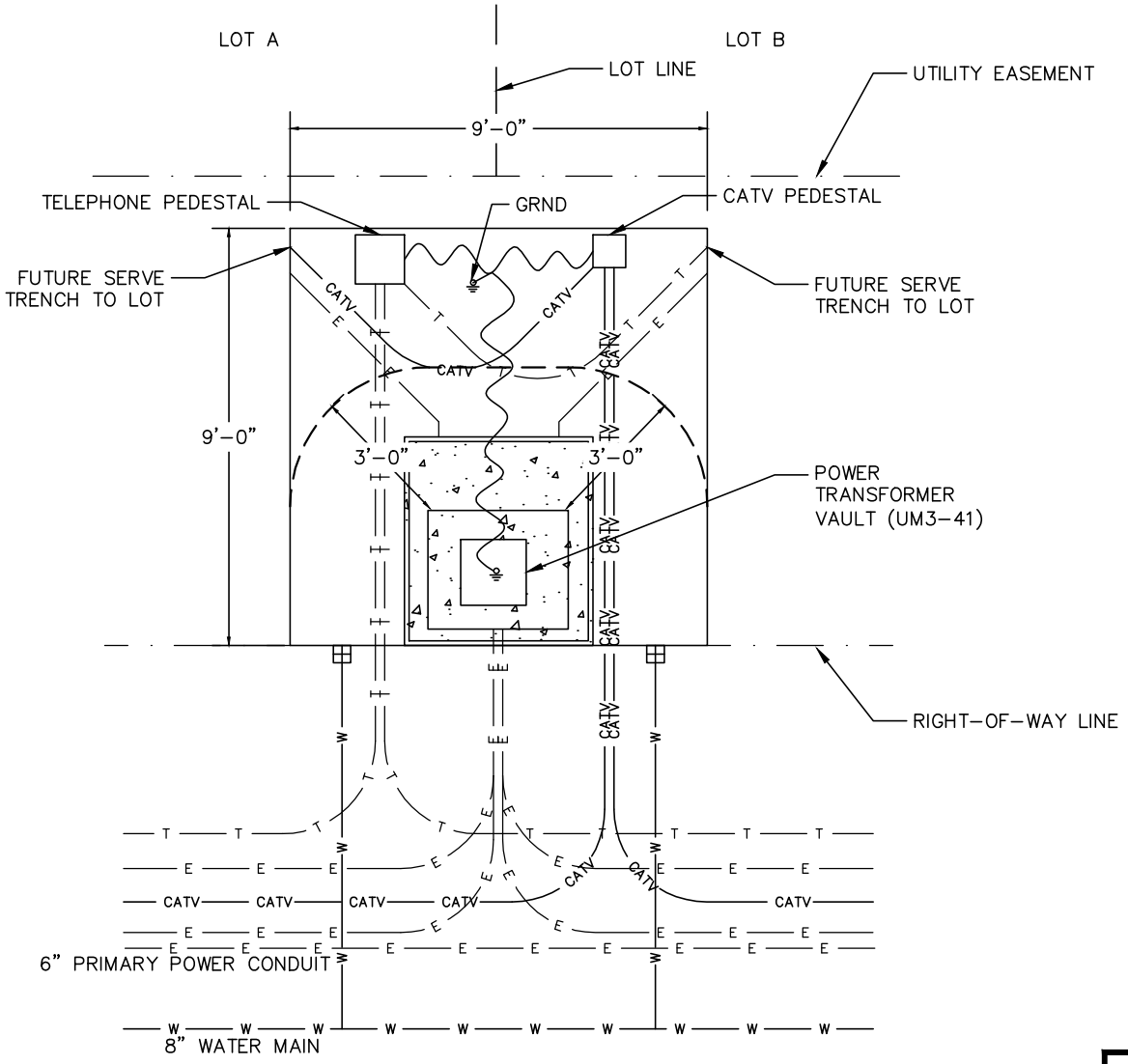
PUBLIC WORKS DIRECTOR

DATE

WATER, SEWER, AND STORM TRENCH SECTION

DRAWING NO. **U-2**

REV:



NO SCALE

NOTES:

1. BONDING SHALL BE PROVIDED BETWEEN ALL ABOVE GROUND METALLIC POWER AND COMMUNICATION APPARATUS SEPARATED BY 6 FEET OR LESS. OPALCO PROVIDE/INSTALL GROUND RODS. OTHER UTILITIES TO PROVIDE/ENSURE BONDING GROUND WIRE BETWEEN APPARATUS AND GROUND RODS.
2. DRY UTILITIES SHALL BE INSTALLED IN A JOINT TRENCH, SEE DWG. U–4 AND U–5.

APPROVAL

Wayne Haefele, P.E.

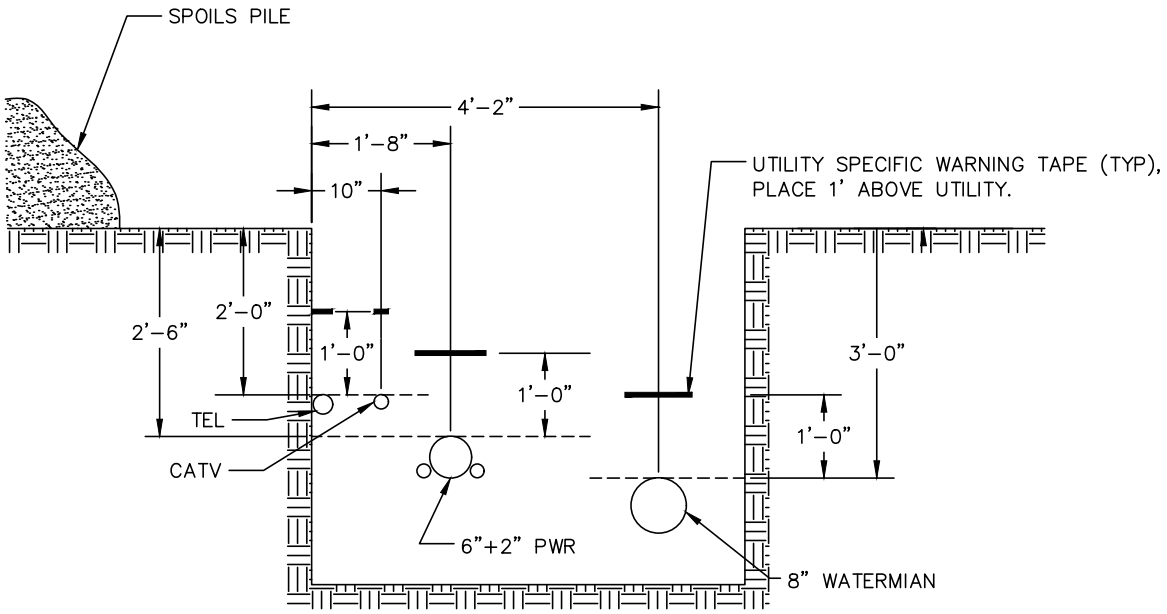
PUBLIC WORKS DIRECTOR

DATE

DRY UTILITY LAYOUT

DRAWING NO. **U-3**

REV:



NO SCALE

NOTES:

1. CONSTRUCT TRENCH IN COMPACTED LIFTS, POWER IN 1ST LIFT (6") PHONE LINE IN 2ND (4"), WATER IN 3RD (8"), TV IN 4TH, ETC. TO MAINTAIN VERTICAL SEPARATION FOR UTILITY LINES CROSSING W/IN TRENCH AND EXIT TO LATERAL TRENCHES.
2. PLACE UTILITY SPECIFIC WARNING TAPE AT 12" ABOVE HIGHEST UTILITY ABOVE EACH UTILITY.
3. PLACE SPOILS PILE AT 24" OFFSET FROM EDGE OF TRENCH.
4. MAINTAIN 12" MIN SEPARATION PRIMARY POWER TO OTHER UTILITIES.
5. MAINTAIN 24" MIN SEPARATION FROM WATER MAIN FOR PLACEMENT OF SADDLE.

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

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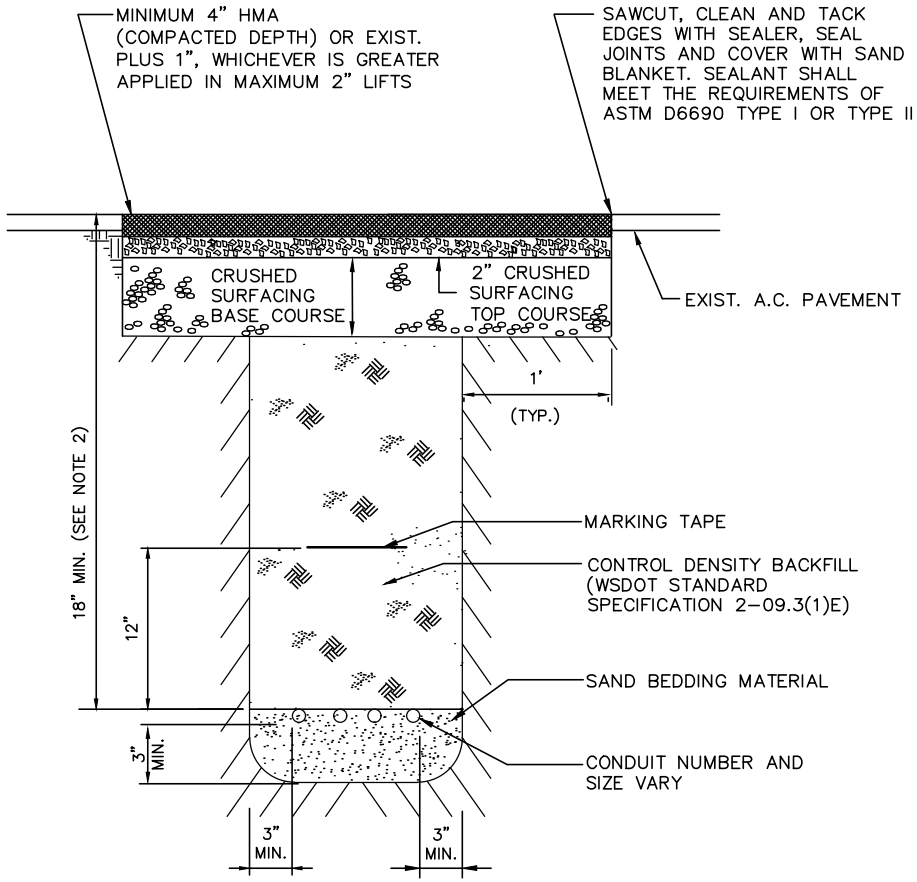
PUBLIC WORKS DIRECTOR

DATE

DRY UTILITIES AND WATER MAIN SECTION

DRAWING NO.
U-4

REV:



NOTES:

1. TRENCH SECTION TO BE USED IN ROCK EXCAVATION ONLY.
2. MINIMUM DEPTH SHALL COMPLY WITH THE NATIONAL ELECTRICAL SAFETY CODE.

NO SCALE

APPROVAL

Wayne Haefele, P.E.

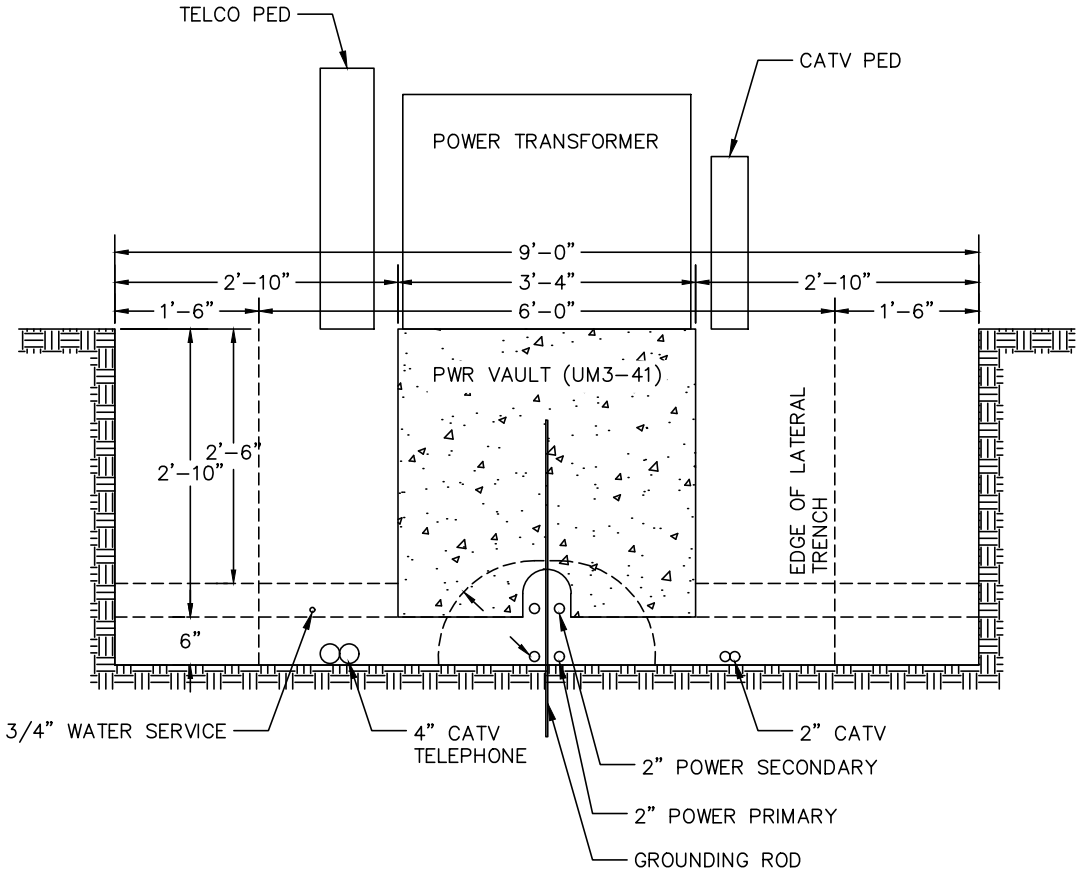
PUBLIC WORKS DIRECTOR

POWER/COMMUNICATION TRENCH SECTION IN ROCK

DATE ----

DRAWING NO. **U-5**

REV:



NO SCALE

NOTES:

1. PLACE PRIMARY DUCT AT BOTTOM OF TRENCH/EXCAVATION.
2. PLACE FIRST LIFT AROUND PRIMARY DUCTS AND LEVEL TO FORM PAD FOR TRANSFORMER VAULT.
3. PLACE SECONDARY/SERVICE LINES ABOVE FIRST LIFT BUT KEEP BELOW 30' FROM SURFACE.
4. DRIVE 10 FT GROUND ROD TO BELOW GRADE.

APPROVAL

Wayne Haefele, P.E.

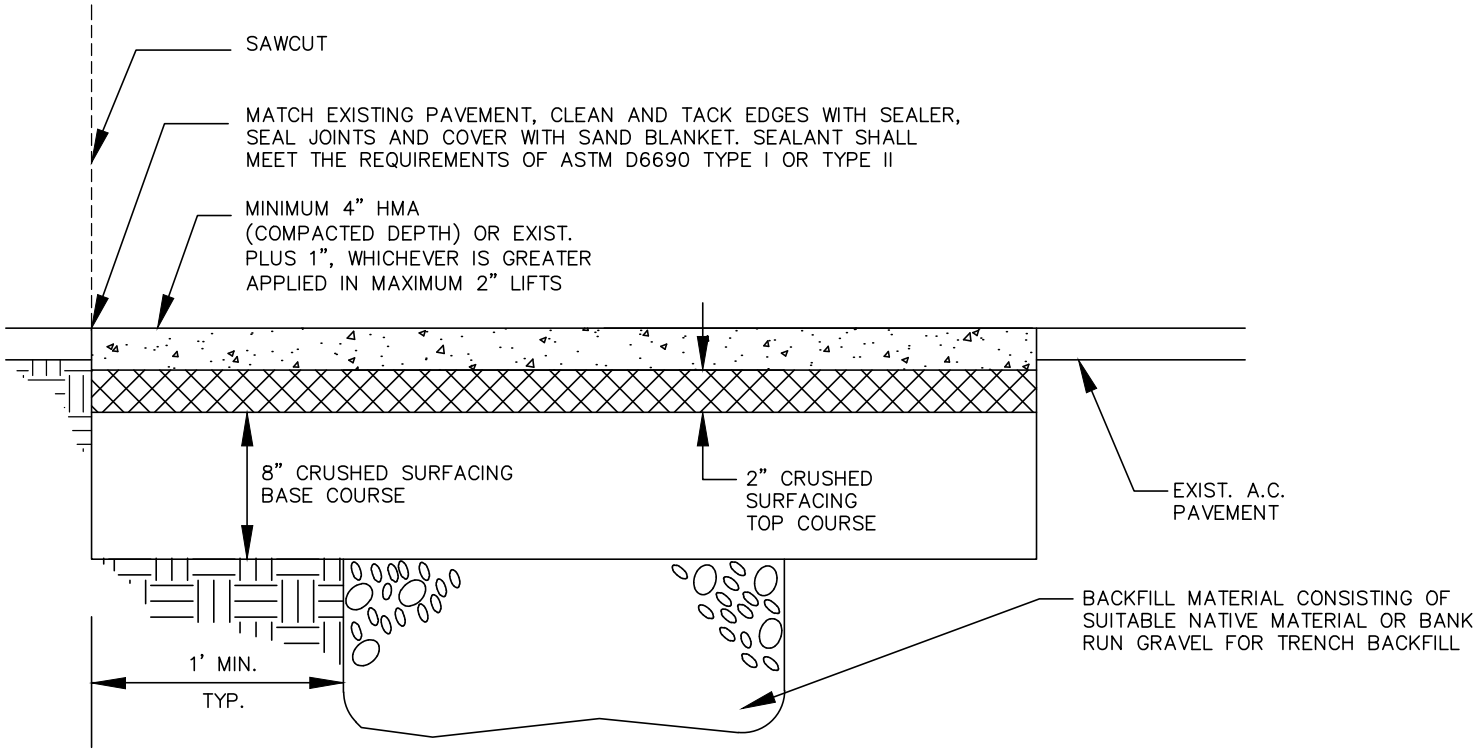
PUBLIC WORKS DIRECTOR

DATE

DRY UTILITY SECTION

DRAWING NO. **U-6**

REV:



NOTES:

1. ALL MATERIALS, WORKMANSHIP, AND INSTALLATION SHALL BE IN CONFORMANCE WITH THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION AS AMENDED BY TOWN OF FRIDAY HARBOR STANDARDS.
2. ALL MATERIALS EXCEPT HMA SHALL BE COMPACTED 95% DENSITY. HMA SHALL BE COMPACTED TO 91%.
3. TOWN REPRESENTATIVE SHALL BE PRESENT DURING COMPACTION EFFORT. APPLICANT SHALL PROVIDE 2 BUSINESS DAYS NOTICE.
4. IF STREET PAVEMENT IS LESS THAN 5 YEARS OLD, THE APPLICANT SHALL GRIND AND INSTALL A 2 INCH OVERLAY. FOR LONGITUDINAL UTILITY INSTALLATIONS THE APPLICANT SHALL GRIND AND INSTALL A 2 INCH OVERLAY FOR HALF A STREET WIDTH. FOR TRANSVERSE CUTS, A 150 FOOT LONG, MINIMUM, GRIND AND OVERLAY SHALL BE INSTALLED.

NO SCALE

APPROVAL

Wayne Haefele, P.E.

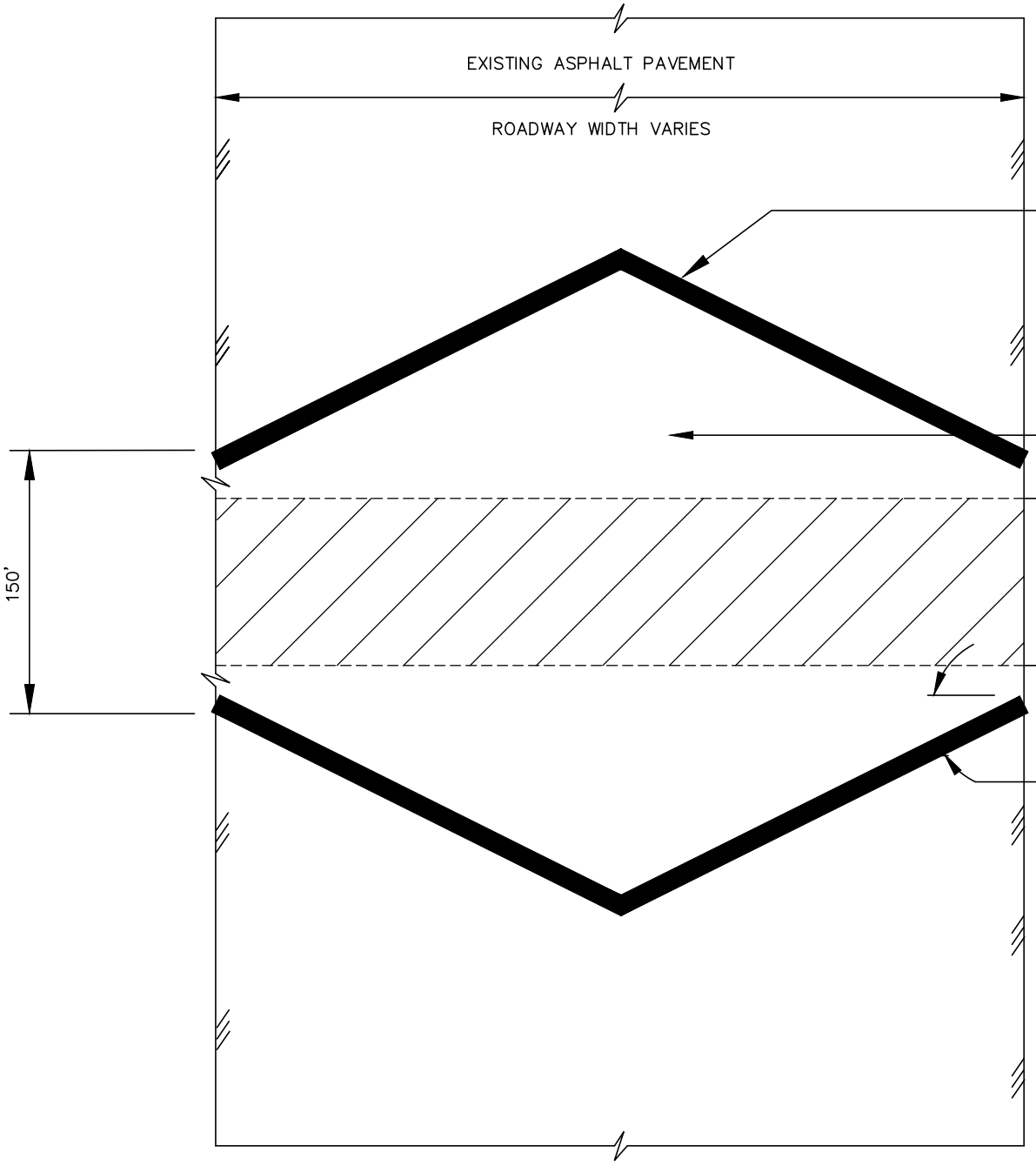
PUBLIC WORKS DIRECTOR

DATE

TRENCH PAVEMENT RESTORATION

DRAWING NO. **U-7**

REV:



NOTES:

1. HMA DIAMOND PATCH IS REQUIRED FOR TRANSVERSE UTILITY CUTS ON STREETS WITH ASPHALT INSTALLED 5 YEARS ON MORE.

NO SCALE

APPROVAL

Wayne Haefele, P.E.

PUBLIC WORKS DIRECTOR

DATE

HMA DIAMOND PATCH

DRAWING NO. U-8

REV:

Sewer

SEWER GENERAL NOTES:

1. A 5 FOOT MINIMUM HORIZONTAL SEPARATION SHALL BE MAINTAINED BETWEEN ALL SEWER FACILITIES AND UNDERGROUND POWER, TELEPHONE AND CABLE FACILITIES UNLESS OTHERWISE APPROVED BY THE TOWN OF FRIDAY HARBOR.

2. FOR WATER MAIN AND SEWER MAIN SEPARATION REQUIREMENTS SEE STANDARD DWG. U–1.

3. ALL CONTRACTORS WORKING WITH AC PIPE MUST BE STATE–CERTIFIED. THE CONTRACTOR SHALL PROVIDE PROTECTIVE CLOTHING AND EQUIPMENT TO CREWS WORKING WITH ASBESTOS CEMENT PIPE IN ORDER TO ASSURE THE WORKERS' EXPOSURE TO ASBESTOS MATERIAL IS AT OR BELOW THE LIMITS PRESCRIBED IN WAC 296–62–07705.

4. THE TOWN OF FRIDAY HARBOR PUBLIC WORKS DEPARTMENT SHALL BE NOTIFIED A MINIMUM OF TWO BUSINESS DAYS IN ADVANCE OF A SEWER CONNECTION TO AN EXISTING MAIN. INSPECTOR SHALL BE PRESENT AT THE TIME OF THE CONNECTION.

5. GRAVITY SEWER PIPING SHALL BE PVC IN ACCORDANCE WITH ASTM D–3034, SDR 35 WITH JOINTS AND RUBBER GASKETS CONFORMING TO ASTM D–3217 AND ASTM F–477. THE TOWN WILL ACCEPT PVC SOLVENT JOINTS.

6. PRECAST MANHOLES SHALL MEET THE REQUIREMENTS OF ASTM C–478. JOINTS SHALL BE RUBBER GASKETED CONFORMING TO ASTM C–443 AND SHALL BE GROUTED FROM THE INSIDE. LIFT HOLES SHALL BE GROUTED FROM THE OUTSIDE AND INSIDE OF THE MANHOLE. PROVIDE KOR–N–SEAL BOOT TO CONNECT PVC PIPE TO MANHOLE.

7. DROP CONNECTIONS AT MANHOLES SHALL BE CONSTRUCTED WITH DUCTILE–IRON PIPE AS SPECIFIED HEREIN FOR WATER SYSTEMS.

8. ALL SEWER MAINS SHALL BE FIELD STAKED FOR GRADES AND ALIGNMENTS BY A SURVEYOR LICENSED IN THE STATE OF WASHINGTON.

9. ALL SANITARY SEWER MAINS AND SERVICES SHALL BE INSTALLED WITH CONTINUOUS DETECTABLE MARKING TAPE INSTALLED 12" ABOVE THE PIPE. THE MARKER SHALL BE DETECTABLE METALLIC TAPE MARKED "SEWER".

10. PRIOR TO BACKFILL, ALL MAINS AND APPURTENANCES SHALL BE INSPECTED AND APPROVED BY THE TOWN OF FRIDAY HARBOR. APPROVALS SHALL NOT RELIEVE THE CONTRACTOR FOR CORRECTION OF ANY DEFICIENCIES AND/OR FAILURES AS DETERMINED BY THE SUBSEQUENT TESTING AND INSPECTIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE TOWN OF FRIDAY HARBOR PUBLIC WORKS DEPARTMENT TWO BUSINESS DAYS IN ADVANCE OF ALL REQUIRED INSPECTIONS.

11. SANITARY SEWERS SHALL BE TESTED FOR DEFLECTION NOT LESS THAN 30 DAYS AFTER THE TRENCH BACKFILL AND COMPACTION HAS BEEN COMPLETED. THE TEST SHALL BE CONDUCTED BY PULLING A PROPERLY SIZED "GO–NOGO" MANDREL THROUGH THE COMPLETED PIPELINE. TESTING SHALL BE COMPLETED AFTER THE LINE HAS BEEN COMPLETELY CLEANED OUT. THE CONTRACTOR SHALL REMOVE ALL DEBRIS SO THAT IT IS NOT FLUSHED INTO THE EXISTING SANITARY SEWER SYSTEM. THE DEFLECTION TEST SHALL BE OBSERVED BY THE TOWN.

12. THE LEAKAGE TEST AND TELEVISION INSPECTION SHALL BE COMPLETE IN ACCORDANCE WITH THE TOWN STANDARDS.

13. THE CONTRACTOR SHALL MAINTAIN SEWER SERVICE TO ALL RESIDENCES AND BUSINESSES AND THROUGH ALL MAINS AT ALL TIMES. TEMPORARY SEWAGE PUMPING BY CONTRACTOR AT CLEANOUT ASSEMBLIES AND MANHOLES WILL BE REQUIRED. A WRITTEN SEWER BY–PASS PLAN SHALL BE SUBMITTED TO AND APPROVED BY THE TOWN

14. ALL MANHOLES LOCATED IN LOW POINTS OF VERTICAL CURVES SHALL HAVE WATERTIGHT LIDS.

15. ALL MAIN–LINE TRENCHES SHALL BE COMPACTED PRIOR TO TESTING SEWER LINES FOR ACCEPTANCE. ALL SIDE SEWERS SHALL BE TESTED FOR ACCEPTANCE AT THE SAME TIME AS THE MAIN SEWER IS TESTED.

NO SCALE

APPROVAL

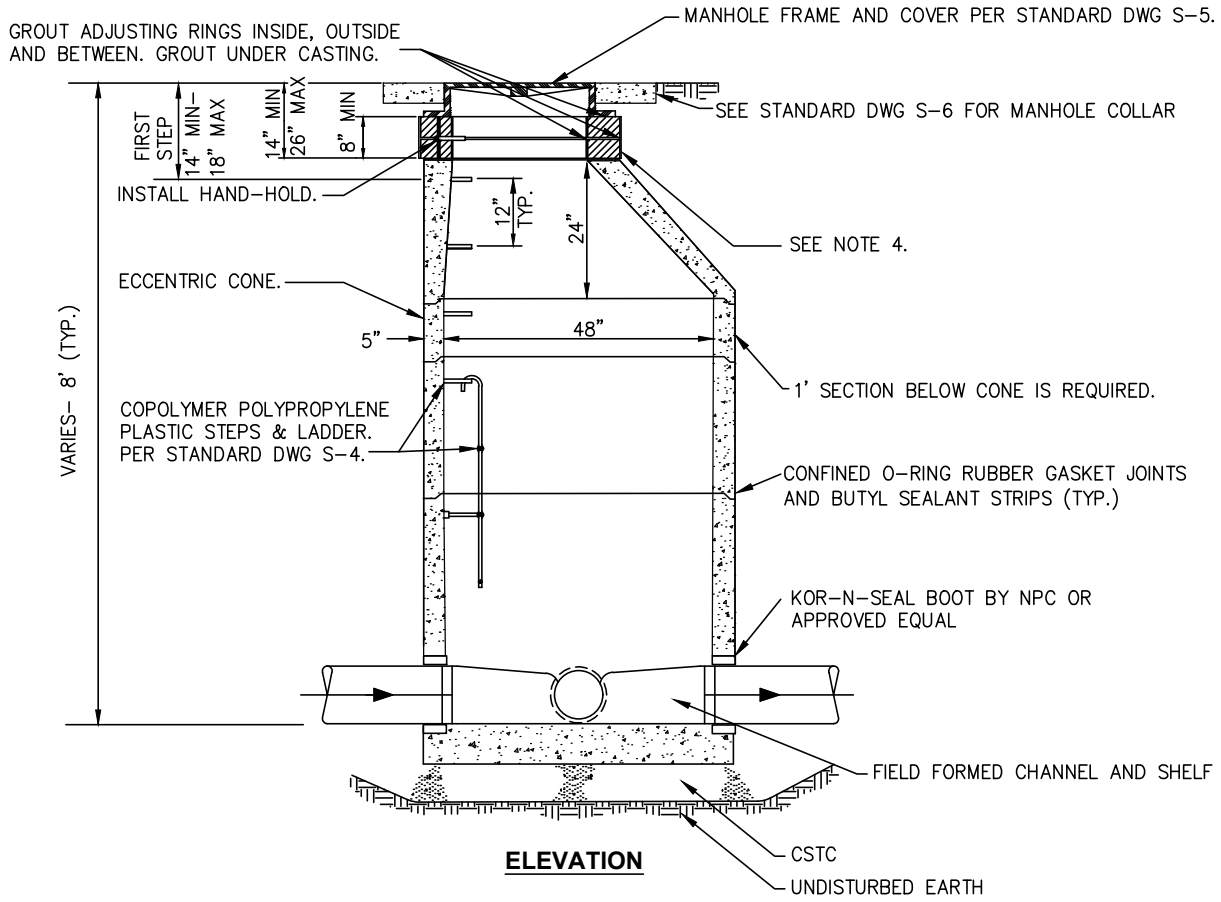
PUBLIC WORKS DIRECTOR

DATE

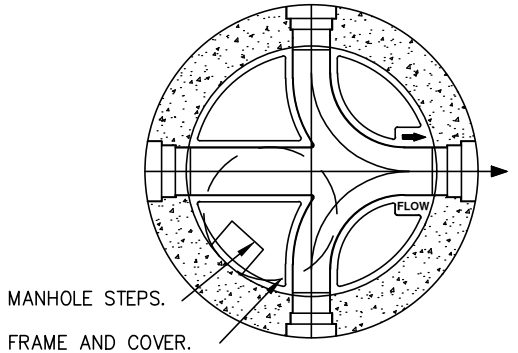
SEWER GENERAL NOTES

DRAWING NO. **S-0**

REV:



ELEVATION



PLAN

NO SCALE

NOTES:

1. MINIMUM DROP IN THE INVERT ELEVATION THROUGH THE MANHOLE SHALL BE 0.1'.
2. MARKER POSTS MAY BE REQUIRED IN EASEMENTS.
3. FOR MANHOLES LESS THAN 5' IN DEPTH, SEE STANDARD DWG S-2 PRECAST SHALLOW MANHOLE.
4. PRECAST REINFORCEMENT GRADE RINGS SET IN CEMENT GROUT, MAXIMUM 2 GRADE RINGS ALLOWED ON NEW MANHOLES. METAL RISER RINGS SHALL NOT BE INSTALLED.

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

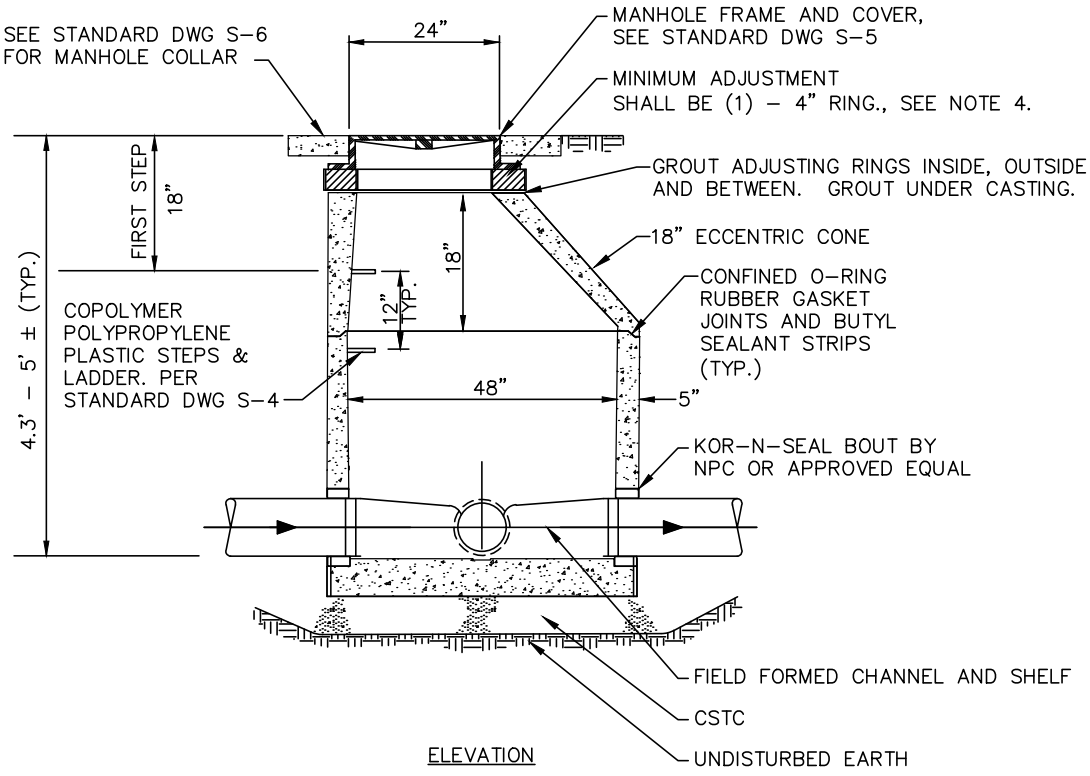
PUBLIC WORKS DIRECTOR

DATE 11/19/2020

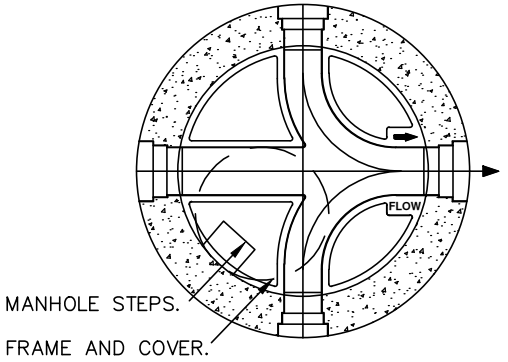
PRECAST MANHOLE

DRAWING NO. S-1

REV:



ELEVATION



PLAN

NO SCALE

NOTES:

1. USE 18" ECCENTRIC CONE AND 2' BASE FOR SHALLOW MANHOLE APPLICATION.
2. MINIMUM DROP IN THE INVERT ELEVATION THROUGH THE MANHOLE SHALL BE 0.1'.
3. MARKER POSTS MAY BE REQUIRED IN EASEMENTS.
4. PRECAST REINFORCEMENT GRADE RINGS SET IN CEMENT GROUT, MAXIMUM 2 GRADE RINGS ALLOWED ON NEW MANHOLES. METAL RISER RINGS SHALL NOT BE INSTALLED.

APPROVAL

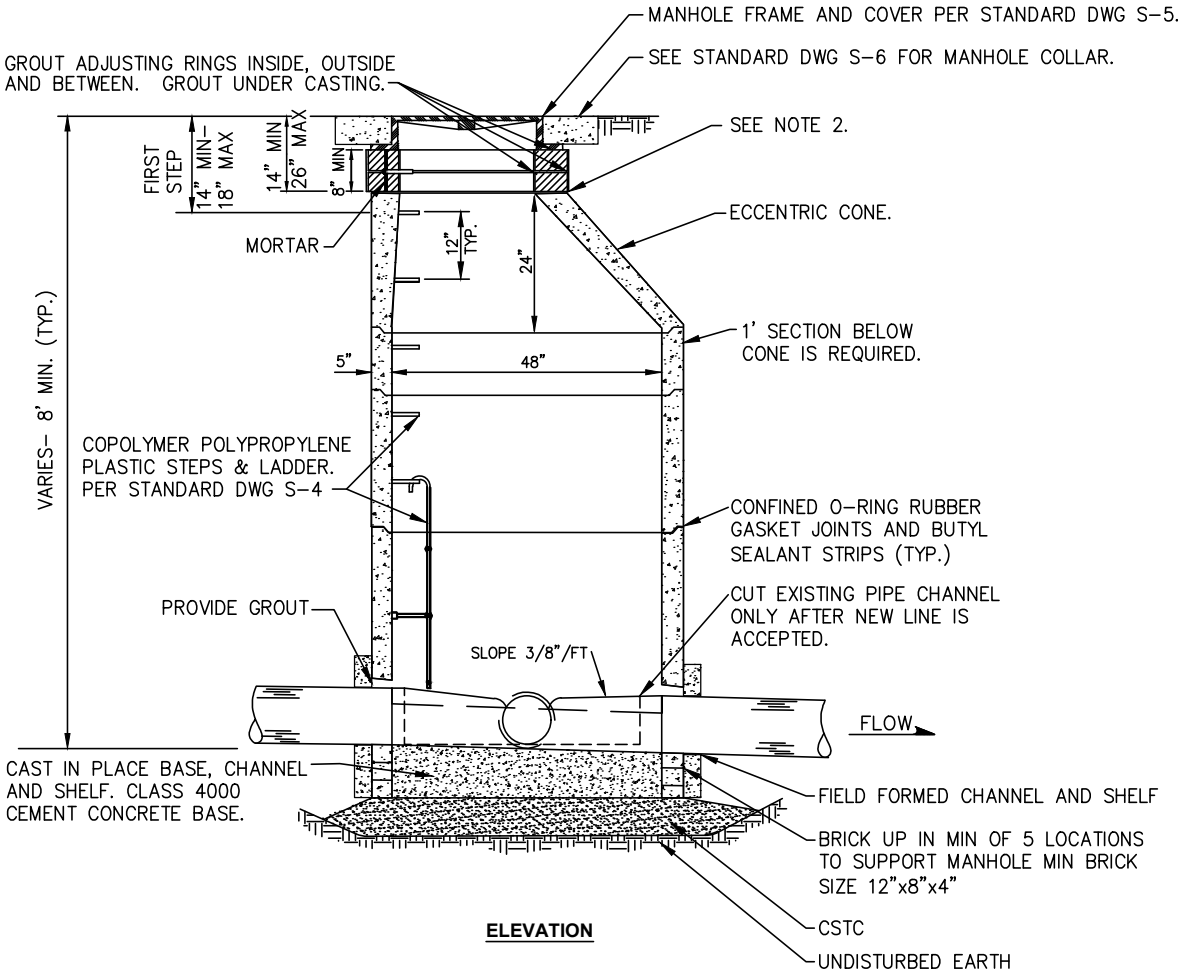
PUBLIC WORKS DIRECTOR

PRECAST SHALLOW MANHOLE

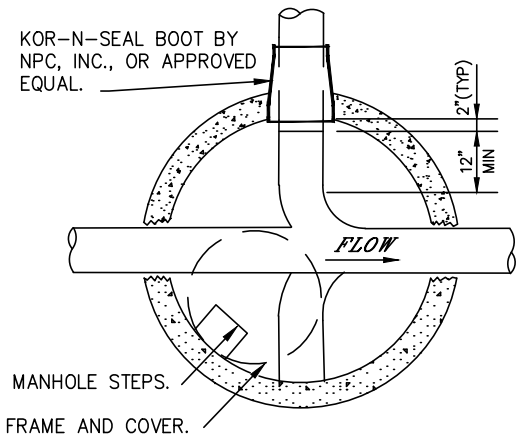
DATE
11/19/2020

DRAWING NO.
S-2

REV:



ELEVATION



PLAN

NO SCALE

NOTES:

1. MARKER POST MAY BE REQUIRED IN EASEMENTS.
2. PRECAST REINFORCEMENT GRADE RINGS SET IN CEMENT GROUT, MAXIMUM 2 GRADE RINGS ALLOWED ON NEW MANHOLES. METAL RISER RINGS SHALL NOT BE INSTALLED.

APPROVAL

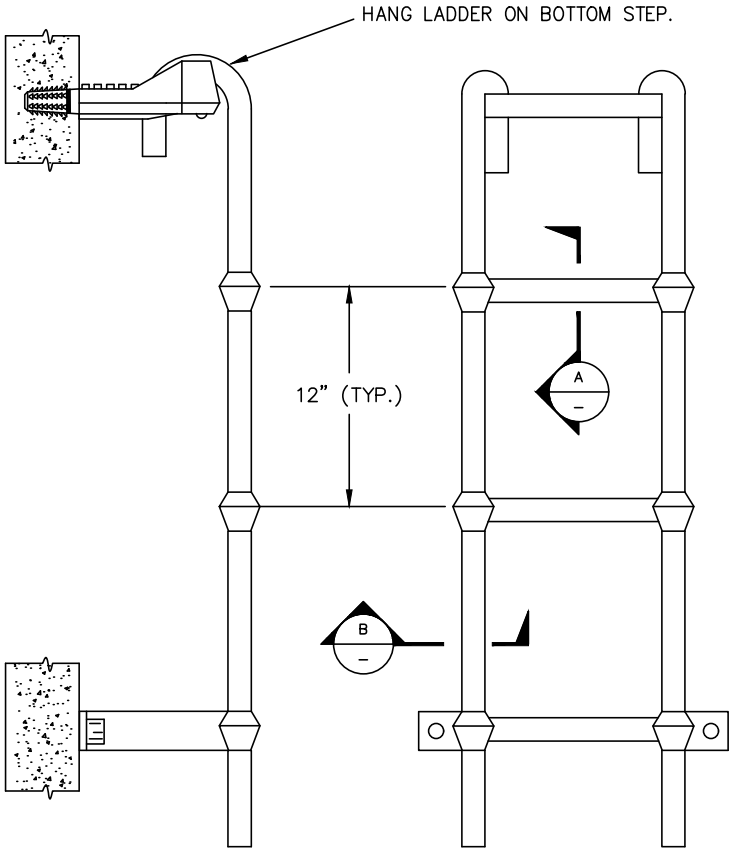
PUBLIC WORKS DIRECTOR

DATE 11/19/2020

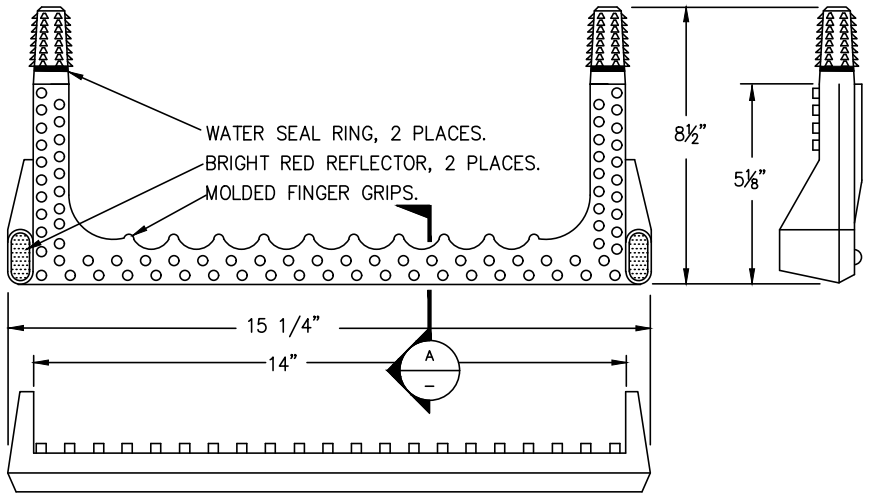
SADDLE MANHOLE

DRAWING NO. S-3

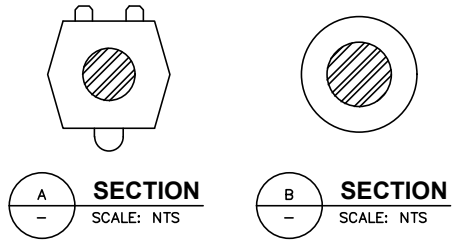
REV:



HANGING LADDER



STEP



A — **SECTION** — SCALE: NTS

B — **SECTION** — SCALE: NTS

NO SCALE

NOTES:

1. STEPS TO BE LANE #P–14850 OR TOWN APPROVED EQUAL.
2. FASTEN LADDER TO MH STRUCTURE WITH STAINLESS STEEL LAG SCREWS INTO LEAD ANCHORS, OR SET LADDER BASE INTO MH SHELF PRIOR TO CURING.

TOWN OF FRIDAY HARBOR — Incorporated 1909 — WASHINGTON

APPROVAL

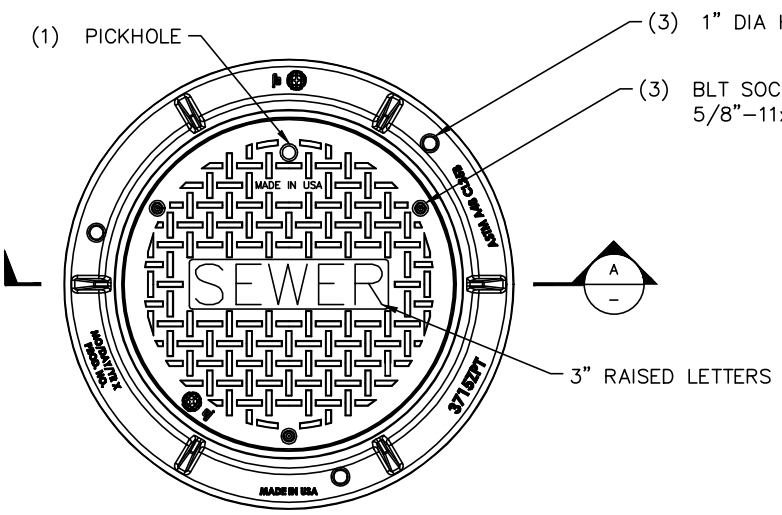
PUBLIC WORKS DIRECTOR

MANHOLE STEPS AND LADDER

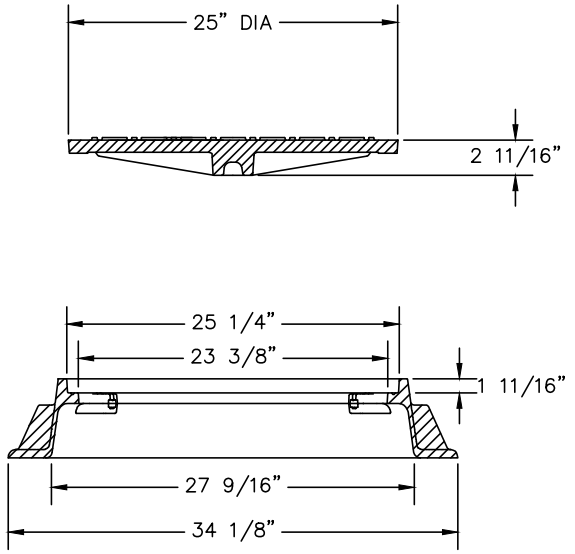
DATE **11/19/2020**

DRAWING NO. **S-4**

REV:



PLAN VIEW



A – **SECTION**
SCALE: NTS

NO SCALE

NOTES:

1. EAST JORDAN IRON WORKS NO. 00370076 OR EQUAL. FRAME SHALL BE GRAY IRON (CL35B). COVER SHALL BE DUCTILE IRON (80–55–06). MANHOLE FRAME AND COVERS SHALL BE MADE OF AMERICAN IRON AND STEEL AND BE MADE IN AMERICA.

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

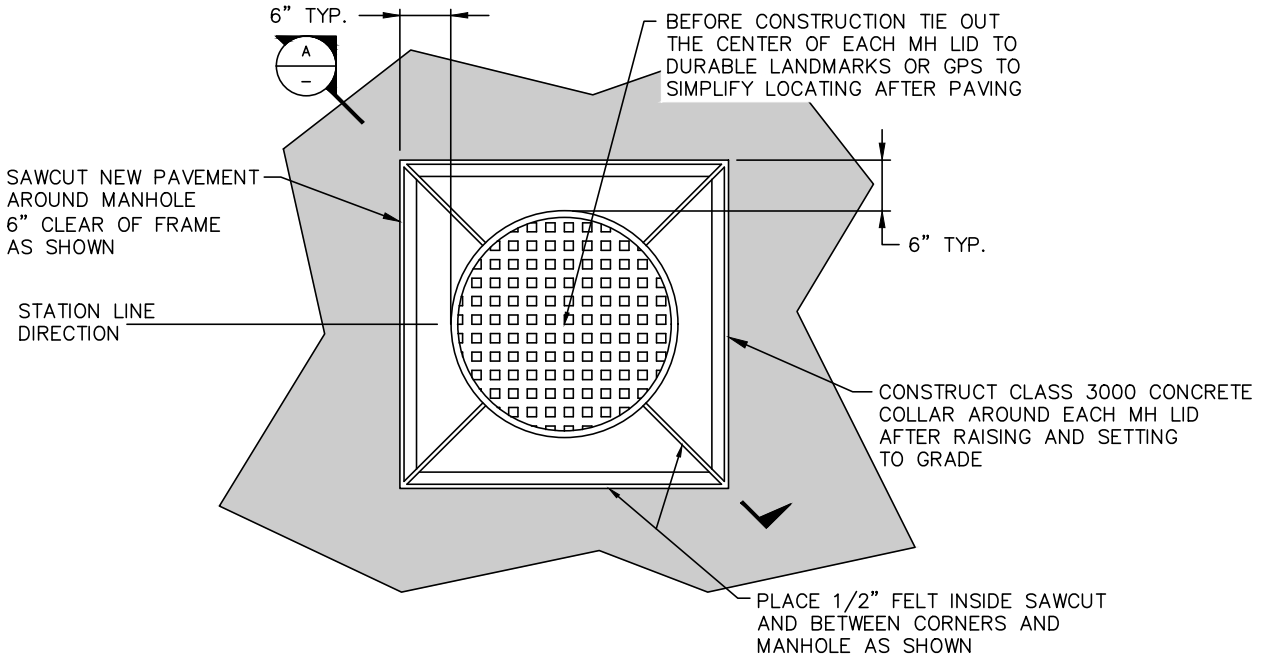
PUBLIC WORKS DIRECTOR

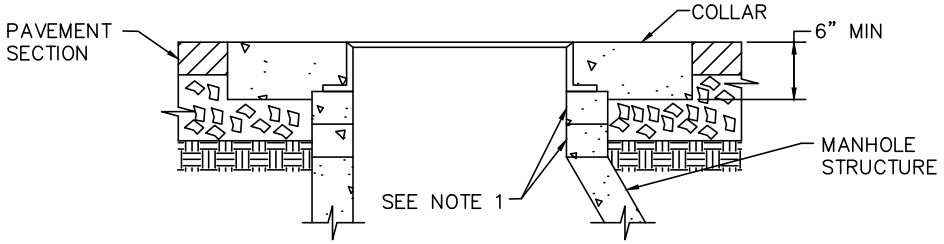
STANDARD MANHOLE FRAME AND COVER

DATE **11/19/2020**

DRAWING NO. **S-5**

REV:





A
–
SECTION
SCALE: NTS

NO SCALE

NOTES:

1. PRECAST REINFORCEMENT GRADE RINGS SET IN CEMENT GROUT, MAXIMUM 2 GRADE RINGS ALLOWED ON NEW MANHOLES. METAL RISER RINGS SHALL NOT BE INSTALLED.

APPROVAL

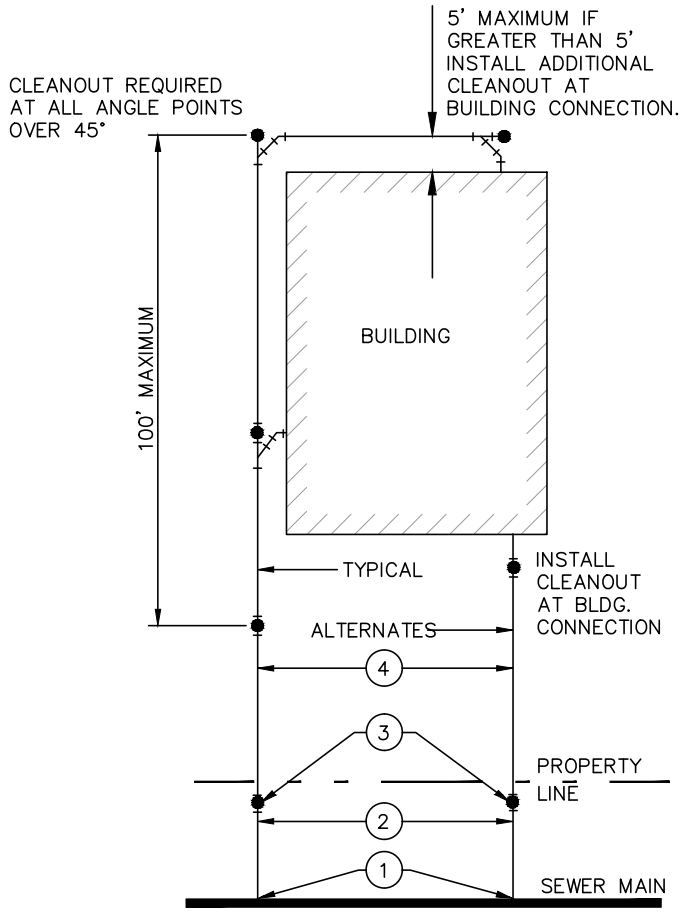
PUBLIC WORKS DIRECTOR

DATE
11/19/2020

MANHOLE COLLAR

DRAWING NO.
S-6

REV:



NOTES:

1. CONNECTION TO SEWER MAIN PER STANDARD DWG S–9.
2. INSTALL 6" MINIMUM PIPE SIZE IN RIGHT OF WAY.
3. INSTALL 6" CLEANOUT PER STANDARD DWG S–10.
4. PRIVATE SIDE SEWER PIPE DIAMETER:
   4" MINIMUM FOR SINGLE FAMILY
   6" MINIMUM FOR OTHER USES
5. ALL CLEANOUTS ON PRIVATE PROPERTY ARE TO BE ADJUSTED TO GRADE PER STANDARD DWG S–9.
6. CLEANOUTS ARE TO BE CONSTRUCTED WITH WYES. STRAIGHT "T"S ARE NOT PERMITTED.
7. ALLOWABLE GRADES ARE 2% (1/4"FT) MINIMUM TO 100% (FT/FT) MAXIMUM.
8. SEWER MUST BE STRAIGHT BETWEEN ANGLE POINTS, CHANGES IN LINE OR GRADE SHALL BE MADE WITH APPROVED FITTINGS.
9. NORMALLY ONLY ONE(1) CONNECTION TO THE SEWER MAIN PER BLDG. IS ALLOWED. TWO (2) DIFFERENT LAYOUTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY.

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

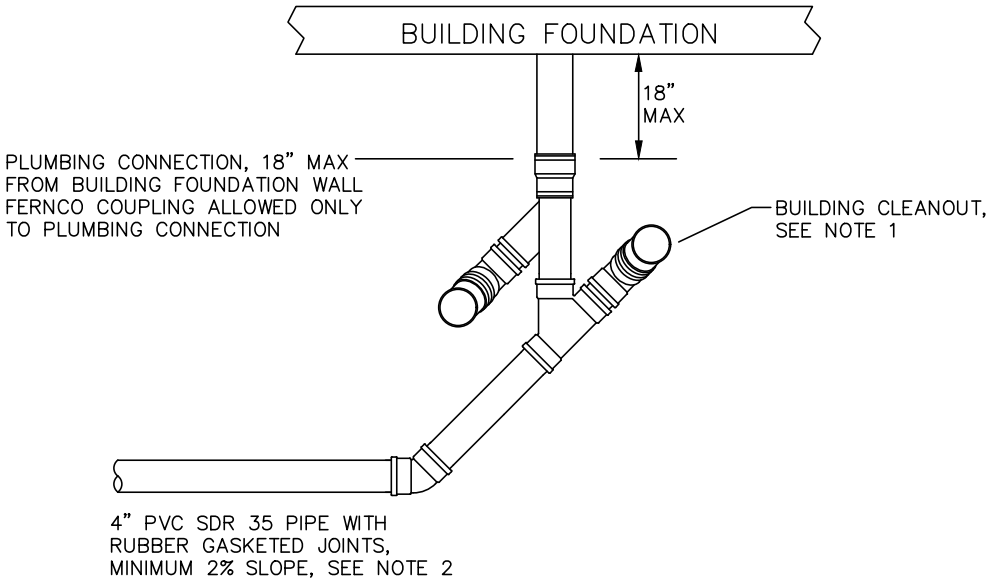
PUBLIC WORKS DIRECTOR

TYPICAL SIDE SEWER LAYOUT

DATE **11/19/2020**

DRAWING NO. **S-7**

REV:



NO SCALE

NOTES:

1. CLEANOUTS IN HARDSCAPE SHALL BE BROUGHT TO GRADE PER STANDARD DWG S-10.
2. ALL PIPE MATERIAL SHALL BE BELL & SPIGOT TYPE WITH RUBBER GASKET JOINT OR GLUED JOINTS AND SHALL BE IN CONFORMANCE WITH ASTM D3034 (SDR-35).

APPROVAL

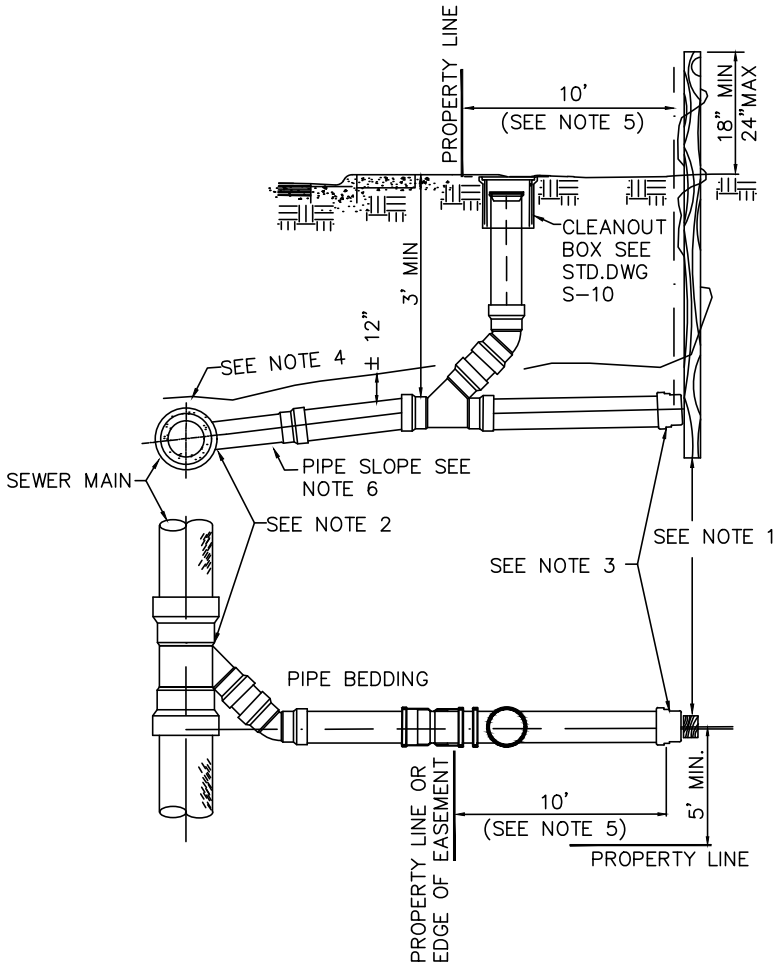
PUBLIC WORKS DIRECTOR

SIDE SEWER HOUSE CONNECTION

DATE **11/19/2020**

DRAWING NO. **S-8**

REV:



NOTES:

1. 2"X4" PRESSURE TREATED WOOD SERVICE MARKER, LENGTH AS REQUIRED. PAINT PORTION OF SERVICE MARKER THAT IS ABOVE GRADE WITH WHITE PAINT. STENCIL "S/S" WITH 3" TALL BLACK LETTERS.
2. FOR NEW SEWER MAINS, INSTALL A MANUFACTURED WYE WITH 45° BEND WITH THE MAIN LINE CONSTRUCTION. FOR EXISTING SEWER MAINS, CORE DRILL AND INSTALL A INSERT-WYE SADDLE.
3. APPROVED WATERTIGHT CAP PLUG OR CONTINUE PIPE.
4. PROVIDE DETECTOR TAPE 12" OVER BEDDING FOR ENTIRE LENGTH OF STUB AND UP 2"X4" SERVICE MARKER.
5. FOR DEVELOPER EXTENSION PROJECTS, EXTEND STUB 10' INTO PROPERTY; OTHERWISE, TERMINATE STUB AT PROPERTY LINE OR EDGE OF EASEMENT.
6. 6" SIDE SEWER STUB AT 2% MINIMUM SLOPE, 100% (45°) MAXIMUM SLOPE.

NO SCALE

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

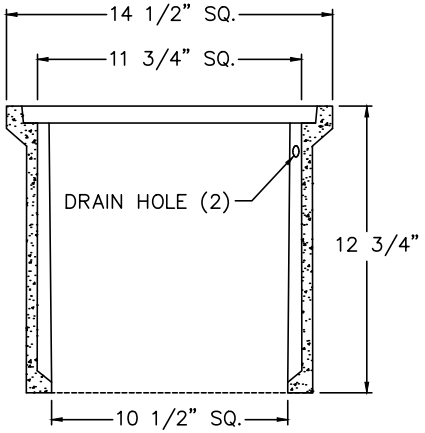
PUBLIC WORKS DIRECTOR

SIDE SEWER STUB CONNECTION TO EXISTING OR NEW MAIN

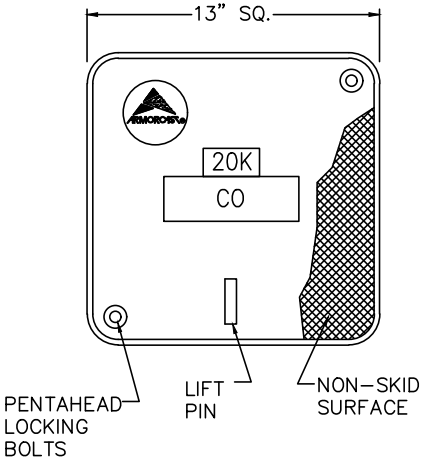
DATE
11/19/2020

DRAWING NO.
S-9

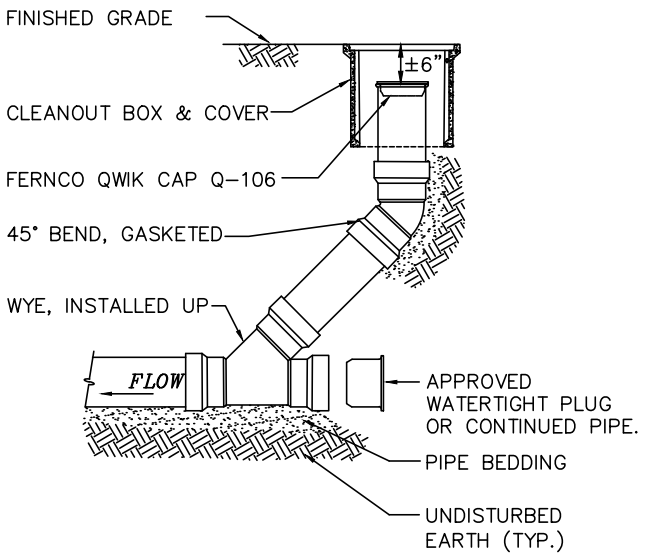
REV:



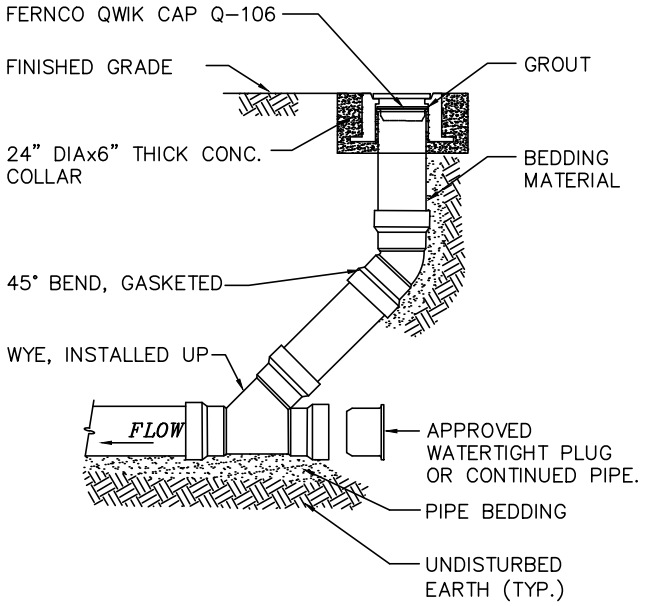
CLEANOUT BOX



CLEANOUT COVER



CLEANOUT IN BOX



CLEANOUT WITH CONCRETE COLLAR

NO SCALE

NOTES:

1. SURFACE CLEANOUTS REQUIRED AT RIGHT OF WAY/PROPERTY LINE, BUILDING CONNECTION, AND EVERY 100 FEET.
2. ALL CLEANOUTS AT RIGHT OF WAY/PROPERTYLINE OR IN PAVED AREAS SHALL BE INSTALLED IN A BOX. CLEANOUTS ON PRIVATE PROPERTY SHALL BE INSTALLED WITH A CONCRETE COLLAR OR IN A BOX.
3. CLEANOUT BOX AND COVER SHALL BE ARMORCAST POLYMER CONCRETE BOX ASSEMBLY, PART #A6001423TA, 20K LOADING WITH PENTAHEAD LOCKING BOLTS AND "CO" STAMPED ON COVER.
4. ALL PIPE MATERIAL SHALL BE BELL & SPIGOT TYPE WITH RUBBER GASKET JOINT AND SHALL BE IN CONFORMANCE WITH ASTM D3034 (SDR-35).

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

PUBLIC WORKS DIRECTOR

SIDE SEWER SURFACE CLEANOUT

DATE 11/19/2020

DRAWING NO. S-10

REV:

NOTE: MAKE TIES TO PERMANENT SURFACE FEATURES SHOWN ON PLANS

PROJECT NAME: _____

REF. DRAWING NO.: _____

FILE NUMBER: _____

PARCEL: _____

STREET: _____

ADDRESS: _____

CONTRACTOR: _____

INSPECTOR: _____

COMPANY: _____

DATE INSTALLED: _____

STUB: DIA. _____ TEE TYPE _____

LENGTH: _____

CENTERLINE STATION: _____

LINE NO.: _____

STA. OF AND DIRECTION

TO NEAREST MANHOLE _____

INVERT EL.:_____

DEPTH FROM NATURAL
GROUND TO STUB: _____

LOCAL B.M. ELEV.: _____

DESCRIPTION OF LOCAL B.M.:_____

_____

_____

PIPE GRADE: _____

_____ FEET BELOW THRESHOLD

HOUSE TYPE: _____

REMARKS: _____

_____

_____

_____

NO SCALE

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

_____
PUBLIC WORKS DIRECTOR

SIDE SERVICE CONNECTION RECORD DRAWINGS

DATE
11/19/2020

DRAWING NO.
S-11

REV:

Stormwater

STORMWATER GENERAL NOTES:

1. ALL STORMWATER PIPE, STRUCTURES AND RETENTION/DETENTION BASINS SHALL BE STAKED FOR GRADE AND ALIGNMENT BY A SURVEYOR LICENSED IN THE STATE OF WASHINGTON.

2. THE CONTRACTOR SHALL MAINTAIN STORM SERVICE TO ALL RESIDENCES AND BUSINESS AND THROUGH ALL EXISTING STORMWATER PIPES AT ALL TIMES. IF THE CONTRACTOR DESIRES TO BY–PASS STORM FLOWS, A BY–PASS PLAN SHALL BE SUBMITTED TO, AND APPROVED BY THE TOWN PRIOR TO IMPLEMENTING THE BY–PASS PLAN.

3. PRIOR TO BACKFILLING, ALL PIPE AND STRUCTURES SHALL BE INSPECTED AND APPROVED BY THE TOWN. APPROVALS SHALL NOT RELIEVE THE CONTRACTOR OF CORRECTION OF ANY DEFICIENCIES AND/OR FAILURES AS DETERMINED BY SUBSEQUENT TESTING AND INSPECTIONS.

4. THE TOWN OF FRIDAY HARBOR PUBLIC WORKS DEPARTMENT SHALL BE NOTIFIED A MINIMUM OF TWO BUSINESS DAYS IN ADVANCE OF ANY REQUIRED INSPECTIONS AND CONNECTION TO AN EXISTING STORM STRUCTURE OR PIPE.

5. STORMWATER PIPE SHALL BE CORRUGATED POLYETHYLENE PIPE (CPEP) UNLESS SPECIFICALLY APPROVED OTHERWISE BY THE TOWN. CPEP UP TO 10 INCH DIAMETER PIPE AND FITTINGS SHALL MEET THE REQUIREMENTS OF AASHTO M252 TYPE S. CPEP 12" TO 60" DIAMETER PIPE AND FITTINGS SHALL MEET THE REQUIREMENTS OF AASHTO M294 TYPE S. ALL JOINTS FOR CPEP PIPE SHALL BE MADE WITH A BELL/BELL OR BELL/SPIGOT COUPLING AND SHALL CONFORM TO ASTM D3212 USING ELASTOMERIC GASKETS CONFORMING TO ASTM F477. ALL GASKETS SHALL BE FACTORY INSTALLED ON THE PIPE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. FITTINGS SHALL BE BLOW MOLDED, ROTATIONAL MOLDED OR FACTORY WELDED PIPE SHALL MEET THE FOLLOWING REQUIREMENTS.

6. DUCTILE IRON PIPE, CLASS 50 SHALL BE INSTALLED IF COVER IS LESS THAN 24–INCH. DUCTILE IRON, CLASS 50 SHALL CONFORM TO ANSI A 21.51 OR AWWA C151 AND SHALL BE CEMENT MORTAR LINED. NON–RESTRAINED JOINTS SHALL BE RUBBER GASKET TYPE, PUSH ON TYPE, OR MECHANICAL TYPE AND SHALL MEET THE REQUIREMENTS OF AWWA C111. CAST IRON FITTINGS MAY BE USED WITH DUCTILE IRON PIPE.

7. PVC PIPE SDR 35 MAY BE INSTALLED IF APPROVED BY THE TOWN. PVC PIPE SDR 35, 4–INCH TO 15–INCH DIAMETER SHALL CONFORM TO ASTM D 3034, 18–INCH TO 48–INCH DIAMETER SHALL CONFORM TO ASTM F679. JOINTS FOR SOLID WALL PVC PIPE SHALL CONFORM TO ASTM D 3211 USING ELASTOMERIC GASKETS CONFORMING TO ASTM F477. FITTINGS FOR SOLID WALL PVC PIPE SHALL BE INJECTION MOLDED, FACTORY WELDED, OR FACTORY SOLVENT CEMENTED.

8. ADJUSTMENTS TO CATCHBASINS AND MANHOLES UNDER 2–INCHES SHALL BE WITH CONCRETE OR NON–SHRINK GROUT.

9. ADJUSTMENTS TO CATCHBASINS OVER 2–INCHES SHALL BE WITH CONCRETE ADJUSTMENT RINGS.

10. ALL ADJUSTMENT RISERS SHALL BE GROUTED WITH NON–SHRINK GROUT OR SOME TYPE OF PORTLAND AND SAND MIXTURE. DRY–STACKING IS NOT ALLOWED.

11. STORM SEWERS SHALL BE TESTED FOR DEFLECTION NOT LESS THAN 30 DAYS AFTER THE TRENCH BACKFILL AND COMPACTION HAS BEEN COMPLETED. THE TEST SHALL BE CONDUCTED BY PULLING A PROPERLY SIZED "GO–NOGO" MANDREL THROUGH THE COMPLETED PIPELINE. TESTING SHALL BE COMPLETED AFTER THE LINE HAS BEEN COMPLETELY FLUSHED OUT WITH WATER. THE CONTRACTOR SHALL REMOVE ALL DEBRIS SO THAT NONE IS FLUSHED INTO THE EXISTING STORM SEWER SYSTEM. THE TEST SHALL BE OBSERVED BY THE TOWN.

NO SCALE

APPROVAL

PUBLIC WORKS DIRECTOR

STORMWATER GENERAL NOTES

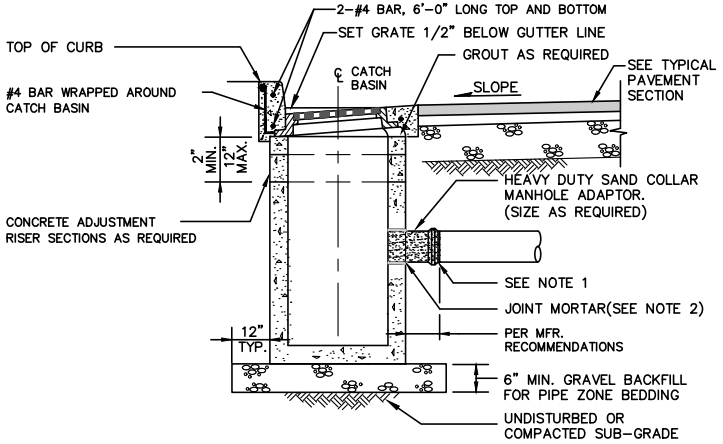
DATE ----

DRAWING NO. **SW-0**

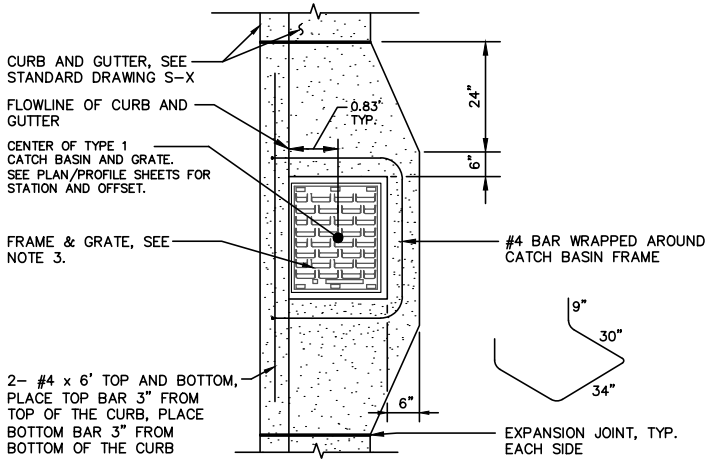
REV:

NOTES:

1. IN ORDER TO MAKE A CONNECTION TO EXISTING PIPE, CONTRACTOR SHALL FURNISH AND INSTALL A FLEXIBLE COUPLING/ADAPTER.
2. FILL GAP WITH JOINT MORTAR IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION SECTION 9-04.3
3. SEE SW-X FOR FRAME, SW-X FOR VANED GRATE, AND SW-X FOR BI-DIRECTIONAL VANED GRATE. FOR GRATES LOCATED IN A LOW SPOT, PROVIDE A BI-DIRECTIONAL VANED GRATE.



ELEVATION



PLAN

NO SCALE

APPROVAL

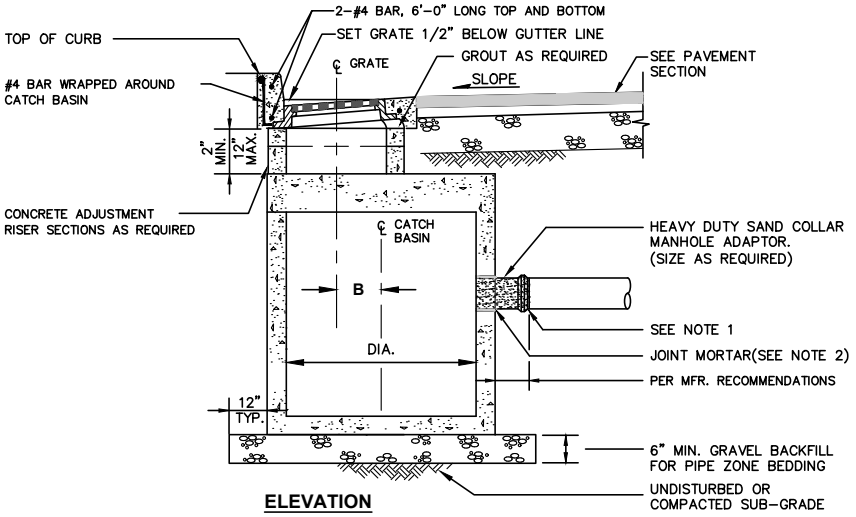
PUBLIC WORKS DIRECTOR

CATCH BASIN TYPE 1 & 1L & CONCRETE INLET INSTALLATION DETAIL

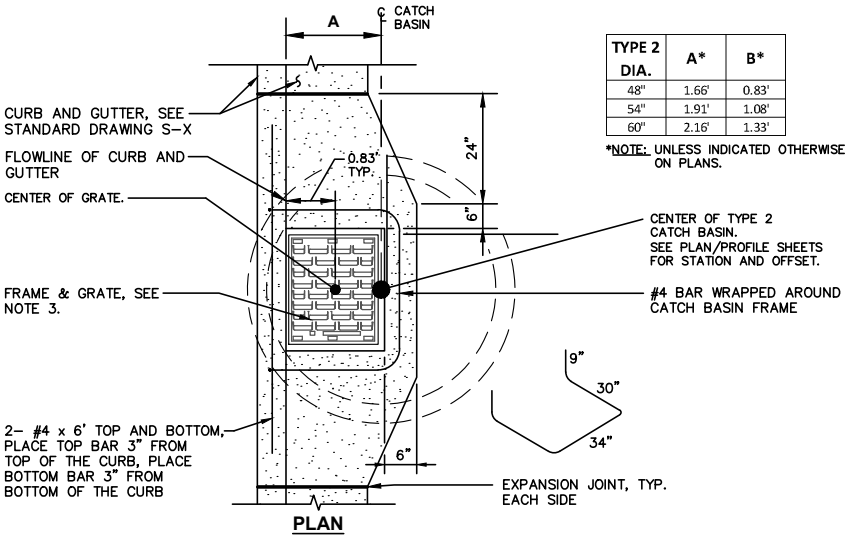
DATE ----

DRAWING NO. **SW-1**

REV:



ELEVATION



PLAN

TYPE 2 DIA.	A*	B*
48"	1.66'	0.83'
54"	1.91'	1.08'
60"	2.16'	1.33'

*NOTE: UNLESS INDICATED OTHERWISE ON PLANS.

NOTES:

1. IN ORDER TO MAKE A CONNECTION TO EXISTING PIPE, CONTRACTOR SHALL FURNISH AND INSTALL A FLEXIBLE COUPLING/ADAPTER.
2. FILL GAP WITH JOINT MORTAR IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION SECTION 9–04.3
3. SEE SW–X FOR FRAME, SW–X FOR VANED GRATE, AND SW–X FOR BI–DIRECTIONAL VANED GRATE. FOR GRATES LOCATED IN A LOW SPOT, PROVIDE A BI–DIRECTIONAL VANED GRATE.

NO SCALE

APPROVAL

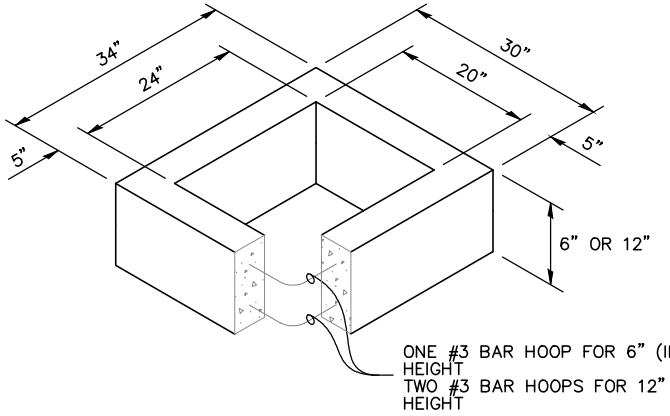
PUBLIC WORKS DIRECTOR

CATCH BASIN, TYPE 2 INSTALLATION DETAIL

DATE ----

DRAWING NO. SW-2

REV:

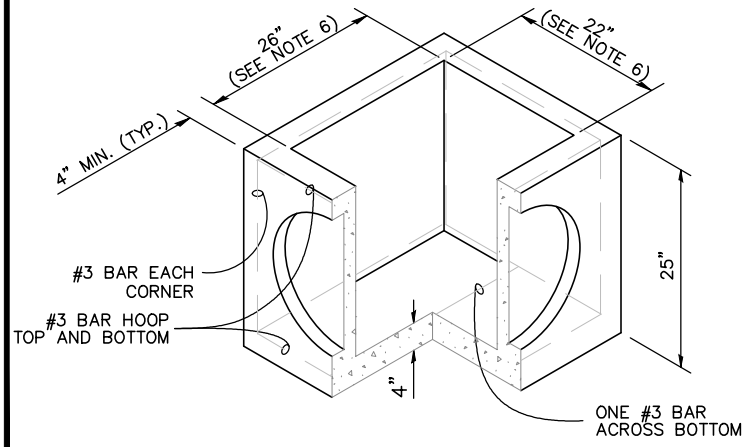


RECTANGULAR ADJUSTMENT SECTION

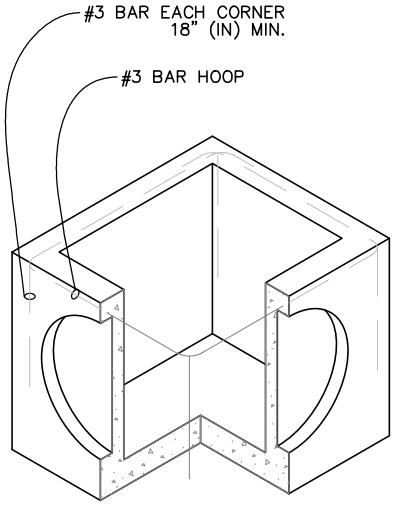
PIPE ALLOWANCES

PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
DUCTILE IRON (STD. SPEC. SECT. 9-05.13)	20"
CPEP * (STD. SPEC. SECT. 9-05.20)	18"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	21"

*CORRUGATED POLYETHYLENE PIPE



PRECAST BASE SECTION



(SEE NOTE 2)

ALTERNATIVE PRECAST BASE SECTION

NOTES

1. ALL PRECAST CONCRETE ITEMS SHALL MEET THE REQUIREMENTS OF AASHTO M199 AND FABRICATED AS SHOWN ON THE STANDARD DRAWINGS.
2. AS ACCEPTABLE ALTERNATIVES TO THE REBAR SHOWN IN THE PRECAST BASE SECTION, FIBERS (PLACED ACCORDING TO THE WSDOT STANDARD SPECIFICATIONS), OR WIRE MESH HAVING A MINIMUM AREA OF 0.12 SQUARE INCHES PER FOOT SHALL BE USED WITH THE MINIMUM REQUIRED REBAR SHOWN IN THE ALTERNATIVE PRECAST BASE SECTION. WIRE MESH SHALL NOT BE PLACED IN THE KNOCKOUTS.
3. THE KNOCKOUT DIAMETER SHALL NOT BE GREATER THAN 18" (IN) . KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" (IN) MINIMUM TO 2.5" (IN) MAXIMUM. PROVIDE A 1.5" (IN) MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION SECTION 9-04.3.
4. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE LOWEST PIPE INVERT SHALL BE 5' (FT).
5. THE FRAME AND GRATE MAY BE INSTALLED WITH THE FLANGE UP OR DOWN. THE FRAME MAY BE CAST INTO THE ADJUSTMENT SECTION.
6. THE PRECAST BASE SECTION MAY HAVE A ROUNDED FLOOR, AND THE WALLS MAY BE SLOPED AT A RATE OF 1 : 24 OR STEEPER.
7. THE OPENING SHALL BE MEASURED AT THE TOP OF THE PRECAST BASE SECTION.
8. ALL PICKUP HOLES SHALL BE GROUTED FULL AFTER THE INLET HAS BEEN PLACED.

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

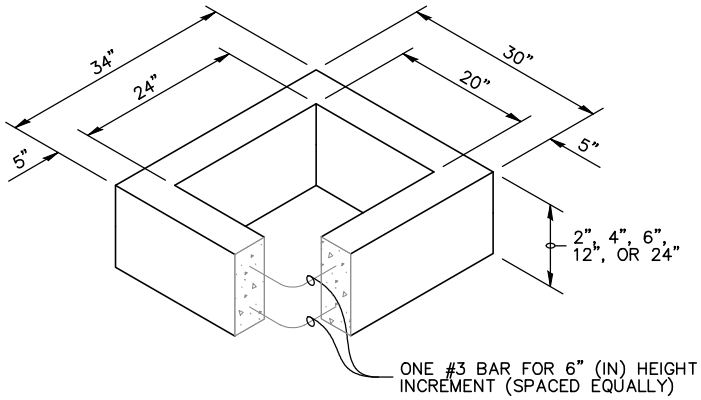
PUBLIC WORKS DIRECTOR

DATE ----

CONCRETE INLET

DRAWING NO. SW-3

REV:



RECTANGULAR ADJUSTMENT SECTION

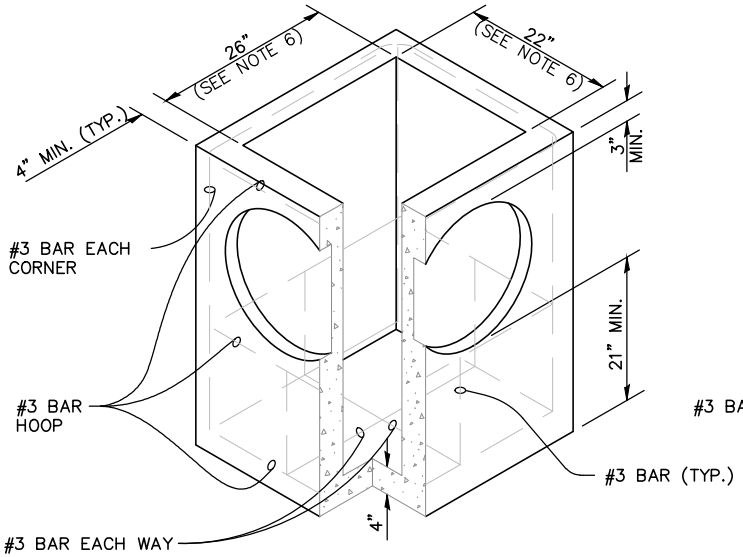
PIPE ALLOWANCES

PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
DUCTILE IRON (STD. SPEC. SECT. 9-05.13)	20"
CPEP * (STD. SPEC. SECT. 9-05.20)	18"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	21"

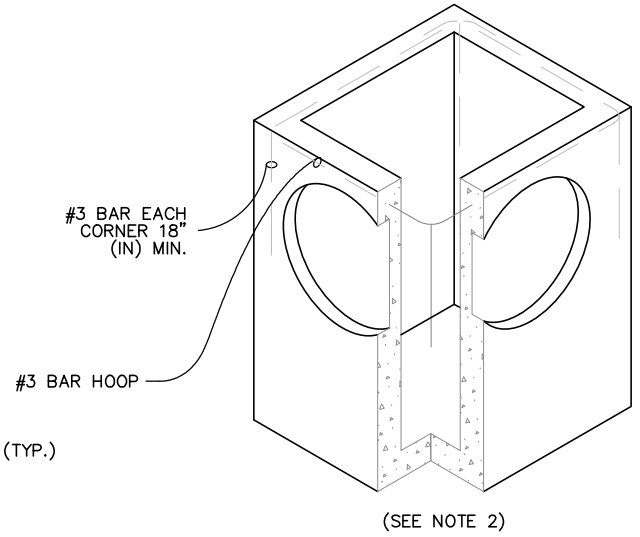
*CORRUGATED POLYETHYLENE PIPE

NOTES

1. ALL PRECAST CONCRETE ITEMS SHALL MEET THE REQUIREMENTS OF AASHTO M199 AND FABRICATED AS SHOWN ON THE STANDARD DRAWINGS.
2. AS ACCEPTABLE ALTERNATIVES TO THE REBAR SHOWN IN THE PRECAST BASE SECTION, FIBERS (PLACED ACCORDING TO THE WSDOT STANDARD SPECIFICATIONS), OR WIRE MESH HAVING A MINIMUM AREA OF 0.12 SQUARE INCHES PER FOOT SHALL BE USED WITH THE MINIMUM REQUIRED REBAR SHOWN IN THE ALTERNATIVE PRECAST BASE SECTION. WIRE MESH SHALL NOT BE PLACED IN THE KNOCKOUTS.
3. THE KNOCKOUT DIAMETER SHALL NOT BE GREATER THAN 20" (IN). KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" (IN) MINIMUM TO 2.5" (IN) MAXIMUM. PROVIDE A 1.5" (IN) MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION SECTION 9-04.3.
4. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE LOWEST PIPE INVERT SHALL BE 5' (FT).
5. THE FRAME AND GRATE MAY BE INSTALLED WITH THE FLANGE DOWN, OR INTEGRALLY CAST INTO THE ADJUSTMENT SECTION WITH FLANGE UP.
6. THE PRECAST BASE SECTION MAY HAVE A ROUNDED FLOOR, AND THE WALLS MAY BE SLOPED AT A RATE OF 1 : 24 OR STEEPER.
7. THE OPENING SHALL BE MEASURED AT THE TOP OF THE PRECAST BASE SECTION.
8. ALL PICKUP HOLES SHALL BE GROUTED FULL AFTER THE BASIN HAS BEEN PLACED.



PRECAST BASE SECTION



(SEE NOTE 2)

ALTERNATIVE PRECAST BASE SECTION

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

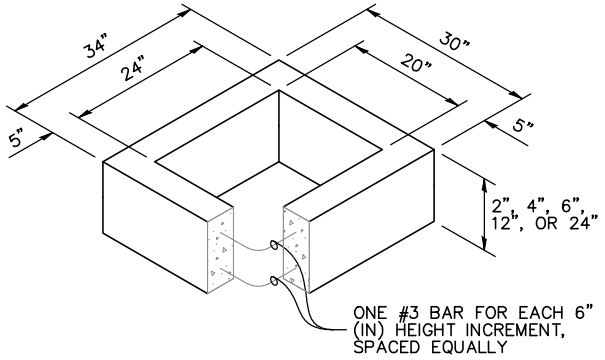
PUBLIC WORKS DIRECTOR

DATE ----

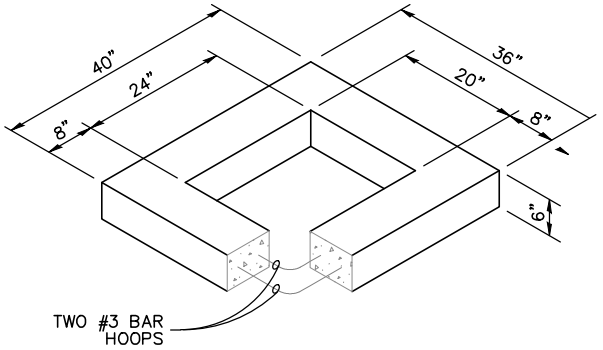
CATCH BASIN TYPE 1

DRAWING NO. **SW-4**

REV:



RECTANGULAR ADJUSTMENT SECTION



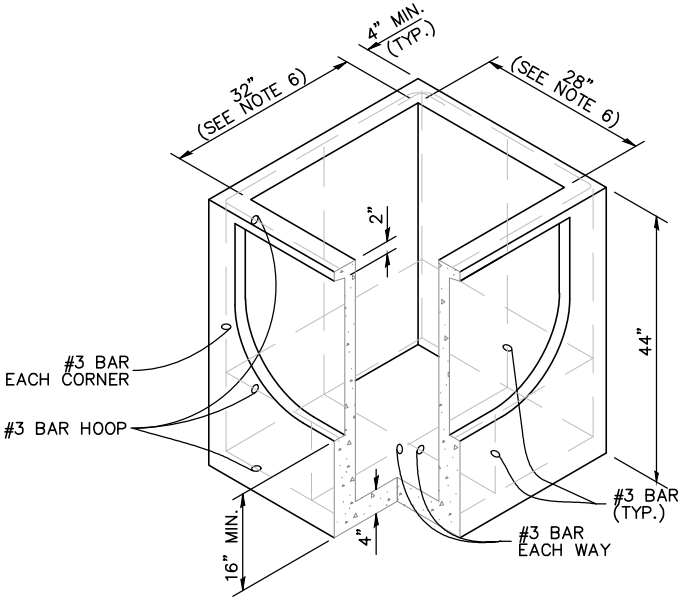
REDUCING SECTION

PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
DUCTILE IRON (STD. SPEC. SECT. 9-05.13)	20"
CPEP * (STD. SPEC. SECT. 9-05.20)	18"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	21"

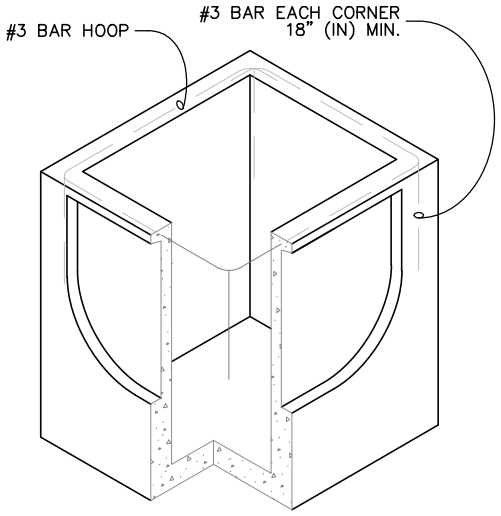
*CORRUGATED POLYETHYLENE PIPE

NOTES

1. ALL PRECAST CONCRETE ITEMS SHALL MEET THE REQUIREMENTS OF AASHTO M199 AND FABRICATED AS SHOWN ON THE STANDARD DRAWINGS.
2. AS ACCEPTABLE ALTERNATIVES TO THE REBAR SHOWN IN THE PRECAST BASE SECTION, FIBERS (PLACED ACCORDING TO THE WSDOT STANDARD SPECIFICATIONS), OR WIRE MESH HAVING A MINIMUM AREA OF 0.12 SQUARE INCHES PER FOOT SHALL BE USED WITH THE MINIMUM REQUIRED REBAR SHOWN IN THE ALTERNATIVE PRECAST BASE SECTION. WIRE MESH SHALL NOT BE PLACED IN THE KNOCKOUTS.
3. THE KNOCKOUT DIAMETER SHALL NOT BE GREATER THAN 26" (IN), IN ANY DIRECTION. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" (IN) MINIMUM TO 2.5" (IN) MAXIMUM. PROVIDE A 1.5" (IN) MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION SECTION 9-04.3.
4. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE LOWEST PIPE INVERT SHALL BE 5' (FT).
5. THE FRAME AND GRATE MAY BE INSTALLED WITH THE FLANGE DOWN OR INTEGRALLY CAST INTO THE ADJUSTMENT SECTION WITH FLANGE UP.
6. THE PRECAST BASE SECTION MAY HAVE A ROUNDED FLOOR, AND THE WALLS MAY BE SLOPED AT A RATE OF 1 : 24 OR STEEPER.
7. THE OPENING SHALL BE MEASURED AT THE TOP OF THE PRECAST BASE SECTION.
8. ALL PICKUP HOLES SHALL BE GROUTED FULL AFTER THE BASIN HAS BEEN PLACED.



PRECAST BASE SECTION



(SEE NOTE 2)

ALTERNATIVE PRECAST BASE SECTION

NO SCALE

APPROVAL

PUBLIC WORKS DIRECTOR

DATE

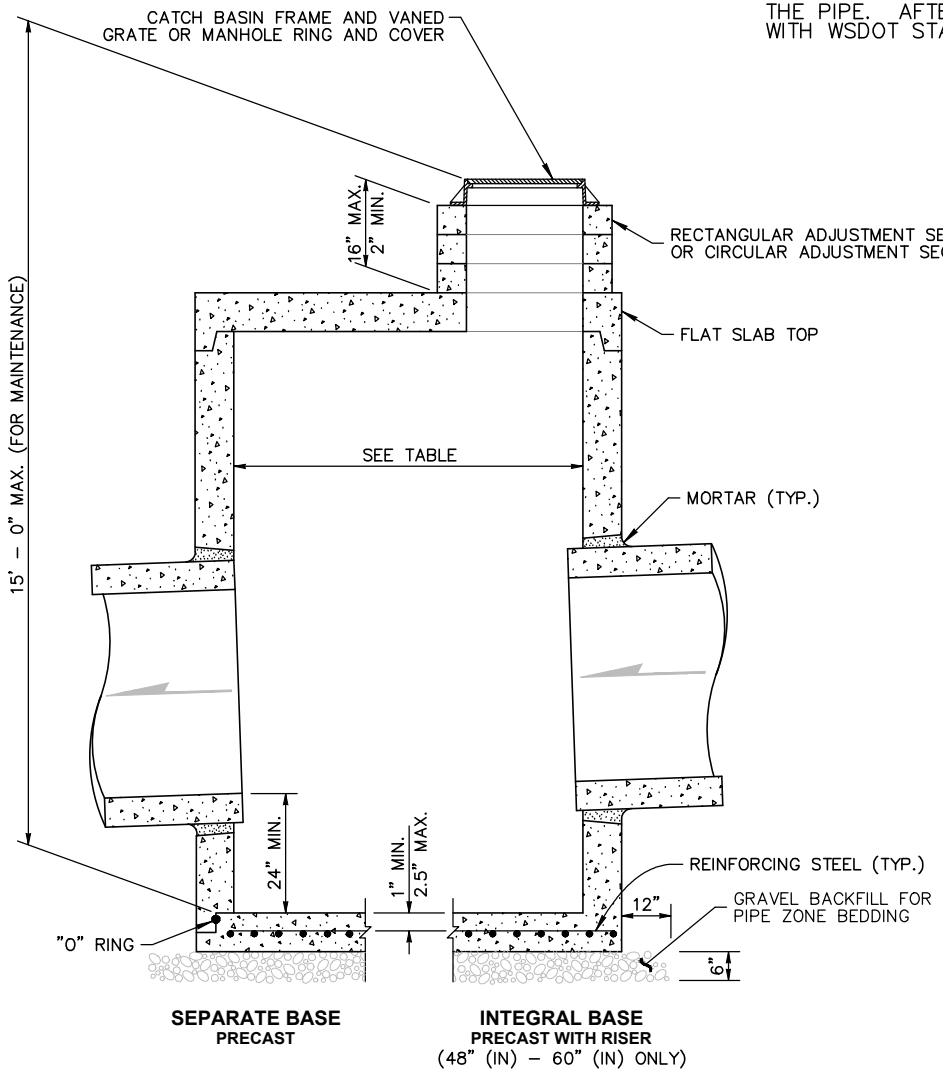
CATCH BASIN TYPE 1L

DRAWING NO.
SW-5

REV:

NOTES

1. THE BOTTOM OF THE PRECAST CATCH BASIN MAY BE SLOPED TO FACILITATE CLEANING.
2. THE RECTANGULAR FRAME AND GRATE MAY BE INSTALLED WITH THE FLANGE UP OR DOWN. THE FRAME MAY BE CAST INTO THE ADJUSTMENT SECTION.
3. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" (IN) MINIMUM TO 2.5" (IN) MAXIMUM. PROVIDE A 1.5" (IN) MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION SECTION 9-04.3.



SEPARATE BASE
PRECAST

INTEGRAL BASE
PRECAST WITH RISER
(48" (IN) - 60" (IN) ONLY)

CATCH BASIN DIMENSIONS				
CATCH BASIN DIAMETER	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"

PIPE ALLOWANCES		
CATCH BASIN DIAMETER	PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER	
	CPEP ①	SOLID WALL PVC ②
48"	24"	30"
54"	30"	36"
60"	36"	42"

① CORRUGATED POLYETHYLENE PIPE (SEE WSDOT STANDARD SPECIFICATION SECTION 9-05.20)
② (SEE WSDOT STANDARD SPECIFICATION SECTION 9-05.12(1))

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

PUBLIC WORKS DIRECTOR

DATE ----

CATCH BASIN TYPE 2

DRAWING NO. SW-6

REV:

NOTES

1. THE PIPE SUPPORTS AND THE FLOW RESTRICTOR SHALL BE CONSTRUCTED OF THE SAME MATERIAL AND BE ANCHORED AT A MAXIMUM SPACING OF 36" (IN). ATTACH THE PIPE SUPPORTS TO THE MANHOLE WITH 5/8" (IN) STAINLESS STEEL EXPANSION BOLTS OR EMBED THE SUPPORTS INTO THE MANHOLE WALL 2" (IN).

2. THE VERTICAL RISER STEM OF THE FLOW RESTRICTOR SHALL BE THE SAME DIAMETER AS THE HORIZONTAL OUTLET PIPE WITH A MINIMUM DIAMETER OF 12" (IN).

3. THE FLOW RESTRICTOR SHALL BE FABRICATED FROM ONE OF THE FOLLOWING MATERIALS:
   0.060" (IN) CORRUGATED ALUMINUM ALLOY DRAIN PIPE
   0.064" (IN) CORRUGATED ALUMINIZED STEEL DRAIN PIPE
   0.060" (IN) ALUMINUM ALLOY FLAT SHEET, IN ACCORDANCE WITH ASTM B 209, 5052 H32 OR EPS HIGH DENSITY POLYETHYLENE STORM SEWER PIPE

4. THE FRAME SHALL BE OFFSET SO THAT: THE SHEAR GATE IS VISIBLE FROM THE TOP; THE FRAME IS CLEAR OF THE CURB.

5. THE SIZE OF THE ELBOWS AND THEIR PLACEMENT SHALL BE SPECIFIED IN THE CONTRACT.

6. RESTRICTOR PLATE WITH ORIFICE AS SPECIFIED. THE OPENING IS TO BE CUT ROUND AND SMOOTH.

7. THE SHEAR GATE SHALL BE MADE OF ALUMINUM ALLOY IN ACCORDANCE WITH ASTM B 26 AND ASTM B 275, DESIGNATION ZG32A; OR CAST IRON IN ACCORDANCE WITH ASTM A 48, CLASS 30B.

   THE LIFT HANDLE SHALL BE MADE OF A SIMILAR METAL TO THE GATE (TO PREVENT GALVANIC CORROSION), IT MAY BE OF SOLID ROD OR HOLLOW TUBING, WITH ADJUSTABLE HOOK AS REQUIRED.

   A NEOPRENE RUBBER GASKET IS REQUIRED BETWEEN THE RISER MOUNTING FLANGE AND THE GATE FLANGE.

   INSTALL THE GATE SO THAT THE LEVEL–LINE MARK IS LEVEL WHEN THE GATE IS CLOSED.

   THE MATING SURFACES OF THE LID AND THE BODY SHALL BE MACHINED FOR PROPER FIT.

   ALL SHEAR GATE BOLTS SHALL BE STAINLESS STEEL.

8. THE SHEAR GATE MAXIMUM OPENING SHALL BE CONTROLLED BY LIMITED HINGE MOVEMENT, A STOP TAB, OR SOME OTHER DEVICE.

9. ALTERNATIVE SHEAR GATE DESIGNS ARE ACCEPTABLE IF MATERIAL SPECIFICATIONS ARE MET.

NO SCALE

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

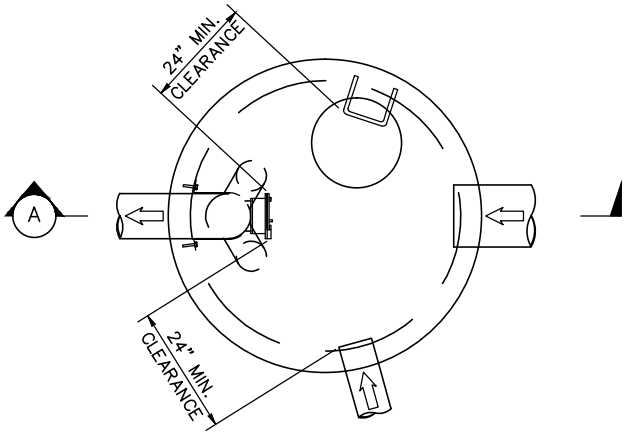
PUBLIC WORKS DIRECTOR

DATE

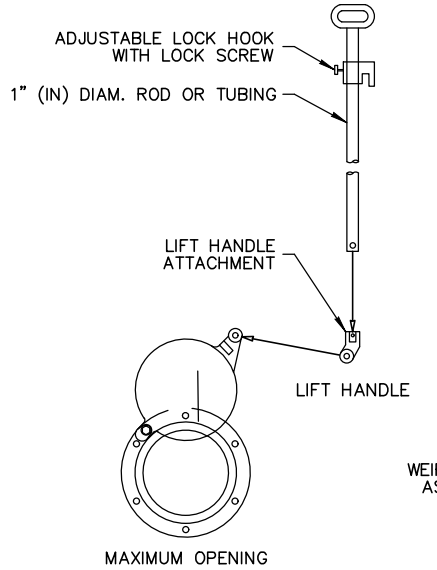
CATCH BASIN TYPE 2 WITH FLOW RESTRICTOR NOTES

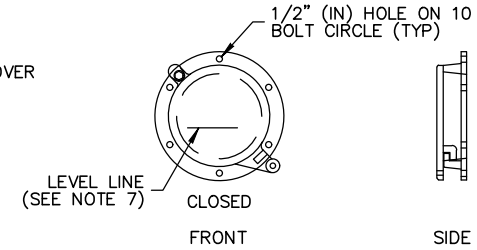
DRAWING NO.
SW-7

REV:

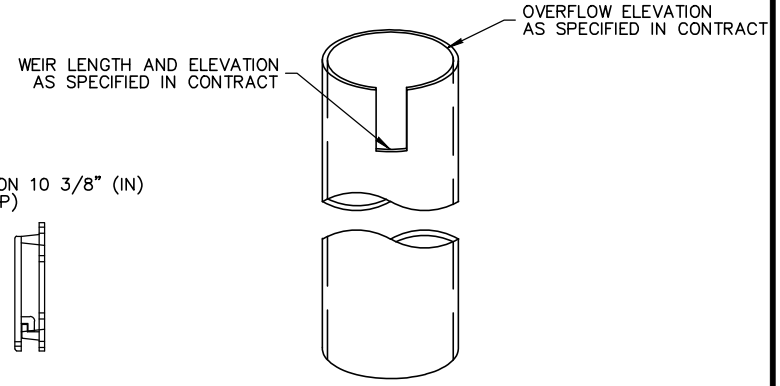


PLAN VIEW

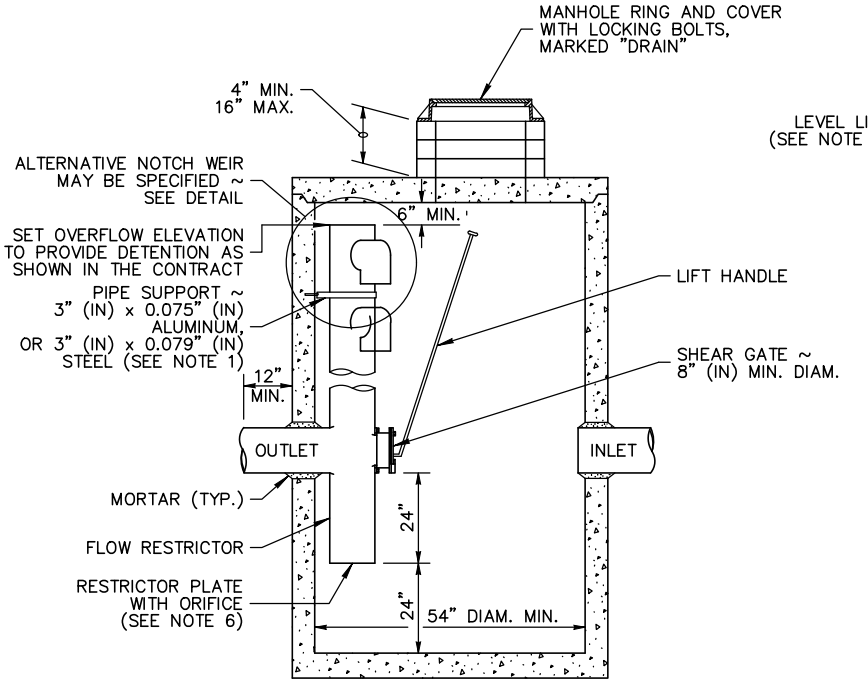




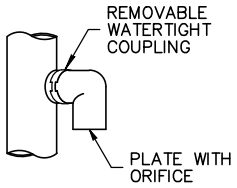
SHEAR GATE DETAILS



NOTCH WEIR DETAIL



SECTION (A)



ELBOW DETAIL

NO SCALE

APPROVAL

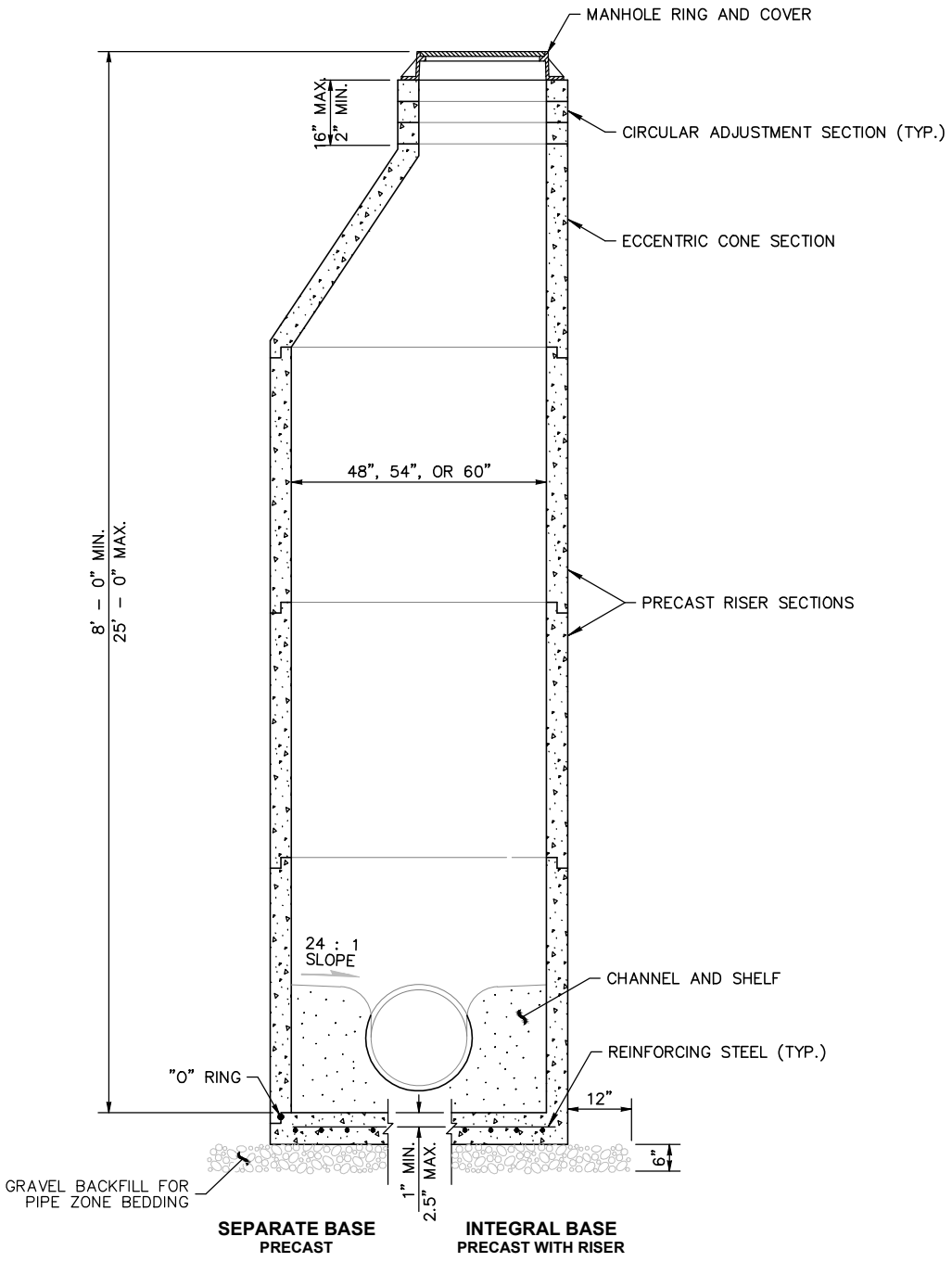
PUBLIC WORKS DIRECTOR

DATE ----

CATCH BASIN TYPE 2 WITH FLOW RESTRICTOR

DRAWING NO. **SW-8**

REV:



NOTES

1. All precast concrete shall meet the requirements of AASHTO M199.
2. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum.
3. For pipe allowances, see Standard Drawing SW–X. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with WSDOT Standard Specification 9–04.3.

MANHOLE DIMENSION TABLE

DIAM.	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"

NO SCALE

APPROVAL

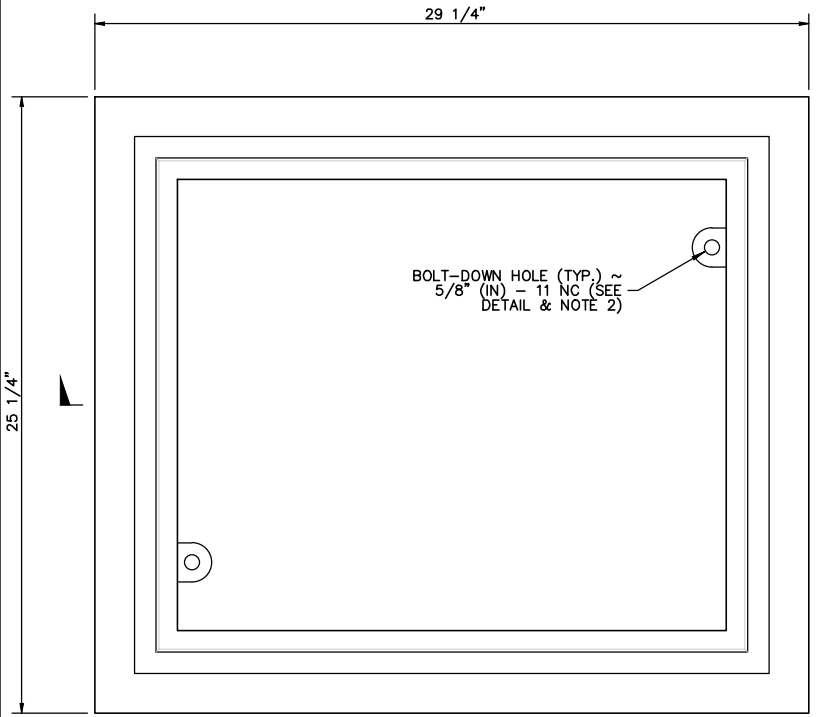
PUBLIC WORKS DIRECTOR

DATE

MANHOLE

DRAWING NO.
SW-9

REV:



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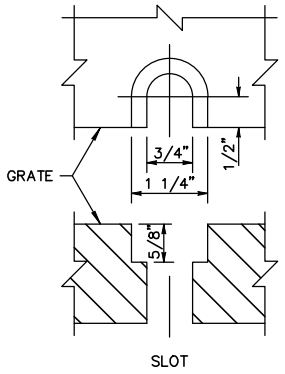
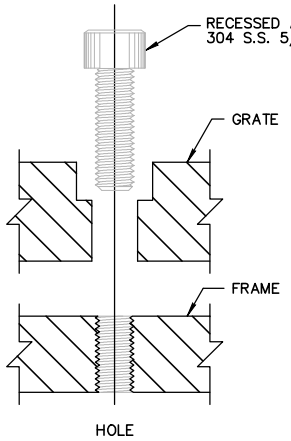
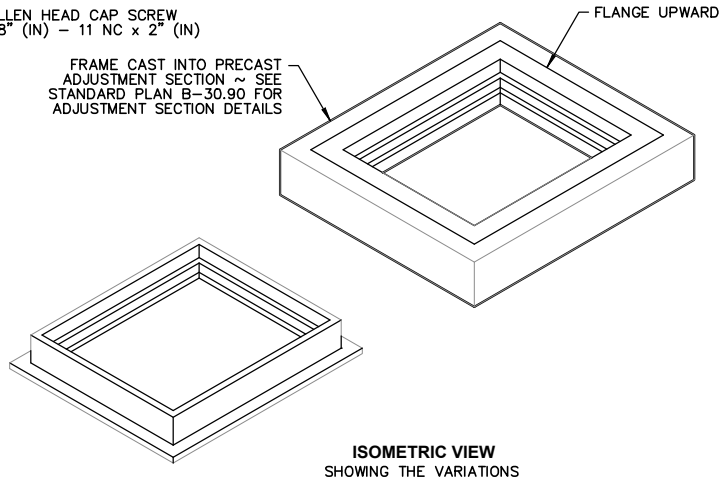


SLOT



HOLE

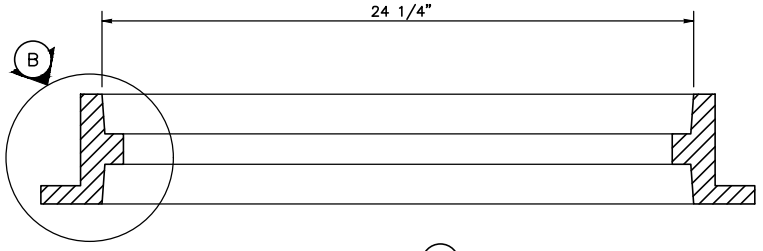
BOLT-DOWN DETAILS
SEE NOTE 2



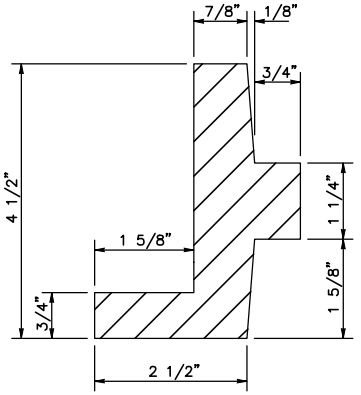
ISOMETRIC VIEW
SHOWING THE VARIATIONS

NOTES

1. This frame is designed to accommodate 20" (in) ×24" (in) grates or covers.
2. Bolt–down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) – 11 NC × 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt–down holes varies by manufacturer.
3. Refer to WSDOT Standard Specification Section 9–05.15 and 9–05.15(2) for additional requirements.



SECTION (A)



DETAIL (B)

NO SCALE

APPROVAL

PUBLIC WORKS DIRECTOR

DATE

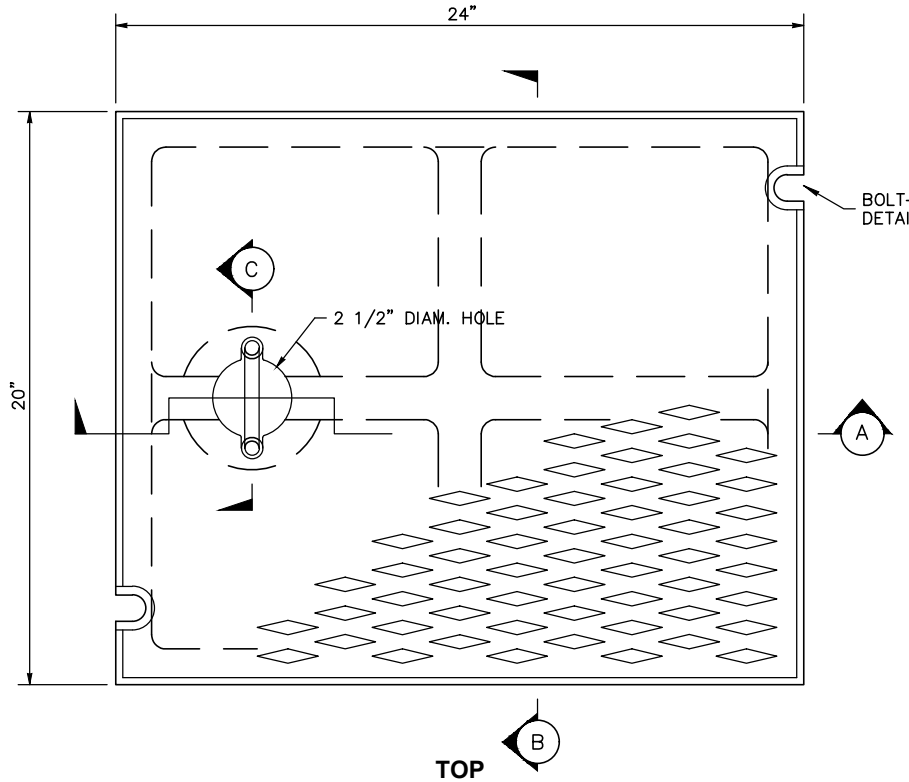
RECTANGULAR FRAME (REVERSIBLE)

DRAWING NO.
SW-10

REV:

NOTES

1. Bolt–down capability is required on all frames, grates, and covers.
2. For frame details, see SW–X.



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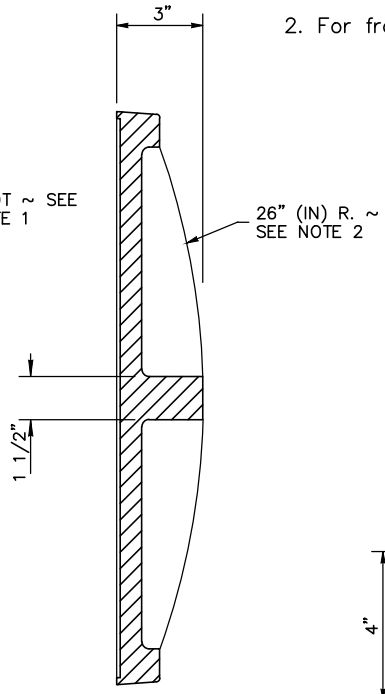
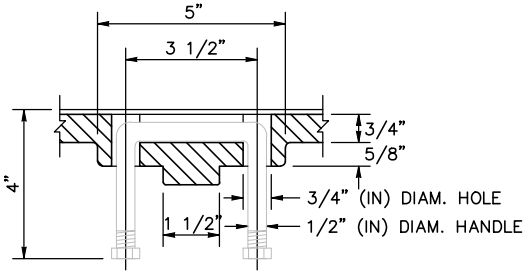
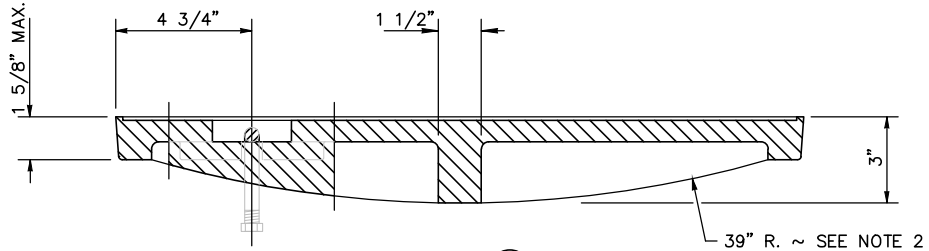


SECTION B



SECTION C



SECTION A

NO SCALE

APPROVAL

PUBLIC WORKS DIRECTOR

DATE ----

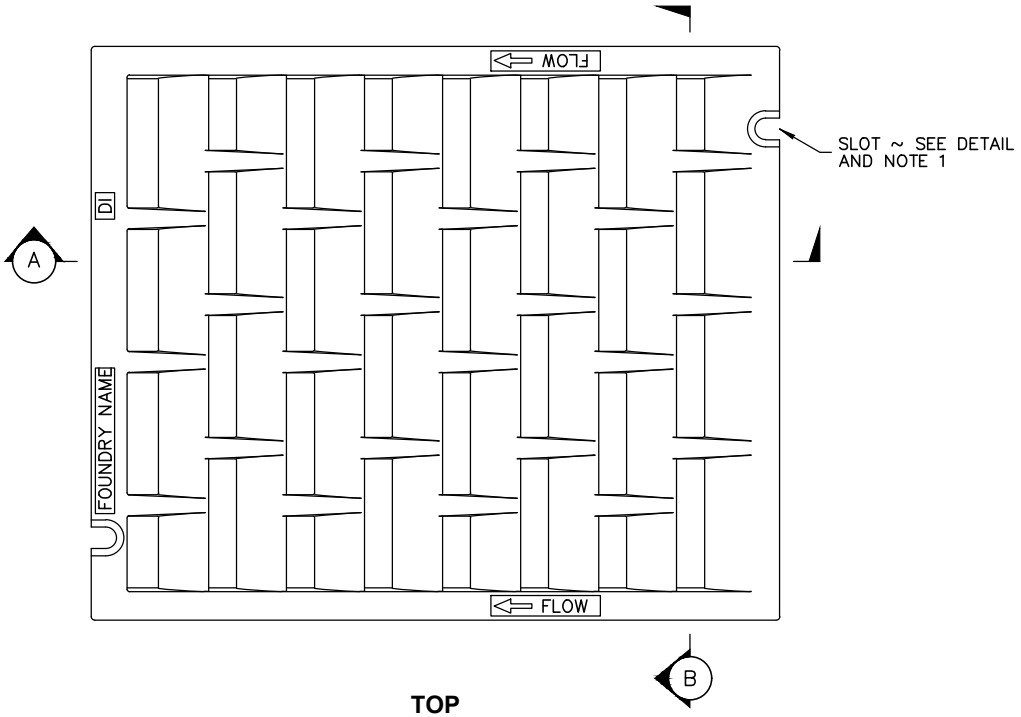
RECTANGULAR SOLID METAL COVER

DRAWING NO. SW-11

REV:

NOTES

1. Bolt–down capability is required on all frames, grates, and covers.
2. For frame details, see SW–X.



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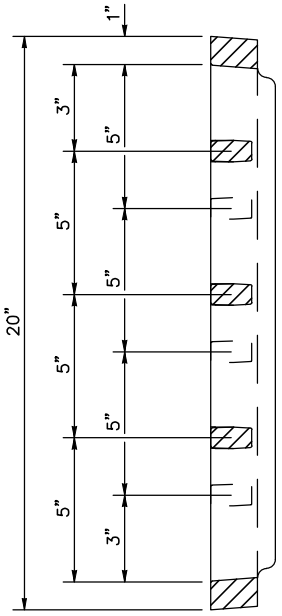
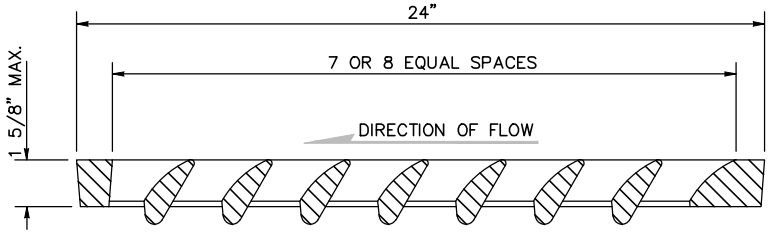


SECTION B



SECTION A

NO SCALE

APPROVAL

PUBLIC WORKS DIRECTOR

RECTANGULAR VANED GRATE

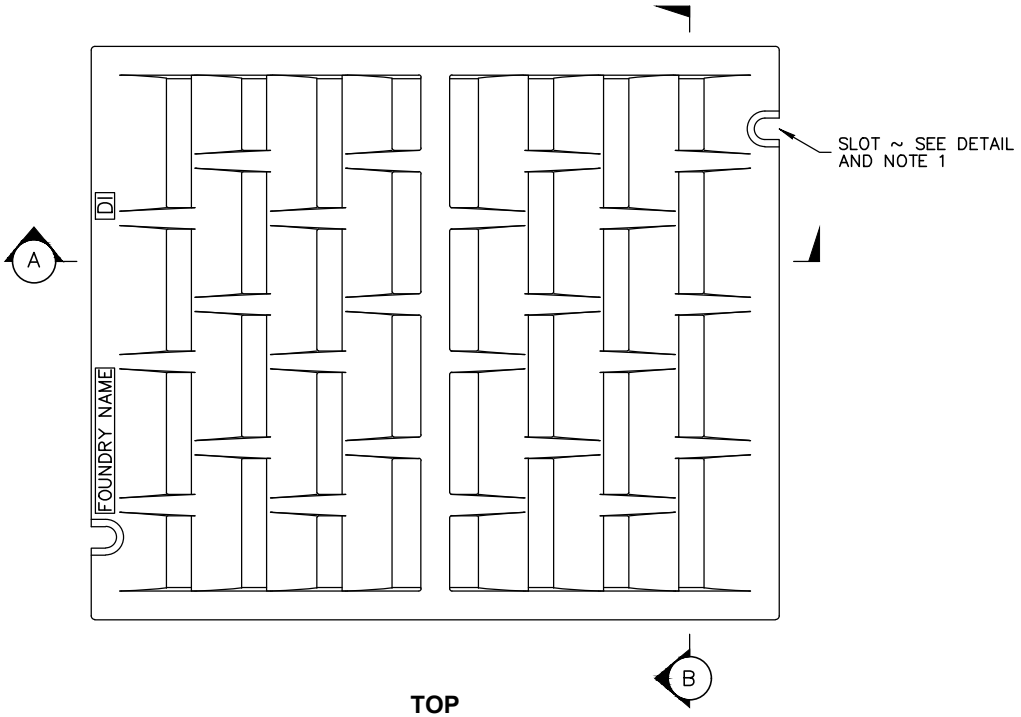
DATE ----

DRAWING NO. **SW-12**

REV:

NOTES

1. Bolt–down capability is required on all frames, grates, and covers.
2. For frame details, see SW–X.



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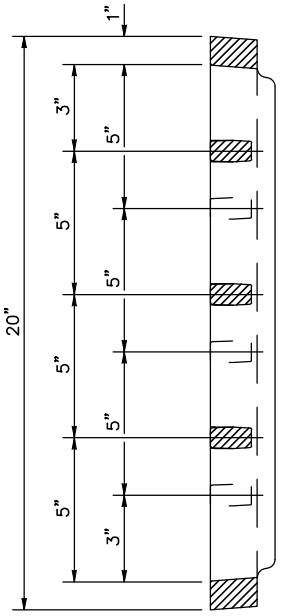
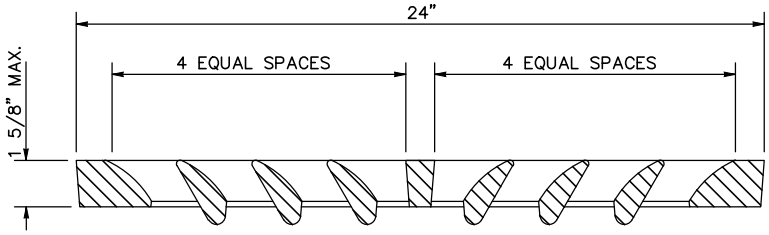


SECTION B



SECTION A

NO SCALE

APPROVAL

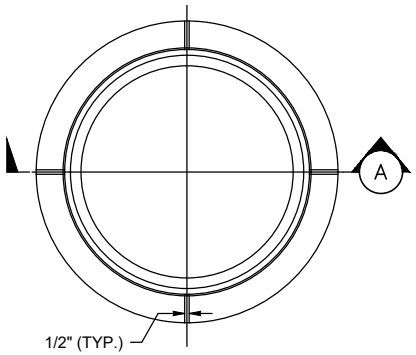
PUBLIC WORKS DIRECTOR

BI-DIRECTIONAL VANED GRATE

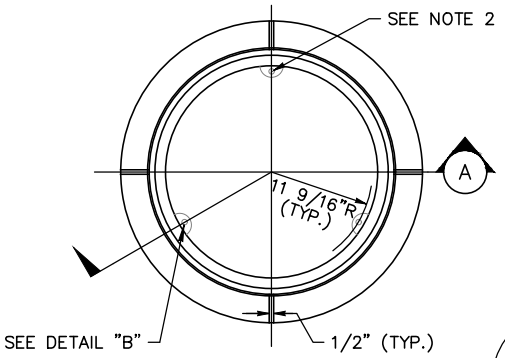
DATE ----

DRAWING NO. SW-13

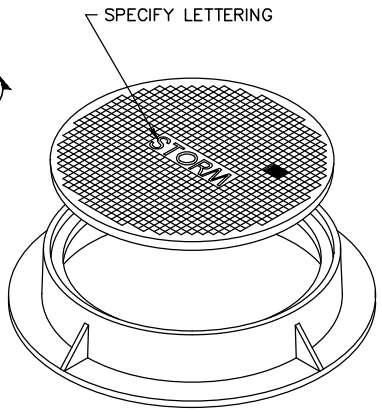
REV:



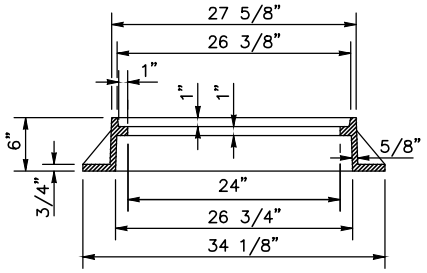
RING PLAN



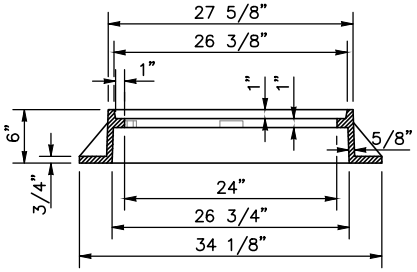
RING PLAN



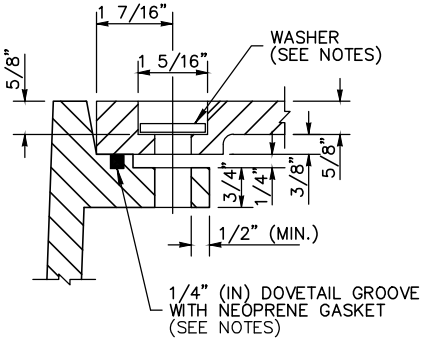
ISOMETRIC VIEW



RING SECTION (A)



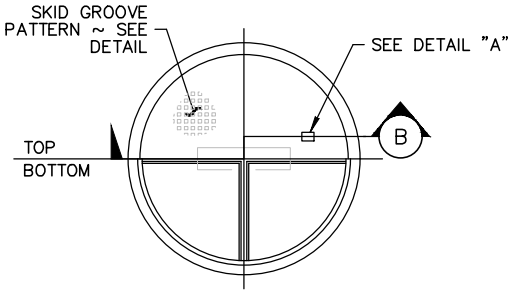
RING SECTION (A)



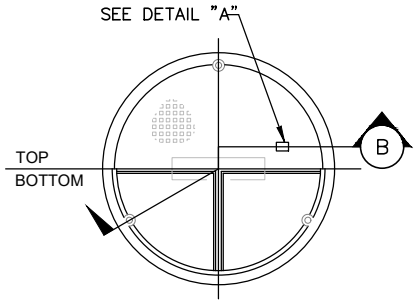
BOLT-DOWN / WATERTIGHT
DETAIL "B"

NOTES

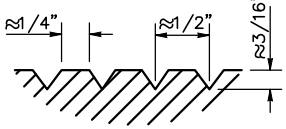
1. The gasket and groove may be in the seat (frame) or in the underside of the cover. The gasket may be "T" shaped in section. The groove may be cast or machined.
2. Bolt–down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 3 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S) 5/8" – 11 NC x 2" (in) allen head cap screw by being tapped or other approved mechanism. Location of bolt down holes varies by manufacturer
3. For bolt–down manhole ring and covers that are not designated "Watertight," the neoprene gasket, groove, and washer are not required.
4. Washer shall be neoprene (Detail "B").
5. In lieu of blind pick notch for manhole covers, a single 1" (in) pick hole is acceptable. Hole location and number of holes may vary by manufacturer.
6. Alternative reinforcing designs are acceptable in lieu of the rib design.
7. For clarity, the vertical scale of the Cover Section has been exaggerated, it is 1.5 times the horizontal scale (1H: 1.5V).



COVER PLAN

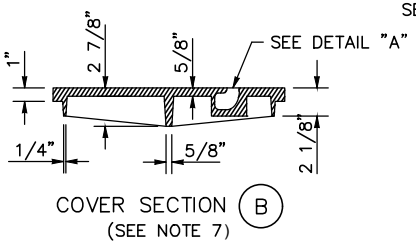


COVER PLAN

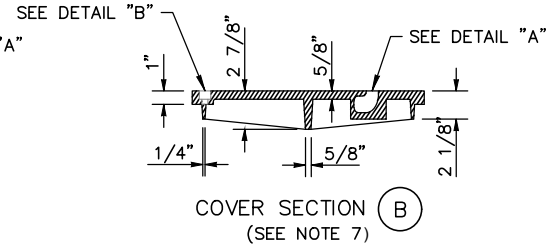


SKID GROOVE PATTERN
DETAIL

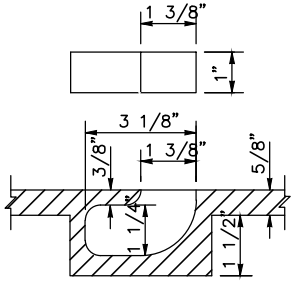
NO SCALE



STANDARD
TYPE 1



BOLT-DOWN / WATERTIGHT
TYPE 2



BLIND PICK NOTCH
DETAIL "A"

APPROVAL

PUBLIC WORKS DIRECTOR

CIRCULAR FRAME(RING) AND COVER

DATE ----

DRAWING NO. SW-14

REV:

SEDIMENTATION/EROSION GENERAL NOTES

1. THE CONTRACTOR SHALL STAKE ALL CLEARING LIMITS AND AREAS OF VEGETATION PRESERVATION PRIOR TO CONSTRUCTION. THE LIMITS SHALL BE OBSERVED DURING CONSTRUCTION.

2. ALL REQUIRED SEDIMENTATION/EROSION CONTROL FACILITIES MUST BE IN OPERATION PRIOR TO LAND CLEARING AND/OR OTHER CONSTRUCTION TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE DRAINAGE SYSTEM. ALL EROSION AND SEDIMENT CONTROL FACILITIES SHALL BE MAINTAINED IN A SATISFACTORY CONDITION UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED. THE IMPLEMENTATION, MAINTENANCE, REPLACEMENT AND ADDITIONS TO EROSION/SEDIMENTATION CONTROL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

3. THE EROSION AND SEDIMENTATION CONTROL SYSTEMS DEPICTED IN THE PLANS ARE INTENDED TO BE MINIMUM REQUIREMENTS TO MEET ANTICIPATED SITE CONDITIONS. AS CONSTRUCTION PROGRESSES AND AS UNEXPECTED OR SEASONAL CONDITIONS DICTATE, THE CONTRACTOR SHOULD ANTICIPATE THAT MORE EROSION AND SEDIMENTATION CONTROL FACILITIES WILL BE NECESSARY TO ENSURE COMPLETE SILTATION CONTROL ON THE PROPOSED SITE. DURING THE COURSE OF CONSTRUCTION, IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE CONTRACTOR TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES, OVER AND ABOVE THE MINIMUM REQUIREMENTS, AS MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES AND THE WATER QUALITY OF THE RECEIVING DRAINAGE SYSTEM.

4. AT NO TIME SHALL MORE THAN ONE FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN ANY CATCH BASIN WITHIN THE PROJECT SITE AND THE FIRST STRUCTURE DOWNSTREAM OF THE PROJECT SITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND DISPOSING OF THE SEDIMENT. ALL CATCH BASINS, CONVEYANCE LINES AND DITCHES SHALL BE CLEANED PRIOR TO PAVING.

5. ALL STORM DRAIN INLETS MADE OPERABLE DURING CONSTRUCTION SHALL BE PROTECTED SO THAT STORMWATER RUNOFF SHALL NOT ENTER THE CONVEYANCE SYSTEM WITHOUT FIRST BEING FILTERED OR OTHERWISE TREATED TO REMOVE SEDIMENT.

6. THE CONTRACTOR SHALL REMOVE MATERIAL DROPPED, WASHED OR TRACKED FROM VEHICLES ONTO THE TOWN RIGHT-OF-WAY OR INTO THE EXISTING STORM DRAINAGE SYSTEM. DEBRIS SHALL NOT BE WASHED INTO THE STORM DRAINAGE SYSTEM.

7. TEMPORARY EROSION CONTROL FACILITIES SHALL BE INSPECTED WEEKLY AND MAINTAINED WITHIN 24 HOURS FOLLOWING A STORM EVENT. SEDIMENT SHALL BE REMOVED TO INSURE THE FACILITIES WILL FUNCTION PROPERLY. THE FACILITIES SHALL BE SATISFACTORILY MAINTAINED UNTIL CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED.

8. NO DISTURBED SOIL SHALL REMAIN UNSTABILIZED FOR MORE THAN TWO DAYS. SOILS SHALL BE STABILIZED AT THE END OF THE SHIFT BEFORE A HOLIDAY OR WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST.

9. THE CONTRACTOR SHALL REMOVE TEMPORARY EROSION CONTROL MEASURES ONLY AFTER TOWN'S AUTHORIZATION.

NO SCALE

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

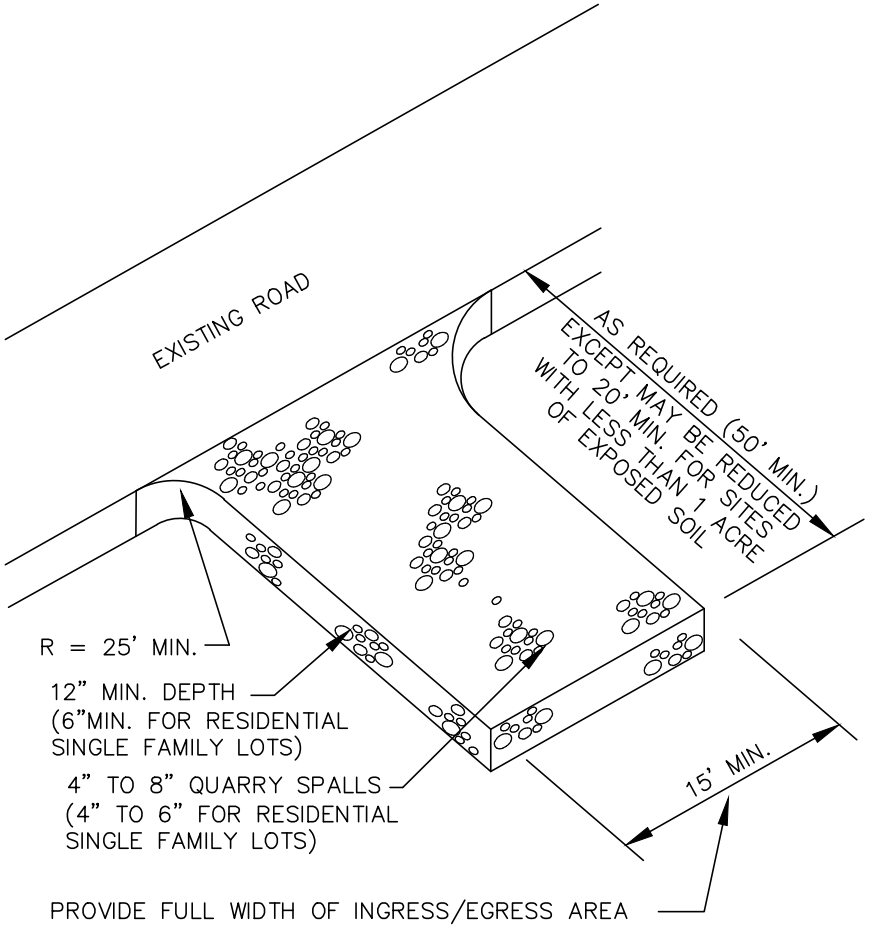
PUBLIC WORKS DIRECTOR

DATE

SEDIMENTATION/ EROSION CONTROL GENERAL NOTES

DRAWING NO.
SE-0

REV:



CONSTRUCTION ENTRANCE ROCK PAD

N.T.S.

NO SCALE

APPROVAL

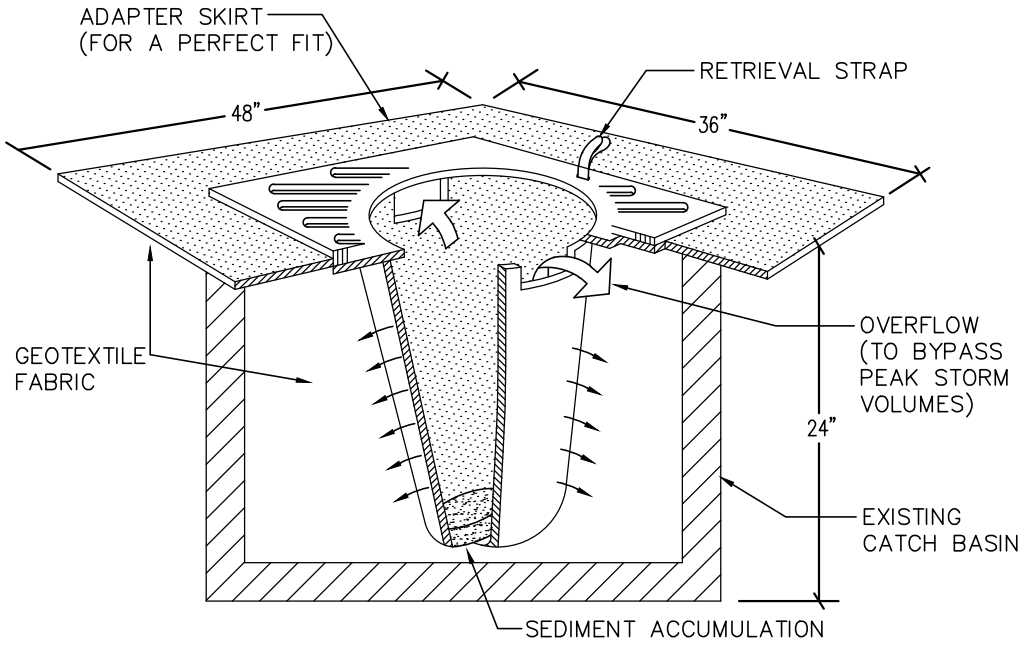
PUBLIC WORKS DIRECTOR

DATE

CONSTRUCTION ENTRANCE ROCK PAD

DRAWING NO. **SE-1**

REV:



PROVIDE CATCH BASIN SEDIMENT PROTECTION WITH STREAMGUARD BASIN INSERT #3003, FROM FOSS ENVIRONMENTAL OR APPROVED EQUAL

STORM DRAIN INLET PROTECTION DEVICE

BEHIND CEMENT CONCRETE SIDEWALK

NO SCALE

NOTES:

1. SIZE THE STORM DRAIN INLET PROTECTION DEVICE FOR THE STORMWATER STRUCTURE IT WILL SERVE.
2. THE DEVICE SHALL HAVE A BUILT-IN HIGH FLOW RELIEF SYSTEM.
3. PERFORM MAINTENANCE IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION 8-01.3(15).

APPROVAL

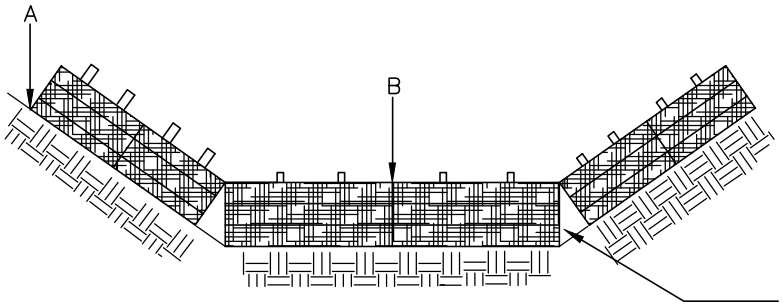
PUBLIC WORKS DIRECTOR

DATE

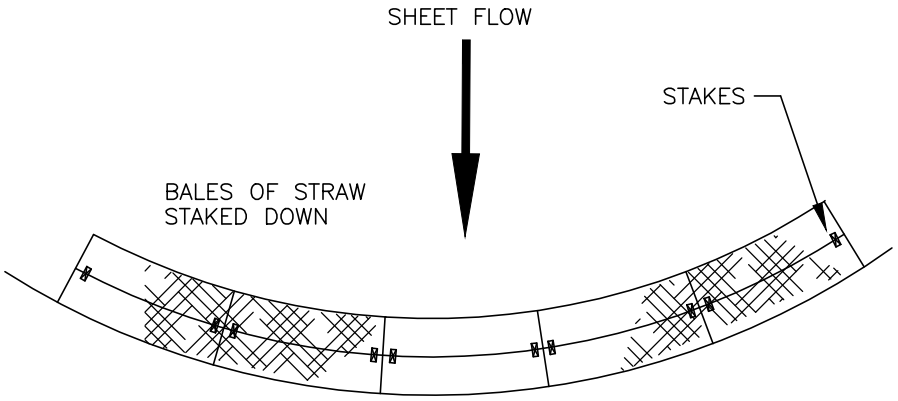
STORM DRAIN INLET PROTECTION DEVICE

DRAWING NO. **SE-2**

REV:

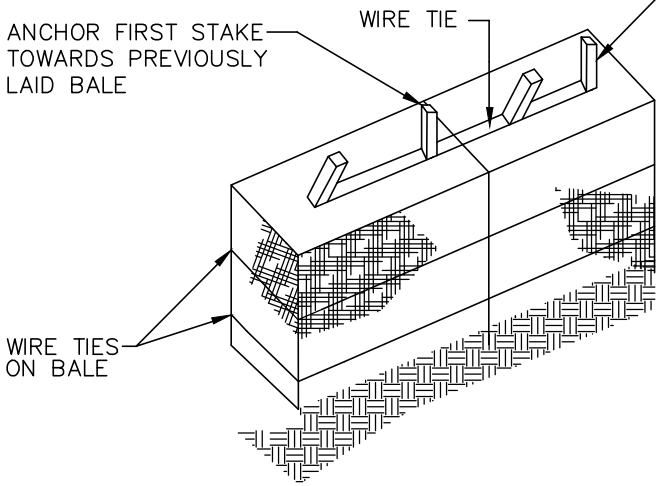


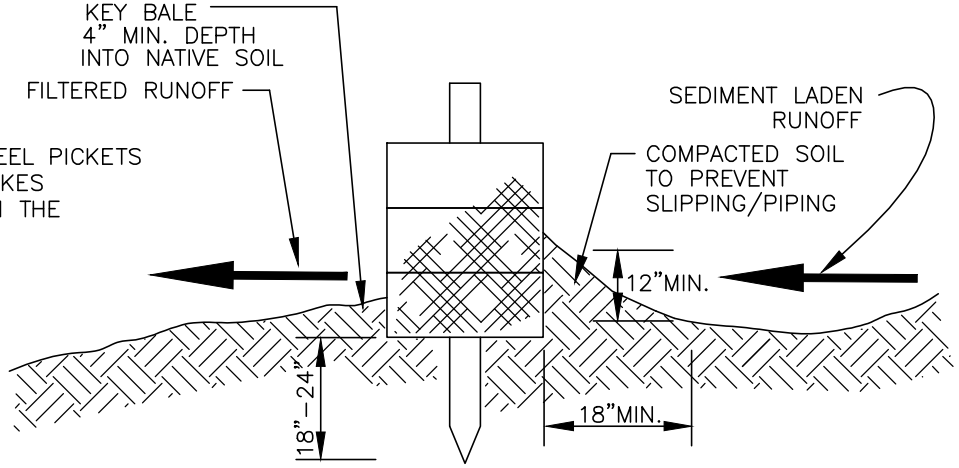
PROPER PLACEMENT OF STRAW BALE BARRIER IN DRAINAGE WAY



PLAN

SINGLE ROW OF BALES OF STRAW TO BE PLACED PRIOR TO THE START OF ROUGH GRADING





CROSS–SECTION OF STRAW BALE

NO SCALE

NOTE:
WEDGE A FLAT SHOVEL OR PICK BETWEEN THE BALES AND MIX THE STRAW TOGETHER TO PREVENT THE WATER FROM FLOWING FREELY BETWEEN THE BALES.

APPROVAL

PUBLIC WORKS DIRECTOR

DATE

STRAW AND HAY BALE BARRIERS - SCHEMATIC

DRAWING NO. **SE-3**

REV:

Water

WATER MAIN GENERAL NOTES:

1. A 2 FOOT MINIMUM HORIZONTAL SEPARATION SHALL BE MAINTAINED BETWEEN ALL WATER FACILITIES AND UNDERGROUND POWER, TELEPHONE AND CABLE FACILITIES UNLESS OTHERWISE APPROVED BY THE TOWN OF FRIDAY HARBOR. SEE STANDARD DWG. W–2 AND U–4.

2. FOR WATER MAIN AND SEWER MAIN SEPARATION REQUIREMENTS SEE STANDARD DWG. U–1.

3. ALL CONTRACTORS WORKING WITH AC PIPE MUST BE STATE–CERTIFIED. THE CONTRACTOR SHALL PROVIDE PROTECTIVE CLOTHING AND EQUIPMENT TO CREWS WORKING WITH ASBESTOS CEMENT PIPE IN ORDER TO ASSURE THE WORKER'S EXPOSURE TO ASBESTOS MATERIAL IS AT OR BELOW THE LIMITS PRESCRIBED IN WAC 296–62–07705.

4. WATER MAINS SHALL BE CONSTRUCTED OF AWWA C–900, SR 18 UNLESS OTHERWISE APPROVED BY THE TOWN.

5. GATE VALVES SHALL BE M&H STYLE 929 OR CLOW MEDALLION AND SHALL BE RESILIENT WEDGE, NON RISING STEM (NRS) WITH TWO INTERNAL O–RING STEM SEALS. VALVE ENDS SHALL BE MECHANICAL JOINT OR ANSI FLANGES. VALVES SHALL CONFORM TO AWWA C–515.

6. ALL FITTINGS FOR PVC PIPING SHALL BE DUCTILE IRON COMPACT FITTINGS CONFORMING TO AWWA C–153 OR CLASS 250 GRAY IRON CONFORMING TO AWWA C–110 AND C–111.

7. SERVICE LINES SHALL BE TYPE K COPPER PIPE, REHAU PEX PIPE OR HIGH DENSITY POLYETHYLENE TUBING (COPPER TUBE SIZE) MEETING THE REQUIREMENTS OF AWWA C901, SDR 11, WITH A MINIMUM PRESSURE RATING OF 200 PSI.

8. UNLESS IT IS NECESSARY TO CLEAR UTILITIES, THE WATER MAIN SHALL BE INSTALLED WITH UNDER 48 –INCHES OF COVER BUT NEVER LESS THAN 36 INCHES OF COVER TO THE TOP OF THE PIPE. ANY DEVIATIONS FROM THIS SHALL BE APPROVED BY THE TOWN OF FRIDAY HARBOR PRIOR TO START OF CONSTRUCTION ACTIVITIES.

9. CONCRETE BLOCKING FOR WATER MAINS SHALL BE DESIGNED AND INSTALLED IN ACCORDANCE WITH AWWA AND TOWN OF FRIDAY HARBOR STANDARDS AND SHALL BE INSTALLED AT ALL VERTICAL AND HORIZONTAL BENDS AND FITTINGS. PRIOR TO BLOCKING, THE FITTINGS SHALL BE WRAPPED WITH VISQUEEN.

10. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE TOWN 2 BUSINESS DAYS IN ADVANCE OF BACKFILLING WATER MAINS.

11. ALL MAINS AND SERVICE LINES SHALL BE DISINFECTED AND TESTED IN CONFORMANCE WITH TOWN OF FRIDAY HARBOR STANDARDS IN THE PRESENCE OF A TOWN REPRESENTATIVE.

12. CONNECTIONS TO EXISTING WATER MAINS SHALL BE COORDINATED WITH THE TOWN.

13. ALL SERVICE STUBS MUST BE TESTED FOR FLOW OF WATER AFTER PRESSURE TEST AND BACTERIA TEST. A TOWN REPRESENTATIVE MUST BE ON–SITE TO OBSERVE THE FLOW TEST. CONTACT THE TOWN TWO BUSINESS DAYS IN ADVANCE.

14. THE CONTRACTOR SHALL CONTACT THE TOWN 5 DAYS PRIOR TO ANY WORK REQUIRING THE SHUTDOWN OF EXISTING WATER MAINS. THE CONTRACTOR IS REQUIRED TO GIVE 2 BUSINESS DAYS NOTICE TO ALL CUSTOMERS AFFECTED BY THE WATER MAIN SHUTDOWN. SHUTDOWNS SHALL BE SCHEDULED MONDAY THROUGH THURSDAY, BETWEEN 8 A.M. AND 2 P.M.

15. ONLY A TOWN REPRESENTATIVES MAY OPERATE THE TOWN SYSTEM'S VALVES, HYDRANTS, BLOW–OFFS FOR FILLS, SHUT DOWNS, FLUSHING OR RECHARGING LINES.

16. THE CONTRACTOR SHALL DEMONSTRATE TO A TOWN REPRESENTATIVE THAT THE FIRE FLOW AND STATIC AND RESIDUAL PRESSURES LISTED IN THE STANDARDS ARE ACHIEVED. THE CONTRACTOR IS REQUIRED TO GIVE 2 BUSINESS DAYS NOTICE TO THE TOWN TO OBSERVE THESE TESTS.

NO SCALE

APPROVAL

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PUBLIC WORKS DIRECTOR

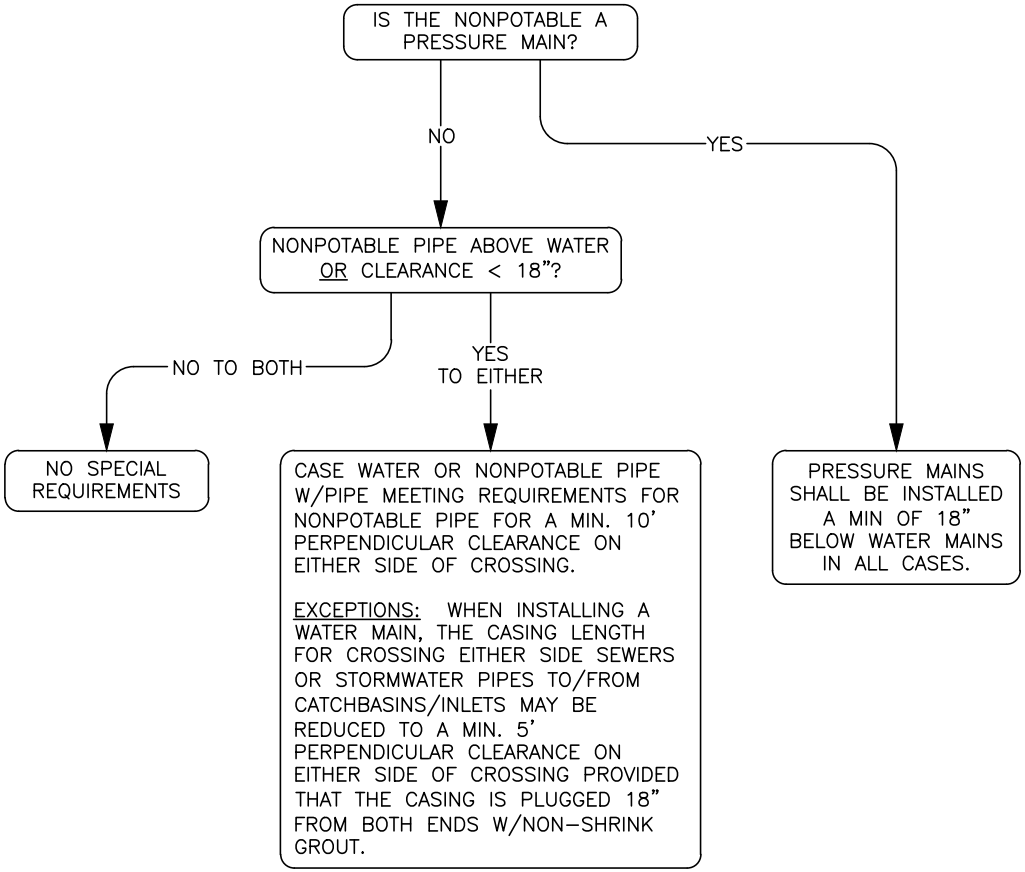
DATE

WATER GENERAL NOTES

DRAWING NO. **W-0**

REV:

WATER MAIN AND NONPOTABLE PIPE CROSSINGS



NOTES:

1. NONPOTABLE PIPE INCLUDES SANITARY SEWER AND STORM WATER PIPES.
2. SEPARATION OF WATER AND NONPOTABLE PIPE SHALL CONFORM TO THE LATEST EDITION OF THE ECOLOGY/DOH PIPELINE SEPARATION DESIGN AND INSTALLATION REFERENCE GUIDE.
3. CROSSING WATER/NONPOTABLE PIPES OR THEIR CASINGS SHALL HAVE A 6" MIN VERTICAL SEPARATION.
4. FLOW CHART APPLIES TO BOTH EXISTING & NEW SERVICES & MAINS.
5. DISTANCES GIVEN ABOVE ARE MEASURED FROM OUTSIDE OF PIPES OR OTHER CASINGS.
6. DESIGNER/INSTALLER SHALL MAKE ALL REASONABLE ATTEMPTS TO MEET THE FOLLOWING:
   - NONPOTABLE PIPE BENEATH WATER BY AT LEAST 18"
   - CROSSINGS AS CLOSE TO 90° AS POSSIBLE

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

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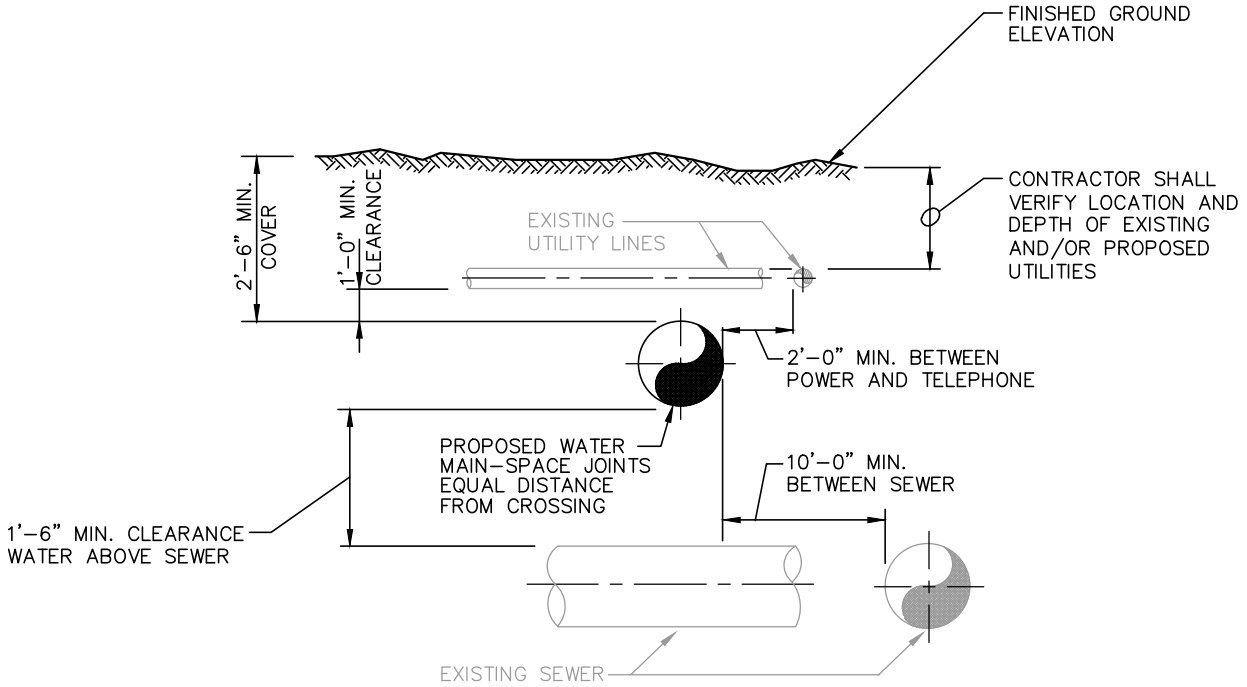
PIPELINE SEPARATION

DRAWING NO. **W-1**

REV:



NO SCALE

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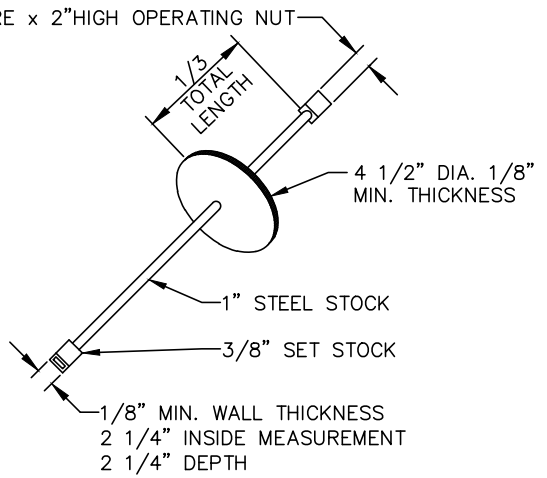
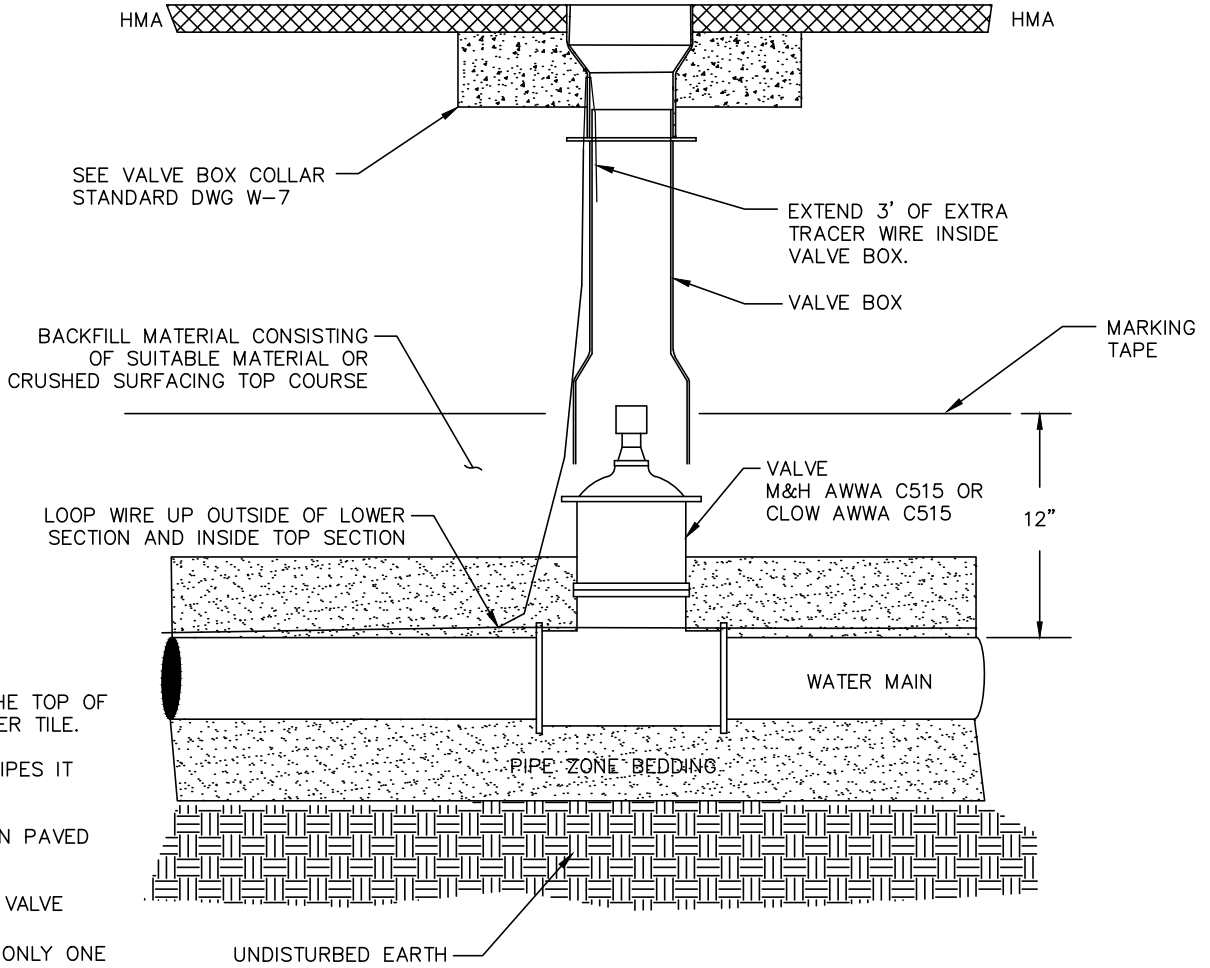
TYPICAL UTILITY CROSSING

DRAWING NO. **W-2**

REV:





NOTES:

1. TRACER WIRE SHALL BE TAPED AT 10-FOOT INTERVALS TO THE TOP OF ALL MAINS AND ON WATER SERVICE LINES UP TO WATER METER TILE.
2. VALVE BOX EARS SHALL BE PLACED IN LINE WITH THE TWO PIPES IT SERVES.
3. SET VALVE BOX TO GRADE IN UNPAVED AND PAVED AREAS. IN PAVED AREAS INSTALL CONCRETE COLLAR PER DWG. W-4.
4. VALVE OPERATING NUT EXTENSIONS ARE REQUIRED WHEN THE VALVE NUT IS MORE THAN TWO (2) FEET BELOW FINISHED GRADE. EXTENSIONS ARE TO BE A MINIMUM OF ONE (1) FOOT LONG, ONLY ONE EXTENSION TO BE ALLOWED PER VALVE.
5. ALL VALVE OPERATING NUT EXTENSIONS ARE TO BE MADE OF STEEL, SIZED AS NOTED, AND PAINTED WITH TWO COATS OF METAL PAINT.
6. VALVE BOXES IN PAVED AREAS SHALL BE TWO-PIECE, ADJUSTABLE, CAST IRON WITH EXTENSION PIECES (IF NECESSARY), AS MANUFACTURED BY OLYMPIC FOUNDRY #940, OR TOWN APPROVED EQUAL. THE WORD "WATER" SHALL BE CAST IN RELIEF IN THE TOP.
7. ALL CONSTRUCTION AND MATERIALS SHALL MEET THE SPECIFICATIONS AND BE APPROVED BY THE TOWN.
8. ALL MJ FITTINGS IN WATER SYSTEM REQUIRE EITHER A ROMAC INDUSTRIES GRIP RING ACCESSORY PACK OR TUF GRIP TLD FOR DUCTILE PIPE OR TLP FOR PVC PIPE.
9. 4 INCH MINIMUM SEPARATION FROM THE TOP OF THE MAIN VALVE TO THE BOTTOM OF THE VALVE BOX IS REQUIRED. THE VALVE BOX SHALL NOT REST ON THE VALVE.

NO SCALE

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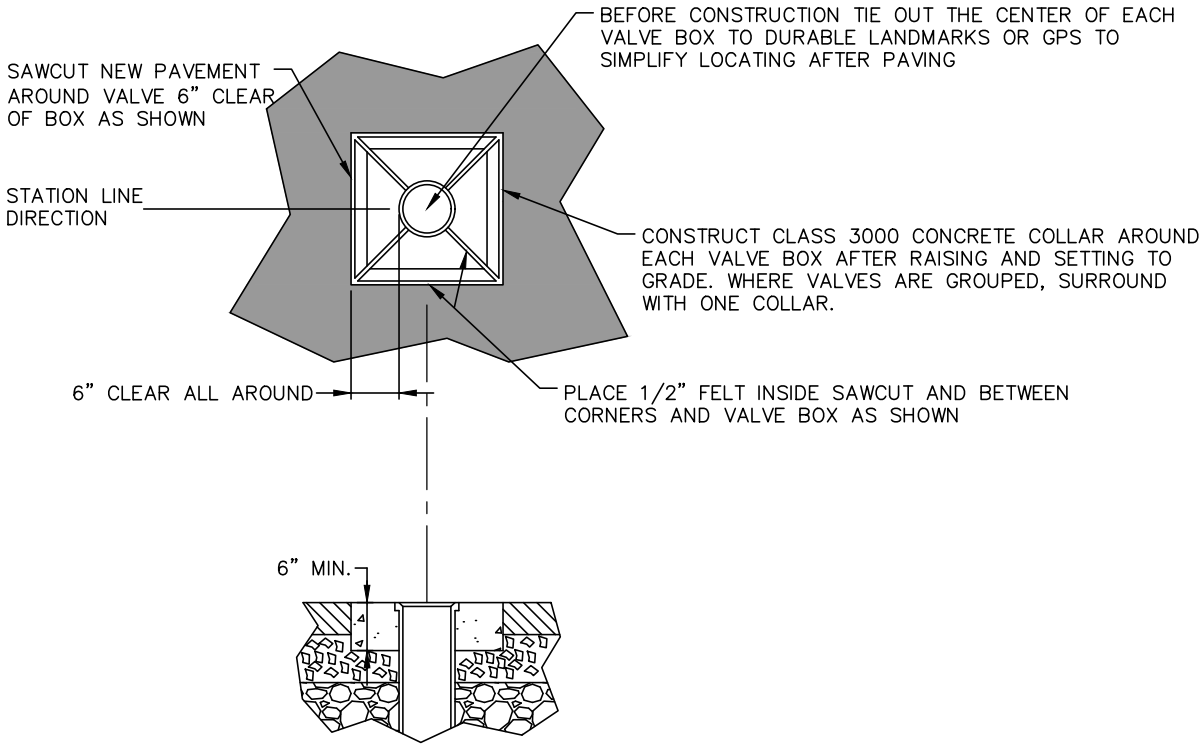
DATE

VALVE INSTALLATION

DRAWING NO. **W-3**

REV:



NO SCALE

APPROVAL

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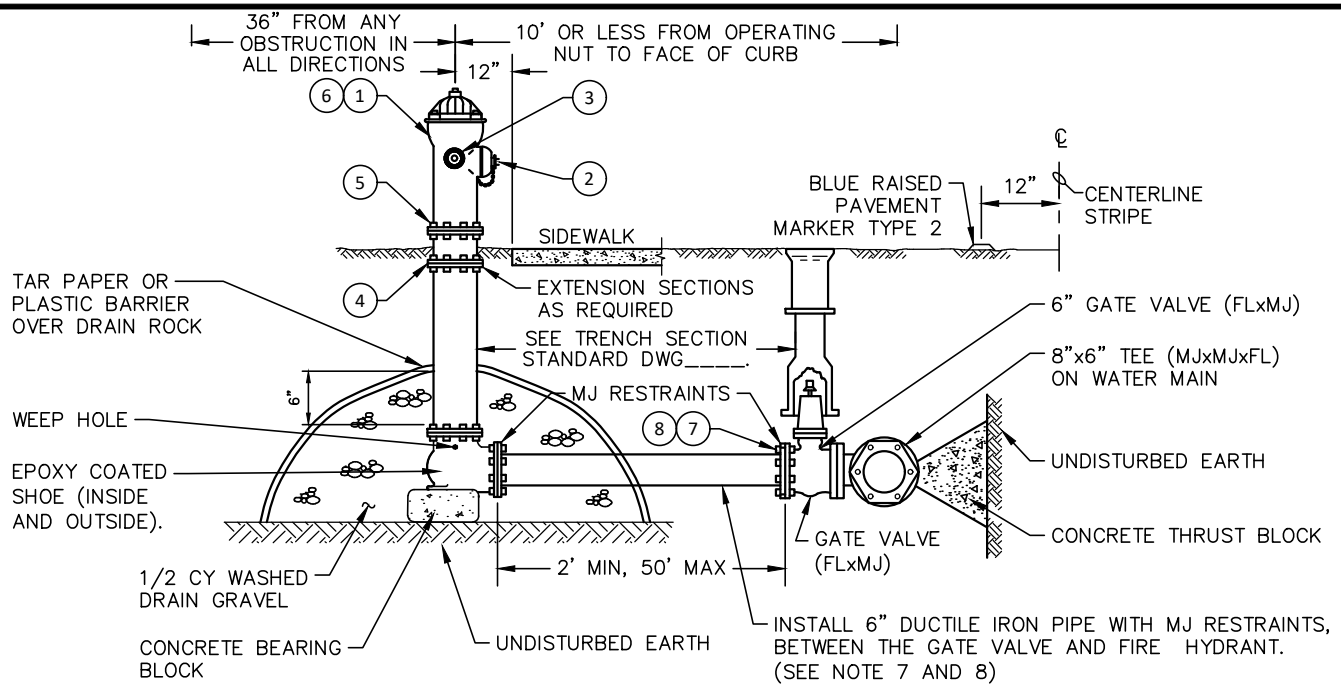
DATE

VALVE BOX COLLAR

DRAWING NO. **W-4**

REV:



NOTES:

1. HYDRANTS WITH 4 1/2" PUMPER NOZZLE. ALL MATERIALS SHALL CONFORM TO AWWA STANDARDS AND SHALL BE OF STANDARD MANUFACTURE (M&H STYLE 929, OR CLOW MEDALLION).
2. RED HEAD BRASS 4" STORZ (S-37) WITH CAP AND CABLE. PORT TO BE FACING STREET FOR FIRE ENGINE ACCESS.
3. NATIONAL STANDARD THREAD ON THE 2 1/2" PORT.
4. IF HYDRANT RISES THROUGH CONCRETE, USE EXPANSION STRIP AROUND HYDRANT BARREL, INSTALLATION OF THE HYDRANT ON PRIVATE PROPERTY SHALL EQUAL OR EXCEED THE TOWN STANDARDS.
5. BREAK-OFF FLANGE TO BE 2" MIN AND 4" MAX FROM GROUND.
6. FIRE HYDRANTS SHALL BE PAINTED WITH TWO COATS OF HIGH GLOSS SAFETY YELLOW RUST-RESISTANT PAINT.
7. HYDRANT CONNECTION PIPE TO BE DUCTILE IRON CLASS 52, ANY INTERMEDIATE JOINTS TO BE MJ WITH RETAINER GLANDS, OR FIELD LOCK GASKET. (TUFGRIP DUCTILE KIT 6" SERIES TLD OR ROMAC INDUSTRIES 6" GRIP RING ACCESSORY PACK)
8. USE MJ RESTRAINTS AND RESTRAINED JOINTS AT ALL MJ CONNECTIONS BETWEEN THE MAIN AND THE HYDRANT.
9. HYDRANTS NOT PLACED BACK OF CURB SHALL HAVE GUARD POST INSTALLED. SEE STANDARD DWG W-9.

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

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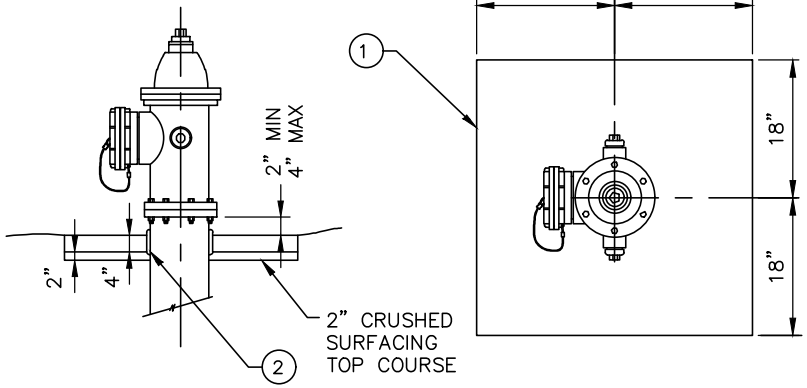
DATE

FIRE HYDRANT INSTALLATION

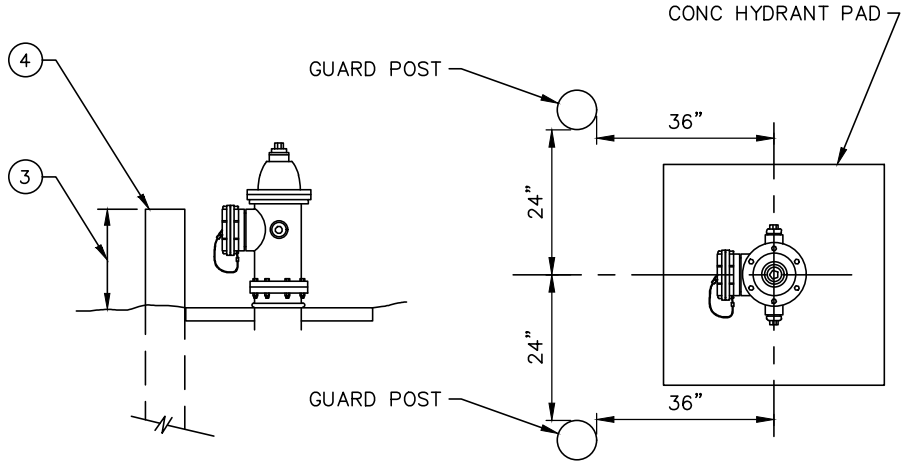
DRAWING NO. **W-5**

REV:



FIRE HYDRANT CONCRETE PAD

(SEE NOTES 1 AND 2)

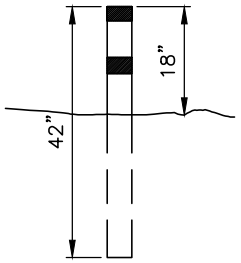


FIRE HYDRANT GUARD POSTS

(SEE NOTES 3 AND 4)

NOTES:

1. CONCRETE SHALL BE CLASS 3000.
2. INSTALL 1/2"x4" EXPANSION STRIP AROUND HYDRANT.
3. GUARD POSTS SHALL BE 6' LONG 9" IN DIAMETER PRECAST CONCRETE OR 6' LONG, 6" DIAM SCH 40, CONCRETE FILLED CLASS 52 STEEL PIPE. PAINTED WITH TWO COATS OF KELLY–MOORE LUXLITE Q.D. ALKYD GLOSS ENAMEL #6100–516 CAT YELLOW OR TOWN APPROVED EQUAL.
4. TOP OF GUARD POST SHALL BE LEVEL WITH TOP OF PUMPER PORT.
5. VALVE MARKER POST SHALL BE INSTALLED AT LOCATIONS REQUESTED BY THE TOWN. VALVE MARKER POST SHALL BE 42" PORTABLE TRAFFIC DELINEATOR POST W/TWO REFLECTOR STRIPS. THEY SHALL BE FURNISHED NEW AND UNUSED AND BURIED 24" DEEP, TO LEAVE 18" EXPOSED AS A MARKER POST THE LETTER "V" AND DISTANCE TO THE VALVE SHALL BE STENCILED ON THE POST WITH 2" HIGH NUMERALS, WITH BLACK ENAMEL PAINT.
6. VALVE MARKER POSTS SHALL BE INSTALLED FOR ALL VALVES LOCATED IN UNIMPROVED OR UNPAVED AREAS. VALVE MARKER POST SHALL BE SET AS DIRECTED BY THE TOWN IN A SAFE AND REASONABLY CONSPICUOUS LOCATION.
7. VALVE MARKER POSTS ARE NOT REQUIRED FOR AUXILIARY HYDRANT VALVES.
8. ONE BLUE LANE MARKER, TYPE 2, SHALL BE INSTALLED ON THE ADJACENT PAVEMENT AT A LOCATION DESIGNATED BY THE TOWN.



VALVE MARKER POST

(SEE NOTES 5, 6 AND 7)

NO SCALE

APPROVAL

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PUBLIC WORKS DIRECTOR

DATE

FIRE HYDRANT CONC. PAD, GUARD POSTS AND VALVE MARKERS

DRAWING NO. **W-6**

REV:

THRUST BLOCK SIZING FOR 250 PSI PRESSURE

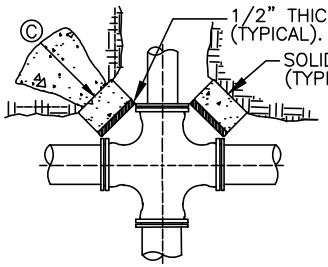
MIN. BEARING AREA AGAINST UNDISTURBED SOIL IN SQUARE FEET.

PIPE SIZE	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
4"	3/(2)	2/(1)	2/(1)	1/(1)	1/(1)
6"	6/(4)	4/(3)	3/(2)	2/(1)	1/(1)
8"	10/(7)	7/(5)	5/(4)	3/(2)	2/(1)
10"	15/(10)	11/(7)	8/(5)	4/(3)	2/(2)
12"	22/(14)	15/(10)	12/(8)	6/(4)	3/(2)
14"	29/(20)	21/(14)	16/(11)	8/(5)	4/(3)
16"	38/(26)	27/(18)	21/(14)	11/(7)	5/(4)

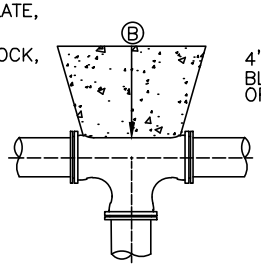
SAFE BEARING LOADS IN LBS./SQ. FT.

THE SAFE BEARING LOADS GIVEN IN THE FOLLOWING TABLE ARE FOR HORIZONTAL THRUSTS WHEN THE DEPTH OF COVER OVER THE PIPE EXCEEDS 2 FEET.

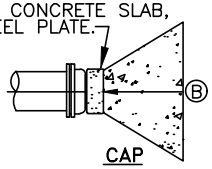
SOIL	SAFE SOIL BEARING LOAD
*MUCK, PEAT, ETC.	SEE GENERAL NOTE #7
SOFT CLAY	1,000
SAND	2,000
SAND AND GRAVEL	3,000
SAND AND GRAVEL CEMENTED W/CLAY	4,000
HARD SHALE	10,000



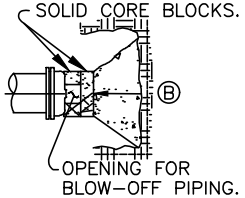
UNBALANCED CROSS



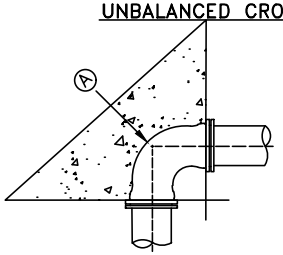
TEE



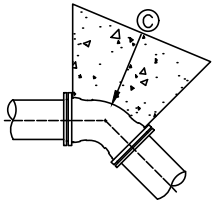
CAP



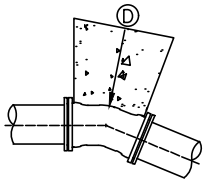
TAPPED CAP/PLUG



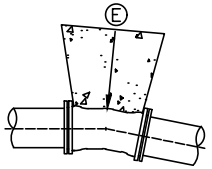
90° BEND



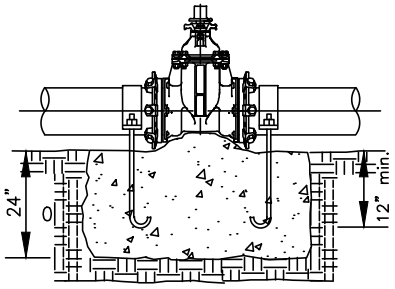
45° BEND



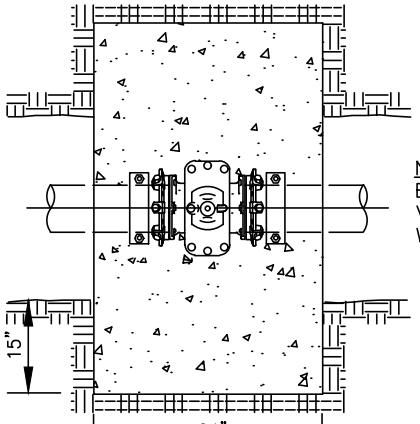
22½° BEND



11¼° BEND



INLINE VALVE – PROFILE



INLINE VALVE – PLAN

NOTE:
BLOCKING AT VALVES IF LINE WILL BE EXTENDED.

NO SCALE

NOTES:

1. CONCRETE THRUST BLOCK AREA BASED UPON A SAFE SOIL BEARING LOAD OF 2,000/(3,000) LBS. PER SQ. FT (SAND/(SAND GRAVEL)).
2. AREAS MUST BE ADJUSTED FOR OTHER SIZE PIPE, PRESSURES AND SOIL CONDITIONS.
3. CONCRETE BLOCKING SHALL BE CAST-IN-PLACE AND HAVE MINIMUM OF 1/2 SQUARE FOOT CONTACT BEARING AGAINST THE FITTING.
4. BLOCK SHALL BEAR AGAINST FITTINGS ONLY AND SHALL BE CLEAR OF JOINTS TO PERMIT TAKING UP OR DISMANTLING JOINT. INSTALL 8 MIL. PLASTIC SHEETING BETWEEN FITTING AND BLOCK.
5. CONTRACTOR SHALL INSTALL BLOCKING ADEQUATE TO WITHSTAND TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.
6. POLYETHYLENE WRAP NOT SHOWN FOR CLARITY. IN MUCK OR PEAT, PIPE AND FITTING RESTRAINT SHALL BE AS DIRECTED BY THE TOWN.
7. CONCRETE BLOCKING AREA IS BASED ON 250 PSI WATER PRESSURE AND 2500 PSI CONCRETE STRENGTH.
8. HARDWARE NOT EMBEDDED IN CONCRETE SHALL BE CLEAN AND COATED WITH COAL TAR EPOXY.

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

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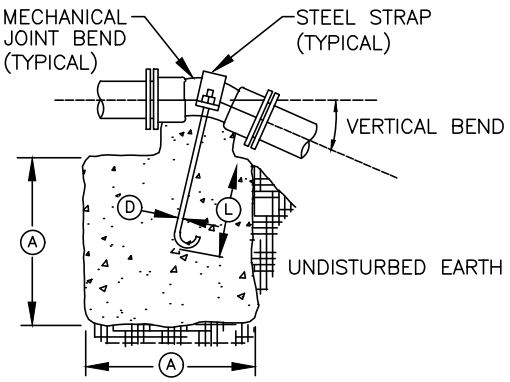
PUBLIC WORKS DIRECTOR

DATE

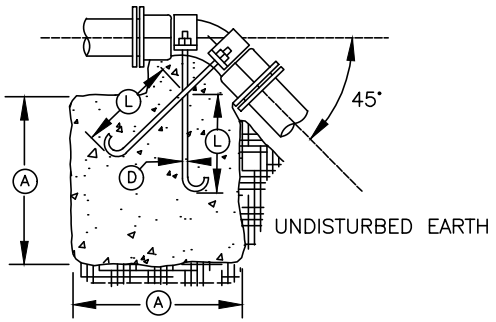
THRUST BLOCKING HORIZONTAL BENDS AND VALVES

DRAWING NO. W-7

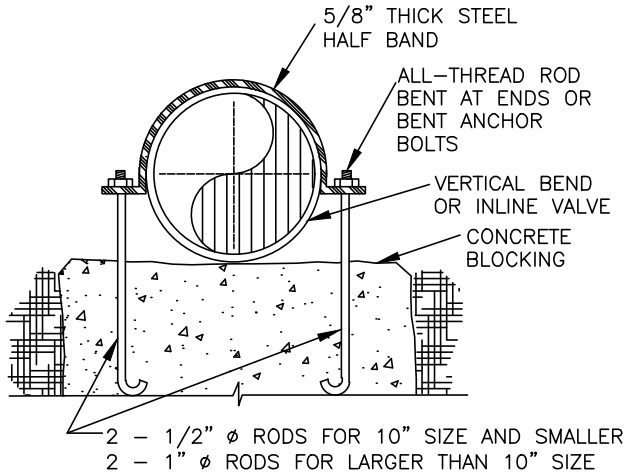
REV:



BLOCKING FOR 11–1/4°, 22–1/2° & 30° VERTICAL BENDS



BLOCKING FOR 45° VERTICAL BENDS



TYPICAL CROSS–SECTION

VERTICAL BLOCKING

PIPE SIZE	VERT. BEND	CU.FT.	Ⓐ	Ⓓ	Ⓛ
4"	11–1/4°	8	2.0'	3/4"	1.5'
	22–1/2°	11	2.2'	3/4"	2.0'
	30°	17	2.6'	3/4"	2.0'
	45°	30	3.1'	3/4"	2.0'
6"	11–1/4°	11	2.2'	3/4"	2.0'
	22–1/2°	25	2.9'	3/4"	2.0'
	30°	41	3.5'	3/4"	2.0'
	45°	68	4.1'	3/4"	2.0'
8"	11–1/4°	16	2.5'	3/4"	2.0'
	22–1/2°	47	3.6'	3/4"	2.5'
	30°	70	4.1'	3/4"	2.5'
	45°	123	5.0'	3/4"	2.0'
12"	11–1/4°	32	3.2'	3/4"	2.0'
	22–1/2°	88	4.5'	7/8"	3.0'
	30°	132	5.1'	7/8"	2.5'
	45°	232	6.1'	3/4"	2.5'
16"	11–1/4°	70	4.1'	7/8"	3.0'
	22–1/2°	184	5.7'	1–1/8"	4.0'
	30°	275	6.5'	1–1/4"	4.0'
	45°	478	7.8'	1–1/8"	4.0'

NO SCALE

NOTES:

1. CONCRETE BLOCKING AREA IS BASED ON 250 PSI WATER PRESSURE AND 2,500 PSI CONCRETE STRENGTH.
2. BOLTS AND NUTS NOT EMBEDDED IN CONCRETE SHALL BE CLEANED AND COATED WITH COAL TAR EPOXY.
3. POLYETHYLENE WRAP NOT SHOWN FOR CLARITY.
4. HARDWARE SHALL BE TWO CARBON STEEL HALF BANDS (5/8" THICK) EQUAL TO 595 SOCKET CLAMP FROM ANVIL INTERNATIONAL. RODS SHALL BE ALL–THREAD, BENT AT THE ENDS OR BENT ANCHOR BOLTS, WITH 12" MIN. EMBEDMENT FOR INLINE VALVES, OR AS SHOWN ON VERTICAL BLOCKING TABLE.

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

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PUBLIC WORKS DIRECTOR

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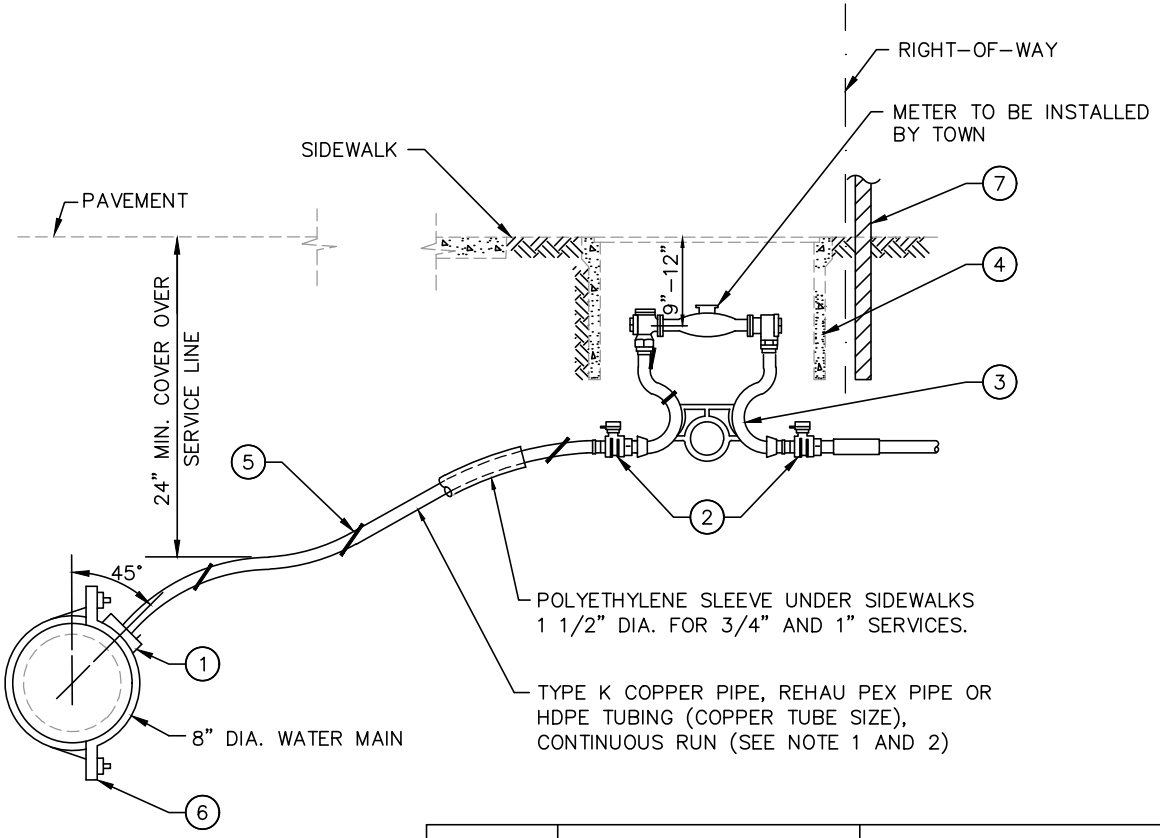
THRUST BLOCKING VERTICAL BENDS

DRAWING NO. **W-8**

REV:



NOTES:

1. PEX PIPE SHALL BE 1" DIA. FOR 3/4" SERVICE AND 1 1/4" DIA. FOR 1" SERVICE.
2. WRAP TRACER WIRE AROUND PEX PIPE ONE WRAP PER FT. ITS ENTIRE LENGTH. CONNECTION AT THE MAIN LINE WIRE SHALL BE MADE WITH A SPLIT-BOLT CONNECTOR. STRIP COATING PRIOR TO CONNECTION.
3. ALL SERVICE PIPE INSTALLED BY OPEN-CUT CONSTRUCTION SHALL BE BEDDED IN CLEAN SAND, 4" OVER AND UNDER. NATIVE MATERIAL WILL NOT BE ACCEPTED FOR BEDDING.
4. IF REQUIRED FOR PREMISE ISOLATION, AN APPROVED, BACKFLOW ASSEMBLY SHALL BE INSTALLED IMMEDIATELY BEHIND THE WATER METER.
5. METER BOX SHALL BE PLACED IN AN ACCESSIBLE LOCATION WITHOUT FENCING, VEGETATION, SIGNS OR OTHER OBSTRUCTIONS.

		PIPE	3/4"	1"
1	CORP STOP (FORD)	COPPER	F1100-3-QNL	F1100-4-QNL
		PEX	F500-3-NL	F500-4-NL
2	CURB STOP (FORD)	COPPER	B41-333-QNL	B41-444-QNL
		PEX	B11-333-NL	B11-444-NL
3	METER SETTER (FORD)	N/A	VBHC72-12W-88-33-NL	VBHC72-12W-84-44-NL
4	METER BOX	OLDCASTLE METER BOX CARSON 1118-12 BCF RECTANGLE HEAVYWALL BODY AND 118 BC DUCTILE IRON COVER WITH READER DOOR.		
5	TRACER WIRE	14 GAUGE COPPER, CONTAINED SOLID CORE, 30MIL HDPE INSULATION, RATED FOR DIRECT BURIAL		
6	SERVICE SADDLE	ROMAC 306 DOUBLE BOLT STAINLESS STEEL SERVICE SADDLE OR FORD FS313 STAINLESS STEEL SERVICE SADDLE		
7	MARKER POST	INSTALL 2"x4"x6', BURY 3', PAINT WHITE WITH "WATER" STENCILED IN BLUE PAINT, IF SERVICE IS NOT IMMEDIATELY CONNECTED.		

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

Wayne Haefele, P.E.

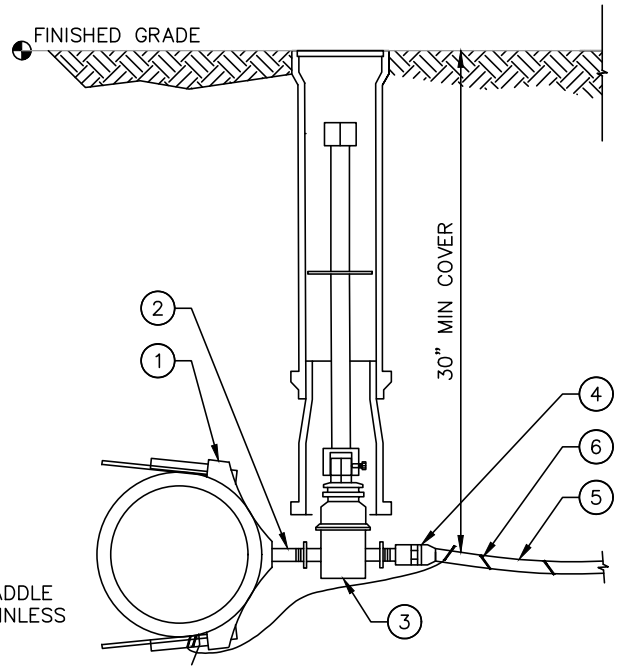
PUBLIC WORKS DIRECTOR

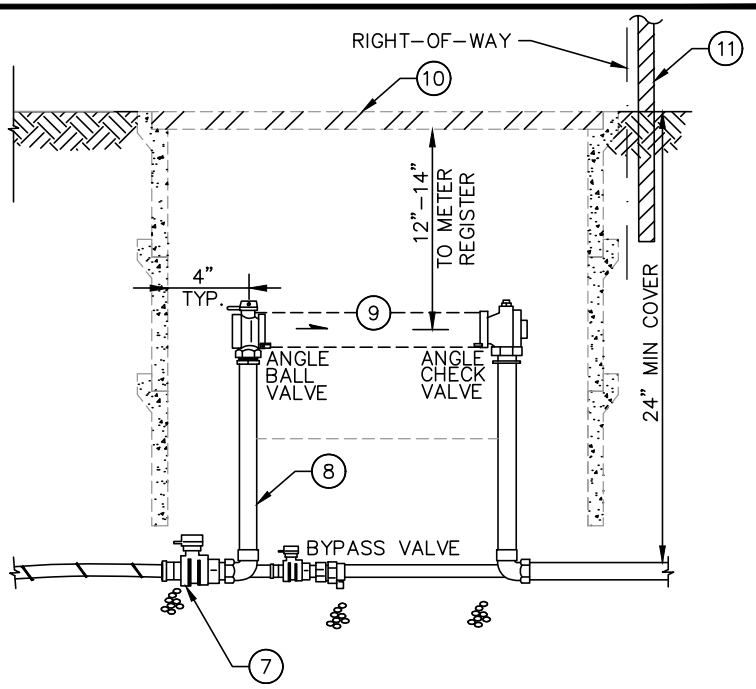
DATE

3/4" TO 1"
WATER SERVICE

DRAWING NO.
W-9

REV:





NOTES:

1. ROMAC, 306 DOUBLE BOLT SERVICE SADDLE WITH I.P. THREAD OR FORD FS313 STAINLESS STEEL SERVICE SADDLE
2. 2" BRASS NIPPLE.
3. HEAVY DUTY 2" GATE VALVE WITH RESILIENT SEAT AND 2" OPERATING NUT. GATE VALVES SHALL BE CLOW F-6103. FOR 1 1/2" SERVICE INSTALL 2"x1 1/2" BRASS BUSHING IN OUTLET THREADS.
4. BRASS BUSHING, NO LEAD.
5. WATER SERVICE SHALL BE REHAU PEX PIPE OR HDPE SDR11. PIPE SHALL BE SLEEVED WITH SCH. 80 PVC 3" DIA., UNDER SIDEWALKS.
6. 14 GAUGE COPPER, CONTINUOUS, SOLID CORE, HDPE COATED, RATED FOR DIRECT BURY. CONNECTION AT THE METER SETTER SHALL BE MADE WITH AN ALL STAINLESS STEEL HOSE CLAMP. CONNECTION AT THE MAIN LINE WIRE SHALL BE MADE WITH A SPLIT-BOLT CONNECTOR. STRIP COATING PRIOR TO CONNECTION.
7. CURB STOP SHALL BE FORD BII-666-NL FOR 1 1/2" SERVICE AND FORD BII-777-NL FOR 2" SERVICE.
8. METER SETTERS SHALL BE "FORD" 70 SERIES COPPER SETTER VBH76-18B-66NL FOR 1 1/2" AND VBH77-18B-11-77-NL FOR 2" SERVICE.
9. METER TO BE INSTALLED BY TOWN AT THE DEVELOPERS EXPENSE.
10. OLDCASTLE METER BOX, CARSON BCF RECTANGLE HEAVYWALL BODY HW1730-18 WITH 1730BCF FLSH COVER DI MAX VIEW READ DOOR.
11. INSTALL 2"x4"x6', MARKER POST, BURY 3', PAINT WHITE WITH "WATER" STENCILED IN BLUE PAINT, IF SERVICE IS NOT IMMEDIATELY CONNECTED.
12. IF REQUIRED FOR PREMISES ISOLATION, AN APPROVED, BACKFLOW ASSEMBLY SHALL BE INSTALLED IMMEDIATELY BEHIND THE WATER METER.
13. ALL SERVICE PIPE INSTALLED BY OPEN CUT CONSTRUCTION SHALL BE BEDDED IN CLEAN SAND, 4" OVER AND UNDER. NATIVE MATERIAL WILL NOT BE ACCEPTED.
14. METER BOX SHALL BE PLACED IN AN ACCESSIBLE LOCATION WITHOUT FENCING, VEGETATION, SIGNS OR OTHER OBSTRUCTIONS.

NO SCALE

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

Wayne Haefele, P.E.

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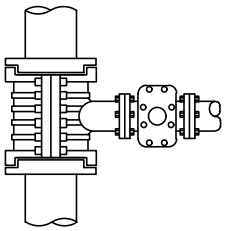
DATE

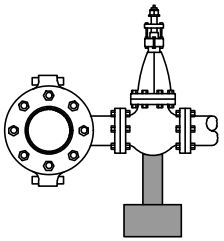
1 1/2" AND 2" WATER SERVICE

DRAWING NO. **W-10**

REV:



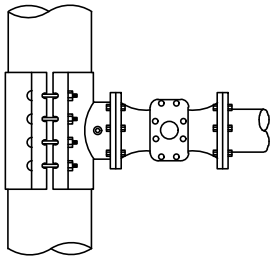
PLAN



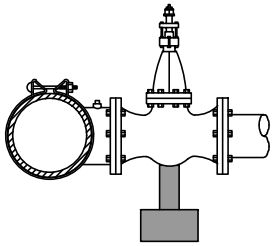
ELEVATION

INSTALLED ON ASBESTOS CEMENT PIPE,
CAST IRON PIPE AND DUCTILE IRON PIPE.

DUCTILE IRON
TAPPING SLEEVE



PLAN



ELEVATION

INSTALLED ON ASBESTOS CEMENT PIPE,
CAST IRON PIPE AND DUCTILE IRON PIPE.

STAINLESS STEEL
TAPPING SLEEVE

NO SCALE

NOTES:

1. STAINLESS STEEL TAPPING SLEEVES SHALL HAVE FULL CIRCLE SEAL.
2. ALL TEES AND VALVES TO BE WATER TESTED BEFORE TAP.
3. SIZE ON SIZE TAPS ALLOWED ONLY WITH DI MECHANICAL SLEEVE. ALL OTHER TAPS SHALL BE AT LEAST 2" SMALLER THAN THE EXISTING MAIN AND SHALL BE EPOXY COATED.
4. BRANCH LINE SHALL BE RESTRAINED AS IF A DEAD-END OR THRUST BLOCK PER DWG W-10

APPROVAL

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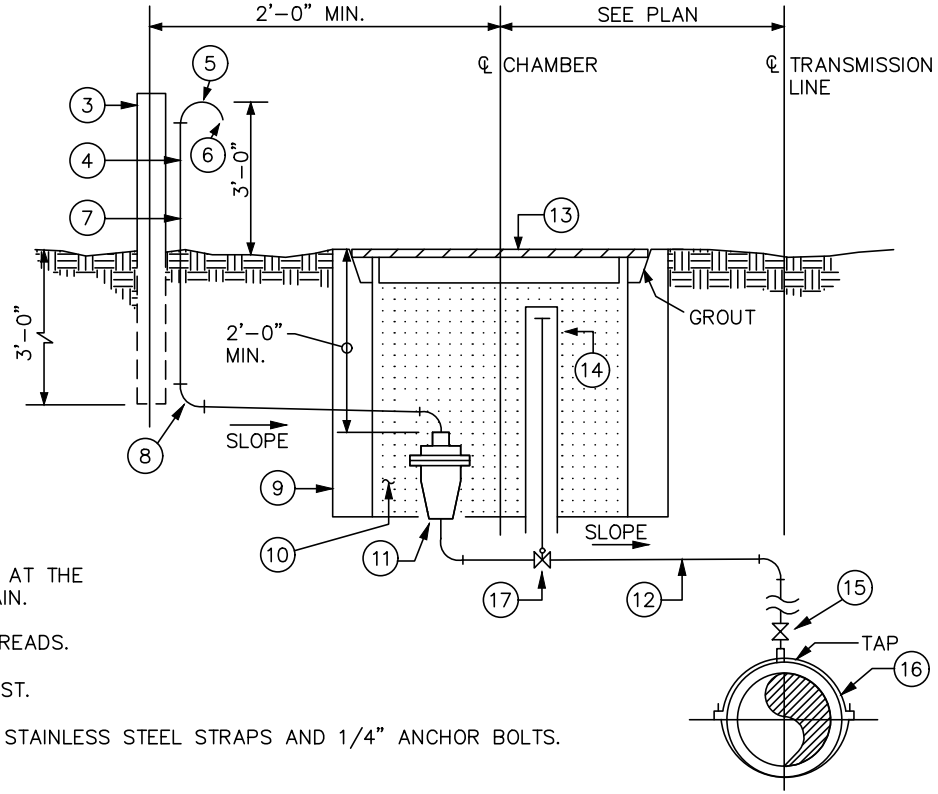
DATE

TAPPING TEES

DRAWING NO.

W-11

REV:



NOTES:

1. LOCATE THE AIR RELEASE VALVE TAP AT THE HIGH POINT OF THE TRANSMISSION MAIN.
2. ALL FITTINGS SHALL BE IRON PIPE THREADS.
3. ATTACH VENT TO 9"X6' CONCRETE POST.
4. STRAP VENT TO POST USING 1/4"X1" STAINLESS STEEL STRAPS AND 1/4" ANCHOR BOLTS.
5. 180° RETURN BEND.
6. 1/4" MESH BRONZE BIRD SCREEN.
7. 1" GALVANIZED STEEL PIPE.
8. GALVANIZED 90° BENDS.
9. OLDCASTLE METER BOX CARSON BCF RECTANGLE HEAVY BODY HW1730–18.
10. INSULATE WITH 1.5" RIGID STYROFOAM.
11. 1" COMBINATION AIR RELEASE AND AIR VACUUM – VALVE VALMATIC 1x1.
12. 1" COPPER PIPE.
13. OLDCASTLE 1730BC DI FLUSH SOLID COVER.
14. PROVIDE 6" ALUMINUM OR PLASTIC DUCT FOR VALVE BOX TO WITHIN SIX (6) INCHES OF THE SURFACE PROVIDE COVER FOR DUCT.
15. CORP STOP FORD F1100–4–QNL.
16. ROMAC 306 DOUBLE BOLT STAINLESS STEEL SERVICE SADDLE WITH I.P. THREAD.
17. BALL CURB VALVE – FORD B41–444–QNL.

NO SCALE

APPROVAL

Wayne Haefele, P.E.

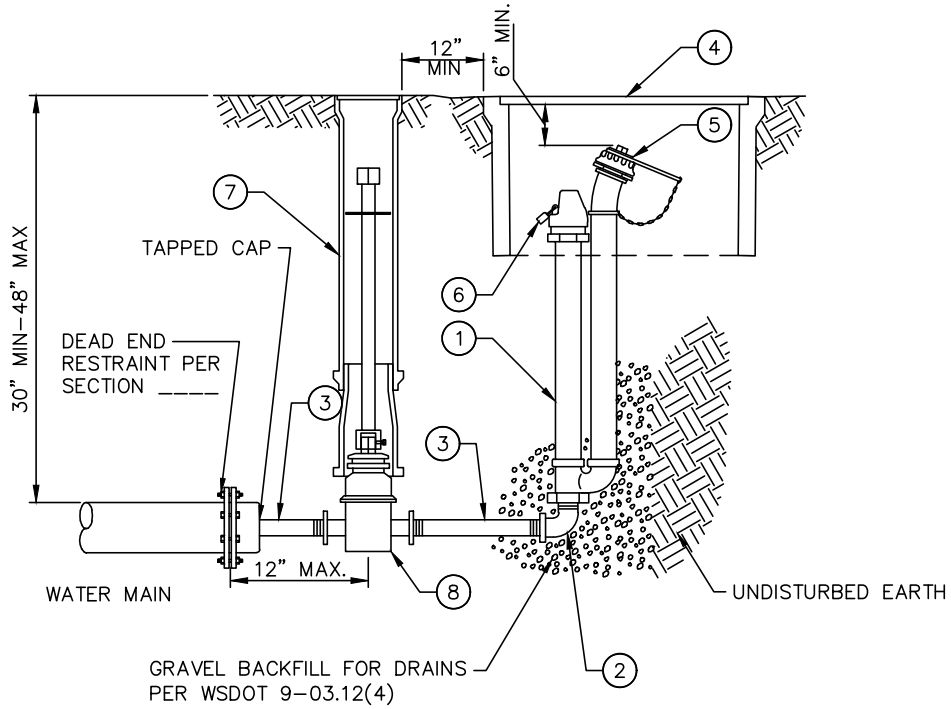
PUBLIC WORKS DIRECTOR

DATE

1" AIR/VACUUM ASSEMBLY

DRAWING NO. **W-12**

REV:



NOTES:

1. GIL #101GHS BLOW–OFF.
2. 2" BRASS STREET "ELL".
3. 2" BRASS NIPPLE.
4. OLDCASTLE METER BOX CARSON 1118–12 BCF RECTANGLE HEAVY WALL BODY AND 1118BC DI FLUSH SOLID COVER.
5. 2" CAP NATIONAL STANDARD THREAD.
6. LOCK TO BE SUPPLIED BY TOWN.
7. VALVE BOX AND EXTENSION PER STANDARD DWG W–6.
8. HEAVY DUTY 2" GATE VALVE WITH RESILIENT SEAT GATE VALVES SHALL BE CLOW F–6103 THREADED ENDS OR TOWN APPROVED EQUAL.
9. ABOVE GROUND INSTALLATION MAY BE APPROVED BY THE TOWN.

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

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PUBLIC WORKS DIRECTOR

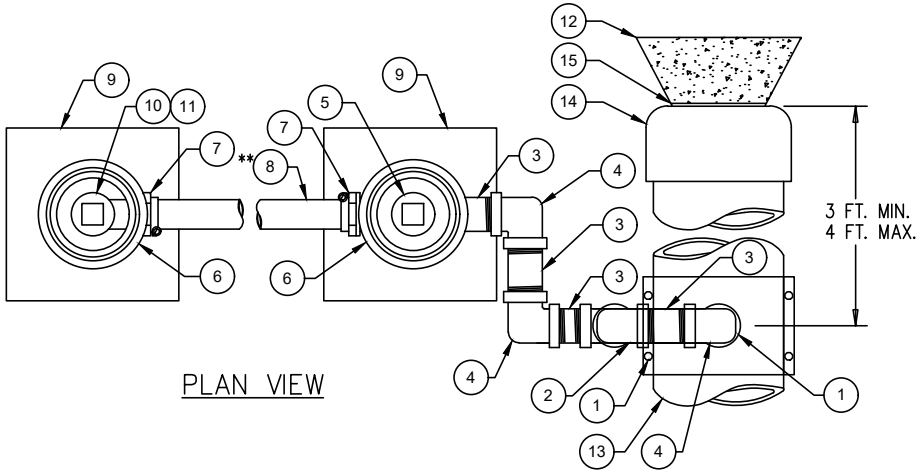
DATE

END OF LINE BLOW-OFF ASSEMBLY

DRAWING NO. **W-13**

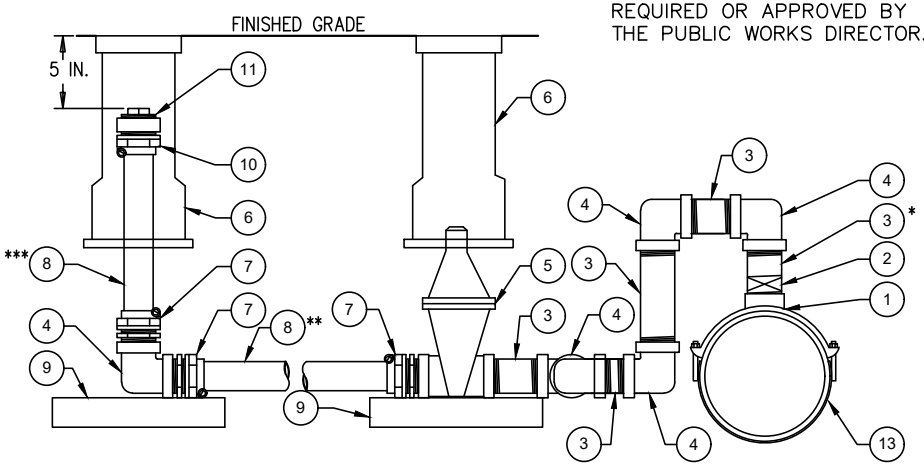
REV:

1. SADDLE W/2 IN. FIPT TAP – ROMAC 202S
2. CORP STOP
3. 2" DIA. BRASS IPT NIPPLE (LENGTH AS REQUIRED)
4. 2" BRASS 90° IPT ELBOW
5. 2" AWWA NON–RISING STEM, RESILIENT WEDGE GATE VALVE W/FIPT ENDS AND 2" OPERATING NUT
6. VALVE BOX – TYLER SERIES 6855 W/DROP LID OR APPROVED EQUAL THE WORD "WATER" TO BE CAST IN LID
7. 2" COPPER PACK JOINT COUPLING PACK X MIPT FORD C84–77 OR APPROVED EQUAL
8. 2" DIA TYPE K RIGID COPER PIPE OR 2" 200 PSI PVC CTS
9. 2" THK. X 12" X 12" CONCRETE BLOCK
10. 2" COPPER PACK JOINT COUPLING PACK X FIPT FORD C14–77 OR APPROVED EQUAL
11. 2" MIPT PLUG W/SQUARE OR HEX WRENCH HEAD, BRASS OR PVC
12. THRUST BLOCK
13. WATER MAIN – SIZE VARIES
14. PIPE CAP – SIZE VARIES
15. 6 MIL PLASTIC



PLAN VIEW

TO BE USED ONLY AS REQUIRED OR APPROVED BY THE PUBLIC WORKS DIRECTOR.



ELEVATION VIEW

NO SCALE

NOTES:

1. SAND OR SELECT BACKFILL REQUIRED WITHIN 6"OF ALL PIPE AND FITTINGS.

* FOR LIVE TAPS NIPPLE TO BE REPLACED WITH 2" MIPT X MIPT CORPORATION STOP – FORD FB500

** COPPER PIPE TO BE CUT AT 24" LONG

*** COPPER PIPE TO BE CUT AS REQUIRED

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

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PUBLIC WORKS DIRECTOR

DATE

2" BLOW-OFF ASSEMBLY

DRAWING NO. **W-14**

REV:

PROCEDURE REQUIREMENTS:

1. ALL ASSEMBLIES MUST BE ON THE WASHINGTON STATE DEPARTMENT OF HEALTH APPROVED BACKFLOW ASSEMBLY LIST.
2. ALL ASSEMBLIES ARE REQUIRED TO BE TESTED BY A WASHINGTON STATE CERTIFIED TESTER UPON INSTALLATION AND ANNUALLY. IN ADDITION, ASSEMBLIES MUST BE TESTED AFTER REPAIRS, RELOCATION, REINSTALLATION AND AFTER BACKFLOW INCIDENT. NOTE THAT AIR GAPS INSTALLED IN LIEU OF A REDUCED PRESSURE BACKFLOW ASSEMBLY ALSO REQUIRE ANNUAL INSPECTION. TEST REPORTS MUST BE SUBMITTED IMMEDIATELY TO THE TOWN.
3. CONTACT TOWN FOR INSPECTION OF ALL NEWLY INSTALLED ASSEMBLIES.
4. CATALOG CUT PRODUCT SUBMITTAL SHALL BE PROVIDED TO THE TOWN PRIOR TO INSTALLATION FOR VERIFICATION OF ASSEMBLY APPROVAL STATUS.
5. WHEN INSTALLING AN ASSEMBLY INSIDE A BUILDING, ENSURE ASSEMBLY IS LOCATED WHERE OCCASIONAL SPITTING FROM RELIEF VALVE PORT, A FOULED CHECK, OR WATER FLUSHED OUT DURING THE ANNUAL TEST WILL NOT BE OBJECTIONABLE. PROPER DRAINAGE MUST BE PROVIDED. TOWN WRITTEN APPROVAL MUST BE RECEIVED FOR INSIDE INSTALLATIONS.
6. ALL RBPA ASSEMBLIES SHALL BE PROTECTED FROM FREEZING, FLOODING AND MECHANICAL DAMAGE DUE TO WATER HAMMER AND EXCESSIVE PRESSURE BUILD UP.

INSTALLATION REQUIREMENTS:

1. CONTACT TOWN TO ENSURE THE CORRECT ASSEMBLY IS INSTALLED FOR THE DEGREE OF HAZARD.
2. ASSEMBLY MUST BE INSTALLED AS A UNIT, INCLUDING TWO SHUT OFF VALVES, RELIEF PORT, TWO CHECK VALVES, AND FOUR TEST COCKS. ALL ASSEMBLIES ARE REQUIRED TO BE AS A UNIT IN THE CONFIGURATION THEY WHERE APPROVED BY DOH.
3. THOROUGHLY FLUSH THE WATER LINE PRIOR TO INSTALLING ASSEMBLIES.
4. ASSEMBLIES MUST BE INSTALLED A MINIMUM OF 12–INCHES FROM THE BOTTOM OF THE RELIEF PORT TO FINISHED GRADE, AND NO HIGHER THAN 5–FOOT FROM THE FLOOR TO CENTERLINE OF ASSEMBLY. AN ASSEMBLY INSTALLED MORE THAN 5–FEET ABOVE FLOOR OR GROUND LEVEL MUST HAVE A PERMANENT PLATFORM UNDER IT FOR THE TESTER OR MAINTENANCE PERSON TO STAND ON. THE PLATFORM MUST COMPLY WITH ALL CURRENT AND APPLICABLE SAFETY STANDARDS AND CODES IN EFFECT. ALL ASSEMBLIES MUST BE INSTALLED HORIZONTALLY, UNLESS THEY HAVE WASHINGTON STATE APPROVAL TO BE INSTALLED VERTICALLY. IF INSTALLED IN A VERTICAL CONFIGURATION, IT MUST BE A MINIMUM OF 12–INCHES FROM FLOOR, AND NO HIGHER THAN 5–FEET FROM THE FLOOR TO CENTER OF THE #2 SHUT OFF VALVE. ALL ASSEMBLIES MUST MAINTAIN A SUFFICIENT CLEARANCE FROM ANY WALL TO ENSURE ACCESSIBILITY OF MAINTENANCE AND TESTING. SIZES 2 1/2 INCHES AND LARGER IN DIAMETER MAY REQUIRE ADDITIONAL SPACE ON ONE SIDE OF THE ASSEMBLY. ASSEMBLIES 2 1/2 INCHES AND LARGER IN DIAMETER SHALL HAVE SUPPORT BLOCK TO PREVENT FLANGE DAMAGE.
5. REDUCED PRESSURE BACKFLOW ASSEMBLIES SHALL NOT BE INSTALLED BELOW GROUND AT ANY TIME.
6. ASSEMBLIES MUST MEET THE ABOVE REQUIREMENTS TO ENSURE ACCESSIBILITY FOR TESTING, MAINTENANCE AND APPROVAL OF THE TOWN. VARIANCE OF ANY INSTALLATION MUST HAVE PRIOR WRITTEN APPROVAL OF THE TOWN.

INSTALLATION REQUIREMENTS:

1. AIR GAP MUST BE TWICE THE INLET DIAMETER OF THE INLET PIPE, MINIMUM OF 1–INCH FOR 1/2" PIPE OR SMALLER.
2. THE AIR GAP MUST PROVIDE A PHYSICAL SEPARATION FROM THE BOTTOM OF THE INLET PIPING TO THE TOP OF THE OVERFLOW RIM OF THE RECEIVING VESSEL.
3. IF INLET PIPING IS CUT DIAGONALLY TO DECREASE SPLASHING, THE AIR GAP SEPARATION IS MEASURED FROM THE BOTTOM OF THE CUT TO THE RECEIVING VESSEL.
4. IF AIR GAP IS LOCATED NEAR SIDEWALLS, THE SEPARATION INCREASES TO THREE TIMES THE INLET DIAMETER OF THE INLET PIPING, MINIMUM OF 1 1/2 INCHES.

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

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PUBLIC WORKS DIRECTOR

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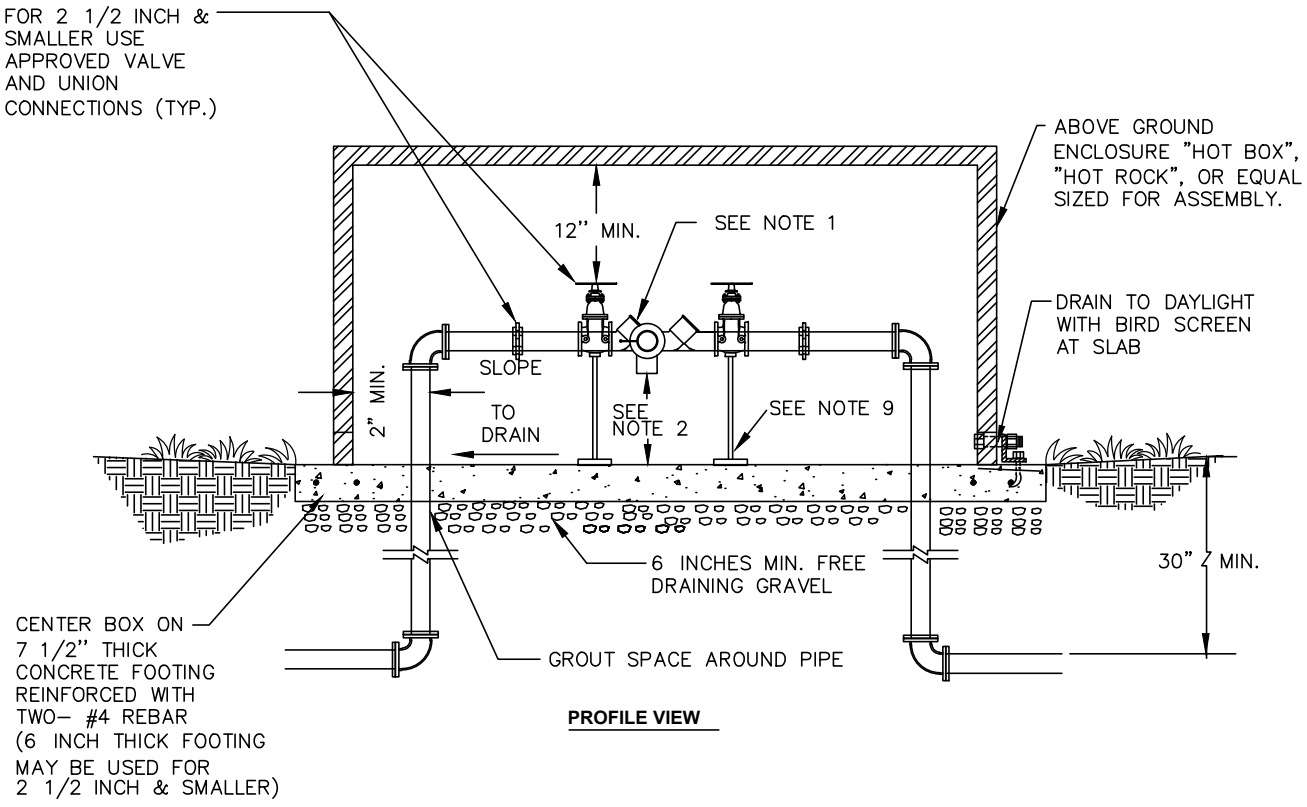
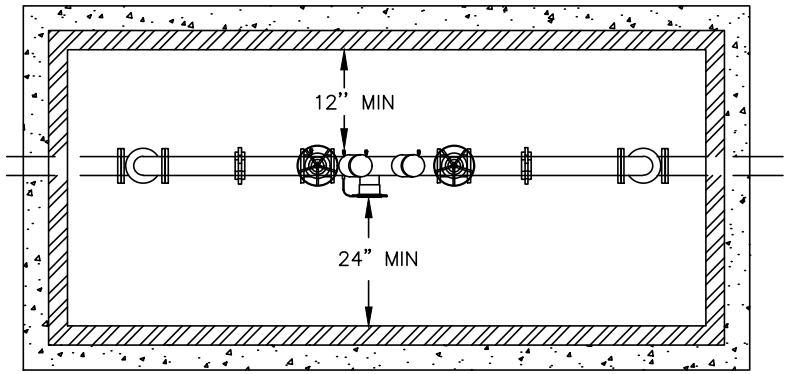
STANDARD RPBA NOTES AND INSTALLATION REQUIREMENTS

DRAWING NO. **W-15A**

REV:



PROFILE VIEW



PLAN VIEW

NOTES

1. MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
2. MUST BE INSTALLED ABOVE FINISHED GRADE, MIN. 12 INCHES TO BOTTOM OF RELIEF PORT.
3. WHEN INSTALLED INSIDE A BUILDING, A FLOOR DRAIN SIZED TO ACCEPT MAXIMUM DISCHARGE FROM THE RELIEF ASSEMBLY IS REQUIRED.
4. FREEZE PROTECTION MUST BE PROVIDED.
5. RISERS AND ALL PIPE IN BOX TO BE BRASS, COPPER, OR PVC.
6. DO NOT INSTALL IN AREA SUBJECT TO FLOODING, ASSEMBLIES MUST BE INSTALLED ABOVE GROUND.
7. A TOWN CROSS CONNECTION SPECIALIST SHALL INSPECT INSTALLATION OF DEVICE AND RECEIVE TEST REPORTS PRIOR TO ESTABLISHMENT OF WATER SERVICE OR APPROVAL. TEST REPORTS MUST BE SIGNED BY A CERTIFIED BACKFLOW ASSEMBLY TESTER AND IMMEDIATELY SENT TO THE TOWN.
8. SOME CLEARANCES (I.E. SIDE AND TOP) MAY NOT BE REQUIRED FOR DEVICES WITH A FULLY REMOVABLE ENCLOSURE.
9. SUPPORTS MUST BE INSTALLED FOR SIZES LARGER THAN 2 1/2 INCHES.

NO SCALE

APPROVAL

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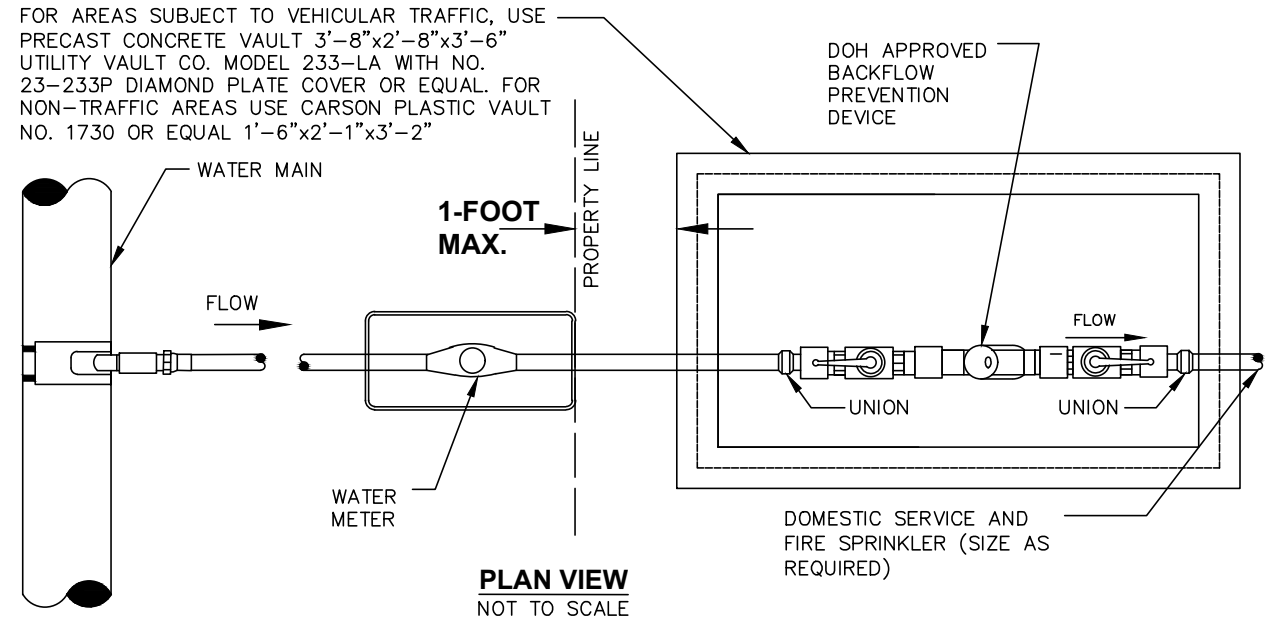
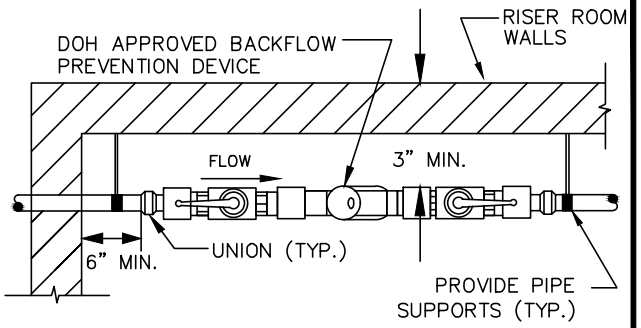
REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) INSTALLATION

DRAWING NO. **W-15B**

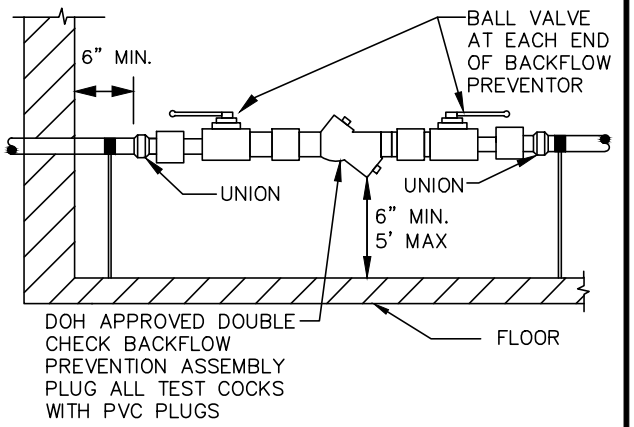
REV:



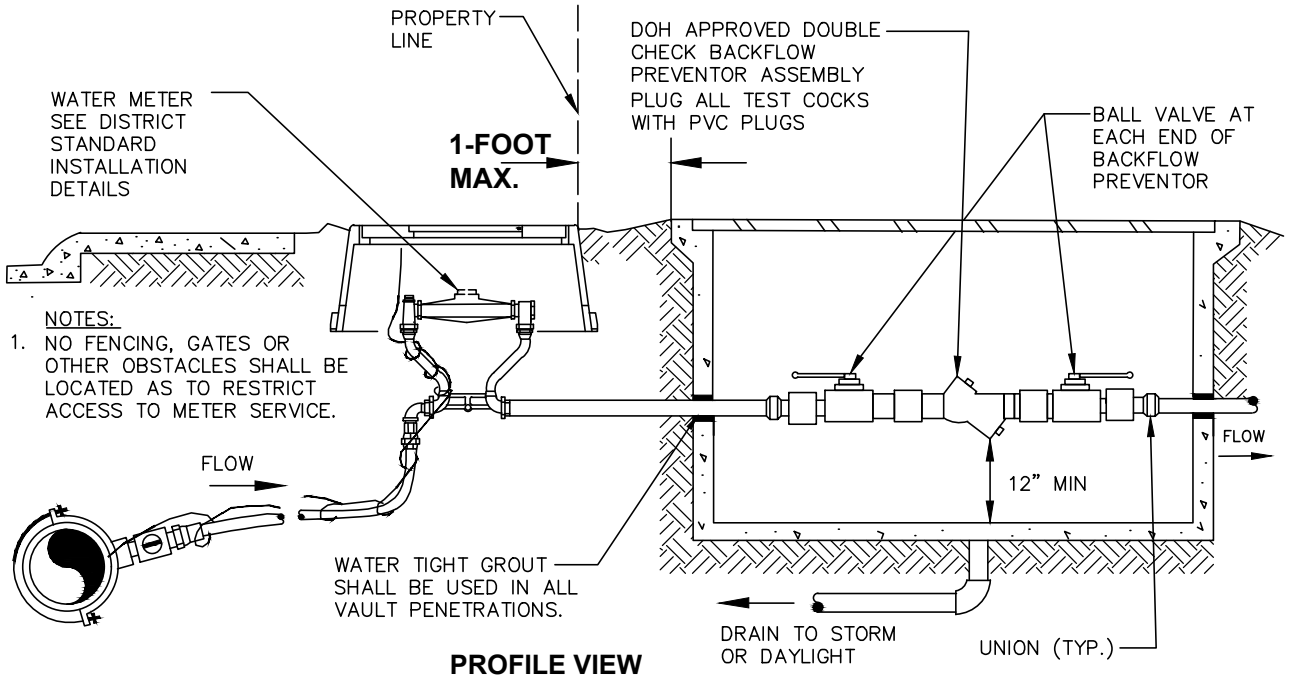
PLAN VIEW
NOT TO SCALE



PLAN VIEW
NOT TO SCALE



PROFILE VIEW
NOT TO SCALE



PROFILE VIEW
NOT TO SCALE

ALTERNATE/ADDITIONAL DCVA IN RISER ROOM DETAIL

NO SCALE

APPROVAL

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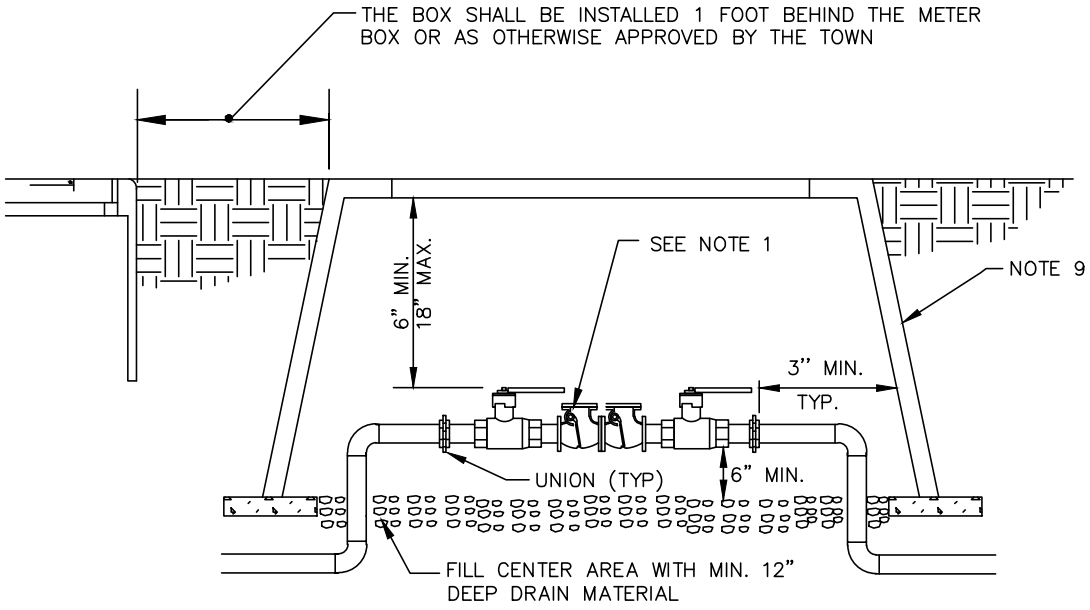
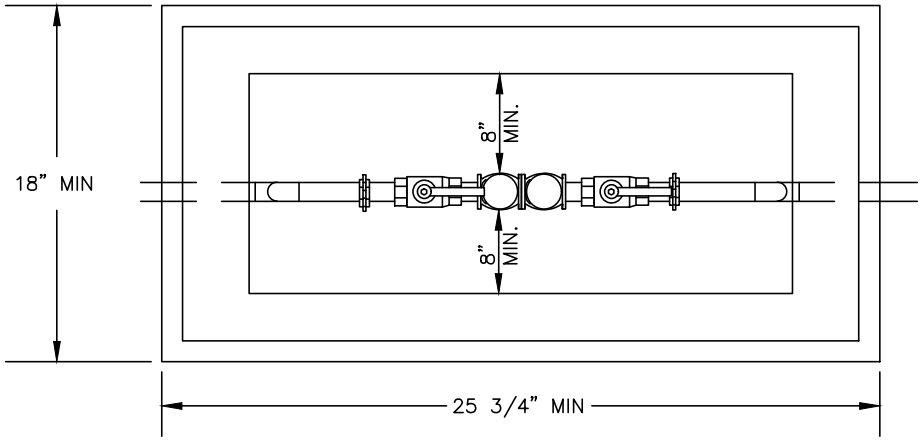
STANDARD FIRE SPRINKLER DCVA CONNECTION

DRAWING NO. **W-16A**

REV:



PROFILE VIEW



PLAN VIEW

NOTES

1. MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
2. MUST BE INSTALLED BELOW GROUND IN AN APPROVED VAULT.
3. FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER.
4. RISERS AND ALL PIPE IN BOX TO BE BRASS, COPPER, OR PVC.
5. THE DCVA SHALL NOT BE INSTALLED WHERE IT MAY BECOME SUBMERGED.
6. A TOWN CROSS CONNECTION SPECIALIST SHALL INSPECT INSTALLATION OF DEVICE AND RECEIVE TEST REPORTS PRIOR TO ESTABLISHMENT OF WATER SERVICE OR APPROVAL. TEST REPORTS MUST BE SIGNED BY A CERTIFIED BACKFLOW ASSEMBLY TESTER AND IMMEDIATELY SENT TO THE TOWN.
7. FOR 2 1/2" TO 3 1/2/" DCVA'S, USE A UTILITY VAULT 506–LA WITH LOCKING STEEL DOOR NO. 55–332.P.
8. FOR 4" AND LARGER DCVA'S, USE A UTILITY VAULT 687–LA WITH BASE 684SB AND 2 LOCKING STEEL DOORS NO. 686–TL–2–332P.
9. FOR 1" AND SMALLER DCVA'S USE CARSON INDUSTRIES "1220–12" OR EQUAL (21 1/2"x15") FOR 1 1/4" TO 2" DCVA USE CARSON INDUSTIES " JUMBO BOX 1730–12" OR EQUAL (33 1/2"x20 1/2")

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

Wayne Haefele, P.E.

PUBLIC WORKS DIRECTOR

DATE

DOUBLE CHECK VALVE ASSEMBLY (DCVA) INSTALLATION

DRAWING NO. **W-16B**

REV:

NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO THE APPROPRIATE FEDERAL, STATE, COUNTY OR TOWN REQUIREMENTS.

2. ALL DCDA'S SHALL BE APPROVED FOR INSTALLATION WITHIN THE SATE OF WASHINGTON BY THE WASHINGTON SATE DEPARTMENT OF HEALTH. THE CONTRACTOR SHALL PROVIDE THE TOWN WITH SPECIFICATIONS AND SHOP DRAWINGS OF THE APPROVED DCDA PRIOR TO CONSTRUCTION.

3. THE SUPPLY LINE FOR THE DCDA SHALL BE DUCTILE IRON, A MINIMUM OF 4" DIA. AND MEET THE MATERIAL AND CONSTRUCTION REQUIREMENTS OF THE TOWN FOR WATER MAIN CONSTRUCTION.

4. THE CONTRACTOR SHALL INSTALL AT THE WATER MAIN A TEE AND 4" MINIMUM SIZED GATE VALVE ON ALL DCDA SYSTEMS. WET TAPS ARE ONLY ALLOWED ON EXISTING WATER MAINS.

5. A FLEXIBLE FITTING (MJ SLEEVE) SHALL BE INSTALLED WHEN ENTERING THE VAULT. THIS FITTING MAY BE OMITTED IF AN MJ BELL CONNECTION IS WITHIN 5 FEET OF THE VAULT.

6. THE CONTRACTOR SHALL LEVEL THE UTILITY VAULTS AND ADJUST THE COVER TO MATCH THE EXISTING GRADE OF 6" ABOVE GRADE IN UNIMPROVED AREAS.

7. THE CONTRACTOR SHALL INSTALL A LADDER–UP AS SHOWN IN THE DETAILS. SUBMIT PRODUCT INFORMATION FOR TOWN REVIEW.

8. ALL VAULTS SHALL BE INSTALLED WITH A 4" ZURN FLOOR DRAIN MODEL 551 WITH GRATING ON A 4" PVC DRAIN PIPE. THE DRAIN SHALL BE RUN TO DAYLIGHT OR A STORM DRAIN SYSTEM WITH A MINIMUM OF 4" SCHEDULE 80 PVC STORM PIPE. IF POSITIVE DRAINAGE FROM THE VAULT CANNOT BE ACHIEVED A SUMP PUMP SYSTEM WILL BE REQUIRED. SUMP PUMP SHALL BE ZOELLER "MIGHTY–MATE" AUTOMATIC SUBMERSIBLE PUMP. WRITTEN DISTRICT APPROVAL IS REQUIRED FOR SUMP PUMP SYSTEM. VAULT SHALL BE CONSTRUCTED SO BACK FLOW ASSEMBLY DOES NOT BECOME SUBMERGED.

9. FIRE DEPARTMENT CONNECTIONS SHALL BE LOCATED, SIZED AND INSTALLED PER THE REQUIREMENTS OF THE FIRE MARSHAL.

10. IF REQUIRED, THE POST INDICATOR VALVE IS TO BE INSTALLED AT THE LOCATION APPROVED BY THE FIRE MARSHAL.

11. ALL TEST COCKS INSTALLED WITH DCDA SHALL HAVE THE APPROPRIATE PLUGS INSTALLED.

12. SIZING OF THE DCDA AND THE DCDA SUPPLY LINE IS THE RESPONSIBILITY OF THE PROPERTY OWNER. WHERE THE DCDA IS INSTALLED WITHIN AN UNDERGROUND VAULT AS SHOWN IN THE DETAILS, THE TOWN WILL MAINTAIN AND OPERATE THE SUPPLY LINE BETWEEN THE MAINLINE AND DCDA. THE DCDA AND ALL ITEMS AFTERWARDS IS THE RESPONSIBILITY OF THE PROPERTY OWNER.

13. BACKFLOW ASSEMBLY TYPE AND INSTALLATION REQUIREMENTS MAY VARY AND WILL BE AT THE TOWNS DISCRETION BASED UPON WASHINGTON STATE DEPARTMENT OF HEALTH DRINKING WATER REGULATIONS RELATING TO CROSS CONNECTION WAC 246–290–010.

PAINT SCHEDULE

EXTERIOR OF VAULT BELOW GRADE TWO COATS OF BITUMASTIC SOLUTION VAULT SHOULD BE DRIED WITH NO MOISTURE PRESENT PRIOR TO APPLICATION OF COATINGS.

PAINT INTERIOR PIPING AND VALVES ONLY. BACKFLOW ASSEMBLY SHALL NOT BE PAINTED.
1 – COAT RUST RESISTOR PRIMER RED #1013
2 – COATS SAFETY BLUE

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

Wayne Haefele, P.E.

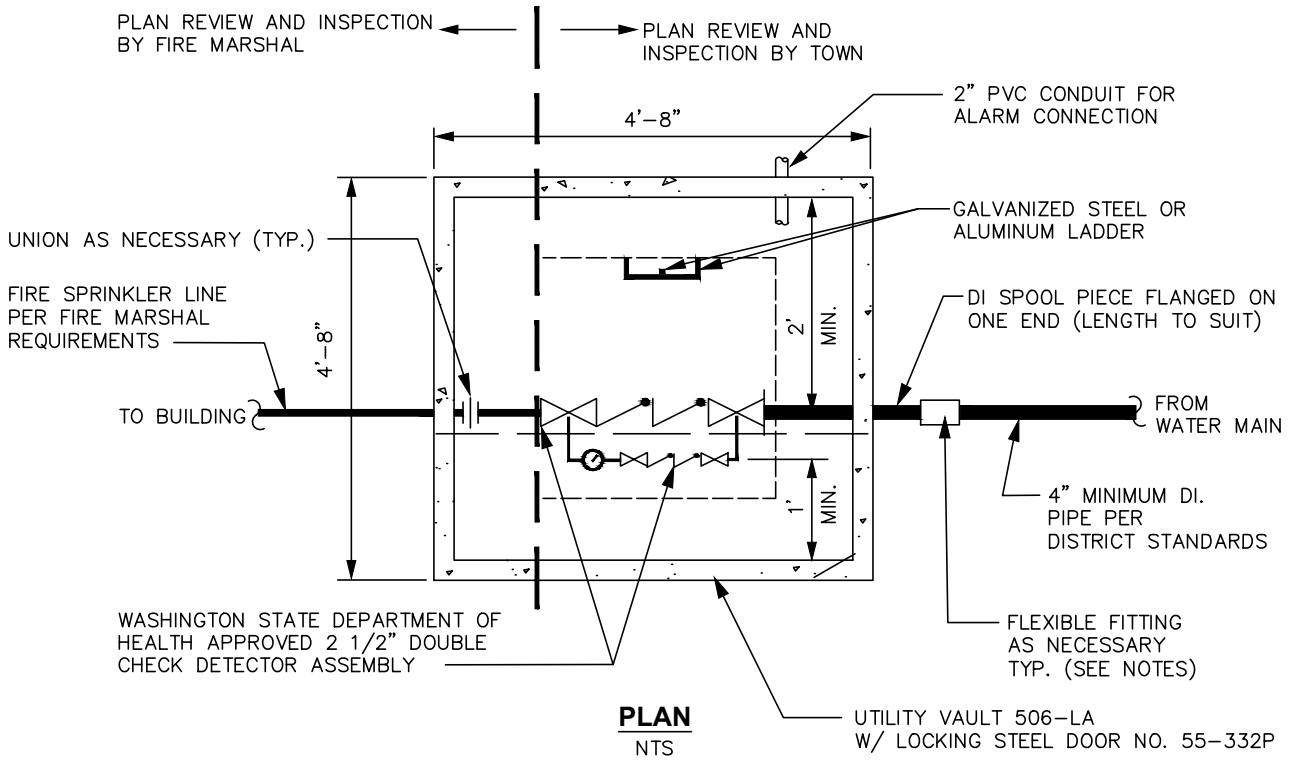
PUBLIC WORKS DIRECTOR

DATE

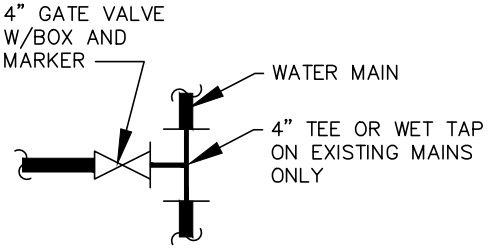
DOUBLE CHECK DETECTOR ASSEMBLY NOTES

DRAWING NO. **W-17A**

REV:

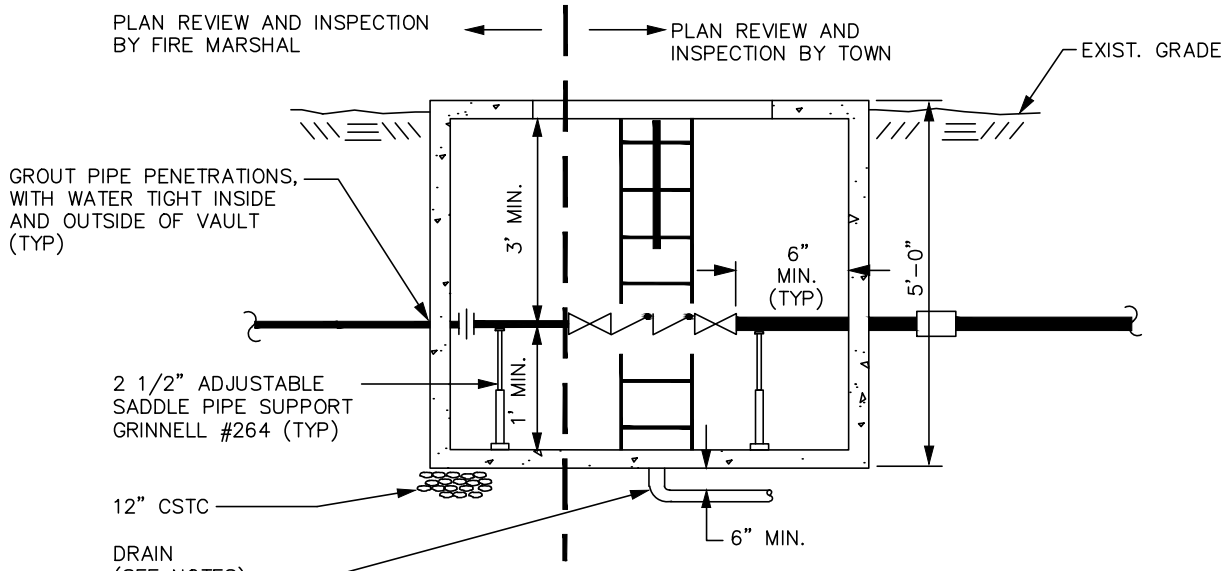


PLAN
NTS



CONNECTION TO MAIN
NTS

FOR LOCATION OF FIRE DEPARTMENT CONNECTION (FDC) AND POST INDICATOR VALVE (PIV), IF APPLICABLE.



ELEVATION
NTS

NO SCALE

APPROVAL

Wayne Haefele, P.E.
PUBLIC WORKS DIRECTOR

DATE

2 1/2" DOUBLE CHECK DETECTOR ASSEMBLY

DRAWING NO.
W-17B

REV:

Streets

STREET GENERAL NOTES:

1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE ADEQUATE TEMPORARY TRAFFIC CONTROL TO ENSURE TRAFFIC SAFETY DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL SUBMIT A TRAFFIC CONTROL PLAN TO THE TOWN AT LEAST FIVE BUSINESS DAYS PRIOR TO STARTING ANY WORK IN THE RIGHT-OF-WAY. ALL TRAFFIC CONTROL DEVICES SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD).

2. ALL CURB AND GUTTER, STREETS, SIDEWALKS, AND ANY OTHER HORIZONTAL CONSTRUCTION SHALL BE STAKED BY AN ENGINEERING FIRM, SURVEYING FIRM, OR TOWN AUTHORIZED CONTRACTOR CAPABLE OF PERFORMING SUCH WORK.

3. THE SUBGRADE AND CRUSHED SURFACING MATERIAL SHALL BE COMPACTED TO 95% MAXIMUM DENSITY. HMA SHALL BE COMPACTED TO 92% MAXIMUM DENSITY.

4. FORM AND SUBGRADE INSPECTION BY THE TOWN IS REQUIRED BEFORE PLACING CONCRETE CURB AND GUTTER AND SIDEWALK. TWO BUSINESS DAYS NOTICE IS REQUIRED FOR FORM INSPECTION.

5. SIDEWALK AND CURB AND GUTTER MAY NOT BE POURED MONOLITHICALLY. THERE MUST BE A COLD JOINT OR FULL-DEPTH EXPANSION JOINT BETWEEN THEM.

6. WHERE NEW ASPHALT JOINS EXISTING, THE EXISTING ASPHALT SHALL BE CUT TO A NEAT VERTICAL EDGE AND TACKED WITH SEALER. SEALANT SHALL MEET THE REQUIREMENTS OF ASTM D6690 TYPE OR TYPE 11.

7. IN THE CASE OF NEW ROAD CONSTRUCTION OR RECONSTRUCTION REQUIRING MAILBOXES TO BE MOVED OR REARRANGED, THE APPLICANT/CONTRACTOR SHALL COORDINATE WITH THE U.S. POSTAL SERVICE FOR THE NEW LOCATION OF THE MAILBOX STRUCTURE(S).

8. ANY EXISTING PUBLIC IMPROVEMENTS DAMAGED DURING CONSTRUCTION SHALL BE REPLACED PRIOR TO FINAL INSPECTION.

9. ANY WORK INVOLVING UTILITY EQUIPMENT SHALL BE IN ACCORDANCE WITH THE UTILITY COMPANY.

10. ANY JUNCTION BOXES AND VAULTS SHALL LOCATED IN A SIDEWALK SHALL HAVE SLIP RESISTANT LIDS AND FRAMES.

11. JUNCTION BOXES AND VAULTS SHALL NOT BE LOCATED WITHIN A SIDEWALK RAMP OR DRIVEWAY ENVELOPE.

12. ALL ILLUMINATION CONDUIT SHALL BE SCHEDULE 80 PVC.

13. ALL LIGHT STANDARDS SHALL BE HAPCO MODEL RTA25D7BM16-01. LUMINAIRE SHALL BE CREE MODEL BXSP_BP_HT_3ME_40K_UL_SV_N_Q9.

NO SCALE

APPROVAL

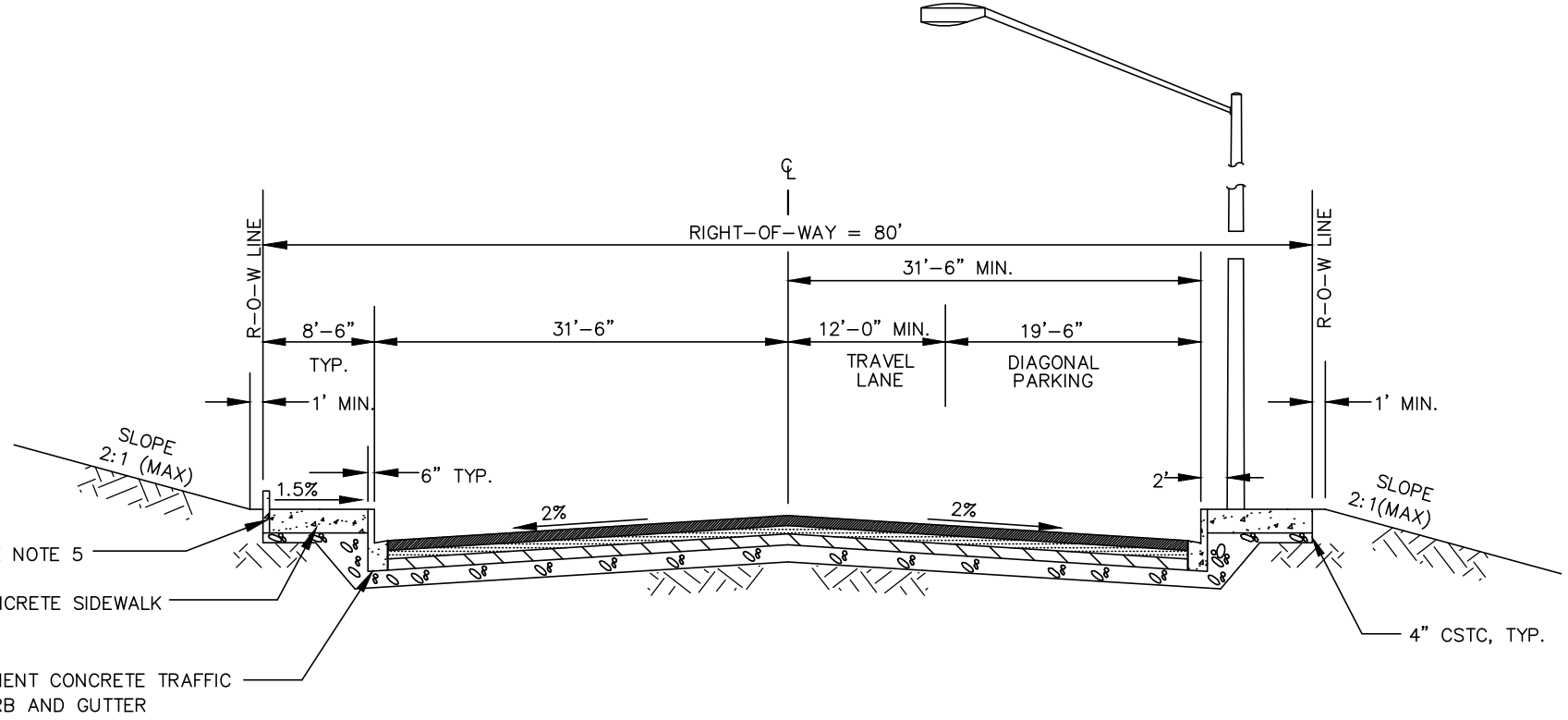
PUBLIC WORKS DIRECTOR

DATE

STREET GENERAL NOTES

DRAWING NO.
ST-0

REV:



NOTES:

1. PAVEMENT MAY BE HOT MIX ASPHALT (HMA) OR PORTLAND CEMENT CONCRETE AS DETERMINED BY THE TOWN.
2. PAVEMENT, CRUSHED SURFACING TOP COURSE AND CRUSHED SURFACING BASE COURSE DEPTHS SHALL BE AS DETERMINED BY A PAVEMENT DESIGN COMPLETED BY A WASHINGTON STATE LICENSED ENGINEER.
3. SIDE SLOPES SHALL BE NO STEEPER THAN RATIOS SHOWN UNLESS RECOMMENDED BY A SOILS REPORT AND APPROVED BY THE TOWN. EXCAVATION SLOPES HIGHER THAN 8' SHALL BE DETERMINED BY SOILS TESTING.
4. IF ROAD GRADE IS LESS THAN .7% THEN CROSS SLOPE SHALL BE 3%.
5. 6" HIGH CEMENT CONCRETE PEDESTRIAN CURB WHERE REQUIRED BY TOWN.
6. SUBGRADE, AND CRUSHED SURFACING MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE AASHTO T–180 TEST PROCEDURE.
7. HMA SHALL BE COMPACTED TO A MINIMUM OF 91% OF THE THEORETICAL MAXIMUM DENSITY.

NO SCALE

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

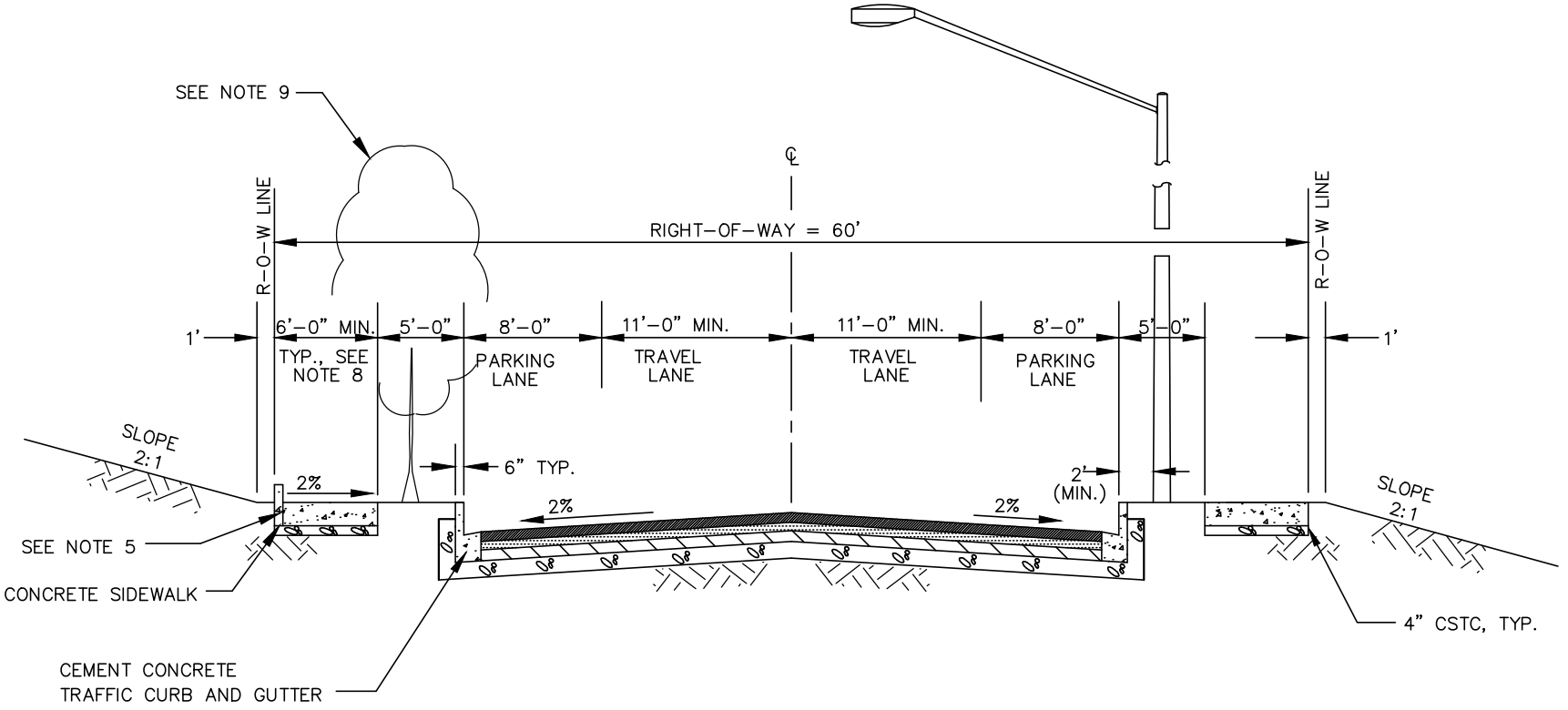
PUBLIC WORKS DIRECTOR

MAJOR ARTERIAL STREET SECTION

DATE

DRAWING NO.
ST-1

REV:



NOTES:

1. PAVEMENT MAY BE HOT MIX ASPHALT (HMA) OR PORTLAND CEMENT CONCRETE AS DETERMINED BY THE TOWN.
2. PAVEMENT, CRUSHED SURFACING TOP COURSE AND CRUSHED SURFACING BASE COURSE DEPTHS SHALL BE AS DETERMINED BY A PAVEMENT DESIGN COMPLETED BY A WASHINGTON STATE LICENSED ENGINEER.
3. SIDE SLOPES SHALL BE NO STEEPER THAN RATIOS SHOWN UNLESS RECOMMENDED BY A SOILS REPORT AND APPROVED BY THE TOWN. EXCAVATION SLOPES HIGHER THAN 8' SHALL BE DETERMINED BY SOILS TESTING.
4. IF ROAD GRADE IS LESS THAN .7% THEN CROSS SLOPE SHALL BE 3%.
5. 6" HIGH CEMENT CONCRETE PEDESTRIAN CURB WHERE REQUIRED BY TOWN.
6. SUBGRADE, AND CRUSHED SURFACING MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE AASHTO T-180 TEST PROCEDURE.
7. HMA SHALL BE COMPACTED TO A MINIMUM OF 91% OF THE THEORETICAL MAXIMUM DENSITY.
8. SIDEWALKS SHALL BE A MINIMUM OF 6' WIDE UNLESS DIRECTED OTHERWISE BY THE TOWN. WIDER SIDEWALKS WILL REDUCE OR ELIMINATE THE LANDSCAPE BUFFER WIDTH.
9. STREET TREES ARE REQUIRED ON BOTH SIDES OF THE STREET.

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

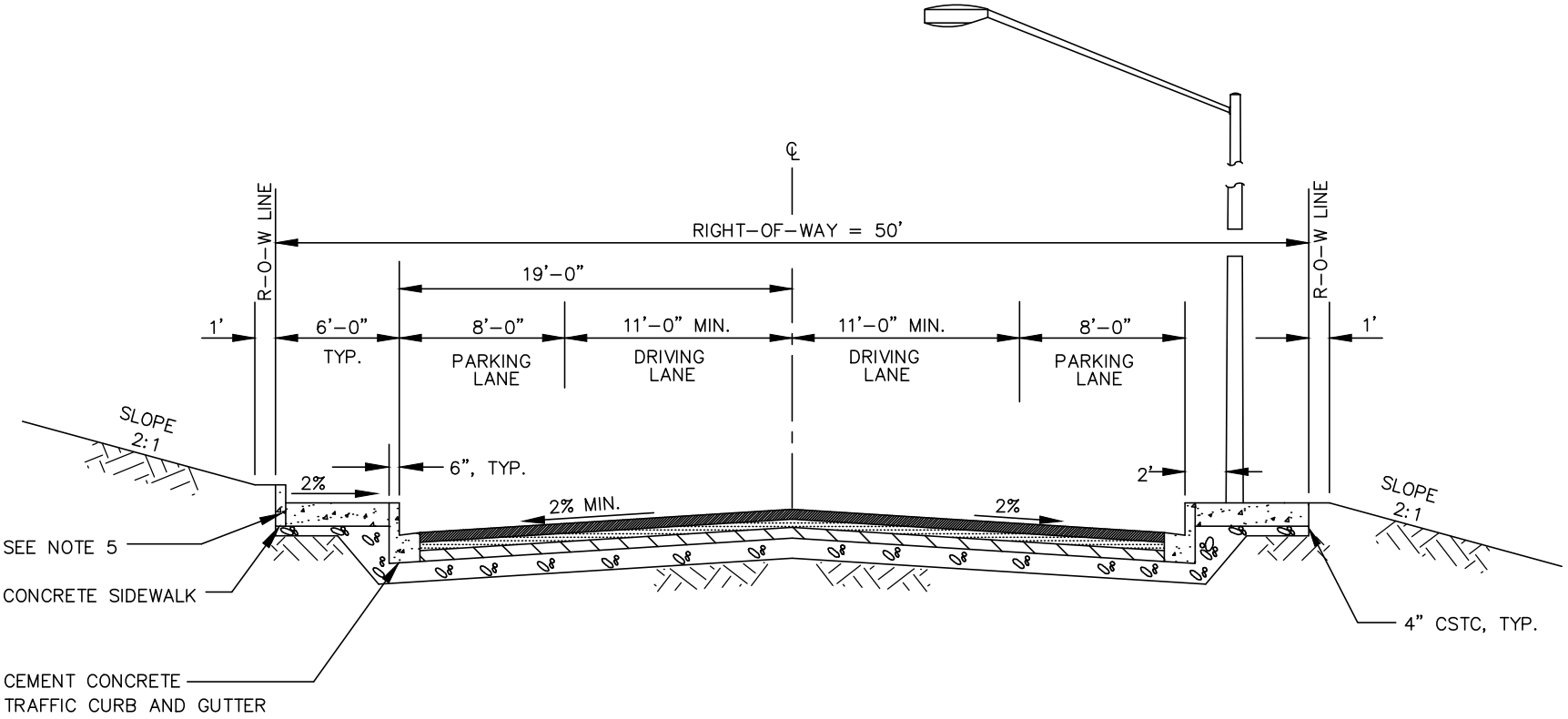
PUBLIC WORKS DIRECTOR

MINOR ARTERIAL 60' RW STREET SECTION

DATE ----

DRAWING NO. **ST-2**

REV:



NOTES:

1. PAVEMENT MAY BE HOT MIX ASPHALT (HMA) OR PORTLAND CEMENT CONCRETE AS DETERMINED BY THE TOWN.
2. PAVEMENT, CRUSHED SURFACING TOP COURSE AND CRUSHED SURFACING BASE COURSE DEPTHS SHALL BE AS DETERMINED BY A PAVEMENT DESIGN COMPLETED BY A WASHINGTON STATE LICENSED ENGINEER.
3. SIDE SLOPES SHALL BE NO STEEPER THAN RATIOS SHOWN UNLESS RECOMMENDED BY A SOILS REPORT AND APPROVED BY THE TOWN. EXCAVATION SLOPES HIGHER THAN 8' SHALL BE DETERMINED BY SOILS TESTING.
4. IF ROAD GRADE IS LESS THAN .7% THEN CROSS SLOPE SHALL BE 3%.
5. 6" HIGH CEMENT CONCRETE PEDESTRIAN CURB WHERE REQUIRED BY TOWN.
6. SUBGRADE, AND CRUSHED SURFACING MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE AASHTO T-180 TEST PROCEDURE.
7. HMA SHALL BE COMPACTED TO A MINIMUM OF 91% OF THE THEORETICAL MAXIMUM DENSITY.

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

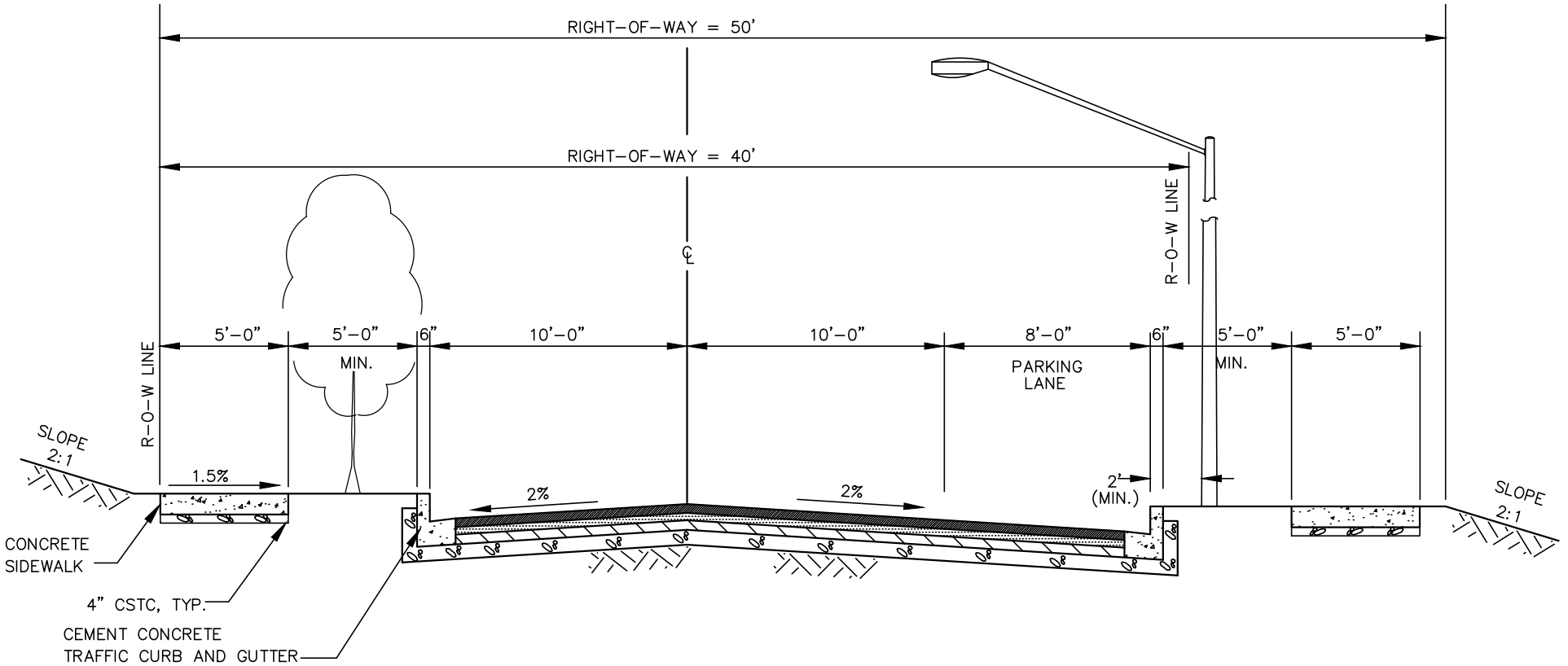
PUBLIC WORKS DIRECTOR

MINOR ARTERIAL 50' RW STREET SECTION

DATE ----

DRAWING NO. **ST-3**

REV:



NOTES:

1. PAVEMENT MAY BE HOT MIX ASPHALT (HMA) OR PORTLAND CEMENT CONCRETE AS DETERMINED BY THE TOWN.
2. PAVEMENT, CRUSHED SURFACING TOP COURSE AND CRUSHED SURFACING BASE COURSE DEPTHS SHALL BE AS DETERMINED BY A PAVEMENT DESIGN COMPLETED BY A WASHINGTON STATE LICENSED ENGINEER.
3. SIDE SLOPES SHALL BE NO STEEPER THAN RATIOS SHOWN UNLESS RECOMMENDED BY A SOILS REPORT AND APPROVED BY THE TOWN. EXCAVATION SLOPES HIGHER THAN 8' SHALL BE DETERMINED BY SOILS TESTING.
4. IF ROAD GRADE IS LESS THAN .7% THEN CROSS SLOPE SHALL BE 3%.
5. SUBGRADE, AND CRUSHED SURFACING MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE AASHTO T–180 TEST PROCEDURE.
6. HMA SHALL BE COMPACTED TO A MINIMUM OF 91% OF THE THEORETICAL MAXIMUM DENSITY.
7. STREET TREES AND ILLUMINATION SHALL BE INSTALLED IN PEDESTRIAN BUFFER. IN 40' RW STREET ARE TREES REQUIRED ON ONE SIDE OF STREET. IN 50' RW STREET TREES ARE REQUIRED ON BOTH SIDES OF STREET.

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

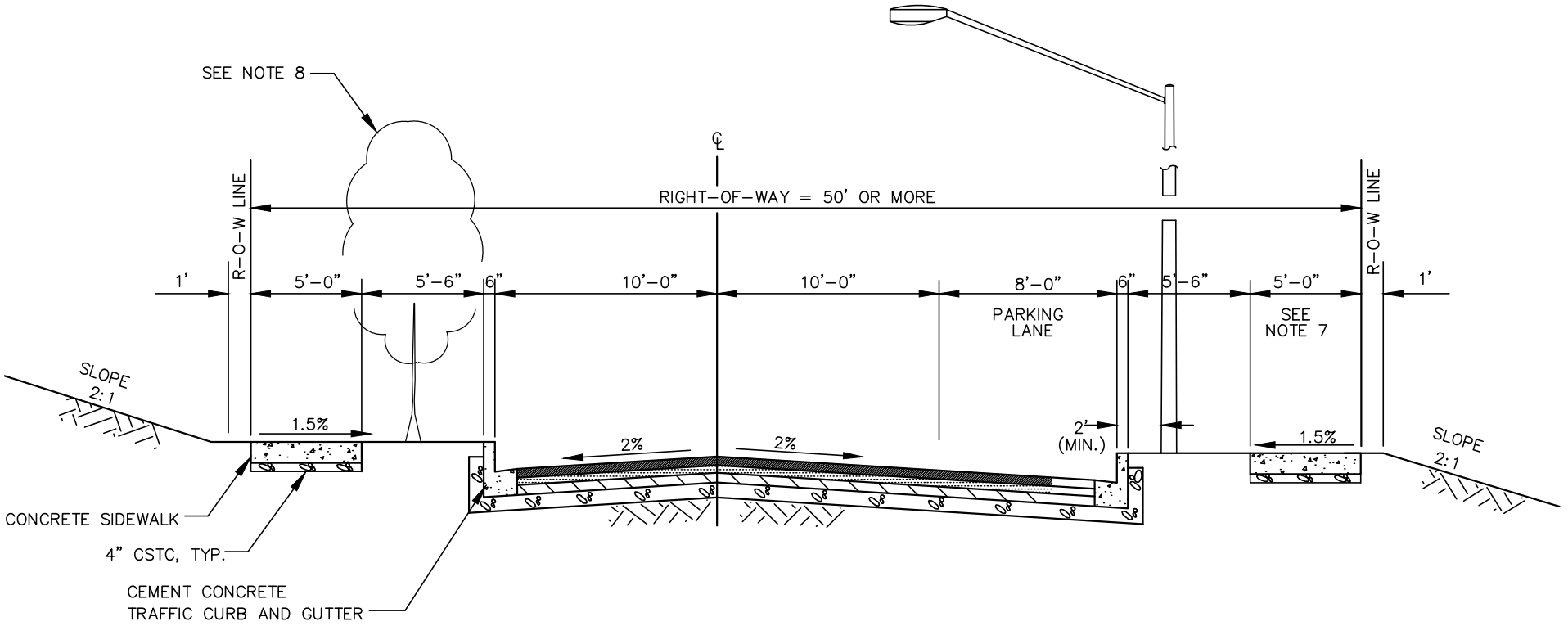
PUBLIC WORKS DIRECTOR

LOCAL ACCESS 40' - 50' RW STREET SECTION

DATE ----

DRAWING NO. ST-4

REV:



NOTES:

1. PAVEMENT MAY BE HOT MIX ASPHALT (HMA) OR PORTLAND CEMENT CONCRETE AS DETERMINED BY THE TOWN.
2. PAVEMENT, CRUSHED SURFACING TOP COURSE AND CRUSHED SURFACING BASE COURSE DEPTHS SHALL BE AS DETERMINED BY A PAVEMENT DESIGN COMPLETED BY A WASHINGTON STATE LICENSED ENGINEER.
3. SIDE SLOPES SHALL BE NO STEEPER THAN RATIOS SHOWN UNLESS RECOMMENDED BY A SOILS REPORT AND APPROVED BY THE TOWN. EXCAVATION SLOPES HIGHER THAN 8' SHALL BE DETERMINED BY SOILS TESTING.
4. IF ROAD GRADE IS LESS THAN .7% THEN CROSS SLOPE SHALL BE 3%.
5. SUBGRADE, AND CRUSHED SURFACING MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE AASHTO T–180 TEST PROCEDURE.
6. HMA SHALL BE COMPACTED TO A MINIMUM OF 91% OF THE THEORETICAL MAXIMUM DENSITY.
7. LANDSCAPE BUFFER AND SIDEWALK REQUIRED ON BOTH SIDE OF STREET UNLESS TOWN DIRECTS SIDEWALKS BE PLACED ON ONE SIDE ONLY.
8. STREET TREES ARE REQUIRED ON BOTH SIDES OF STREET.

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

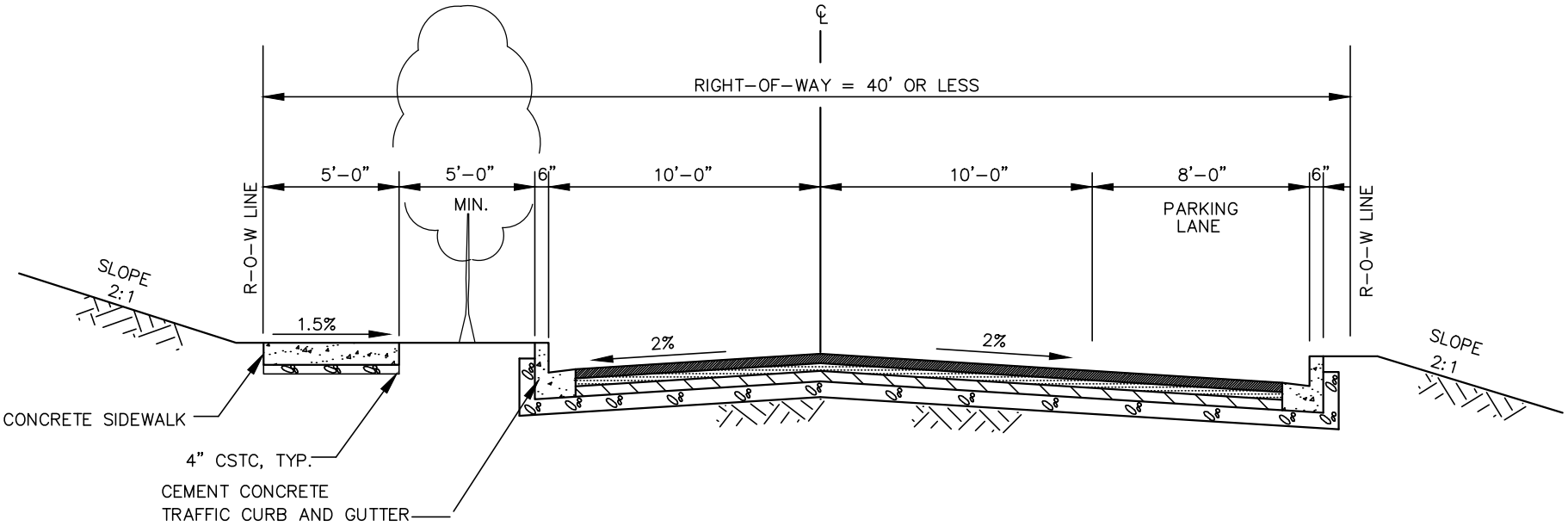
PUBLIC WORKS DIRECTOR

RES-50'
STREET SECTION

DATE

DRAWING NO.
ST-5

REV:



NOTES:

1. PAVEMENT MAY BE HOT MIX ASPHALT (HMA) OR PORTLAND CEMENT CONCRETE AS DETERMINED BY THE TOWN.
2. PAVEMENT, CRUSHED SURFACING TOP COURSE AND CRUSHED SURFACING BASE COURSE DEPTHS SHALL BE AS DETERMINED BY A PAVEMENT DESIGN COMPLETED BY A WASHINGTON STATE LICENSED ENGINEER.
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NO SCALE

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

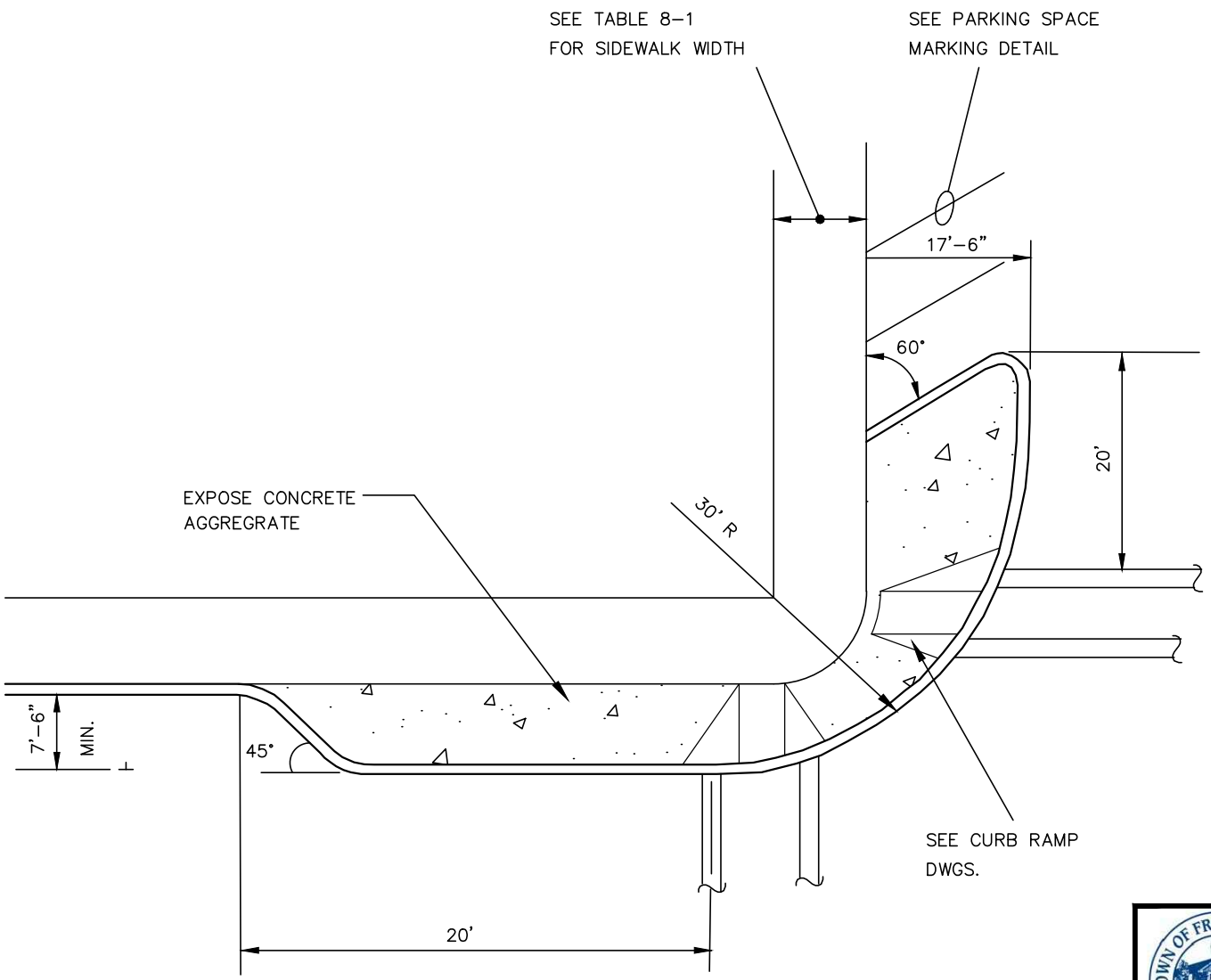
PUBLIC WORKS DIRECTOR

RES-40' RW STREET SECTION

DATE

DRAWING NO.
ST-6

REV:



NO SCALE

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

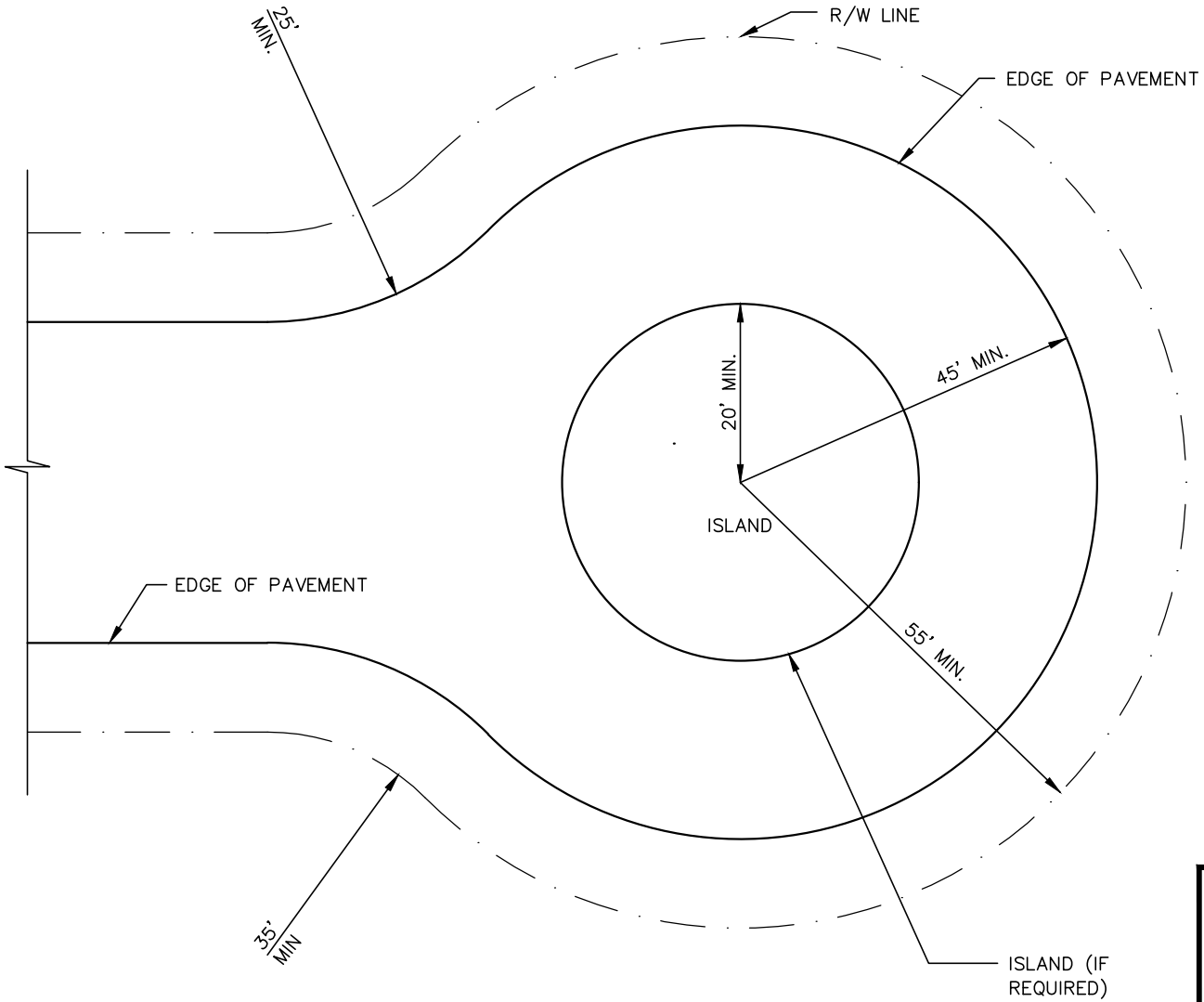
PUBLIC WORKS DIRECTOR

DATE
XX/XX/XXXX

BULB DETAIL

DRAWING NO.
ST-7

REV:



NOTES:

1. ISLAND IS MANDATORY WHEN RADIUS OF PAVED AREA EXCEEDS 45'.
2. ISLAND AT CENTER OF BULB SHALL HAVE A VERTICAL CURB IF ROADWAY SLOPED TO OUTER EDGE. OTHERWISE USE VERTICAL CURB AND GUTTER.

NO SCALE

APPROVAL

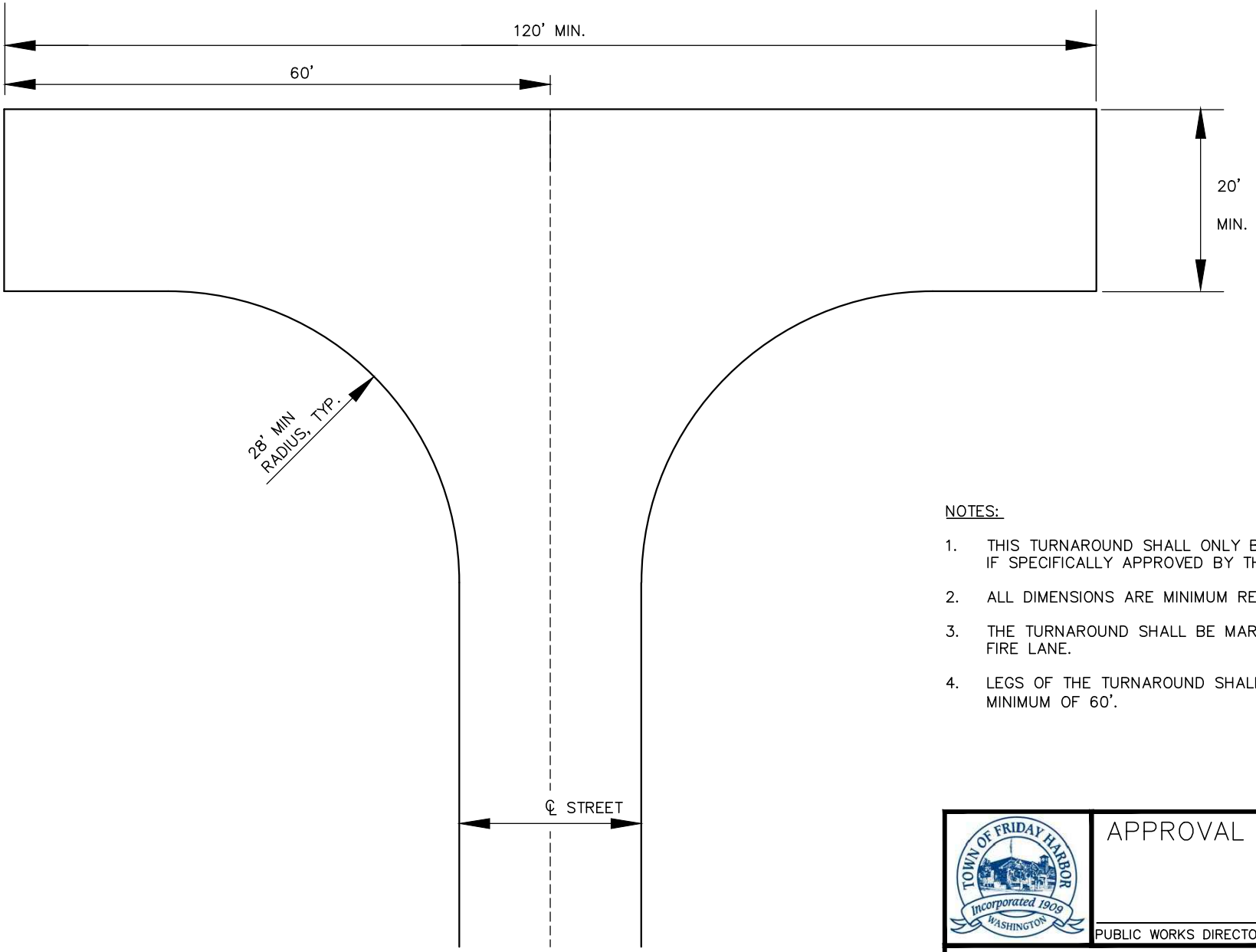
PUBLIC WORKS DIRECTOR

CUL-DE-SAC

DATE **XX/XX/XXXX**

DRAWING NO. **ST-8**

REV:



NOTES:

1. THIS TURNAROUND SHALL ONLY BE UTILIZED IF SPECIFICALLY APPROVED BY THE TOWN.
2. ALL DIMENSIONS ARE MINIMUM REQUIRMENTS.
3. THE TURNAROUND SHALL BE MARKED AS A FIRE LANE.
4. LEGS OF THE TURNAROUND SHALL BE A MINIMUM OF 60'.

NO SCALE

APPROVAL

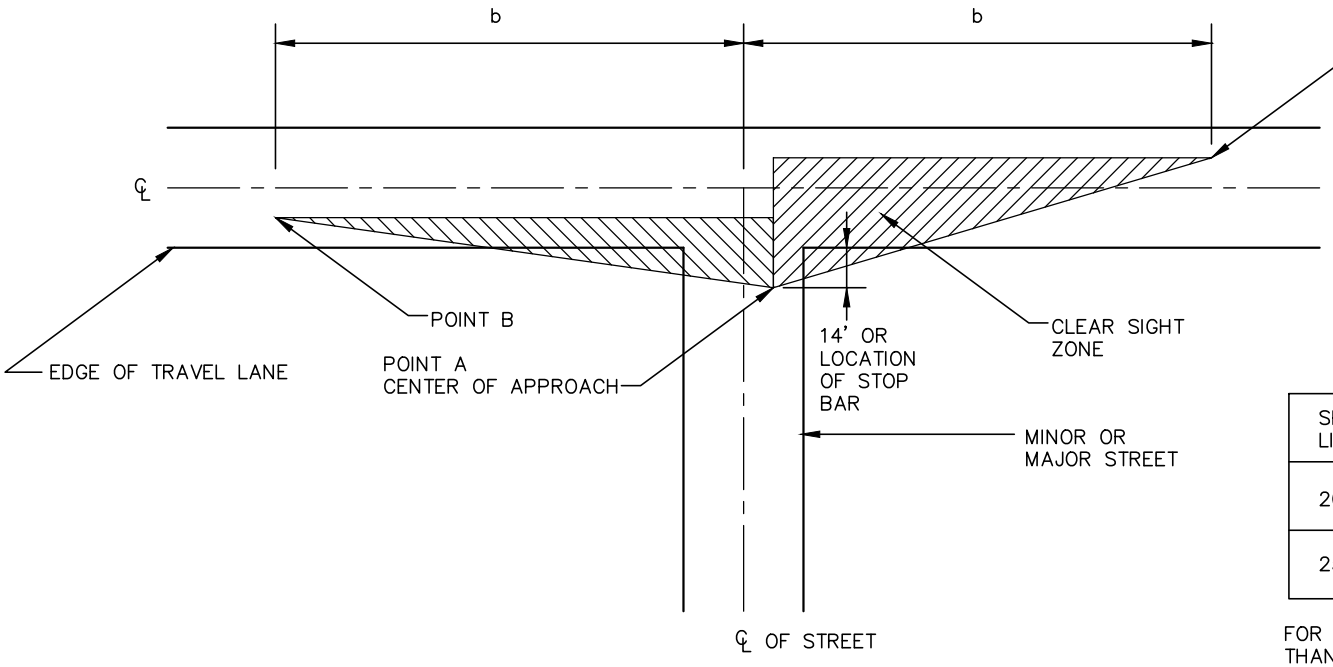
PUBLIC WORKS DIRECTOR

TEMPORARY DEAD END TURNAROUND

DATE
XX/XX/XXXX

DRAWING NO.
ST-9

REV:



SPEED LIMIT	b
20 MPH	225'
25 MPH	280'

FOR APPROACH GRADES GREATER THAN 3%, MULTIPLY BY ADJUSTMENT FACTOR IN AASHTO MANUAL.

NO SCALE

APPROVAL

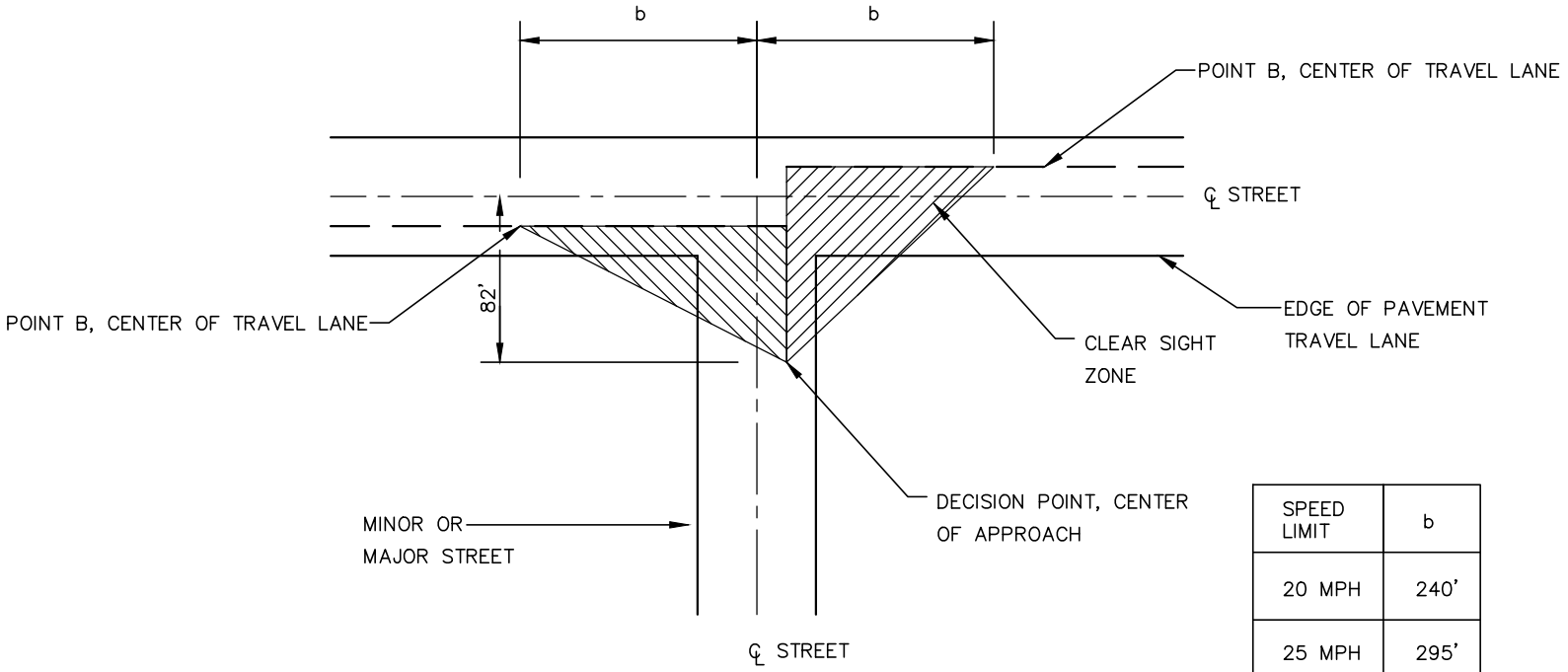
PUBLIC WORKS DIRECTOR

SIGHT DISTANCE STOP CONTROLLED INTERSECTIONS

DATE
XX/XX/XXXX

DRAWING NO.
ST-10

REV:



SPEED LIMIT	b
20 MPH	240'
25 MPH	295'

FOR APPROACH GRADES GREATER THAN 3%, MULTIPLY BY ADJUSTMENT FACTOR IN AASHTO MANUAL.

NO SCALE

APPROVAL

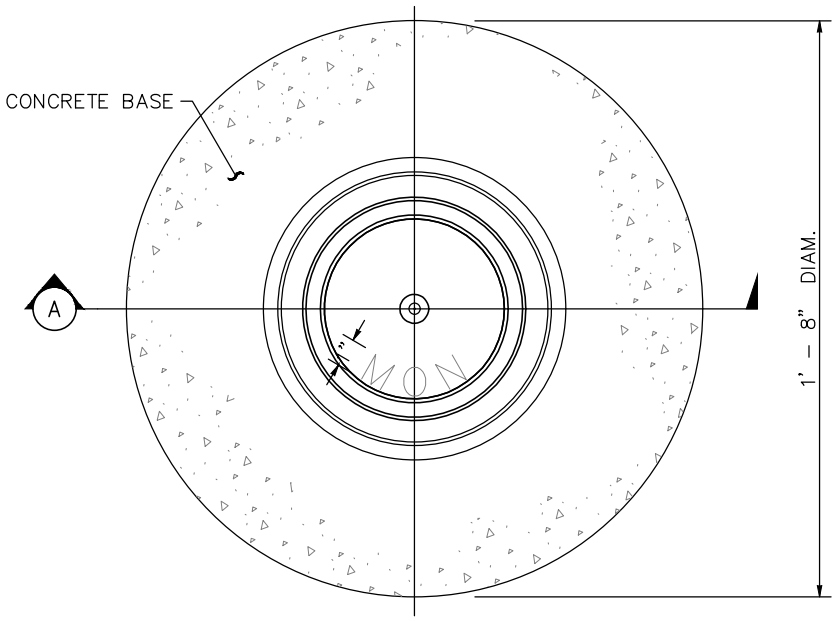
PUBLIC WORKS DIRECTOR

SIGHT DISTANCE UNCONTROLLED INTERSECTIONS

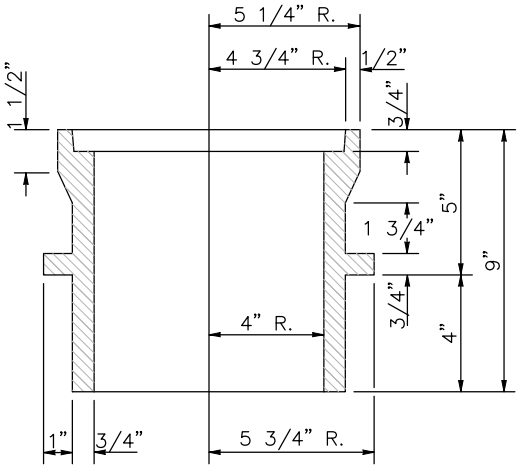
DATE
XX/XX/XXXX

DRAWING NO.
ST-11

REV:



PLAN VIEW



SECTION

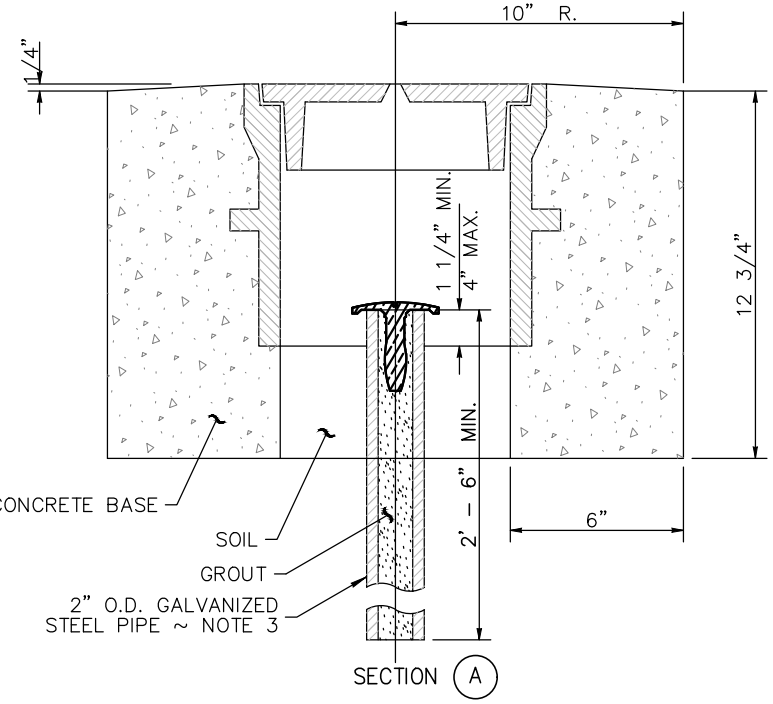
CASE

NOTES:

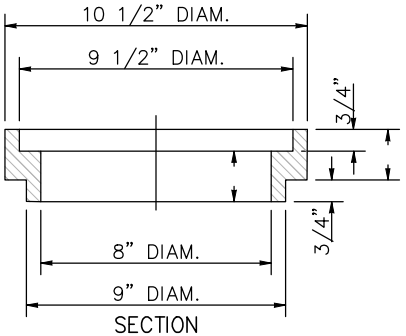
1. DIMENSIONS MAY VARY ACCORDING TO MANUFACTURER.
2. BASE TO BE PLACED ON A WELL COMPACTED FOUNDATION.
3. BRASS DISC SHALL BE TYPE TO PLACE IN 2" O.D. GALVANIZED PIPE. IN LIEU OF 2" O.D. PIPE A PRECAST CONCRETE BASE (6" X 6" X 16 1/2") WITH BRASS DISC MAY BE INSTALLED.
4. THE BRASS DISC SHALL BE ROTATED SO IT MAY BE READ WHILE THE OBSERVER IS FACING NORTH.
5. THE DEVELOPER SHALL PREPARE AND SUBMIT A RECORD OF SURVEY FOR ANY NEW MONUMENTS.

RISER RING DIMENSION			
A (SIZE)	1 1/2"	2"	3"

APPROXIMATE WEIGHTS	
CASE	60 LBS
COVER	19 LBS
TOTAL	79 LBS

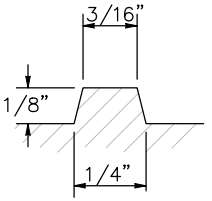


INSTALLATION



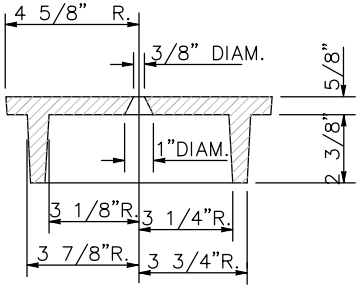
SECTION

RISER RING



SECTION OF LETTER

NO SCALE



SECTION

COVER

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

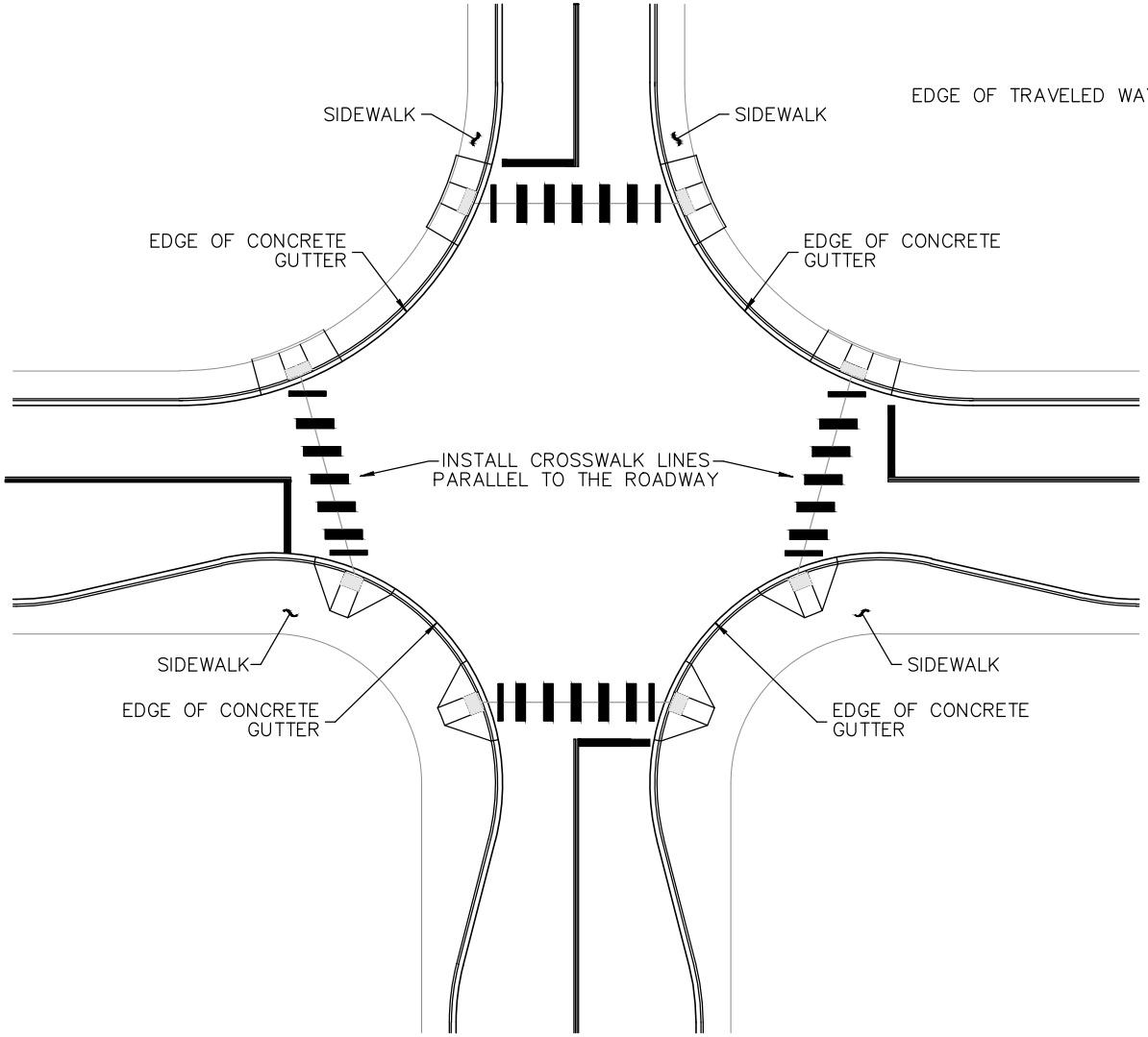
PUBLIC WORKS DIRECTOR

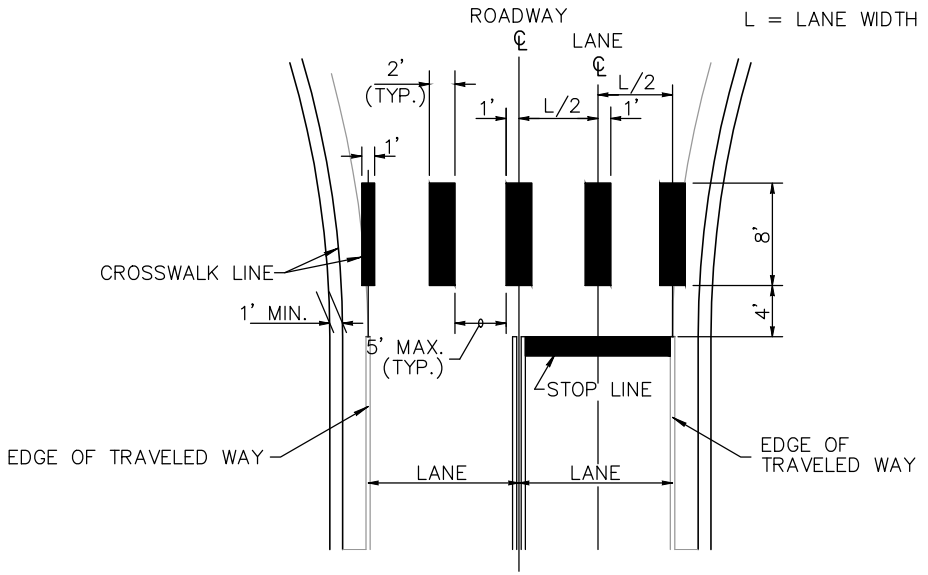
PRECAST MONUMENT CASE AND COVER

DATE **XX/XX/XXXX**

DRAWING NO. **ST-12**

REV:





DETAIL

NOTES:

1. CROSSWALK AND STOP BAR SHALL BE THERMOPLASTIC, PREMARK, BEADED, BY ENNIS FLINT.
2. TO THE MAXIMUM EXTENT POSSIBLE, CURB RAMP CENTERLINE SHOULD BE PERPENDICULAR TO THE CROSSWALK CENTERLINE.
3. TO THE MAXIMUM EXTENT POSSIBLE, CROSSWALKS SHOULD BE PERPENDICULAR TO THE CENTERLINE OF THE TRAVELED WAY.
4. LOWER LANDING OF CURB RAMP MUST FALL WHOLLY WITHIN CROSSWALK LINES.
5. WHEN MARKED CROSSWALK IS NOT PRESENT, STOP BAR MUST BE PLACED A MINIMUM DISTANCE OF 4' UPSTREAM FROM THE EDGE OF THE DETECTABLE SURFACE.
6. EXISTING CROSSWALK MARKINGS THAT CONFLICT WITH THE NEW MARKINGS MUST BE REMOVED BY A GRINDING.

NO SCALE

APPROVAL

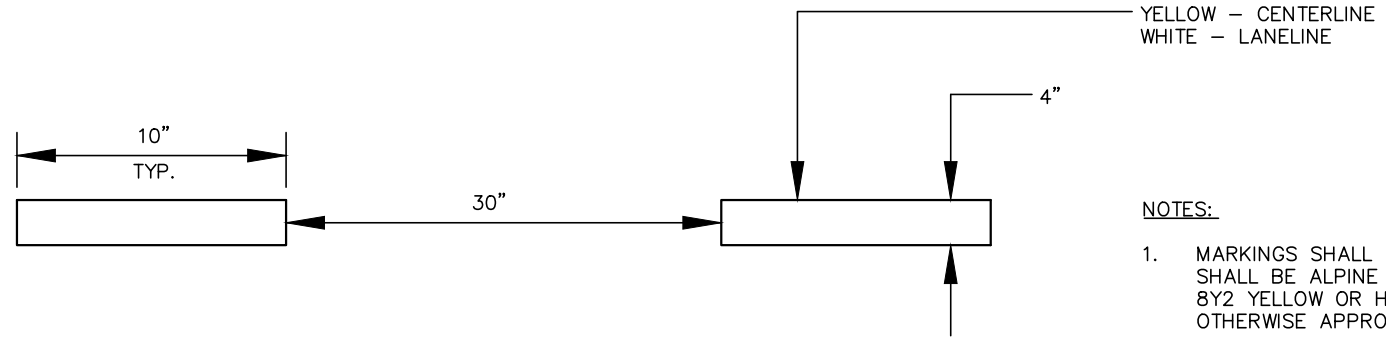
PUBLIC WORKS DIRECTOR

CROSSWALK AND STOP BAR

DATE
XX/XX/XXXX

DRAWING NO.
ST-13

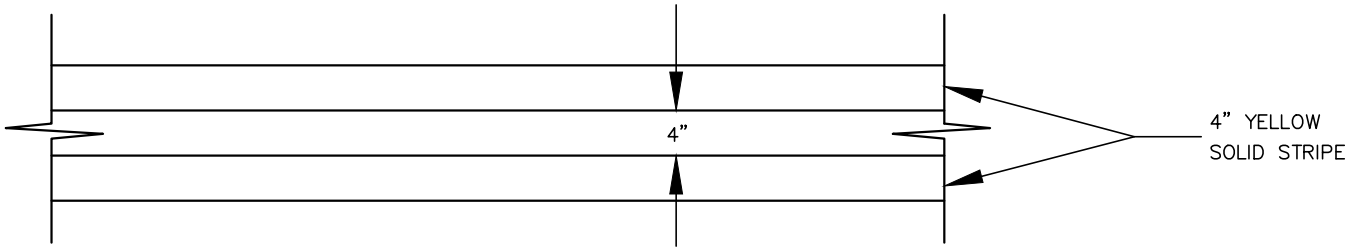
REV:



CENTERLINE & LANE LINE

NOTES:

1. MARKINGS SHALL BE PAINTED, PAINT SHALL BE ALPINE PRODUCTS, INC. HW 8Y2 YELLOW OR HW 8W1 WHITE, UNLESS OTHERWISE APPROVED BY TOWN.



DOUBLE CENTERLINE

NO SCALE

APPROVAL

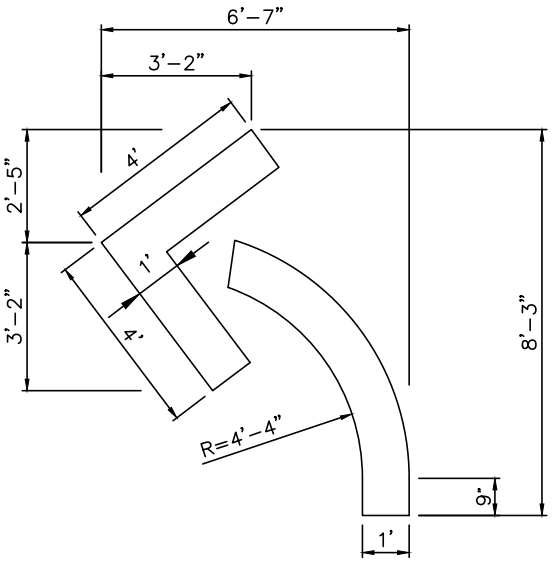
PUBLIC WORKS DIRECTOR

PAVEMENT MARKINGS

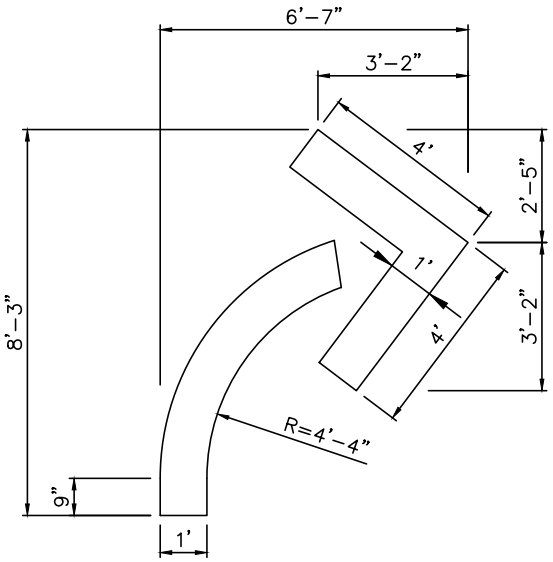
DATE
XX/XX/XXXX

DRAWING NO.
ST-14

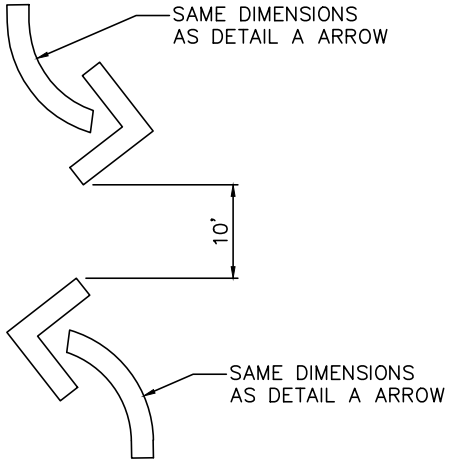
REV:



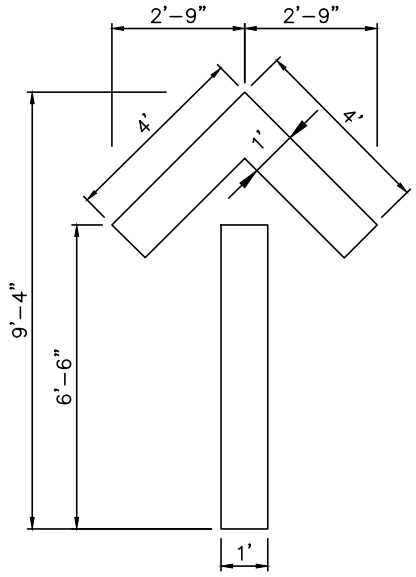
DETAIL A – LEFT



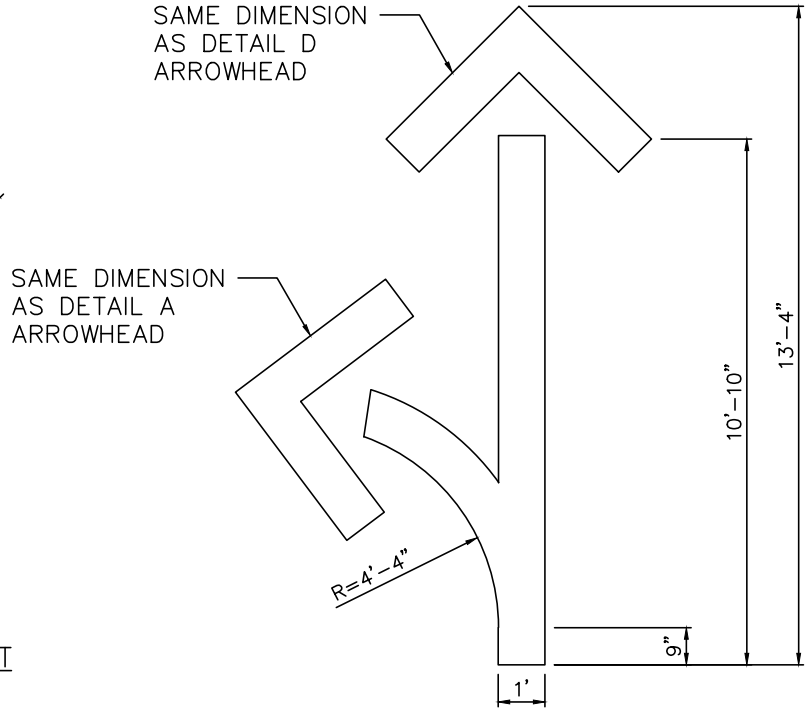
DETAIL B – RIGHT



DETAIL C – TWO WAY LEFT TURN



DETAIL D – STRAIGHT



DETAIL E – STRAIGHT/LEFT

NOTES:

1. MARKINGS SHALL BE THERMOPLASTIC, PREMARK, BEADED, BY ENNIS FLINT UNLESS OTHERWISE APPROVED BY THE TOWN.

NO SCALE

APPROVAL

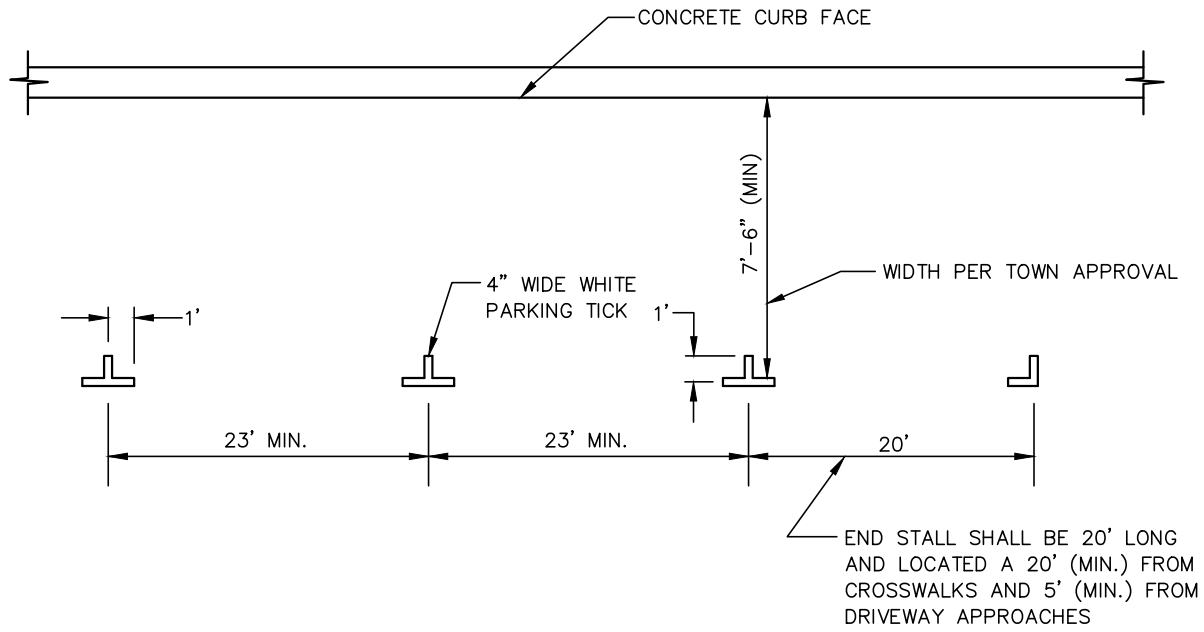
PUBLIC WORKS DIRECTOR

PAVEMENT ARROW MARKINGS

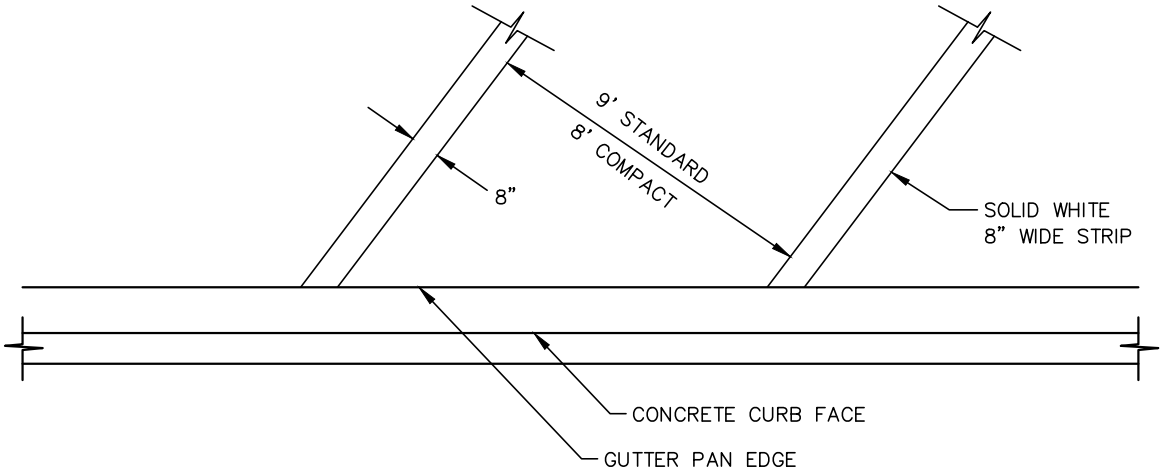
DATE
XX/XX/XXXX

DRAWING NO.
ST-15

REV:



PARALLEL PARKING SPACE MARKING



ANGLE PARKING SPACE MARKING

NO SCALE

NOTES:

1. SEE FHMC 17.46.606 FOR PARKING PLAN REQUIREMENTS.
2. PAINTED MARKINGS SHALL BE ALPINE PRODUCTS, INC. HW 8W1 WHITE, UNLESS OTHERWISE APPROVED BY TOWN.

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

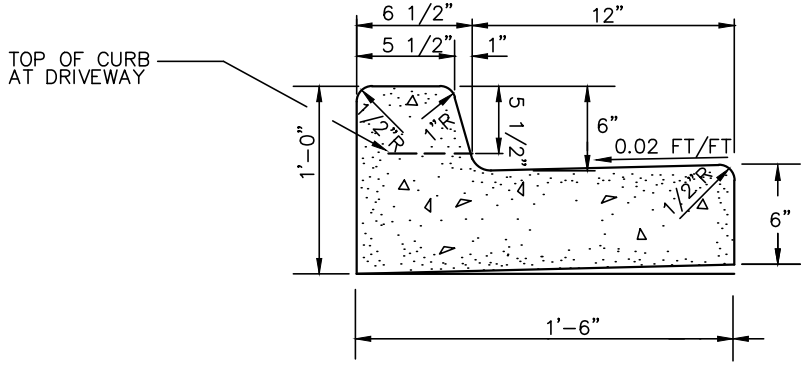
PUBLIC WORKS DIRECTOR

PARKING SPACE MARKINGS

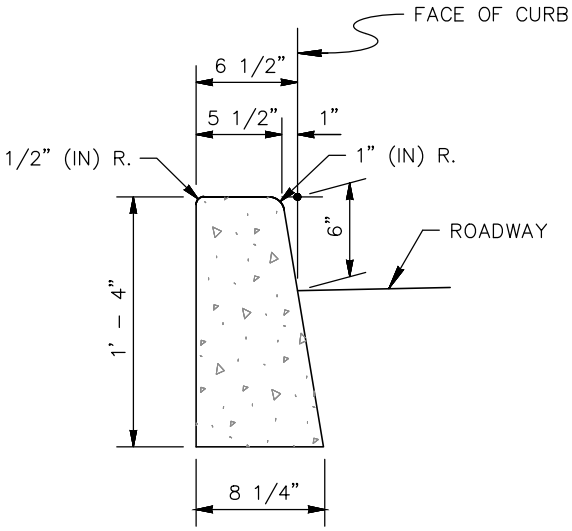
DATE
XX/XX/XXXX

DRAWING NO.
ST-16

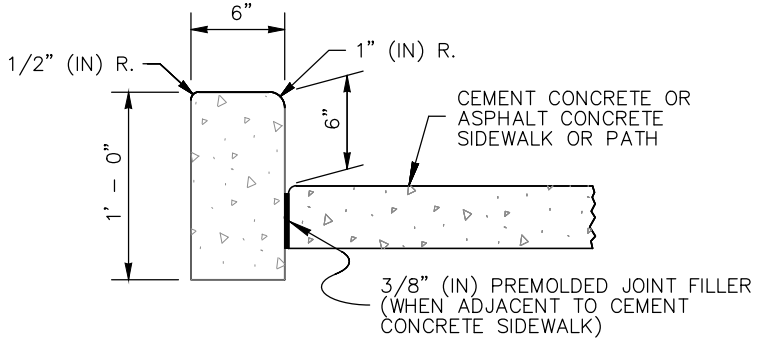
REV:



CEMENT CONCRETE TRAFFIC CURB AND GUTTER



CEMENT CONCRETE TRAFFIC CURB



CEMENT CONCRETE PEDESTRIAN CURB

NO SCALE

NOTES:

1. THE CURBS, GUTTERS AND SIDEWALKS SHALL HAVE CONTRACTION JOINTS (3/8" x 1-1/2") AT INTERVALS OF NOT GREATER THAN 15'-0".
2. CEMENT CONCRETE SHALL BE CLASS 4000.
3. SEE DRAWING NO. 18 FOR EXPANSION JOINT DETAIL AND SPACING.
4. CURBS SHALL BE CONSTRUCTED ON 4" MIN CRUSHED SURFACING TOP COURSE, COMPACTED TO 95% OF MAXIMUM DRY DENSITY.

APPROVAL

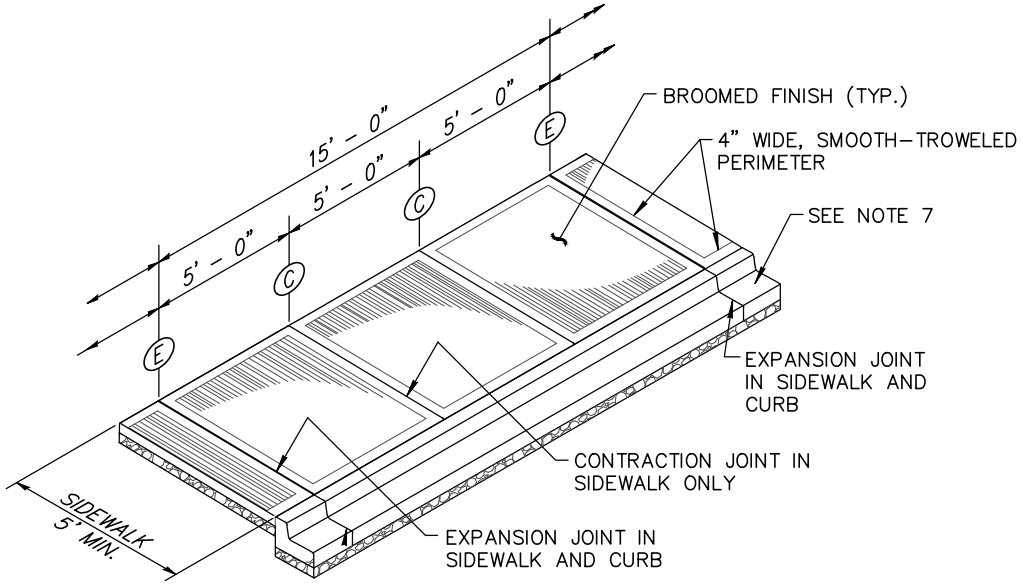
PUBLIC WORKS DIRECTOR

DATE
XX/XX/XXXX

CEMENT CONCRETE CURBS

DRAWING NO.
ST-17

REV:



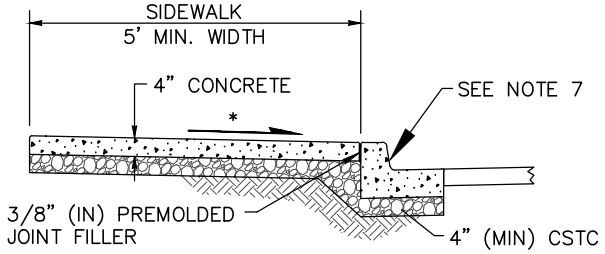
ISOMETRIC VIEW

LEGEND:

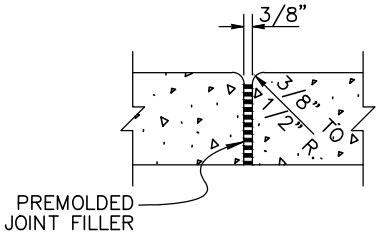
* 1.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX)

NOTES:

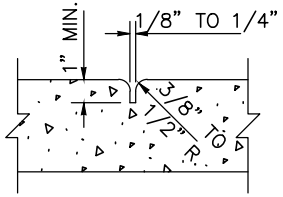
1. EXPANSION JOINTS SHALL BE 3/8" PREMOLDED JOINT FILLER EXTENDING THROUGH THE FULL CONCRETE CROSS SECTIONS. IN ADDITION TO THE EXPANSION JOINT LOCATIONS SHOWN, EXPANSION JOINTS SHALL ALSO BE PLACED BETWEEN EXISTING AND NEW SIDEWALK INSTALLATIONS, CURB RAMPS, UTILITY POLES, SIGN POSTS, METER BOXES, VAULTS, ETC.
2. CONCRETE SHALL BE CLASS 3000, AIR ENTRAINED.
3. ALL EXTERNAL SIDEWALK EDGES TO BE TROWELED WITH 1/2" RADIUS EDGER.
4. BROOMED FINISH ON SIDEWALKS SHALL BE APPLIED PERPENDICULAR TO THE PEDESTRIAN DIRECTION OF TRAVEL.
5. 4" CSTC IS REQUIRED UNDER ALL CONCRETE.
6. 95% COMPACTION FOR SUBGRADE AND CSTC REQUIRED UNDER ALL CONCRETE SIDEWALKS.
7. CEMENT CONCRETE TRAFFIC CURB AND GUTTER.



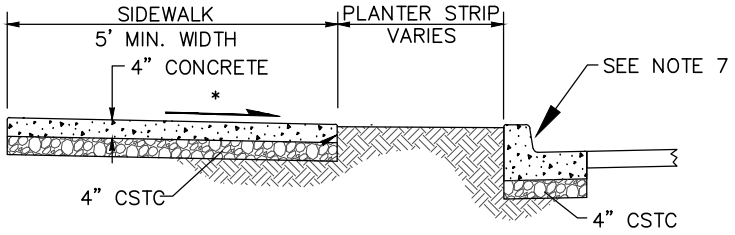
SIDEWALK ADJACENT TO CURB



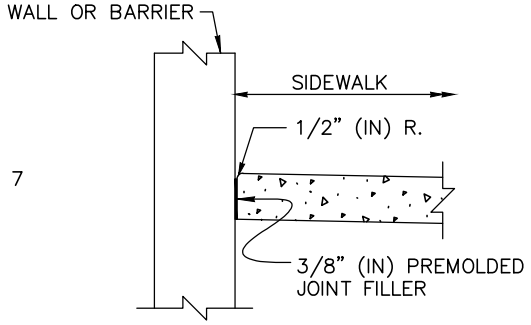
(E) EXPANSION JOINT



(C) CONTRACTION JOINT



SIDEWALK ADJACENT TO PLANTER STRIP



SIDEWALK ADJACENT TO WALL DETAIL

NO SCALE

APPROVAL

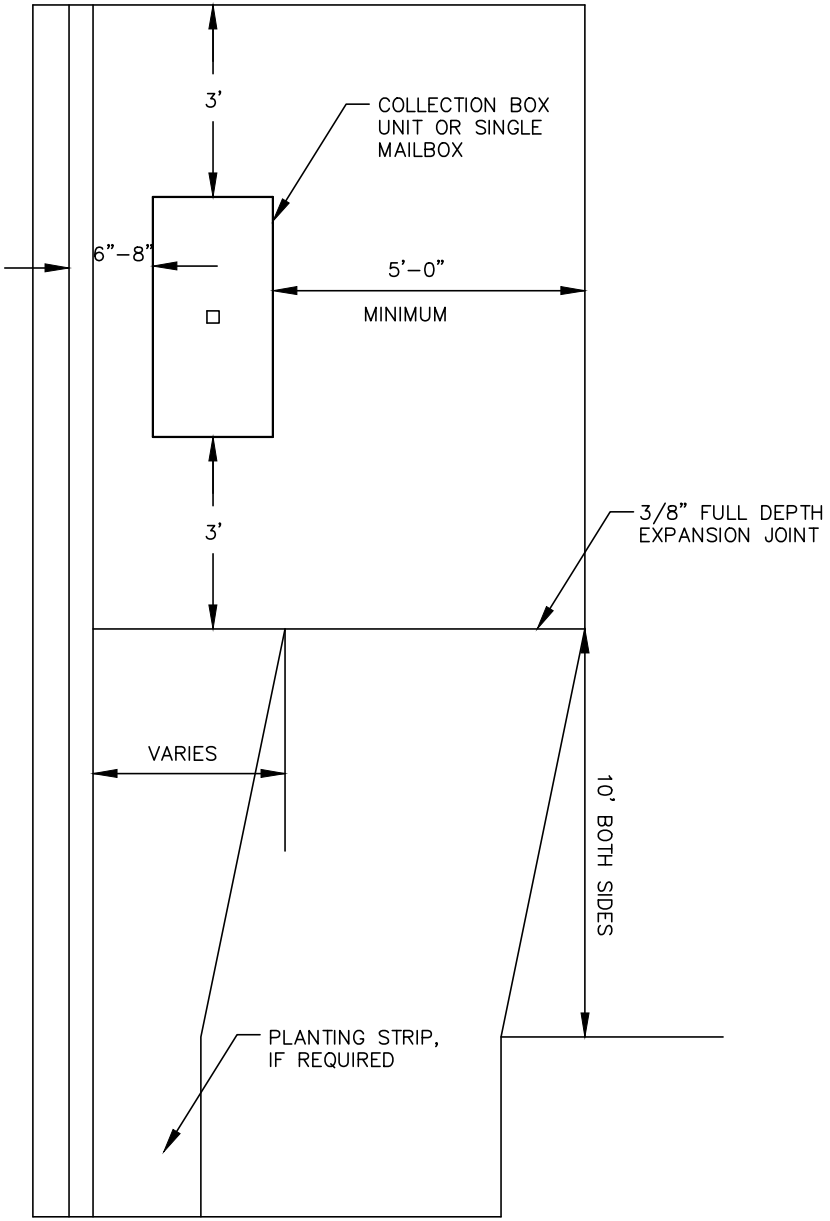
PUBLIC WORKS DIRECTOR

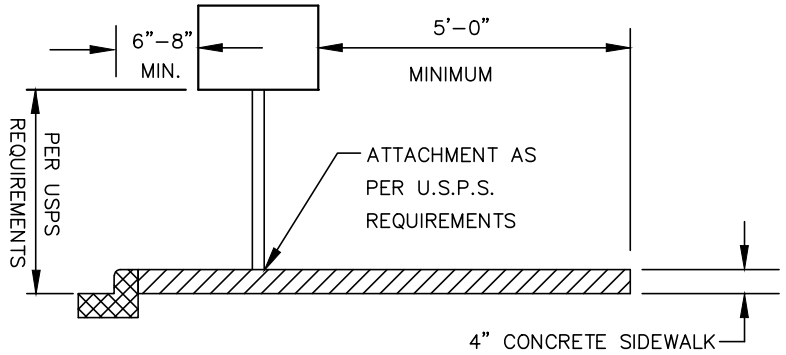
CEMENT CONCRETE SIDEWALKS

DATE **XX/XX/XXXX**

DRAWING NO. **ST-18**

REV:





NOTES:

1. COORDINATE MAILBOX LOCATION WITH LOCAL POSTMASTER AND ENSURE MAILBOX DOES NOT WITHIN SIGHT TRIANGLE.
2. INSTALL USPS APPROVED MAILBOX ONLY.
3. PAINT CURB YELLOW 20' BEFORE MAILBOX AND 10' AFTER MAILBOX.

NO SCALE

APPROVAL

PUBLIC WORKS DIRECTOR

MAILBOX SIDEWALK TRANSITION

DATE XX/XX/XXXX

DRAWING NO. ST-19

REV:

CURB RAMP NOTES FOR CURB RAMP STANDARD DRAWINGS

1. A SEPARATE CURB RAMP SHALL BE PROVIDED FOR EACH MARKED OR UNMARKED CROSSWALK. CURB RAMP LOCATION SHALL BE PLACED WITHIN THE WIDTH OF THE ASSOCIATED CROSSWALK OR AS SHOWN IN THE CONTRACT PLANS WHEN NO MARKED CROSSWALK IS PRESENT. IF ONLY ONE RAMP IS TO BE PROVIDED, PRIOR APPROVAL BY THE TOWN SHALL BE OBTAINED.
2. CURB DESIGN TYPE, WIDTH, AND SLOPES SHALL BE INDICATED ON THE DESIGN DRAWINGS AND AS PER THE STANDARD PLANS.
3. A MINIMUM 5'x5' FLAT LANDING, WITH 2% MAXIMUM SLOPE IN ALL DIRECTIONS, SHALL BE PROVIDED AT THE TOP AND BOTTOM OF ALL RAMPS. MAXIMUM SLOPES ARE INCLUSIVE OF ALL CONSTRUCTION TOLERANCES.
4. SEE STD. DWG. ST–17 FOR CEMENT CONCRETE TRAFFIC CURB AND GUTTER, CEMENT CONCRETE TRAFFIC CURB, AND CEMENT CONCRETE PEDESTRIAN CURB DETAILS.
5. PEDESTRIAN CURB MAY BE OMITTED IF THE GROUND SURFACE AT THE BACK OF THE CURB RAMP AND/OR LANDING WILL BE THE SAME ELEVATION AS THE CURB RAMP OR LANDING AND THERE WILL BE NO MATERIAL TO RETAIN.
6. SEE STD. DWG. ST–18 FOR SIDEWALK DETAILS.
7. CURB RAMP, LANDING, AND FLARE SURFACES SHALL BE BROOM FINISHED AND MINIMUM 4" THICK.
8. CEMENT CONCRETE FOR RAMPS SHALL BE AIR ENTRAINED CONCRETE CLASS 3000, CONFORMING TO WSDOT STD. SPEC. 6–02.
9. REMOVAL/REPLACEMENT OF CEMENT CONCRETE CURB AND SIDEWALK SHALL BE FROM EXPANSION JOINT TO EXPANSION JOINT UNLESS OTHERWISE DIRECTED BY THE TOWN.
10. GRADE BREAKS FOR RAMPS SHALL BE PERPENDICULAR TO DIRECTION OF TRAVEL.
11. AT GRADE BREAKS, THE ENTIRE LENGTH OF THE GRADE BREAK BETWEEN THE TWO ADJACENT SURFACE PLANES SHALL BE FLUSH.
12. GRATINGS, JUNCTION BOXES, ACCESS COVERS, OR OTHER APPURTENANCES SHALL NOT BE PLACED IN FRONT OF THE CURB RAMP OR ON ANY PART OF THE CURB RAMP OR LANDING, UNLESS APPROVED IN ADVANCE BY THE TOWN.
13. RAMPS AND WINGS SHALL PROVIDE AND MAINTAIN POSITIVE DRAINAGE TOWARDS THE STREET.
14. DRAINAGE INLETS SHALL BE LOCATED OUTSIDE THE CURB RAMP.

NO SCALE

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

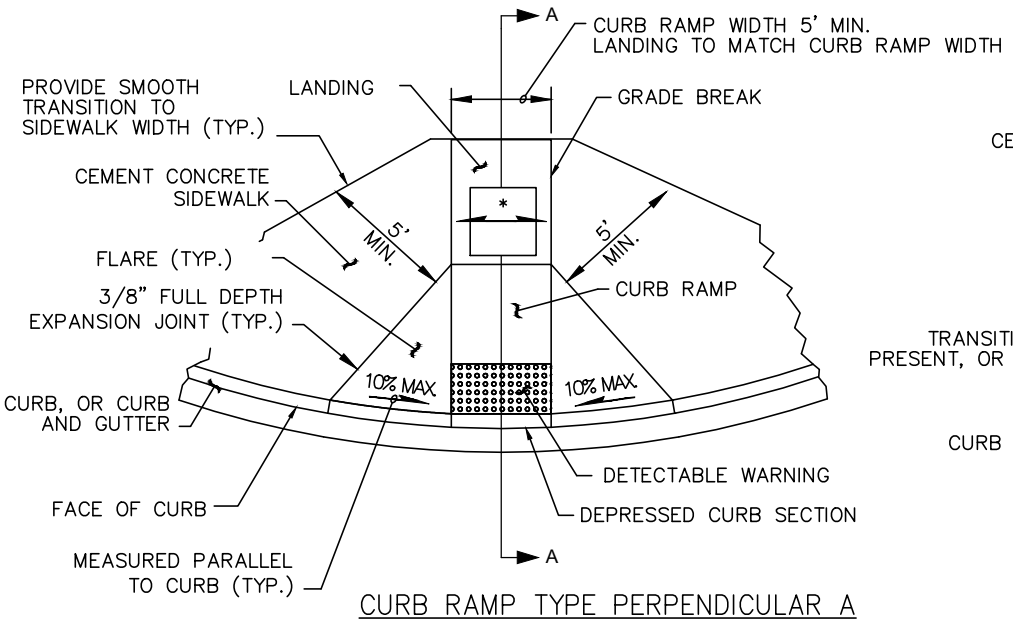
PUBLIC WORKS DIRECTOR

CURB RAMP CONSTRUCTION NOTES

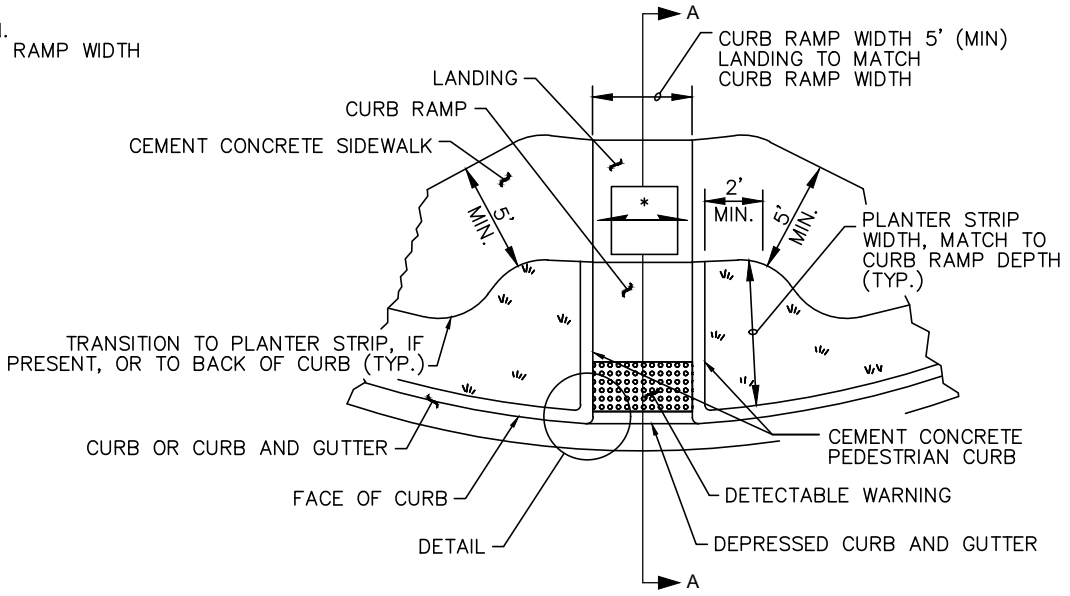
DATE
XX/XX/XXXX

DRAWING NO.
ST-20

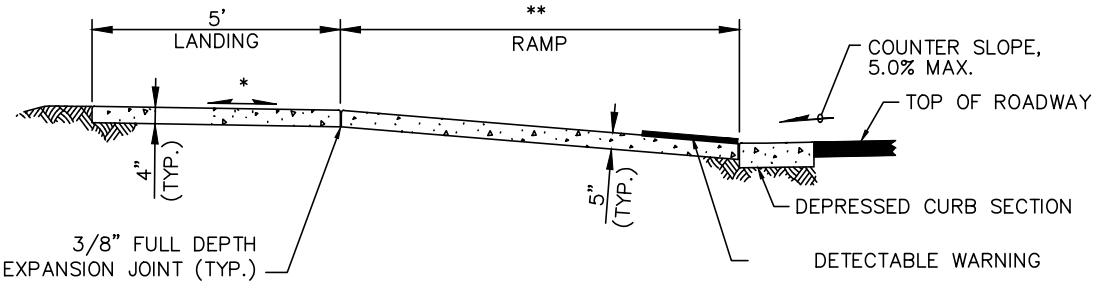
REV:



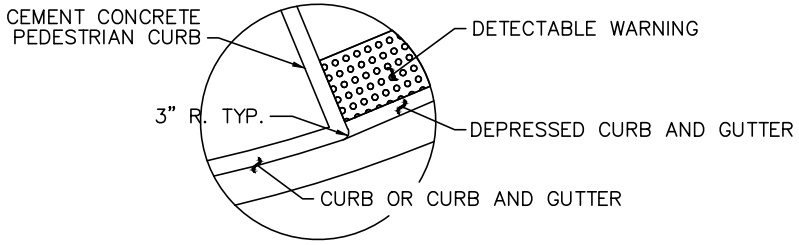
CURB RAMP TYPE PERPENDICULAR A



CURB RAMP TYPE PERPENDICULAR B



SECTION A–A



DETAIL

NOTES:

SEE ST–20 FOR CURB RAMP CONSTRUCTION NOTES.

LEGEND:

SLOPE IN EITHER DIRECTION

* 1.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX).

** 7.5% OR FLATTER RECOMMEND FOR DESIGN/FORMWORK (8.3% MAX).

*** RUNNING SLOPE OF THE CURB RAMP SHALL BE 8.3% MAXIMUM BUT SHALL NOT REQUIRE THE RAMP LENGTH TO EXCEED 15 FT. AS MEASURED RADIALLY AT BACK OF RAMP.

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

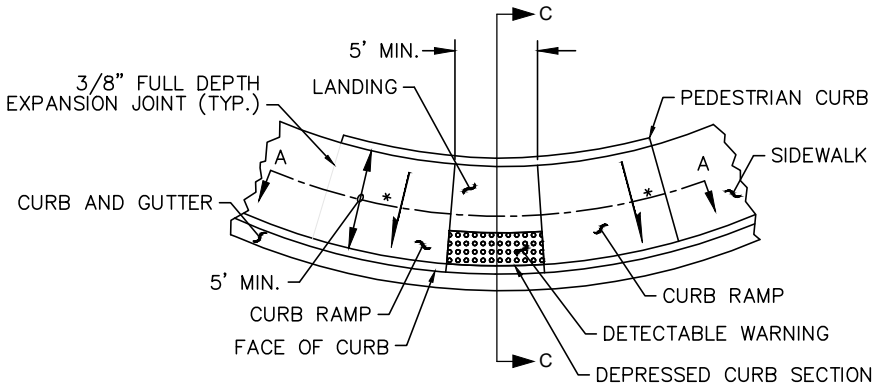
PUBLIC WORKS DIRECTOR

PERPENDICULAR CEMENT CONCRETE CURB RAMP

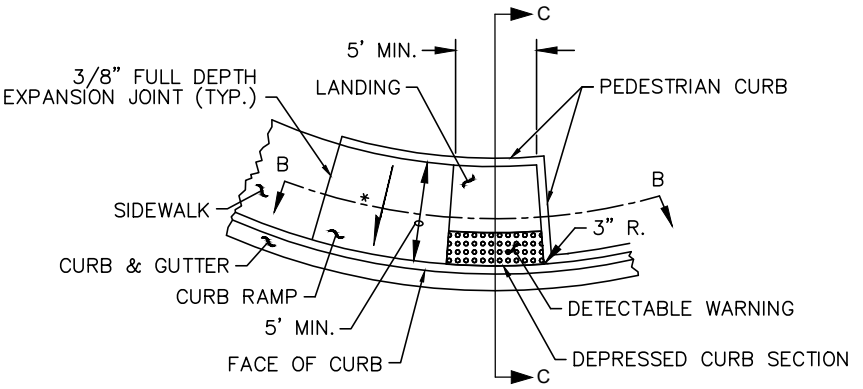
DATE **XX/XX/XXXX**

DRAWING NO. **ST-21**

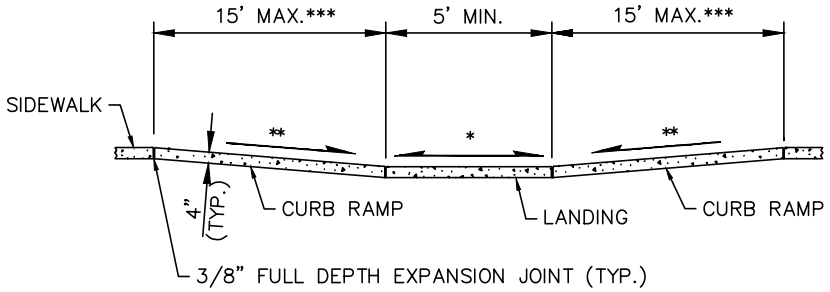
REV:



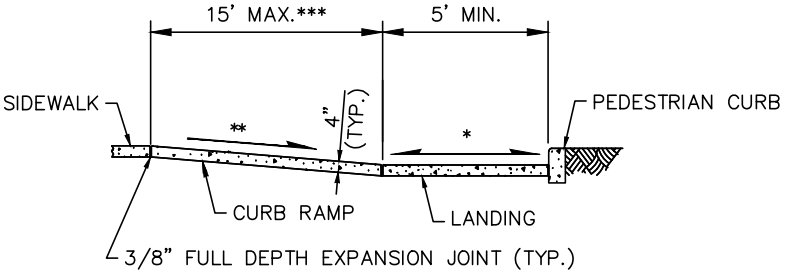
CURB RAMP TYPE PARALLEL A



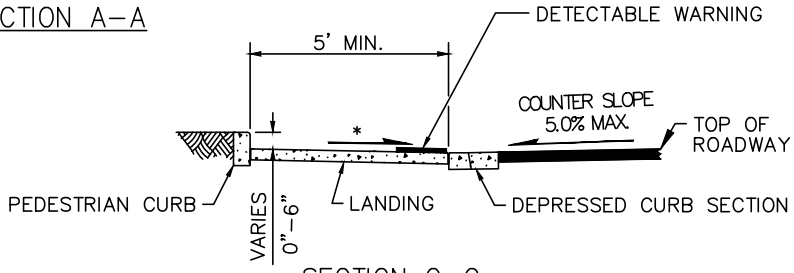
CURB RAMP TYPE PARALLEL B



SECTION A–A



SECTION B–B



SECTION C–C

NOTES:

SEE ST–20 FOR CURB RAMP CONSTRUCTION NOTES.

LEGEND:

SLOPE IN EITHER DIRECTION

* 1.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX).

** 7.5% OR FLATTER RECOMMEND FOR DESIGN/FORMWORK (8.3% MAX).

*** RUNNING SLOPE OF THE CURB RAMP SHALL BE 8.3% MAXIMUM BUT SHALL NOT REQUIRE THE RAMP LENGTH TO EXCEED 15 FT. AS MEASURED RADIALLY AT BACK OF RAMP.

NO SCALE

TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON

APPROVAL

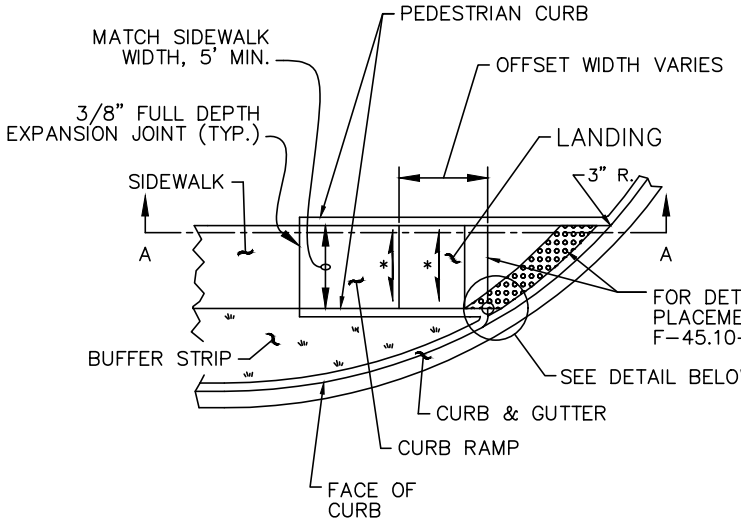
PUBLIC WORKS DIRECTOR

PARALLEL CEMENT CONCRETE CURB RAMP

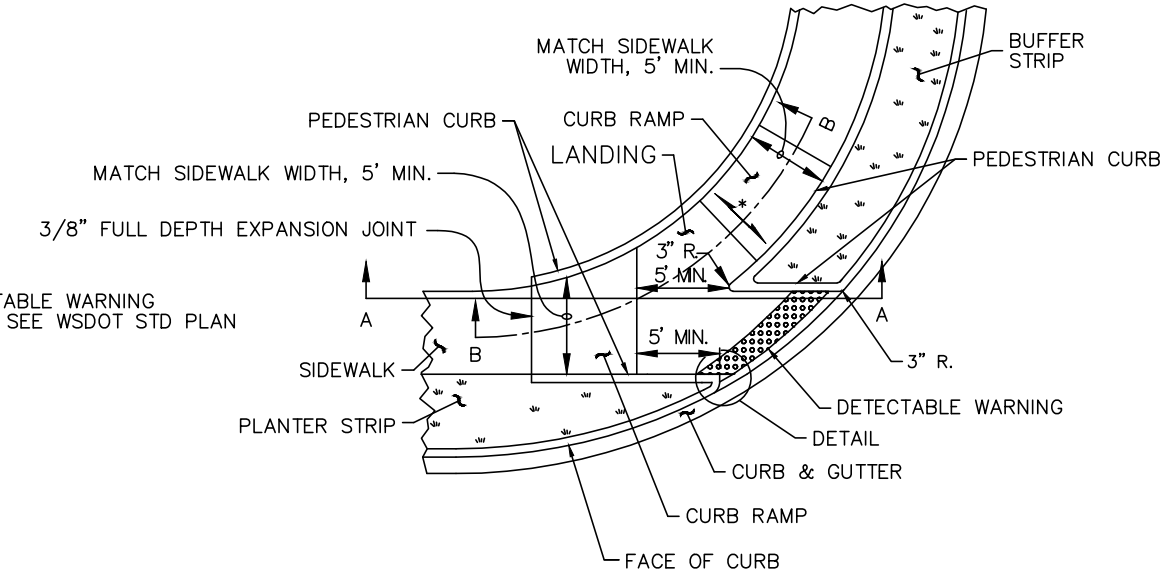
DATE
XX/XX/XXXX

DRAWING NO.
ST-22

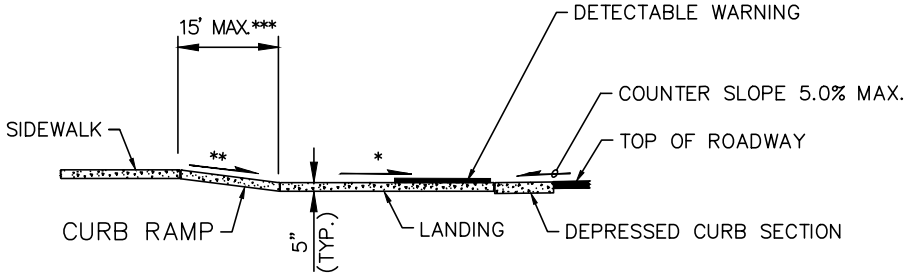
REV:



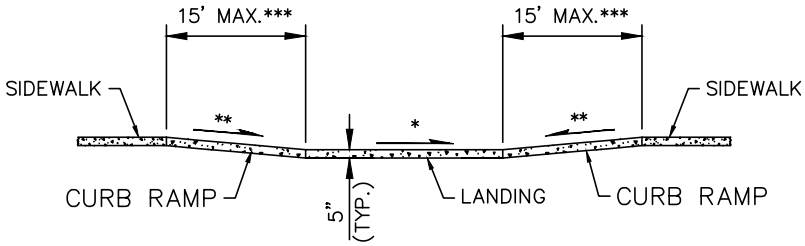
CURB RAMP TYPE DIRECTIONAL A



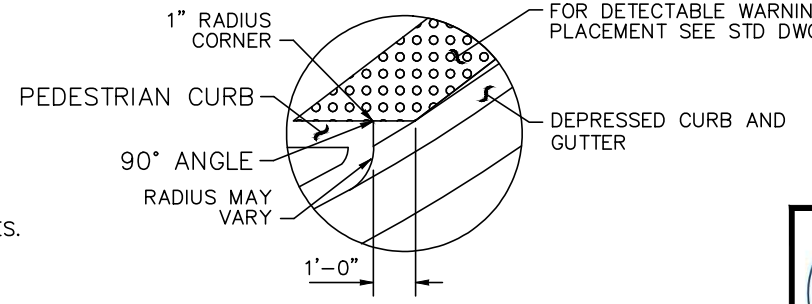
CURB RAMP TYPE DIRECTIONAL B



SECTION A-A



SECTION B-B



DETAIL

NO SCALE

NOTES:

SEE ST-20 FOR CURB RAMP CONSTRUCTION NOTES.

LEGEND:

SLOPE IN EITHER DIRECTION

* 1.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX).

** 7.5% OR FLATTER RECOMMEND FOR DESIGN/FORMWORK (8.3% MAX).

*** RUNNING SLOPE OF THE CURB RAMP SHALL BE 8.3% MAXIMUM BUT SHALL NOT REQUIRE THE RAMP LENGTH TO EXCEED 15 FT. AS MEASURED RADIALLY AT BACK OF RAMP.

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

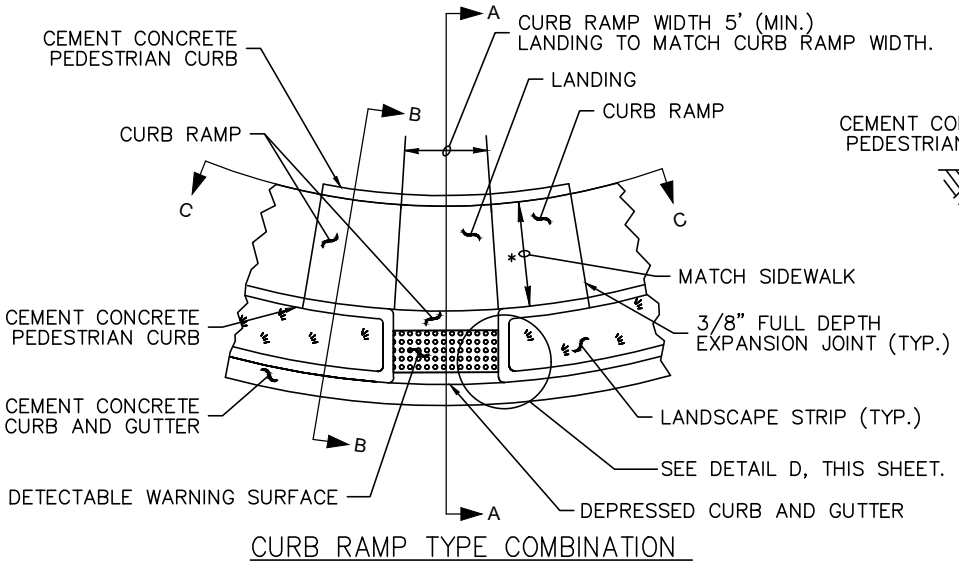
PUBLIC WORKS DIRECTOR

DIRECTIONAL CEMENT CONCRETE CURB RAMP

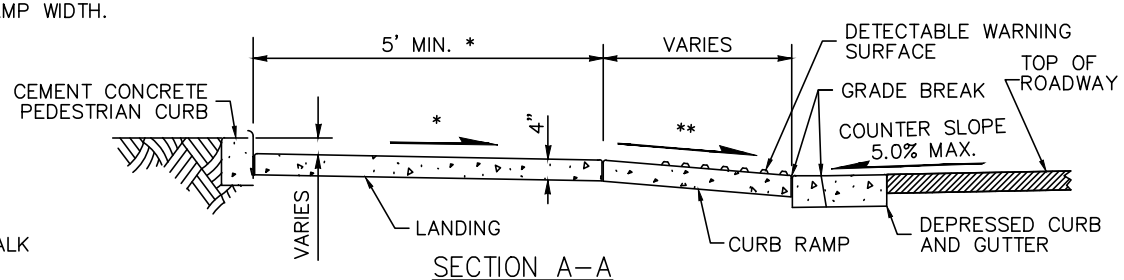
DATE XX/XX/XXXX

DRAWING NO. ST-23

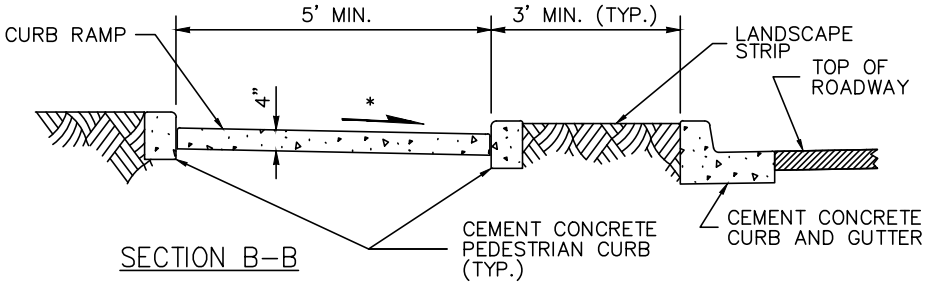
REV:



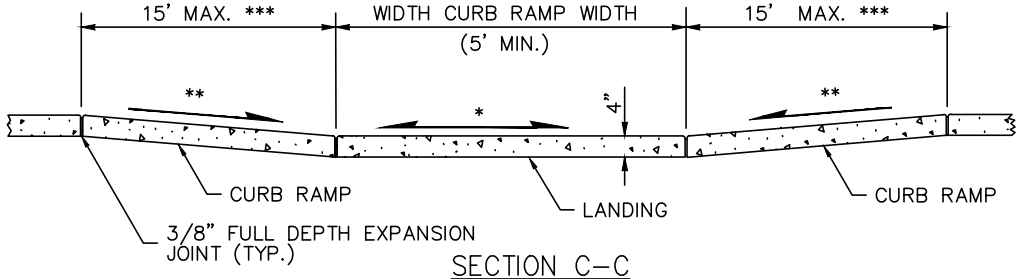
CURB RAMP TYPE COMBINATION



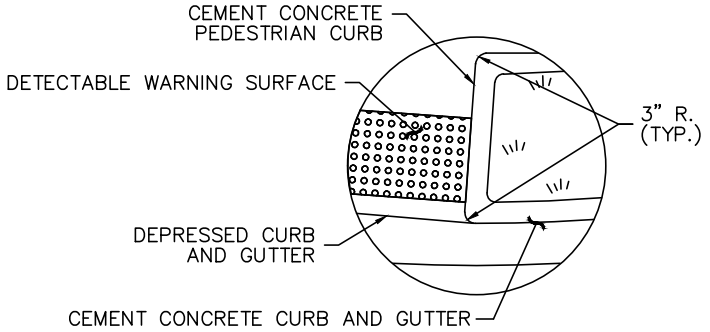
SECTION A–A



SECTION B–B



SECTION C–C



DETAIL D

NO SCALE

NOTES:

SEE ST–20 FOR CURB RAMP CONSTRUCTION NOTES.

LEGEND:

SLOPE IN EITHER DIRECTION

* 1.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX).

** 7.5% OR FLATTER RECOMMEND FOR DESIGN/FORMWORK (8.3% MAX).

*** RUNNING SLOPE OF THE CURB RAMP SHALL BE 8.3% MAXIMUM BUT SHALL NOT REQUIRE THE RAMP LENGTH TO EXCEED 15 FT. AS MEASURED RADIALLY AT BACK OF RAMP.

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

PUBLIC WORKS DIRECTOR

COMBINATION CURB RAMP

DATE **XX/XX/XXXX**

DRAWING NO. **ST-24**

REV:

NOTES:

1. THE DETECTABLE WARNING SURFACE (DWS) SHALL EXTEND THE FULL WIDTH OF THE CURB RAMP, LANDING, OR OTHER ROADWAY ENTRANCE AS APPLICABLE. EXCEPTION: IF THE MANUFACTURER OF THE DWS REQUIRES A CONCRETE BORDER AROUND THE DWS, A VARIANCE OF UP TO 2 INCHES ON EACH SIDE OF THE DWS IS PERMITTED.

2. THE DETECTABLE WARNING SURFACE (DWS) SHALL BE PLACED AT THE BACK OF CURB, WITH TWO LEADING CORNERS OF THE DWS PANEL PLACED ADJACENT TO THE BACK OF THE CURB, AND WITH NO MORE THAN A 2 INCH GAP BETWEEN THE DWS AND THE BACK OF THE CURB MEASURED AT THE CENTER OF THE DWS PANEL. EXCEPTION: IF THE MANUFACTURER REQUIRES A CONCRETE BORDER AROUND THE DWS, A VARIANCE OF UP TO 2 INCHES FROM THE BACK OF THE CURB IS PERMITTED (MEASURED AT THE LEADING CORNERS OF THE DWS PANEL).

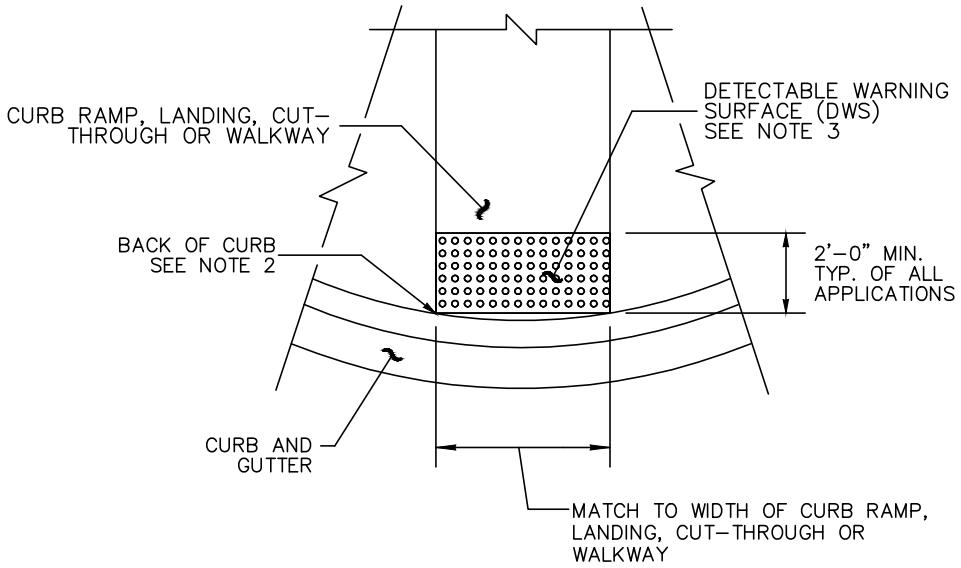
3. THE ROWS OF TRUNCATED DOMES SHALL BE ALIGNED TO BE PERPENDICULAR TO THE GRADE BREAK AT THE BACK OF THE CURB.

4. THE ROWS OF TRUNCATED DOMES SHALL BE ALIGNED TO BE PARALLEL TO THE DIRECTION OF TRAVEL.

5. IF CURB AND GUTTER ARE NOT PRESENT, SUCH AS A SHARED–USE PATH CONNECTION, THE DETECTABLE WARNING SURFACE SHALL BE PLACED AT THE PAVEMENT EDGE.

6. WHEN THE GRADE BREAK BETWEEN THE CURB RAMP AND THE LANDING IS LESS THAN OR EQUAL TO 5 FT. FROM THE BACK OF THE CURB AT ALL POINTS, PLACE THE DETECTABLE WARNING SURFACE ON THE BOTTOM OF THE CURB RAMP DIRECTLY ABOVE THE GRADE BREAK.

7. FOR NEW CONCRETE CONSTRUCTION, DETECTABLE WARNING SURFACE MATERIAL SHALL BE "CAST–IN–PLACE" BY ARMOR–TILE, ADA SOLUTIONS, OR ALERTTILE APPLIED INTEGRAL TO THE CONCRETE POURING OF THE RAMP. FOR RETROFIT CONCRETE APPLICATIONS, DECTECTABLE WARNING MATERIAL SHALL BE "SURFACE APPLIED" BY ARMOR–TILE, ADA SOLUTIONS, OR ALERTTILE. FOR ASPHALT APPLICATIONS, "TOPMARK" BY FLINT TRADING MAY BE USED OR CONSULT THE TOWN FOR ALLOWABLE OPTIONS. NO SUBSTITUTIONS WILL BE PERMITTED WITHOUT PRIOR WRITTEN APPROVAL BY THE TOWN. DETECTABLE WARNINGS SHALL BE FEDERAL YELLOW. INSTALLATION SHALL CONFORM TO MANUFACTURER'S SPECIFICATIONS.



DETECTABLE WARNING SURFACE DETAIL

NO SCALE

APPROVAL

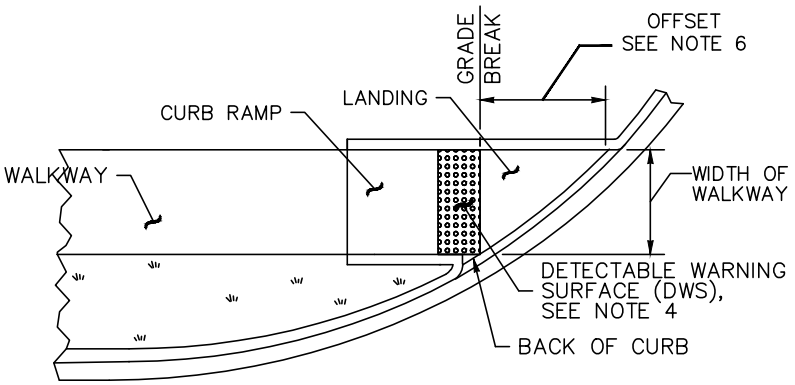
PUBLIC WORKS DIRECTOR

DETECTABLE WARNING SURFACE

DATE **XX/XX/XXXX**

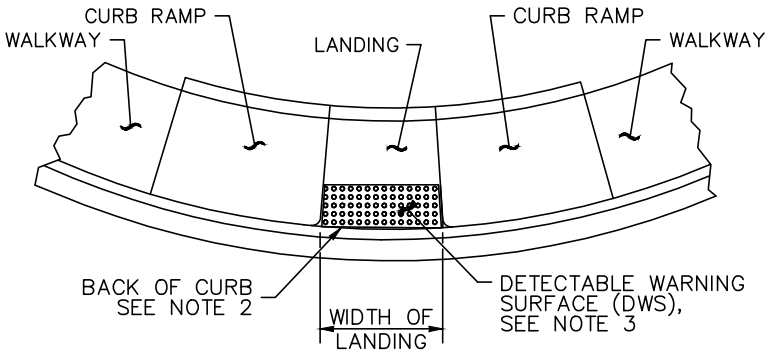
DRAWING NO. **ST-25**

REV:

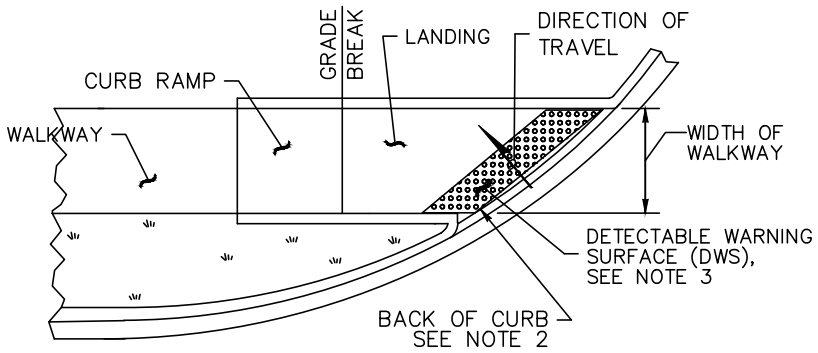


SINGLE DIRECTION CURB RAMP

(GRADE BREAK BETWEEN CURB AND LANDING ≤ 5 FT. FROM BACK OF CURB)

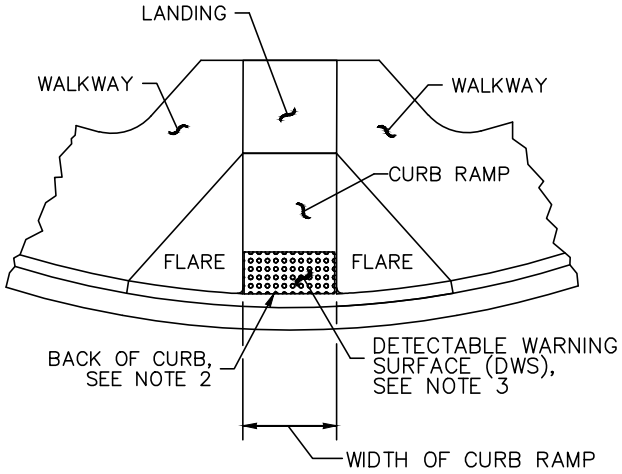


PARALLEL CURB RAMP



SINGLE DIRECTION CURB RAMP

(GRADE BREAK BETWEEN CURB AND LANDING > 5 FT. FROM BACK OF CURB)



PERPENDICULAR CURB RAMP

NO SCALE

NOTES REFERENCED ARE LOCATED ON STD. DWG. XX–XX

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

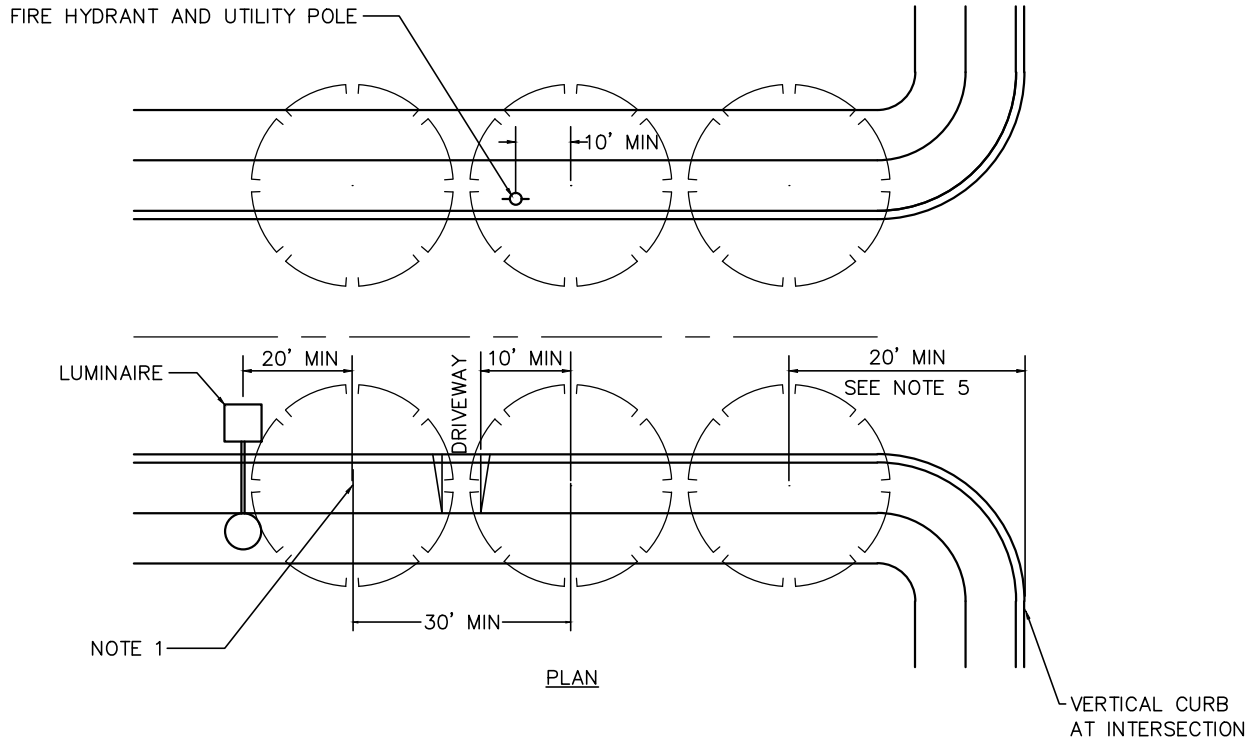
PUBLIC WORKS DIRECTOR

DETECTABLE WARNING SURFACE PLACEMENT

DATE **XX/XX/XXXX**

DRAWING NO. **ST-26**

REV:



NOTES:

1. TREES SHALL GENERALLY BE PLANTED IN THE CENTER OF THE PLANTING STRIP.
2. TREES SHALL BE STAKED IN A MANNER NOT TO OBSTRUCT SIDEWALK TRAFFIC.
3. IN CASE OF BLOCK-OUTS, MIN. CLEAR SIDEWALK WIDTH SHALL BE 5 FEET IN RESIDENTIAL OR 8 FEET IN BUSINESS DISTRICTS.
4. TREES SHALL BE PLANTED A MINIMUM OF 5 FEET FROM UNDERGROUND UTILITIES.
5. TREES SHALL NOT BE PLANTED WITHIN THE CLEAR SIGHT AREA.

NO SCALE

APPROVAL

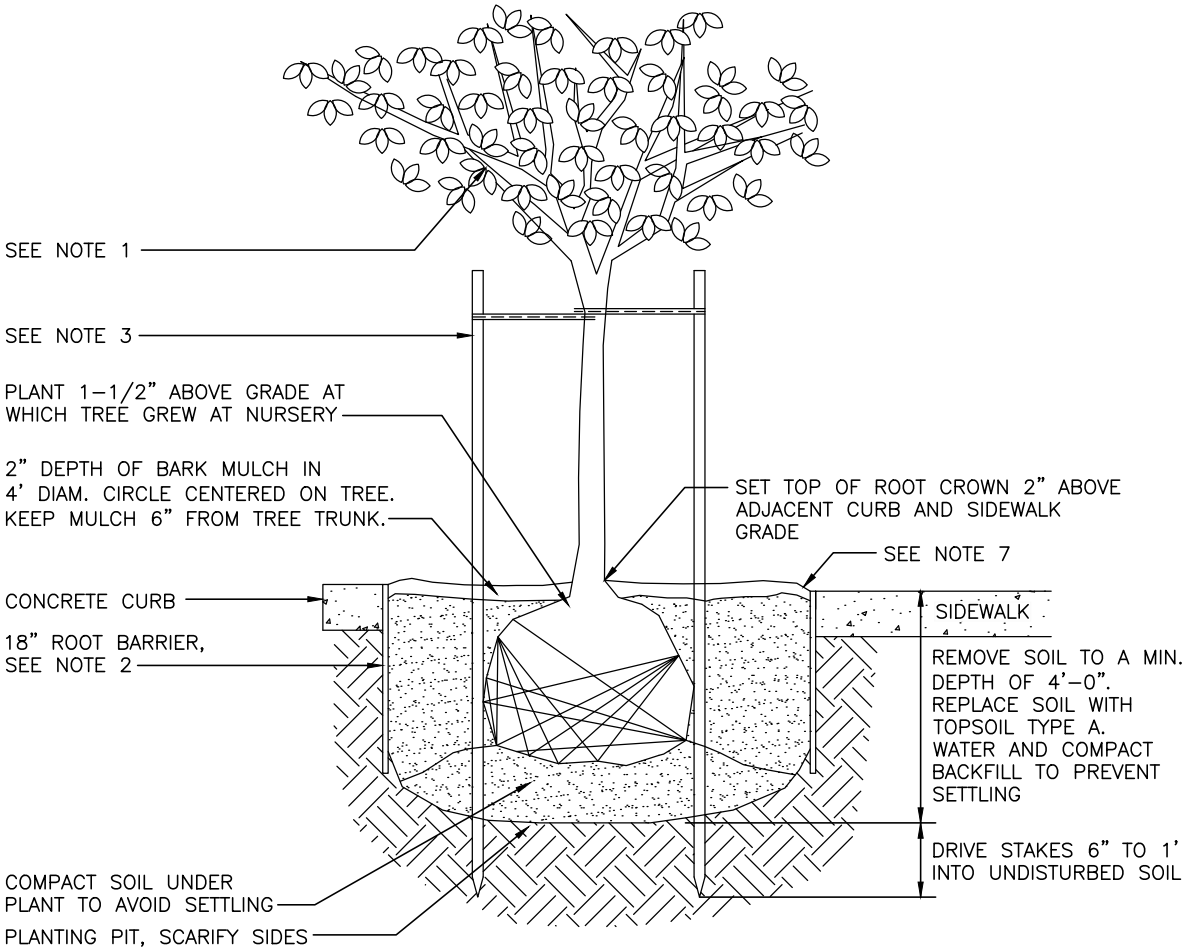
PUBLIC WORKS DIRECTOR

STREET TREE LOCATIONS

DATE
XX/XX/XXXX

DRAWING NO.
ST-27

REV:



NOTES:

1. TREE SHALL BE 2" CALIBER MEASURED 6" ABOVE THE CROWN. TREE SHALL BE IN GOOD HEALTH AND FORM AND CONFORM TO WSDA STANDARDS. SPECIES SHALL BE ON TOWN'S TREE LIST.
2. PLACE ROOT BARRIER AT EDGE OF PAVEMENT/SIDEWALK PRIOR TO PLACEMENT OF SIDEWALK OR CURB & GUTTER TO PREVENT UNDERMINING.
3. "CHAINLOCK" OR EQUAL TREE TIE MATERIAL (1" SIZE) NAIL OR STABLE TREE TIE MATERIAL TO STAKE TO HOLD VERTICALLY LOOP EACH TIE AROUND HALF TREE LOOSELY TO PROVIDE 1" SLACK FOR TRUNK GROWTH.
4. TREES SHALL BE HANDLED TO ENSURE PROTECTION AND FULL SUPPORT UNDER THE ROOT BALL AND ORIENTED TO ALIGN STRUCTURAL BRANCHES FOR OPTIMUM COMPATIBILITY WITH BUILDINGS AND ADJACENT STREET/ SIDEWALK CLEARANCES. REMOVE TWINE, BURLAP AND WIRE BASKETS TO EXPOSE THE TOP 2/3 OF THE ROOT BALL. ALL OTHER CONTAINERS, GROW BAGS AND MATERIALS USED IN THE COMMERCIAL PRODUCTION OF NURSERY STOCK SHALL BE REMOVED ENTIRELY FROM THE ROOT BALL. ROOTS SHOULD BE PRUNED, LOOSENED AND/OR STRAIGHTENED TO ENSURE PROPER GROWTH AND ESTABLISHMENT.
5. INSTALL TREE GATOR SLOW RELEASE WATERING BAG OR EQUAL ON EACH TREE. CONTRACTOR SHALL FILL BAGS A MINIMUM OF TWO TIMES PER WEEK UNTIL TOWN ACCEPTS PROJECT.
6. TOPSOIL SHALL BE 10% COMPOST AND 90% SANDY LOAM BY VOLUME, AND SCREENED THROUGH 3/8" SCREEN.
7. SHAPE SOIL SURFACE TO PROVIDE 4' DIAMETER WATERING RING 3" TO 4" HIGH.
8. A TOWN REPRESENTATIVE SHALL BE PRESENT DURING TREE PLANTING. TWO BUSINESS DAY NOTICE IS REQUIRED.

NO SCALE

APPROVAL

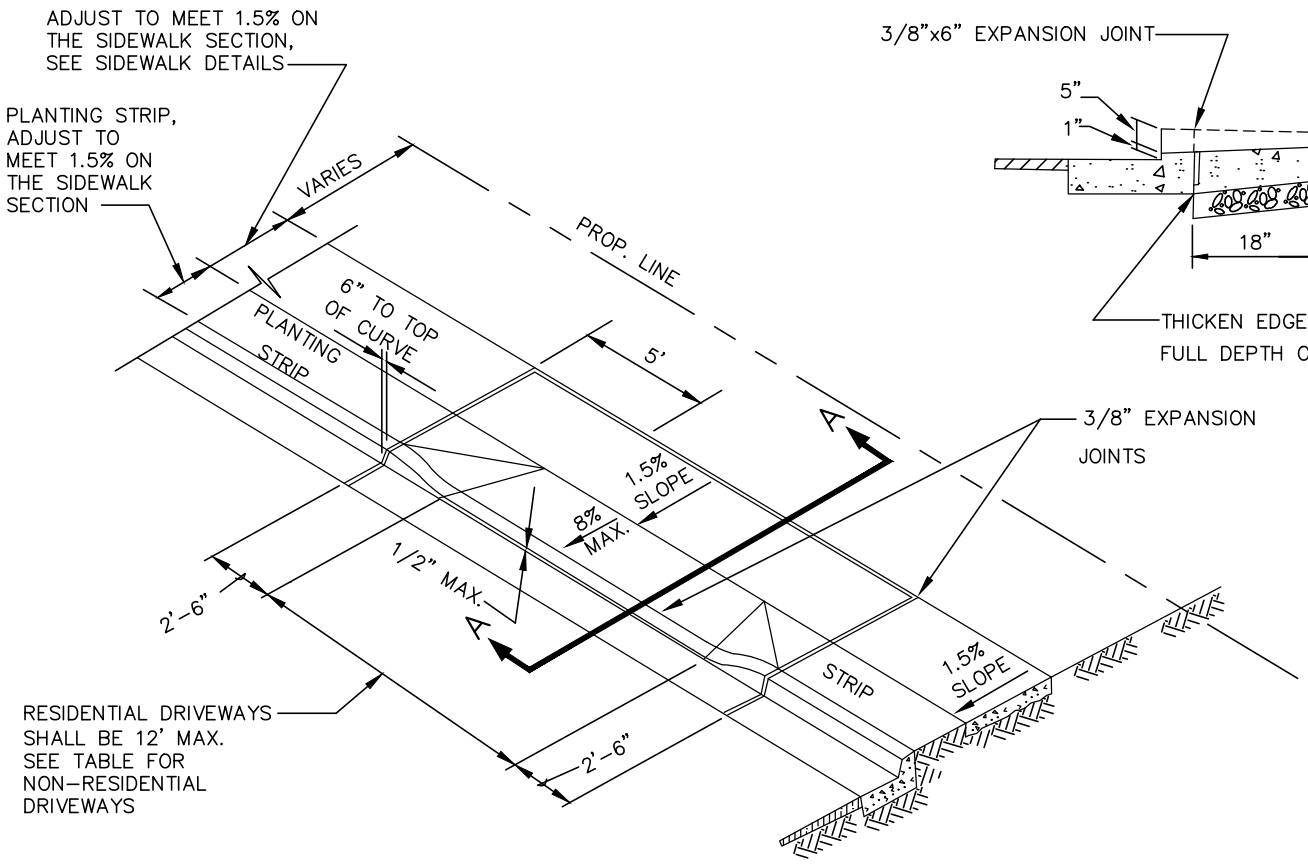
PUBLIC WORKS DIRECTOR

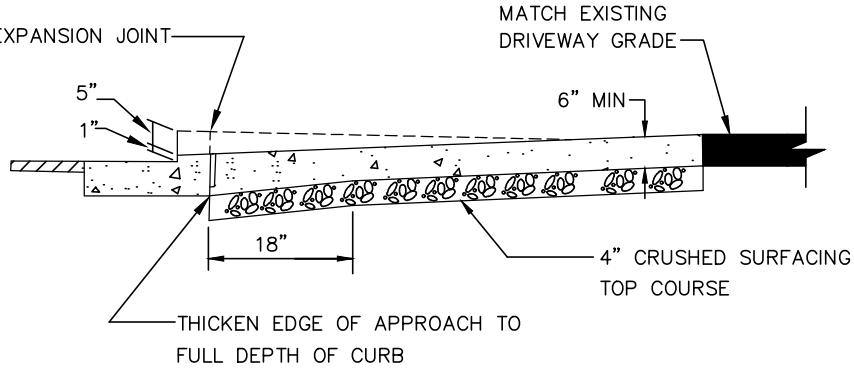
TREE PLANTING

DATE
XX/XX/XXXX

DRAWING NO.
ST-28

REV:





SECTION A–A

NON–RESIDENTIAL DRIVEWAY WIDTHS		
PROPERTY FRONTAGE	MAX # DRIVEWAYS	WIDTH (FT)
< 60'	1	24'
60'– < 120'	1	30'
120' OR GREATER	2	24'

NOTES:

1. EXPANSION JOINTS SHALL BE 3/8" PREMOLDED JOINT FILLER EXTENDING THROUGH THE FULL CONCRETE CROSS SECTIONS.
2. EXPANSION JOINTS SHALL BE PLACED IN THE CENTER OF ALL DRIVEWAYS OVER 20' IN WIDTH.
3. CONCRETE FOR DRIVEWAYS SHALL BE CLASS 3000 AIR ENTRAINED.
4. ALL EXTERNAL EDGES TO BE TROWELED WITH 1/4" RADIUS EDGER.
5. BROOMED FINISH ON DRIVEWAY AND SIDEWALK SHALL BE APPLIED PERPENDICULAR TO THE PEDESTRIAN DIRECTION OF TRAVEL.
6. 4" CSTC IS REQUIRED UNDER ALL CONCRETE.
7. 95% COMPACTION FOR SUBGRADE AND CSTC REQUIRED UNDER ALL DRIVEWAY APPROACHES.
8. CEMENT CONCRETE TRAFFIC CURB AND GUTTER IS REQUIRED.
9. RECOMMENDED MAXIMUM GRADES +/– 15% BEYOND GRADE BREAK POINT. VERTICAL CURVES NOT TO EXCEED A 3 1/4" CREST OR A 1" SAG IN A 10' CHORD.

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

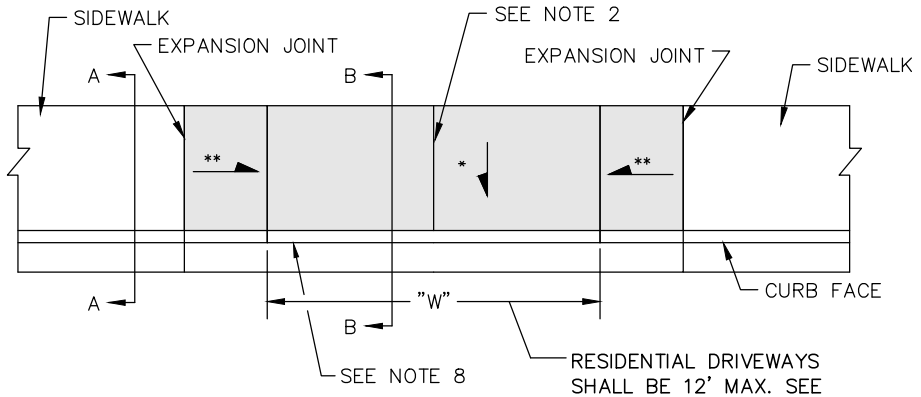
PUBLIC WORKS DIRECTOR

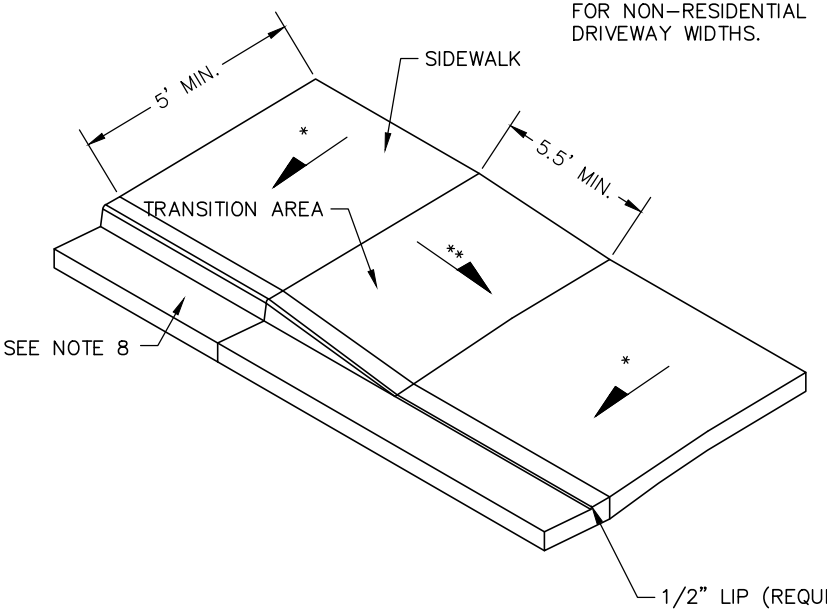
CEMENT CONCRETE DRIVEWAY W/ PLANTER STRIP

DATE XX/XX/XXXX

DRAWING NO. ST-29

REV:





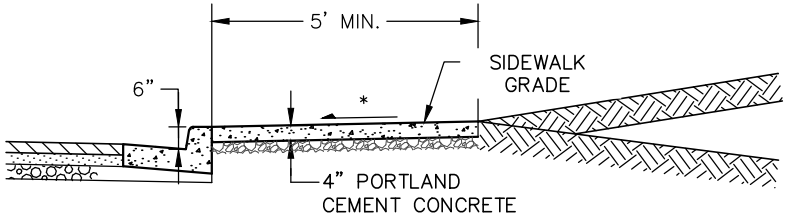
LEGEND:

* 1.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX)

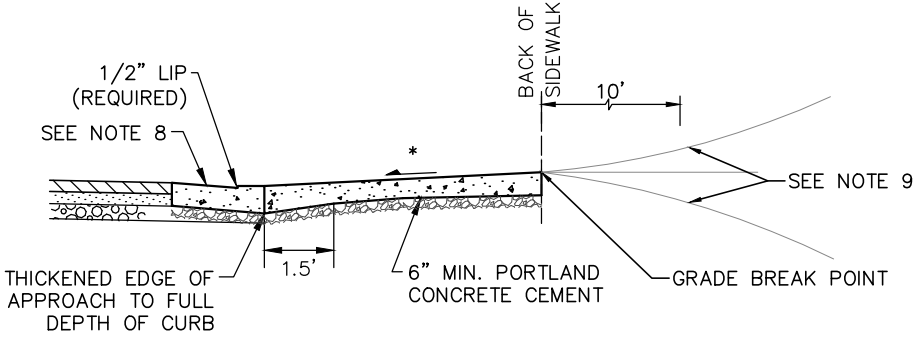
** 7.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (8.3% MAX)

NOTES:

1. EXPANSION JOINTS SHALL BE 3/8" PREMOLDED JOINT FILLER EXTENDING THROUGH THE FULL CONCRETE CROSS SECTIONS.
2. EXPANSION JOINTS SHALL BE PLACED IN THE CENTER OF ALL DRIVEWAYS OVER 20' IN WIDTH.
3. CONCRETE FOR DRIVEWAYS SHALL BE CLASS 3000 AIR ENTRAINED.
4. ALL EXTERNAL EDGES TO BE TROWELED WITH 1/4" RADIUS EDGER.
5. BROOMED FINISH ON DRIVEWAY AND SIDEWALK SHALL BE APPLIED PERPENDICULAR TO THE PEDESTRIAN DIRECTION OF TRAVEL.
6. 4" CSTC IS REQUIRED UNDER ALL CONCRETE.
7. 95% COMPACTION FOR SUBGRADE AND CSTC REQUIRED UNDER ALL DRIVEWAY APPROACHES.
8. CEMENT CONCRETE TRAFFIC CURB AND GUTTER IS REQUIRED.
9. RECOMMENDED MAXIMUM GRADES +/- 15% BEYOND GRADE BREAK POINT. VERTICAL CURVES NOT TO EXCEED A 3 1/4" CREST OR A 1" SAG IN A 10' CHORD.



SECTION A-A



SECTION B-B

NO SCALE

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

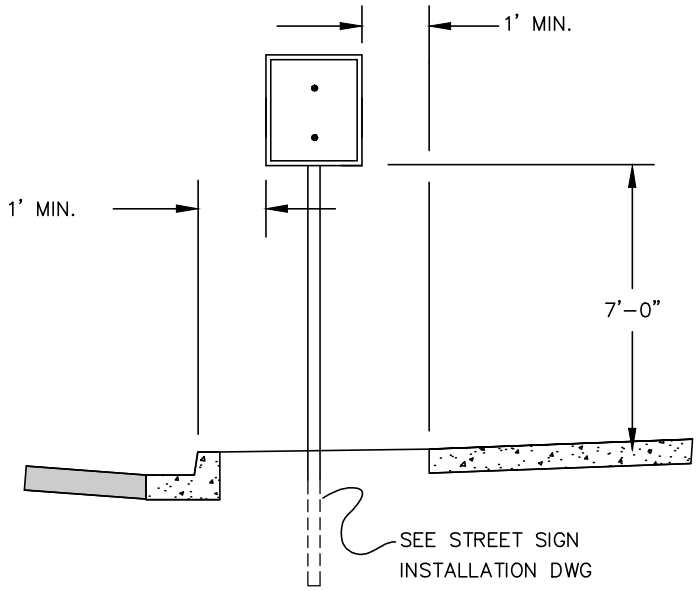
PUBLIC WORKS DIRECTOR

CEMENT CONCRETE DRIVEWAY W/O PLANTER STRIP

DATE **XX/XX/XXXX**

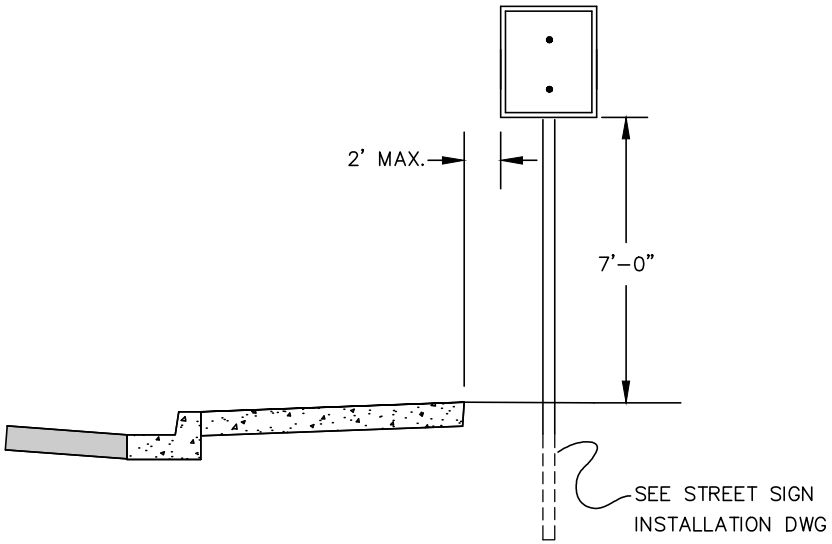
DRAWING NO. **ST-30**

REV:



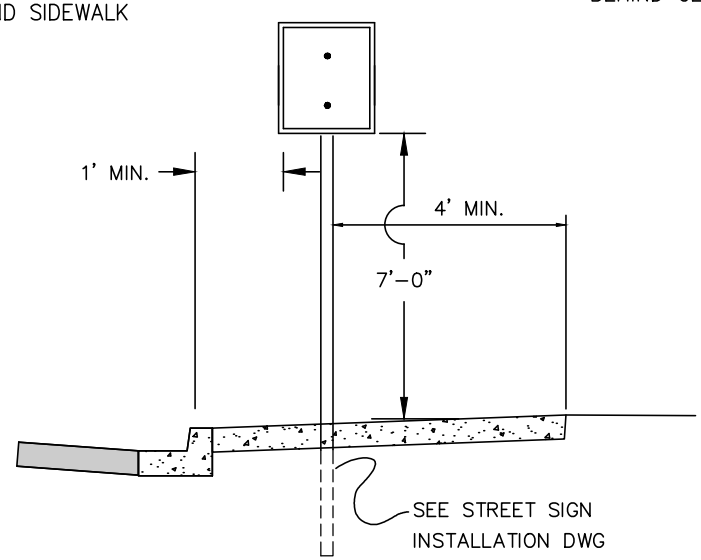
CASE 1

BETWEEN CURB AND SIDEWALK



CASE 2

BEHIND CEMENT CONCRETE SIDEWALK



CASE 3

WITHIN CEMENT CONCRETE SIDEWALK

NO SCALE

APPROVAL

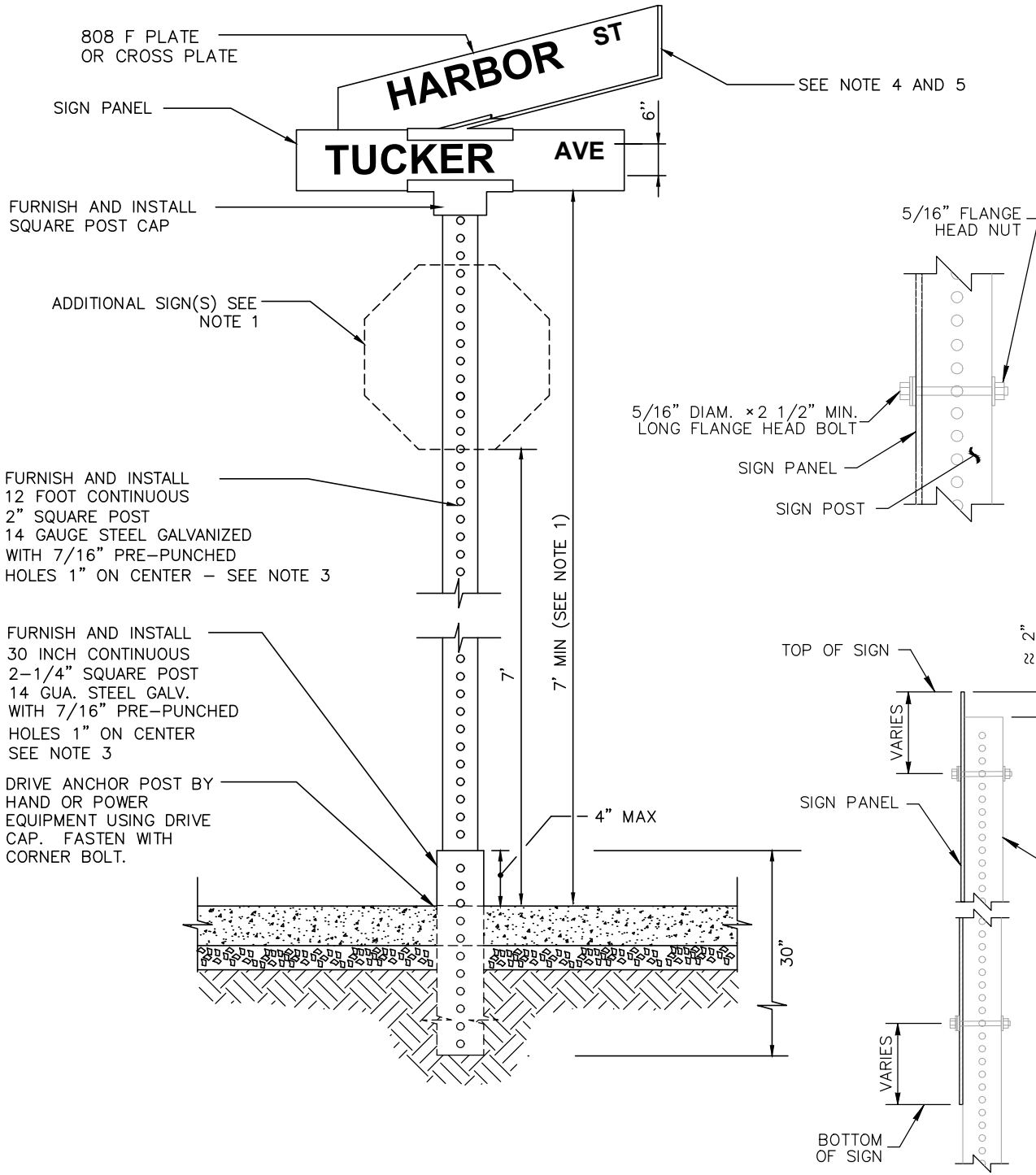
PUBLIC WORKS DIRECTOR

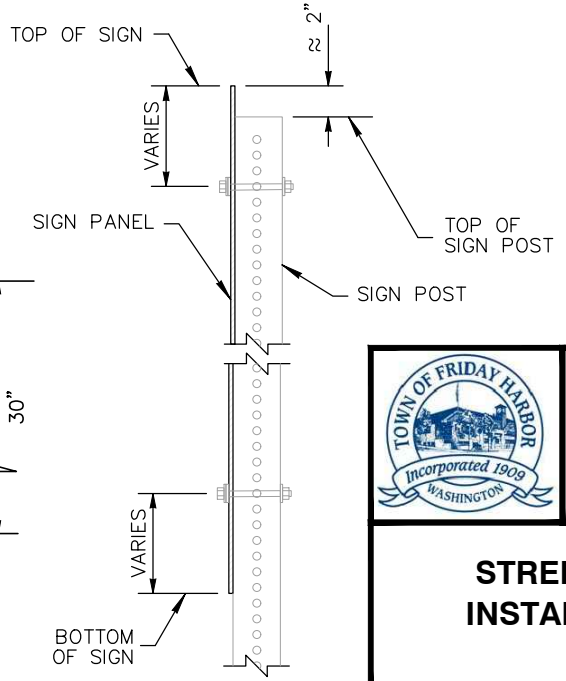
DATE
XX/XX/XXXX

SIGN LOCATION

DRAWING NO.
ST-31

REV:





NOTES:

1. IF ADDITIONAL SIGN IS MOUNTED ON POLE, HEIGHT MUST BE GREATER TO ALLOW FOR 7' OF CLEARANCE FROM BOTTOM OF SIGN TO FINISHED GRADE.
2. NEATLY SAWCUT OR LEAVE BUCK-OUT FOR SIGN POST. INSTALL EXPANSION JOINT MATERIAL AND REPLACE WITH CONCRETE.
3. POSTS AND ANCHORS SHALL BE COLORED GREEN, COLORED WITH AN ACRYLIC ENAMEL BY ELECTROD EPOSITION AND THOROUGHLY BAKED. COLOR IS PERMA-GREEN PER FEDERAL STANDARD 595-A COLOR NUMBER 14109. OBTAIN TOWN APPROVAL PRIOR TO INSTALLATION.
4. THE SHEET ALUMINUM SIGN SHALL BE CONSTRUCTED OF ALLOY 6061-T6. 5052-H36 OR 5052-H38, WITH A THICKNESS OF 0.080 IN OR 14 GUAGE.
5. SIGN FACE MATERIAL FOR POST-MOUNTED STREET NAME SIGNS SHALL BE TYPE IV WHITE SHEETING OVERLAID WITH GREEN ELECTRO CUT FILM WITH THE STREET NAME CUT OUT.
6. LETTERS SHALL BE 4" UC C SERIES, EXCEPT SUFFIXES AND PREFEIXES 3" UC C SERIES
7. ALL ROADWAYS SHALL INCLUDE THE ABBREVIATED LABEL (I.E. - COURT - CT. AVENUE - AVE. ETC.) ROADWAY LABEL SHALL BE UPPER CASE.

NO SCALE

APPROVAL

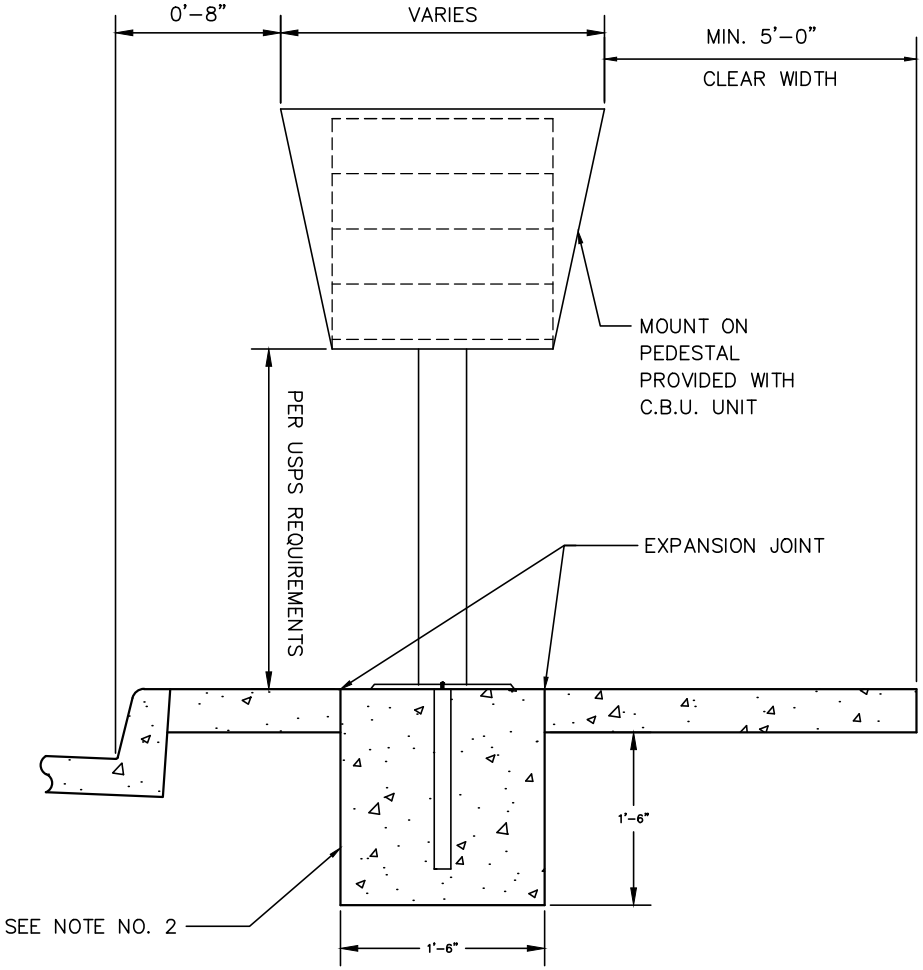
PUBLIC WORKS DIRECTOR

STREET SIGN INSTALLATION

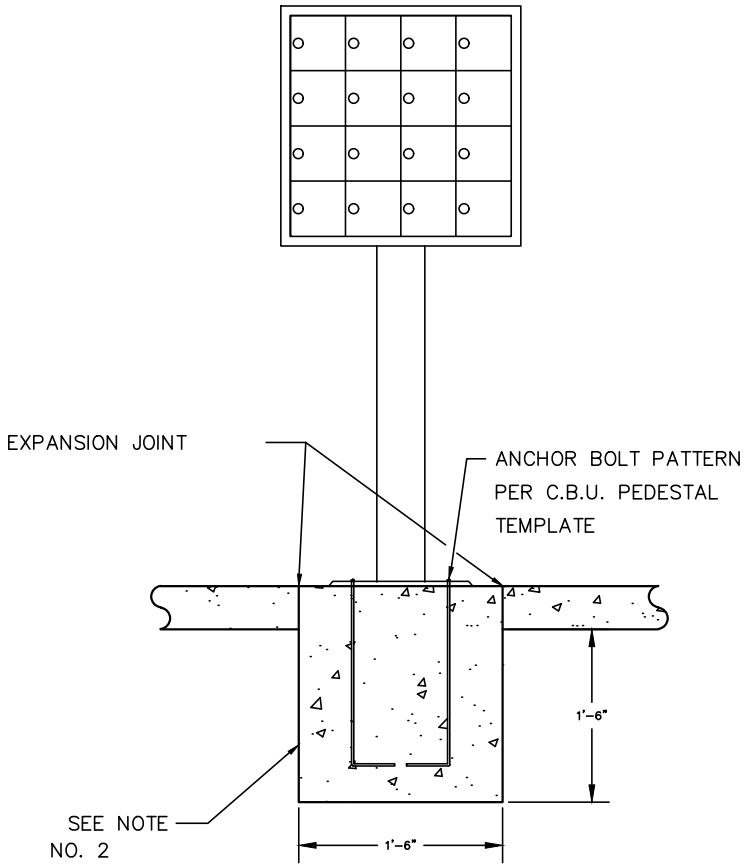
DATE
XX/XX/XXXX

DRAWING NO.
ST-32

REV:



SIDE



FRONT

NO SCALE

NOTES:

1. INSTALLATION OF C.B.U., INCLUDING CONSTRUCTION OF THE BASE, SHALL BE COMPLETED BY THE DEVELOPER.
2. MEANDER SIDEWALK AROUND MAILBOX TO MAINTAIN A MINIMUM OF 5' SIDEWALK; SEE MAILBOX SIDEWALK TRANSITION DWG.
3. COORDINATE MAILBOX LOCATION WITH LOCAL POSTMASTER AND ENSURE MAILBOX IS NOT WITHIN SIGHT TRIANGLE.
4. INSTALL USPS APPROVED MAILBOX ONLY.
5. ANCHOR BOLTS SHALL BE CUT FLUSH TO MOUNTING SURFACE.

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

PUBLIC WORKS DIRECTOR

COLLECTION BOX UNIT (C.B.U.) MAILBOX INSTALLATION

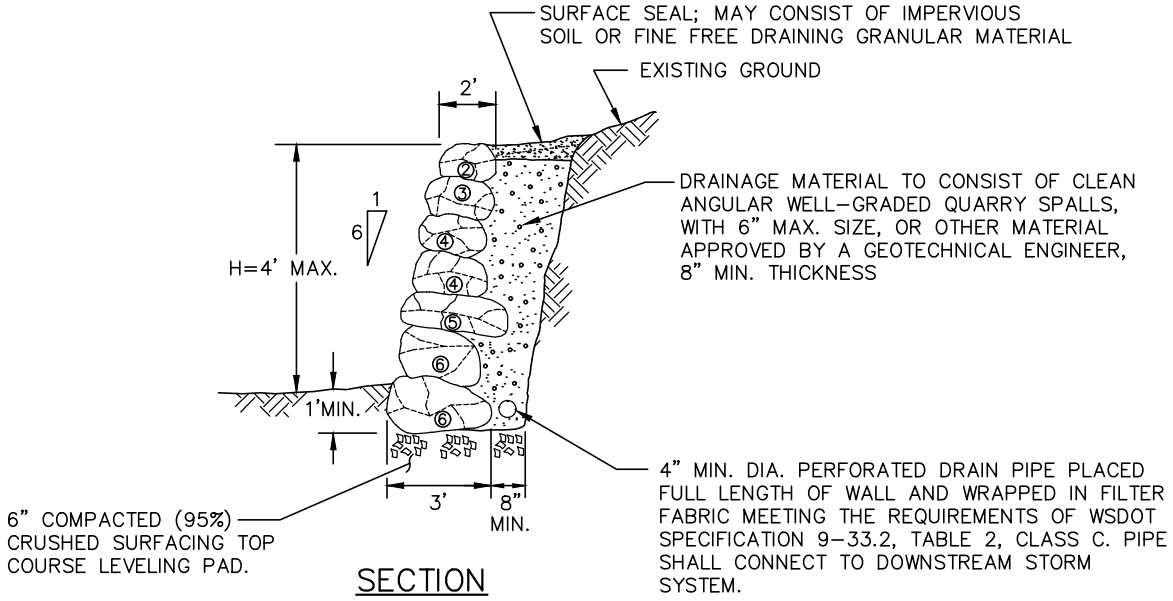
DATE XX/XX/XXXX

DRAWING NO. ST-33

REV:

NOTES:

1. FENCE OR HANDRAIL REQUIRED WHEN HEIGHT IS 30" OR GREATER.



SECTION

SIZE	APPROXIMATE WEIGHT – LBS.	APPROXIMATE DIAMETER
1 MAN	50–200	12"– 18"
2 MAN	200–700	18"– 28"
3 MAN	700–2000	28"– 36"
4 MAN	2000–4000	36"– 48"
5 MAN	4000–6000	48"– 54"
6 MAN	6000–8000	54"– 50"

NO SCALE

APPROVAL

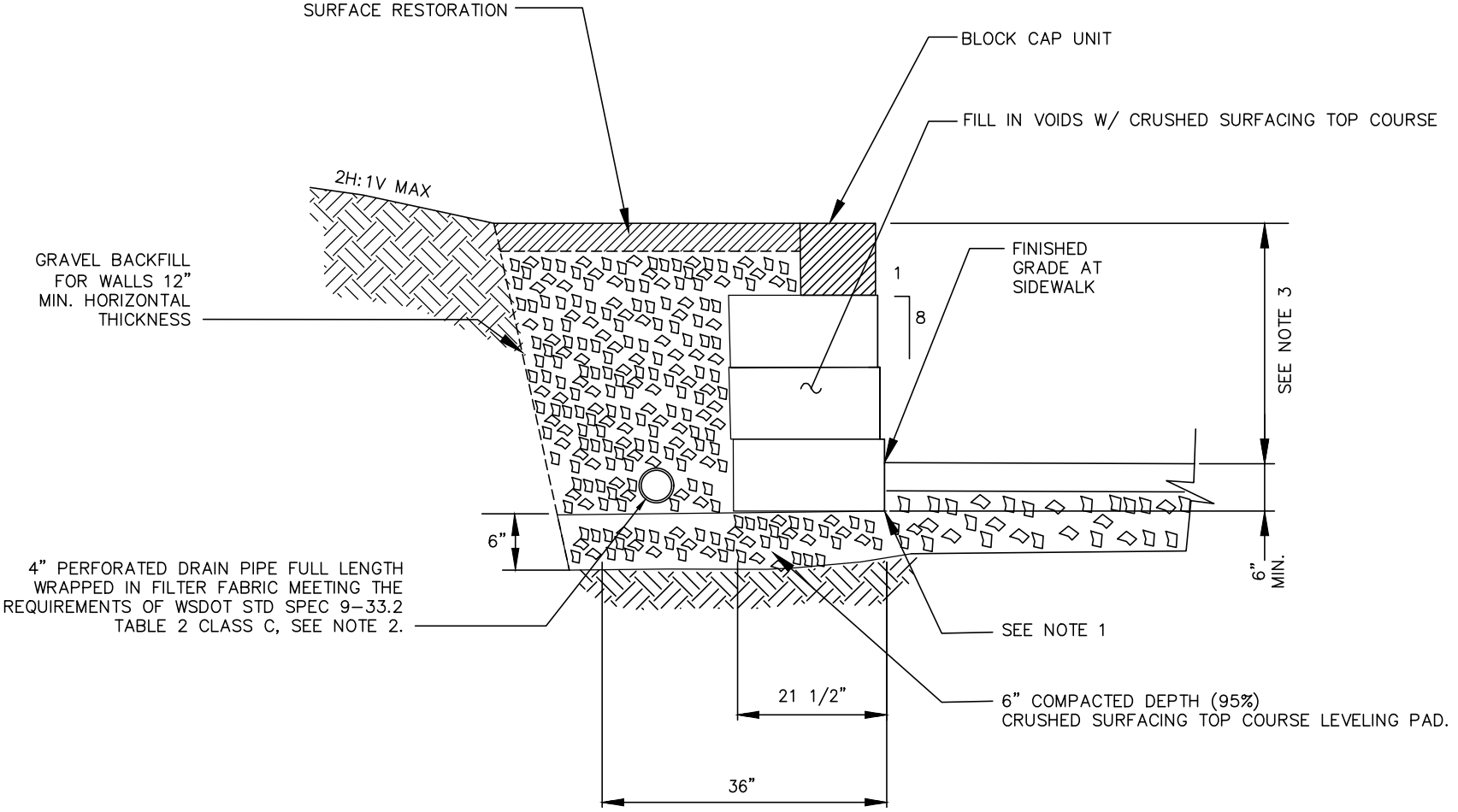
PUBLIC WORKS DIRECTOR

DATE XX/XX/XXXX

ROCK WALL

DRAWING NO. **ST-34**

REV:



MODULAR BLOCK RETAINING WALL CUT SECTION

NO SCALE

NOTES:

1. MODULAR BLOCK RETAINING WALL STANDARD BLOCK UNIT 8"X18"X21 1/2".
2. DRAIN PIPE TO CONNECT TO DOWNSTREAM STORM SYSTEM.
3. MODULAR BLOCK GRAVITY WALL EXPOSED HEIGHT SHALL BE 4' OR LESS.
4. INSTALL FENCE OR HANDRAIL IF WALL HEIGHT IS GREATER THAN 30 INCHES.

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

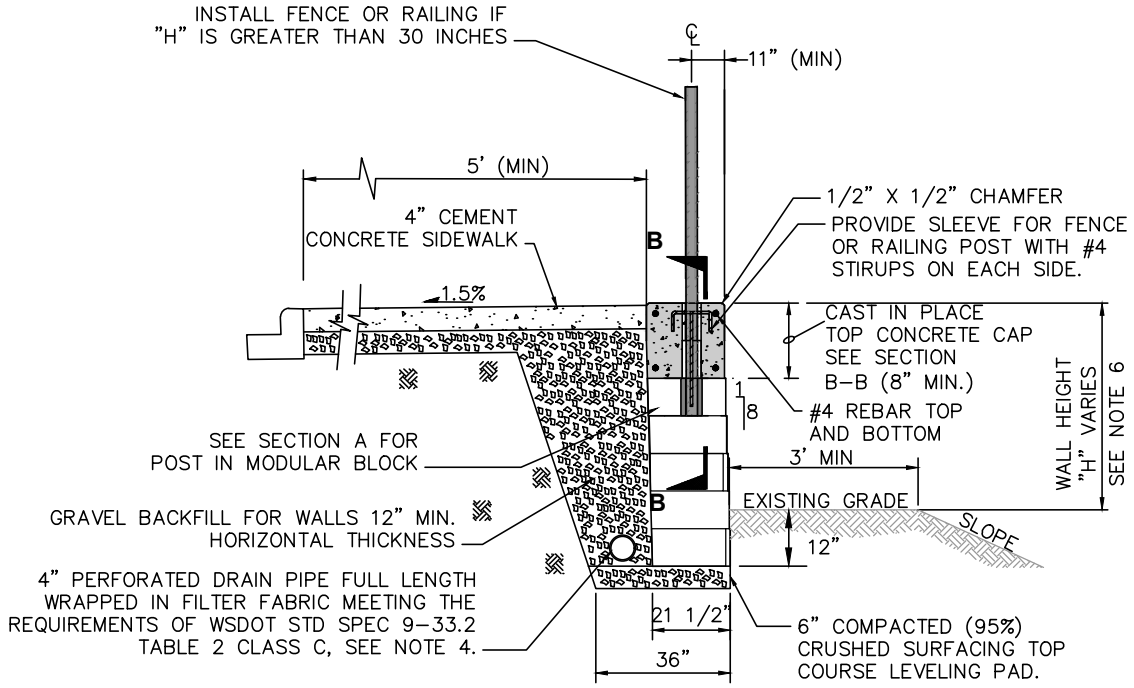
PUBLIC WORKS DIRECTOR

MODULAR BLOCK RETAINING WALL CUT SECTION

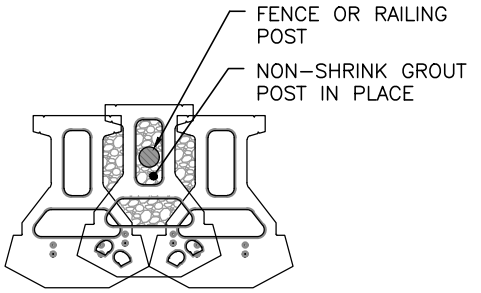
DATE **XX/XX/XXXX**

DRAWING NO. **ST-35**

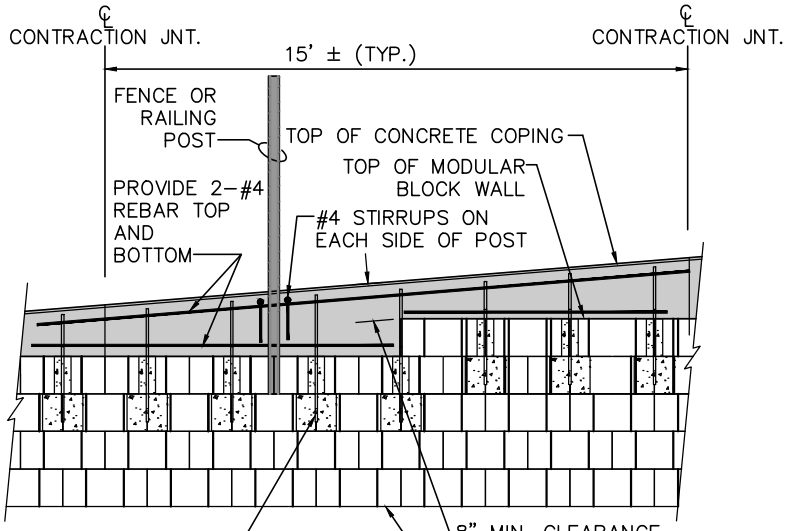
REV:



MODULAR BLOCK RETAINING WALL



SECTION A



SECTION B–B

NO SCALE

NOTES:

1. MAINTAIN 2" MINIMUM COVER ON ALL REBAR.
2. CONTRACTION JOINTS SHALL BE PLACED EVERY 15' AND AT ALL WALL RADIUS AND BEND POINTS. JOINT LOCATIONS TO MATCH SIDEWALK EXPANSION JOINTS LOCATIONS.
3. MODULAR BLOCK RETAINING WALL STANDARD BLOCK UNIT 8"x18"x21 1/2".
4. DRAIN PIPE TO CONNECT TO DOWNSTREAM STORM SYSTEM.
5. CONCRETE CAP SHALL BE CLASS 3000 PSI.
6. MODULAR BLOCK GRAVITY WALL EXPOSED HEIGHT IS 4' OR LESS.

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

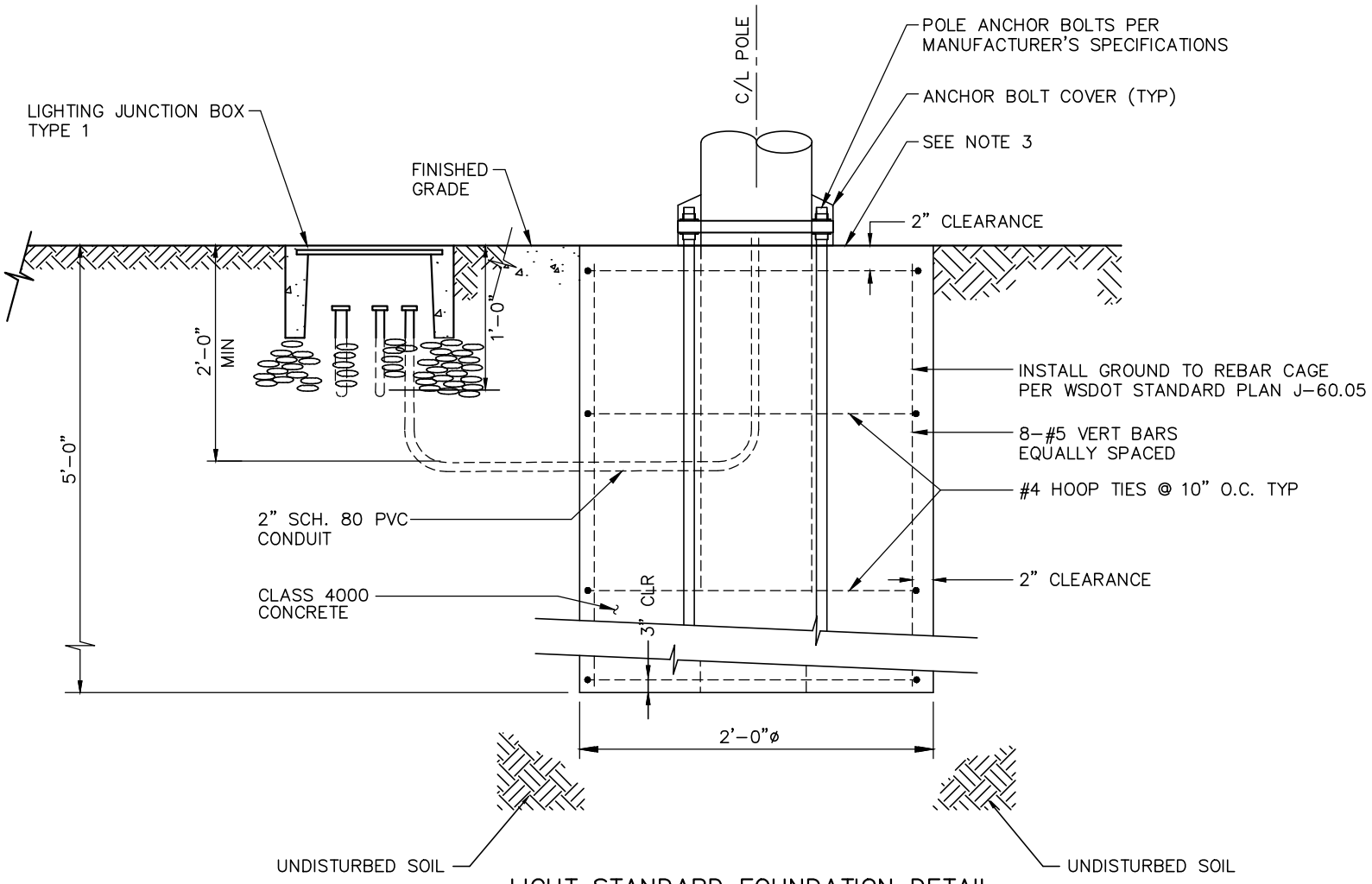
PUBLIC WORKS DIRECTOR

MODULAR BLOCK RETAINING WALL FILL SECTION

DATE **XX/XX/XXXX**

DRAWING NO. **ST-36**

REV:



LIGHT STANDARD FOUNDATION DETAIL

NO SCALE

NOTES:

1. THE ENGINEER SHALL CONFIRM THAT THE FOUNDATION WILL BE EMBEDDED IN COMPETENT SOILS WITH A MINIMUM ALLOWABLE BEARING PRESSURE OF 1,500 PSF.
2. THE FOUNDATION SHALL BE LOCATED ON LEVEL GROUND OR AT LEAST 4 TIMES THE SHAFT DIAMETER AWAY FROM THE SLOPE.
3. IF PIER IS IN SIDEWALK, PLACE A 6-INCH DEEP BY 2 FOOT SQUARE CAP OVER PIER. TOP OF SQUARE PIER SHALL MATCH SIDEWALK ELEVATION.

TOWN OF FRIDAY HARBOR Incorporated 1909 WASHINGTON

APPROVAL

PUBLIC WORKS DIRECTOR

LIGHT STANDARD FOUNDATION DETAIL

DATE **XX/XX/XXXX**

DRAWING NO. **ST-37**

REV: