



**CITY OF SEABROOK**

**SUBDIVISION DESIGN  
STANDARDS**

**JULY 2010**  
(Revision through October 2024)

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# **CHAPTER 1**

## **GENERAL AND PROCEDURE REQUIREMENTS**

## **CHAPTER 1- GENERAL AND PROCEDURE REQUIREMENTS**

### 1.1 General

- 1.1.1 These Standards describe the general requirements for the preparation of construction plans and the supporting documents required for approval by the City. Specific design requirements, in addition to these Standards, may be required.
- 1.1.2 Construction plans for public improvements within the City Limits or extraterritorial jurisdiction shall be approved by the City Engineer and staff.
- 1.1.3 Construction plans for private improvements that connect to or affect the public infrastructure shall be approved by the City as required in the site development division of these Standards.
- 1.1.4 All projects that are required to conform to these Standards shall also be in compliance with all applicable ordinances in the City. The following list of ordinances is for information purposes. This list may be expanded at any time.
  - A. Subdivision
  - B. Zoning
  - C. Flood Plain Management
  - D. Traffic
  - E. Sign
  - F. Water and Sewer
- 1.1.5 All construction plans and supporting documentation shall conform to the requirements of these Standards and regulations of all Federal, State, County, and Local entities having jurisdiction.

### 1.2 Preliminary Research

- 1.2.1 The Development Committee will be available for preliminary meetings to discuss a proposed project. This preliminary meeting between the City and the developer should be scheduled with the Department of Public Works staff prior to submittal of any documents for review. The purpose of this meeting is to discuss the project concepts and to establish the status of requirements and issues that may be pertinent to the project.
- 1.2.2 Research all existing utility and right-of-way information with City, County, State, and other public and private utility agencies listed below:
  - A. Department of Public Works
  - B. Harris County Engineer

- C. Harris County Flood Control District
- D. Texas Department of Transportation
- E. Telephone Companies
- F. CenterPoint Energy - Electric
- G. CenterPoint Energy - Gas
- H. Cable Television Companies
- I. Railroad Companies
- J. Pipeline Companies
- K. Others as applicable

### 1.3 Capacity Allocations

- 1.3.1 Construction plan approval shall not infer that capacity is committed for service to the property. A capacity allocation for service to the development shall be secured separately prior to connection to water and wastewater facilities.
- 1.3.2 Prior to beginning construction on a project, a current commitment of drainage capacity from the appropriate authority will be required.

### 1.4 Design Review Requirements for Public Works Projects

- 1.4.1 Submit three (3) copies of construction plans and supporting documentation to the Department of Public Works for review. Plans will be circulated to appropriate Departments and comments will be returned to the engineer in a timely manner. When plans are submitted that conform to these Standards, without specific approval or variance request, the Department of Public Works will make every effort possible to return plans within ten (10) working days from submittal by the developer.
- 1.4.2 A traffic impact study may be required for any development proposal expected to generate traffic volumes which will significantly impact the capacity and/or safety of the street system. All proposed developments generating volumes of 1,000 trips per day or greater shall meet this criteria. The trip estimates shall be based on the latest version of the Institute of Transportation Engineers, TRIP GENERATION MANUAL.
- 1.4.3 Submit approval letters based on the preliminary project point from all public and private utilities and other entities affected by the project. Approval letter shall state that service will be available to the project.
- 1.4.4 Confirmation in writing of preliminary approval by the Harris County Flood Control District shall be provided to the City.

- 1.4.5 After all comments have been adequately addressed, submit three (3) copies of the revised and final construction plans, with the redline plans, to the Department of Public Works for approval.
  - 1.4.6 Construction plans will be reviewed within two (2) weeks.
  - 1.4.7 Submit the original construction plan sheets to the Department of Public Works for signatures. All sheets will be signed by the City. The City signature blocks shall be provided on all sheets.
  - 1.4.8 Submit one reproducible copy of the original construction plans one reproducible reduced to eleven inches by seventeen inches (11" X 17") and a computer copy electronic copy to the Department of Public Works after the construction plans have been approved and signed by all appropriate governmental agencies.
  - 1.4.9 All separate or special easements that are required for construction shall be recorded in the Harris County Official Records prior to final approval of the construction plans.
- 1.5 Construction Procedure Requirements for Public Works Projects
- 1.5.1 Construction shall not begin until construction plans are signed by appropriate officials of the City of Seabrook. Construction shall not begin within the project until all permits and/or any right-of-way use agreements are negotiated between the effected parties.
  - 1.5.2 Notify the Department of Public Works at least forty-eight (48) hours prior to the pre-construction meeting for the project. Department of Public Works staff must attend the pre- construction meeting.
  - 1.5.3 Notify the Department of Public Works at least forty-eight (48) hours prior to beginning construction. The Department of Public Works staff will make periodic inspections. The Department of Public Works shall be notified at least twenty-four (24) hours prior to each time concrete is placed on the project.. The Department of Public, Works shall be notified at least twenty-four (24) hours prior to all pipe inspection tests and other tests that may be required.
  - 1.5.4. Notify the Department of Public Works at least forty-eight (48) hours prior to a final inspection. The Department of Public Works staff will be present during all final inspections.
  - 1.5.5 After completion of the project and prior to the final inspection, the project engineer shall provide the City one set of reproducible as-built drawings and an electronic computer aided drafting copy. Record drawings shall reflect the facilities constructed and all significant horizontal and vertical changes made from the approved plans during construction.
  - 1.5.6 For all projects, all delivery tickets for all materials (e.g., concrete, cement stabilized sand) shall be maintained by the contractor and be made available for the review of the' Department of Public Works. These delivery tickets shall be

maintained for a maximum of one year from the completion of the project.

1.5.7. An approved subdivision plat and all applicable easements shall be recorded in the Harris County Plat Records and in the Harris County Official Records prior to beginning construction.

1.5.8 Changes from approved construction plans shall be approved by the City Engineer. The Project Engineer will submit change order requests in writing to the Public Works Department. The Public Works Department will respond in writing within five (5) working days.

1.5.9 Inspection by the City of Seabrook shall be provided as set forth in this policy.

## 1.6 Approval and Acceptance of Public Works Projects

1.6.1 Public Works projects shall have final approval of the Department of Public Works prior to placing the facilities in service.

1.6.2 Final approval by the Department of Public Works shall be granted when the following items are complete:

- A. Construction is completed in accordance with the approved construction plans and final inspection items have been completed.
- B. All required information including record drawings are submitted to the Department of Public Works. Engineer shall certify the correctness of the record drawing and compliance of construction in accordance with these Standards.
- C. Street lighting plans have been approved by the city and CenterPoint Energy – Electric.
- D. Appropriate improvement bonds will be submitted to the City for the specified period. Bonds shall be provided from bonding companies holding a certificate of authority as an acceptable surety on Federal Bonds (as published annually in the Federal Register). Bonds shall be for 50% of the total cost of the improvements, and inspection fees must be paid prior to acceptance of the improvements. Additionally, there shall be a one year operating cost for street light improvement projects.
- E. All other public entities having jurisdiction have given their approval of the project.
- F. The City shall require a notarized certification from the Engineer or Contractor that all materials installed in the Project are completely in place in accordance with approved plans and specifications.
- G. The developer has paid the 1<sup>st</sup> year street light operating costs to City.

1.6.3 Final approval by the Department of Public Works will be documented in written form.

1.6.4 Public Works projects within the City of Seabrook will be subject to a maintenance period of one (1) year. An inspection prior to the end of the maintenance period of a Public Works project shall be conducted by the Department of Public Works and all other entities having jurisdiction. All required facilities, shall be operational prior to final acceptance of a project.

## 1.7 Right-of-Way Use Permits

1.7.1 Prior to construction of any facilities, including crossings within a street right-of-way, easement, and/or building line, a permit must be obtained from the Department of Public Works, Harris County, the Texas Department of Transportation, and/or governmental entity having jurisdiction.

1.7.2 Projects within the City Limits of Seabrook must obtain a right-of-way use permit from the City Council prior to installation in a public right-of-way.

1.7.3 Projects within any state highway right-of-way will require approval of the Texas Department of Transportation.

1.7.4 A request for a right-of-way use permit issued by the City of Seabrook must be submitted with complete supporting information, to the Department of Public Works, no less than ten (10) working days prior to the City Council meeting proposed for action on the item. Incomplete submittals will be rejected until all items are adequately addressed by the Project Engineer. Staff will review the item and submit comments to the Owner and to the City Council meeting proposed for action on the item. Incomplete submittals will be rejected until all items are adequately addressed by the Project Engineer. Staff will review the item and submit comments to the Owner and to the City Council prior to the Council meeting. Council will act on the request and a certified copy of the City Council meeting minutes and/or the right-of-way use permit will be provided to the Owner.

1.7.5 The Owner or authorized agent shall submit plans and supporting documents. The Owner or authorized agent shall be responsible for location of all facilities in the area of construction. All disturbed areas are to be restored after construction.

1.7.6 Private facilities permitted within a public right-of-way shall be the maintenance responsibility of the private entity. If private facilities are not maintained in good order, the permit shall be void and the facilities shall be removed at the expense of the private entity. Upon request of the City, or entity having jurisdiction, facilities shall be removed, relocated or replaced at no cost to the City.

## 1.8 Approvals and Variances

1.8.1 Approvals required in these Standards are the responsibility of the Owner. Failure to obtain appropriate approvals may be grounds for suspension of construction until appropriate approvals are granted. Specific approval, is required for items that are described in these Standards. Items that do not conform to these Standards and are not allowed by specific approval shall be submitted for a variance request.

- 1.8.2 Specific approval, as required by these Standards, shall be specifically requested by the Owner prior to or at the time of submittal of review plans for the project. All specific approval items shall be granted by the City Engineer in writing.
- 1.8.3 Construction work related to any specific approval item that has not been approved in writing should not begin until the City Engineer has granted approval in writing. Any work that proceeds without specific approval will be subject to removal and replacement in accordance with these Standards.

Materials and manufactured items used in construction of a Public Works project shall be approved by the Department of Public Works prior to installation. Water and sanitary sewer system appurtenances shall be subject to the approved items as listed in the Approved Products List available from the Department of Public Works. Items not appearing on the approved list shall not be used for construction of public works facilities in the City.

The Approved Products list may be expanded to include additional items with approval of the Department of Public Works. Products proposed for approval by the Department of Public Works shall be locally available from a reputable supplier. A complete submittal of information regarding the proposed approved product and samples of the product shall be submitted to the Department of Public Works for review. The Department of Public Works shall review the product information- Final approval of the product for use in construction of public works facilities shall be provided in writing by the Department of Public Works.

## 1.9 Variances

Construction plans that do not conform to these Standards, not including items that allow for specific approval by staff, shall be submitted for approval of the variance. Variances to these Standards shall be submitted to the City Council. All variances shall be submitted to the Department of Public Works in writing at least ten (10) working days prior to action by the City Council. Variance requests should be submitted with pertinent construction plans, right-of-way use permit or other pertinent information. Incomplete variance requests will be rejected until all items are adequately addressed by Project Engineer and the Developer. Staff will prepare recommendations to the Council regarding the variance. Construction work related to the variance should not begin prior to approval of a variance. Any work related to the variance that proceeds without approval of a variance shall be subject to removal and replacement in accordance with these Standards.

## **CHAPTER 2**

# **CONSTRUCTION PLAN AND MISCELLANEOUS REQUIREMENTS**

## **CHAPTER 2 - CONSTRUCTION PLAN AND MISCELLANEOUS REQUIREMENTS**

### 2.1 Required Plan Sheets

2.1.1 Cover sheet

2.1.2 General Notes

2.1.3 Final plat (Recorded print shall be included in the record drawings)

2.1.4 Construction notes and legend

2.1.5 Overall plans for proposed improvements

2.1.6 Drainage area map

2.1.7 Lot grading plan

2.1.8 Plan and profiles

2.1.9 Specific construction details

2.1.10 Standard Public Works construction details

### 2.2 Drawing Requirements

2.2.1 The seal, date, and original signature of the engineer responsible for preparation of the plans is required on each sheet. The engineer may use a stamped or embossed imprint for his/her seal, however, the embossed imprint must be shaded such that it will reproduce on prints.

2.2.2 A bench mark elevation and description is required on each sheet.

2.2.3. Label each plan sheet as to street right-of-way widths, pavement widths and thickness, type of roadway materials, curbs, intersection radii, curve data, stationing, existing utilities type and location, etc.

2.2.4 Stationing must run from left to right except for short streets or lines originating from a major intersection where the full length can be shown on one sheet.

2.2.5 A north arrow is required on all sheets and should be oriented either upward or to the right. This requirement may be waived under the following conditions: a storm or sanitary sewer whose flow is from west to east or from south to north and a primary outfall ditch whose flow is from west to east or from south to north.

2.2.6 Show all lot lines, property lines, rights-of-way lines, and easement lines.

2.2.7 A cover sheet shall be required for all projects involving three or more plan and profile sheets. All plan sheet numbers should be included on the cover sheet. A vicinity map should always be included to show the project location. A City of Seabrook approval block shall be provided for signatures by the appropriate city

officials.

- 2.2.8 If a roadway exists where plans are being prepared to improve or construct new pavement or to construct a utility, this roadway should be labeled as to its existing width, type of surfacing, and base thickness, if available.
- 2.2.9 Plans prepared for the City shall be prepared using permanent ink, photographic or other approved process on mylar.
- 2.2.10 Do not place match lines in intersections.
- 2.2.11 Service areas shall be delineated on the cover sheet or area map.
- 2.2.12 All utility lines four inches (4") in diameter or larger within the right-of-way or construction easement should be shown in the profile view. All utility lines, regardless of size, should be shown in the plan view.
- 2.2.13 Show flow line elevations and direction of flow of all existing ditches.
- 2.2.14 Show natural ground profiles along the centerline of each right-of-way or easement line except as required below. When there is difference of 0.50 feet or more from one right-of-way or easement line to the other, show dual right-of-way profiles.
- 2.2.15 Resolve all known conflicts of proposed utilities with existing utilities.
- 2.2.16 Plans shall be on standard twenty-two inch by thirty-four inch (22" x 34") drawing sheets.
- 2.2.17 Details of special structures not covered by approved standard drawings, such as stream and gully crossing, special manholes, etc., should be drawn with the horizontal and vertical scales equal to each other.
- 2.2.18 Plans shall be drawn to accurate scale, showing proposed pavement typical cross-sections and details, lines and grades, and all existing topography within the street rights-of-way; and at intersections, the cross street shall be shown at sufficient distance in each direction along the cross street for designing adequate street crossings.
- 2.2.19 Grades should be labeled for the top of curb except at railroad crossings. Centerline grades are acceptable only for paving without curbs and gutters.
- 2.2.20 Curb return elevations and grades for turnouts shall show in the profile.
- 2.2.21 Gutter elevations are required for vertical curves where a railroad track is being crossed.
- 2.2.22 The surface elevation at the property line of all existing driveways should be shown in the profile.
- 2.2.23 Station all esplanade noses affected by proposed construction, both existing and

proposed.

2.2.24 Station all points of curvature, points of tangency, radius returns and grade change, points of intersection in the plan view. Station all radius returns and grade change points of intersection in the profile with their respective elevations.

2.2.25 The standard scales permitted for plans and profiles of paving and utility plans are as follows:

A. Major thoroughfares or special intersections/situations

1" = 2' Vertical; 1" = 20' Horizontal

B. Minor streets:

1" = 5' Vertical; 1" = 50' Horizontal

or

1" = 4' Vertical; 1" = 40' Horizontal

(for reconstruction on minor streets, a larger scale may be required to show detail.)

C. The scales described above are the minimum allowable. Larger scales may be required to show details of construction.

D. Deviations to these scales can only be allowed with the specific approval of the Department of Public Works.

2.2.26 In addition to the plan and profile sheets described above, each set of construction drawings shall contain paving and utility key drawings indexing specific plan and profile sheets. Key overall layouts may be drawn at a scale of one inch equals one hundred feet (1" = 100') or one inch equals two hundred feet (1" = 200').

2.2.27 Standard City details, where applicable, shall be included.

2.2.28 Construction plans shall include a legend describing standard symbols that may not be described in the plans.

2.2.29 All property ownership and easement information will be shown in the construction plans. Harris County recording information shall be shown in the construction plans. When ownership, easement, and right-of-way recording information is not shown on the plat included in the plans, this information will be shown on the construction plan sheets.

## 2.3 Graphic Standards

The graphic standards to be used in the preparation of construction plans are provided in Appendix A.

## 2.4 Easements

- 2.4.1 All easements and recording information, existing and proposed, shall be shown in the construction plans in accordance with Section 2.2.29.
- 2.4.2 Storm sewer, sanitary sewer, and water line easements shall be dedicated for the specific intended use. Easements for a specific facility shall be exclusive and shall not overlap other easements, except to cross the easements.
- 2.4.3 Public utility easement requirements for a sixteen-foot (16') easement are as outlined in the "typical Utility Location in 10-Foot Wide and 16-Foot Wide Easement Back-to-Back Lots and Perimeter Lots" drawing prepared by the utility Coordinating Committee for Metropolitan Area, effective June 1, 1971. The public utility easement width for dry distribution lines may be ten feet (10'). Perimeter easement may be eight feet (8') by eight feet (8'), provided that the easement is dedicated by separate instrument or special notes on the plat.
- 2.4.4 Water line easements - the following minimum width easements are required when facilities are not located within public street rights-of-way or water line easements:
- A. Fire hydrants located outside of public rights-of-way or water line easements shall be encompassed by a ten-foot by ten-foot (10' x 10') exclusive, easement. Fire hydrants shall not be located within any other type of easements.
  - B. Water meter easements shall be exclusive and should be located adjoining a public right-of-way or water line easement.
  - C. Two-inch. (2") and smaller meters serving non-residential and multi-family developments shall be set in five-foot by five-foot (5' x5') exclusive water meter easements.
  - D. Three-inch (3") and larger meters shall be set in a minimum of ten-foot by twenty-foot (10' x 20') exclusive, water meter easements.
  - E. When specifically approved by the Department of Public Works, water mains may be located in the easements not adjacent to public street rights-of-way. These water mains shall be centered in a sixteen-foot (16') wide exclusive easement restricted to water only.
  - F. For new construction, any water main, except at a flush valve, located less than five feet ( 5') from the right-of-way shall have a water line easement adjoining the right-of-way. Water line easements adjoining a right-of-way for mains smaller than twelve inches (12") shall have a minimum width of five feet (5'). For mains greater than twelve inches (12") in diameter, the easement adjoining the right-of-way shall have a minimum width often feet (10').
  - G. Water mains may be located at the center of a ten-foot (10') water line easement, provided the easement adjoins the public right-of-way.

- 2.4.5 Sanitary Sewer Easements - the following minimum easement widths are required for the type of service:
- A. Rear lot easements combining utilities with buried electric service and sanitary sewers of eight inches (8") and ten inches (10") in diameter shall have a minimum width of sixteen feet (16').
  - B. The total width of the easements as specified in paragraph A above shall be at least equal to the depth of the proposed sewer line.
  - C. The width of all exclusive sanitary sewer easements shall be equal to the depth of the sewer from finished grade plus two (2) pipe diameters. Sewer shall be located in the center of the easement. The minimum width of a sanitary easement shall be sixteen feet (16') when split along a lot line, and ten feet (10') wide for easements located within a single lot.
  - D. Exclusive sanitary sewer easement adjoining a public right-of-way may be five feet (5') wide provided the sewer is at least five feet (5') from the edge of the easement and the sewer is no deeper than ten feet (10'). Sewers at greater depth than ten feet (10') shall be centered within an exclusive easement parallel and adjoining the right-of-way as described in Section 2.4.5 C.
  - E. Exclusive easements for force mains of all sizes shall have a minimum width easement of sixteen feet (16') for a single force main where the force main is not located adjacent to a public right-of-way. Where the force main is located in an easement adjacent to public rights-of-way, the force main may be located at the center of a ten-foot (10') easement. Where the force main is located less than five feet (5') from the right-of-way, the minimum easement width shall be five feet (5') adjacent to the right-of-way.
  - F. Combined storm and sanitary sewer easement shall have minimum widths as required in Section 2.4.6 for storm sewer easements. Additionally, the sanitary sewer main, trunk or force main shall be located such that the centerline of the pipe shall be at least half the width of the easement, defined in Section 2.4.5 C, but not less than seven and one-half feet (7.5'), from the edge of the easement.
  - G. For combined storm and sanitary sewer easements located adjacent to public rights-of-way where the sanitary sewer is located along the outside of the easement, the centerline of the sanitary sewer pipe shall be at least half the width of the easement defined in Section 2.4.5 C, but not less than seven and one-half feet (7.5') from the outside edge of the easement.
  - H. Where sanitary sewers or force mains are installed in easements separated from public rights-of-way by other private or utility company easements, the sanitary sewer easement should be extended along or across the private utility company easement to provide access for maintenance of the sewer or force main.

2.4.6 Storm Sewer Easements - the following minimum easement widths are required:

- A. The minimum width shall be twenty feet (20') with the storm sewer centered in an exclusive easement, except as specifically approved by the Department of Public Works.
- B. For storm sewers greater than ten feet (10') and less than fifteen feet (15') in diameter or width, the minimum width of an exclusive easement shall be twenty-five feet (25').
- C. For storm sewer greater than fifteen feet (15') in diameter or width, the minimum width of an exclusive easement shall be determined by the Department of Public Works.
- D. For storm sewers whose depth to flow line is greater than fifteen feet (15'), add five feet (5') to the minimum easement width specified in section 2.4.6 A and/or 2.4.6 B, above.
- E. For all easements specified in section 2.4.6, a minimum distance of five feet (5') must be maintained from the easements line to the outside edge of the storm sewer.
- F. Where approvals are granted for a special use or combination along side lot or back lot, the minimum width shall be twenty- five feet (25'). The easement width shall meet or exceed all other easement requirements.
- G. For specifically approved storm sewers located in an exclusive easement adjacent to public rights-of-way, the minimum easement width shall be ten feet (10'). The easement width shall meet or exceed all other easement requirements.

2.5 Utility Locations

2.5.1 The utility locations for back lot easements are outlined in the "Typical Utility Location in 10-Foot Wide and 16-Foot Wide Easement Back-to-Back Lots and Perimeter Lots" drawing prepared by the Utility Coordination Committee for Metropolitan Area effective June 1, 1971. A portion of the Utility Coordination Committee drawings are provided in Appendix B.

2.5.2 All utilities shall be underground with the exception of electric primary lines. The electric primary lines, defined as feeders or three phase lines, should be located around the subdivision perimeter whenever possible.

2.5.3 Water Main Location

- A. All water mains shall be located within a public right-of-way or within dedicated water main easements. The location of water mains within a public street right-of-way is described in Section 3.3.
- B. Water mains shall not be located in combination easements without the

specific approval of the Department of Public Works.

#### 2.5.4 Sanitary Sewer Location

- A. Sanitary sewer laterals less than ten inches (10") in diameter and less than eight feet (8') deep may be located within the back lot easement as described in Section 2.5.1.
- B. Sanitary sewers of twelve inches (12") or larger in diameter are usually located within a public right-of-way or an easement adjoining the right-of-way. Large sanitary sewers shall be located within the public street right-of-way in accordance with Section 4.3.1. Sanitary sewers may be located in exclusive or combination easements easement widths comply with Section 2.4.5.
- C. Sanitary sewers shall not be located in side lot easements without the specific approval of the Department of Public Works.
- D. Sanitary sewers should be located within the right-of-way between the property line and the back of curb on the opposite side of the right-of-way from the water main.

#### 2.5.5 Storm Sewers

- A. Storm sewer shall be located in the public street right-of-way in accordance with Section 5.3.
- B. All storm sewer lines shall be located within public rights-of-way or approved easements. Placement of a storm sewer in side lot and back lot easements is discouraged. Specific approval of the Department of Public Works for the use of side lot or back lot easements for storm sewers should be obtained prior to plan preparation.
- C. For boulevard paving sections with esplanades, the storm sewer is usually located in the center of the esplanade.

### 2.6 Private Facility Locations (Not Including Landscaping)

- 2.6.1 Installation of private facilities, including utilities, in public road rights-of-way and their adjoining easements shall be approved by the City.
- 2.6.2 Private facilities shall not conflict with other facilities in the right-of-way and shall not be located in exclusive easements as required in these Standards. All structures within the public right-of-way shall be approved by the Department of Public Works and shall be located so as to not interfere with existing or proposed public facilities.
- 2.6.3 All facilities in the right-of-way shall be located at least two feet (2') behind the curb and all underground facilities in the right-of-way shall be located at least two and one-half feet (2.5') below the top of curb on a public street.

- 2.6.4 Private facilities shall be constructed in accordance with construction plans approved by the Department of Public Works.
- 2.6.5 Landscaping within the public right-of-way or adjoining easements shall not affect public utilities or traffic visibility. (Reference - visibility criteria in the Major Thoroughfare Plan).

## 2.7 Crossings

### 2.7.1 Highway Crossings - All State and County Roads

- A. State Highway crossings shall be constructed in conformance with the requirements of the Texas Department of Transportation.
- B. A water main shall be encased in a steel pipe casing extending at least five feet (5') from outside edge of each service road or outside edge of pavement, across the right-of-way to a similar location on the other side of the highway. For highway or roadway crossings with open ditches, the casings shall extend from right-of-way line to right-of-way line.
- C. County road crossing shall be constructed in accordance with the requirements of Harris County.
- D. Where additional right-of-way has been acquired or will be required for future widening, the casing, where required, should be carried to within ten feet (10') of each future right-of-way line.

### 2.7.2 Street Crossings

- A. Water main crossings under Harris County and Texas Department of Transportation roadways may require encasement. If required, the encasement shall meet the requirements outlined in the City construction detail for "Water Main Encasement".
- B. Conduits and sewers that do not carry liquid under pressure may be bored and jacked into place without an encasement pipe.
- C. Crossings under existing concrete streets, other than major thoroughfares, shall be constructed by boring and jacking. P.V.C. pipe shall be jacked into place using equipment designed for that purpose. Water may be used to facilitate the boring and jacking operations. Jetting the pipe main into the place will not be permitted. When conditions exist that warrant open cut across an existing street, the Department of Public Works shall specifically approve the crossing.
- D. All open cut installations under existing or proposed streets shall be backfilled as shown in the City Construction Details. Cement stabilized sand backfill shall meet the requirements of Section 4.2.2.
- E. All street crossings shall be constructed in accordance with construction

plans approved by the City. All street crossings shall be inspected by the Department of Public Works. All street crossings shall meet the requirements of these Standards.

### 2.7.3 Railroad and Pipeline Crossings

- A. For railroad crossings, the carrier pipe shall be encased in steel pipe casing extending from right-of-way line to right-of-way line.
- B. All construction within the railroad or pipeline right-of-way shall conform to minimum requirements set out in the agreement with the owner of the right-of-way.

### 2.7.4 Ditch and Stream Crossings

- A. Crossing under a stream or ditch is preferred by the City. The top of the carrier pipe shall be designed to provide a minimum clearance of at least four feet (5') below the ultimate flow line and sides of the ditch and with sufficient bottom length to exceed the ultimate future ditch sections.
- B. Where existing or proposed bridges have sufficient space and structural capacity for installing water mains or conduits (twelve inches (12") or smaller) under the bridge, but above the top of the bent cap elevation, such installation will be permitted upon specific approval of the construction plans by the City of Seabrook Public Works Department. In all cases, the water main or conduit shall be above the bottom chord of the bridge and eighteen inches (18") above the 100-year water surface elevation. All conduits attached to a bridge shall be constructed using steel pipe and shall extend a minimum of ten feet (10') beyond the bridge bent or to the right-of-way line, whichever is greater. All conduit attached to a bridge shall be maintained by the owner of the conduit or will be subject to removal.
- C. Separate, free-standing crossings across drainage ways are not allowed.
- D. All stream or ditch crossings shall be constructed of steel pipe from right-of-way line to right-of way line.

## 2.8 Trench Safety

All construction within the City shall conform to the requirements for trench safety. Trench safety is required for all excavations greater than five feet (5') in depth. Adequate details for construction in accordance with applicable OSHA regulations will be required in all construction plans that are approved by the City.

## 2.9 Street Lighting

- 2.9.1 The installation of street lighting shall be mandatory along all public streets in the City. In addition, the installation of street lighting is strongly encouraged along existing or repaved streets.

- 2.9.2 The location of street lights will be designed by CenterPoint Energy - Electric and reviewed and approved by the City.
- 2.9.3 Private lighting systems may supplement or replace all or a portion of public street lighting as long as the net result provides equivalent lighting to the standard set herein. A perpetual entity, such as an incorporated homeowners association and/or an appropriate private entity, shall notify the City of its agreement to pay for the operation, maintenance, and insurance of a private lighting system prior to installation of the system. The system shall be approved by the City Council.
- 2.9.4 Street lights shall be designed in accordance with the requirements set out in Appendix E.

## 2.10 Bench Marks

- 2.10.1 A permanent bench mark shall be set in or within 500 feet of each subdivision section or at a spacing of one mile, whichever is greater. The bench mark will be based on the North America Vertical Datum of 1988 (NAVD 88), 2001 adjustment (TSARP or CORS can be used) and North American Datum of 1983 for horizontal location.
- 2.10.2 The bench mark elevation and location shall be certified by a Registered Professional Land Surveyor (RPLS) and meet the standards and specifications as established by the Texas Society of Professional Surveyors (TSPS) Manual of Practice (latest edition) for a Category 8, Condition III (TSPS 3<sup>rd</sup> Order) Vertical Control Survey.
- 2.10.3 Surveyor shall secure a monument number from the City Engineer, i.e. yyyy xxxx with yyyy being the year set and xxxx being the monument number and prepare a monument sheet with grid coordinates Texas Coordinate System of 1983, South Central Zone, (NAD 83), longitude and latitude, elevation and a sketch showing swing ties and location relative to the nearest street intersection.
- 2.10.4 Bench marks shall be constructed of a brass disk set in concrete and stamped "BM No. YYYY XXXX." The concrete footing for the bench mark shall be eight inches (8") in diameter, three feet (3') deep and set below ground four to six inches (4" – 6"). Concrete shall be reinforced with two number four (2- #4) rebars.
- 2.10.5 The construction plans shall clearly identify the location of the bench mark and shall include a complete description, coordinates, elevation and datum with adjustment date of the bench mark. Include an insert of the monument sheet in the survey control drawing

## 2.11 Residential Lots and Improvements

- 2.11.1 All residential lots shall drain to a public right-of-way directly adjoining the lot. Drainage from a residential lot to a public right-of-way at the rear or side of a lot may be permitted provided the drainage system has been properly designed to accept the flow. Drainage from a residential lot to an adjoining greenbelt or golf

course shall require a public easement for drainage purposes to be maintained by the homeowner's association or appropriate private entity. Drainage to a private easement shall require a specific approval by the Public Works Department. Drainage to a private easement shall be noted on the recorded subdivision plat. Drainage to a Harris County drainage easement shall be approved by the Harris County Flood Control District.

- 2.11.2 A lot grading plan showing proposed minimum slab elevations will be included in the construction plans. If slab elevations do not change, a notice of minimum elevation will suffice. The minimum slab elevation shall also be shown on the subdivision plat.

## 2.12 Flood Plain Management

- 2.12.1 All development shall conform with the requirements of the National Flood Insurance Program, as required by the regulations of the local governing authority having jurisdiction.
- 2.12.2 Amendments to the published flood maps, map revisions and all requests for changes to the base flood elevation within the Seabrook city limits shall be submitted to the City for approval. Technical data required by the Federal Emergency Management Agency and justification for the proposed change must be included with all requests.
- 2.12.3 All data submitted shall be prepared under the supervision of a registered professional engineer and/or a registered public surveyor and shall comply with all requirements of the Federal Emergency Management Agency.

**CHAPTER 3**

**WATER SYSTEM DESIGN  
REQUIREMENT**

## **CHAPTER. 3 - WATER SYSTEM DESIGN REQUIREMENTS**

### 3.1 General

Water system design requirements are established based on land uses as established in this section.

- 3.1.1 Type A Development shall include all residential zoning districts or similar development within the City.
- 3.1.2 Type B Development shall include all commercial zoning districts or similar development within the City.
- 3.1.3 Construction and sizing of all water mains and appurtenances shall meet or exceed the requirements of the Texas Department of Health and the Texas State Board of Insurance.
- 3.1.4 The Public Water System shall not extend beyond the water meter. All construction to the meter shall conform to the Standards. All private construction beyond the meter shall conform to the requirements of the Seabrook Plumbing Code.
- 3.1.5 Design shall conform to the City of Seabrook Construction Details.

### 3.2 Water Main Sizing and Materials

- 3.2.1 Water mains in Type A Development shall have a minimum size as follows:
  - A. Two-inch (2") mains may serve a maximum of two (2) domestic, residential service connections. Two-inch (2") mains shall not exceed two hundred feet (200') in length and shall be installed with a blow off at the end of the line. All two-inch (2") mains shall be specifically approved by the Department of Public Works.
  - B. Four-inch (4") mains may serve a maximum of twenty (20) lots when supported on both ends by a larger main. A dead end four inch (4") main may supply a maximum of ten (10) lots, shall not exceed four hundred feet (400') long and shall be terminated with a blow off. Fire hydrants are not allowed on a four inch (4") main.
  - C. Six-inch (6") mains shall be a maximum of one thousand five hundred feet (1,500') long when supported on both ends by eight inch (8") mains or larger and shall have no more than two (2) intermediate fire hydrants. Dead end six-inch (6") mains shall not be more than six hundred feet (600') in length and shall terminate at a fire hydrant.
  - D. Eight-inch (8") mains are required for mains over one thousand five hundred feet (1,500') long, or when three (3) or more intermediate fire hydrants are required. Eight-inch (8") mains shall not be dead end, except as provided in Section 1.2.2.
  - E. Twelve-inch (12") and larger mains will be required at locations established by the Department of Public Works.

3.2.2 Water mains in Type B Developments shall have a minimum sizing as follows:

- A. Minimum size of mains shall be eight-inch (8"). Maximum length of a dead-end eight-inch (8") main shall be three hundred fifty feet (350'). A dead-end main shall be terminated with a fire hydrant.
- B. Twelve-inch (12") and larger mains will be required at locations established by the Department of Public Works and the City of Seabrook Comprehensive Master Plan.
- C. Six-inch (6") fire hydrant leads will not exceed two hundred feet (200') in length.

3.2.3 The length of a dead-end water main shall be measured from the intersection with a multiple feed (looped) main to the end of the main. The allowable length of a dead-end main with multiple sizes shall not exceed the allowable length required in Section 1.2.1 and 1.2.2.

3.2.4 Water mains shall be constructed using the following materials:

- A. Poly Vinyl Chloride (PVC) Pressure Pipe, four-inch (4") through twelve inch (12"), shall conform to the requirements of ANSI/AWWA C900, current revision, Class 150 DR 18. Pipe shall be designed and constructed in conformance with the minimum requirements of the "Manual of Water Supply Practices", AWWA Manual No. M23.
- B. Ductile-Iron Pipe (D.I.P.), four-inch (4") through fifty-four inch (54"), shall conform to the requirements of "Ductile-Iron Pipe, Centrifugally Cast, for Water and Other Liquids", AWWA C151, (ANSI A21.5I), current revision. Pipe thickness shall be the minimum specified in C151. Under special conditions, the Department of Public Works may require thickness design in conformance with the minimum requirements of "Thickness Design of Ductile-Iron Pipe", AWWA C150 (ANSI A21.5I), current revision. Pipe shall be installed in conformance with the minimum requirements of AWWA C600, "Installation of Ductile-Iron Water Mains and Their Appurtenances". Ductile-Iron Pipe shall be furnished with bituminous or cement mortar lining, AWWA C104 (ANSI A21.4). Polyethylene tube encasement shall be provided as required in Section 1.8.6 of these Standards.
- C. Steel Water Pipe, (allowed only for casing), four-inch (4") and larger shall conform to the requirements of "Standard for Steel Water Pipe Six Inches and Larger", AWWA C200. Steel pipe minimum wall thickness shall conform to the thickness shown on the City of Seabrook Construction Details. All steel pipe shall have coal tar coating in accordance with "Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape-Hot Applied", AWWA C203.
- D. Other pipe materials may be used for construction of water mains, when specially approved by the Department of Public Works.
- E. Bedding and backfill shall conform to the City of Seabrook Construction Details.
- F. Alternate materials which are identified in the Approved Products List may be used with specific approval from the Department of Public Works.

- 3.2.5 Water mains and appurtenances are not allowed in the following sizes: ten-inch (10") and fourteen-inch (14").
- 3.2.6 All public water mains shall be installed within a water line or public utility easement or right-of-way.
- 3.2.7 Construction of water mains shall be in accordance with approved construction plans and the City of Seabrook Construction Details.

### 3.3 Location of Water Mains

- 3.3.1 The recommended location for water mains within the right-of-way is eight feet (8') inside right-of-way.
- 3.3.2 Water mains shall be placed along a uniform alignment with the right-of-way. When necessary, the water main may be deflected at a fire hydrant location to accommodate proper installation of the fire hydrant. At all locations where a water main changes alignment, the location of the water main shall be clearly shown on the construction plans. A minimum distance of three feet (3') shall be maintained from the right-of-way line to the outside edge of the water line.
- 3.3.3 When necessary, water mains may be located within the esplanade section of boulevard type streets. Mains should be located as near the centerline as possible to avoid conflicts with future pavement widening.
- 3.3.4 Along streets with open ditch drainage, all twelve-inch (12") and smaller water mains may be located five feet (5') from the right-of-way line and sixteen-inch (16") and larger water mains may be located subject to Department of Public Works approval.
- 3.3.5 Water mains may be located at the center of a ten-foot (10') water easement provided the easement adjoins a public right-of-way.
- 3.3.6 Location of a water main in an easement not adjoining a public right-of-way shall be prohibited except as specifically approved by the Department of Public Works.

### 3.4 Clearance of Water Lines from Other Utilities

Water mains shall be designed and located to conform to regulations of the Texas Department of Health.

- 3.4.1 When a water main is placed parallel to another utility line at or near the same grade, it shall have a minimum of four feet (4') of horizontal separation. When the other utility is a sanitary sewer, a minimum of nine feet (9') of separation must be provided. In the event that a minimum of nine feet (9') cannot be maintained, the sanitary sewer must be constructed of pressure type pipe with watertight joints as used in water main construction and the clearances must be as defined in the following sections or as specifically approved by the Department of Public Works. When a water main crosses a utility other than sanitary sewer, a minimum of six inches (6") of clearance must be maintained and the water main shall have one joint of pipe, a minimum of eighteen feet (18') long, centered on the other utility.

- 3.4.2 For water mains crossing an existing or proposed sanitary sewer or force main, the following clearances shall be provided for protection from contamination. The minimum clearances will be approved only when justified and field conditions so dictate. The latest Texas Commission on Environmental Quality (TCEQ) Design Criteria shall be followed for minimum criteria and instructions for water line crossings.
- 3.4.3 When water mains and sanitary sewers are installed, they shall be installed no closer to each other than nine feet (9') in all directions and parallel lines must be installed in separate trenches. Where the nine-foot (9') separation distance cannot be achieved, the following procedures shall be used.
- A. Where a sanitary sewer parallels the water main, the sanitary sewer shall be constructed of ductile iron or PVC pipe meeting AWWA specifications, having a minimum working pressure rating of one hundred fifty pounds per square inch (150 psi) or greater and equipped with pressure type joints. The water main and sanitary sewer shall be separated by a minimum vertical distance of two feet (2') and a minimum horizontal distance of four feet (4'), measured between the nearest outside diameters of the pipes and the water main shall be located above the sewer.
  - B. Where a sanitary sewer crosses the water main, and that portion of the sewer within nine feet (9') of the water is constructed as described in Section 1.4.3 the water line may be placed no closer than six inches (6") from the sewer. The separation distance must be measured between the nearest outside pipe diameters. The water line shall be located at a higher elevation than the sewer, wherever possible and one (1) joint, a minimum of eighteen feet (18') long, of the new pipe must be centered on the existing line.
- 3.4.4 Where water lines are installed in areas which have existing sanitary sewers, every effort should be made to maintain nine feet (9') of separation between the outside pipe diameters of the two lines. Where this separation cannot be achieved because of local conditions, which must be fully documented in any planning material submitted, the following spaces shall be observed.
- A. Where a new water line is to cross or be installed in parallel with an existing sanitary sewer, and the sewer is constructed as described in Section 1.4.3 A, the separation distances specified in those rules shall apply as though the sewer were new.
  - B. Where a new water line is to be installed in parallel with an existing clay, truss, or concrete gravity sewer showing no evidence of leakage and the water line is installed above the sewer a minimum of two feet (2') vertically and four feet (4') horizontally, the sanitary sewer need not be disturbed. Should excavation for the water line produce evidence that the sewer is leaking, then the sewer must be repaired.
  - C. Where a new water main is to cross an existing clay, truss, or concrete gravity sewer showing no evidence of leakage, the sewer need not be disturbed if the water line is to be installed at least twenty-four (24") above the existing sewer. A full joint of the water line, at least eighteen feet (18') long, should be centered over the sewer crossing, in this case, so as to provide maximum protection against contamination.

- D. Existing clay, truss, or concrete sewer pipe which shows no evidence of leakage and because of physical limitations must remain at a higher elevation than a proposed intersecting water line or closer than two feet (2') may remain undisturbed if the water line is inserted in a joint of pressure type encasement pipe at least eighteen feet (18') long and two (2) nominal sizes larger than the water line. The encasement pipe should be centered on the sewer crossing and both ends sealed with cement grout. In lieu of this procedure, that portion of the sewer within nine feet (9') of the water line may be replaced with cast iron or ductile iron pipe with watertight joints as described in Section 1.4.3 A, above.
- E. Unless sanitary sewer manholes and the connecting sewer can be made completely watertight and tested for no leakage, they must be installed so as to provide a minimum of nine feet (9') of horizontal clearance from an existing or proposed water line. Encasement of the water line in a carrier pipe as described in Section 1.4.4 D may be approved in special cases if the plans have approval of the Texas Department of Health.

### 3.5 Depth of Cover

Minimum depth of cover for water, mains shall be as follows:

- 3.5.1 Twelve-inch (12") and smaller mains shall have a minimum cover of four feet (4') from the top of curb. For open ditch roadway sections, twelve-inch (12") and smaller mains shall be installed at least three feet (3') below the ultimate flowline of ditch or six feet (6') below natural ground at the right-of-way line, whichever is deeper.
- 3.5.2 Sixteen-inch (16") and larger mains shall have a minimum cover of five feet (5') from the top of curb. For open ditch roadway sections, sixteen-inch (16") and larger mains shall be installed at least three feet (3') below the flowline of ditch or seven feet (7') below natural ground at the right-of-way line, whichever is deeper.
- 3.5.3 Changes in grade to clear other utilities or underground features may be made by deflecting pipe joints. The maximum designed deflection shall be one-half (1/2) of manufacturers allowable deflection. If a depth greater than eight feet (8') to the top of pipe is required, a welded steel section will be used. The standard depth of cover maintained on the water main and the grade change shall be made using the welded steel section. The installation of fittings for vertical deflections of changes in grade shall not be allowed except with specific approval of the Department of Public Works.

### 3.6 Valves

- 3.6.1 All water system valves shall conform with AWWA standards and shall be designed as follows:
  - A. Two-inch (2") through twelve-inch (12") valves shall be resilient seated gate valves, AWWA C509, counter-clockwise opening with mechanical joints. Valves shall have a complete coating on all iron parts in the valve interior to eliminate corrosion.
  - B. Sixteen-inch (16") and larger valves may be butterfly valves, AWWA C504, with complete interior coating to avoid corrosion of all iron parts, as approved by the

Department of Public Works. All butterfly valves shall be installed in a vault of adequate size and construction, as approved by the Department of Public Works.

- C. Cast iron valve boxes are required on all gate valves less than or equal to sixteen-inch (16") as noted below. Valve vaults are required on all valves larger than sixteen-inch (16").
  - D. All valves shall be sized equal to the size of the main on which it is located.
  - E. Valves shall be approved by the City and shall be listed on the Approved Products List provided by the Department of Public Works. Hardware shall be Stainless Steel 304.
- 3.6.2 Spacing - Valves shall be set at maximum distances along the main as follows:
- A. Four-inch (4") through and including twelve-inch (12") mains - one thousand feet (1,000').
  - B. Sixteen-inch (16") and larger mains - two thousand feet (2,000').
  - C. All main intersections shall have a minimum of one (1) less valve than the number of mains at the intersection.
- 3.6.3 Locations - Valves shall be located as follows:
- A. All mains shall be valved within the street right-of-way. Valves shall not be placed under or within two feet (2') of ultimate pavement, except as specifically approved by the Department of Public Works.
  - B. Valves are normally located on the projection of intersecting street right-of-way lines or at the curb return adjoining a paved street across the main. Tapping sleeves and valves are excluded from this requirement.
  - C. All fire hydrants shall be isolated from the service main with a valve located in the fire hydrant lead. This valve shall not be located in the slope or flow line of roadside ditches.
  - D. Intermediate valves not located on the projection of intersecting street right-of-way lines may be located at lot line projections or five feet (5') from fire hydrants but not set in driveways.
  - E. Valves shall be placed at the end of all mains that are to be extended in the future, and extend main a minimum of twenty feet (20') past valve.
  - F. Valves located near reducers shall be located on the smaller diameter pipe.

### 3.7 Fire Hydrants

- 3.7.1 Fire hydrants shall have three-way nozzle arrangements, five and one-quarter-inch (5-1/4") compression type main valve, mechanical joint boot, and conform to the requirements of AWWA C502. The pumper nozzle shall be Factory Installed 5" STORZ connection with blind cap and the hose nozzles shall be two and one-half-inch (2-1/2") threads. Fire hydrant shall be listed on the Approved Products List (example: Mueller

Centurion or American Darling) provided by the Department of Public Works.

3.7.2 Spacing - fire hydrants shall be spaced along all mains six-inches (6") and larger as follows:

- A. Type A Development - Five Hundred Foot (500') Spacing.
- B. Type B Development - Three Hundred Foot (300') Spacing and at all street intersections.
- C. Fire hydrants should be set at street intersections.

3.7.3 Location - fire hydrants should be located as follows:

- A. Fire hydrants shall be located three feet (3') behind the back curb or projected future curb and be set at the point of curvature (PC) of the intersection curb radius. A parallel tee may be used for a fire hydrant lead at the water main when specifically approved by the Department of Public Works.
- B. On all State Highways and open-ditch roadways, set the fire hydrants or flushing valves within three feet (3') of the right-of-way.
- C. Fire hydrants located between right-of-way intersections should be set at a lot line, however, this location may be adjusted five feet (5') either way to miss driveways or other obstructions, in which case the fire hydrants should not be closer than three feet (3') from curbed driveways or five feet (5') from non-curbed driveways.
- D. Fire hydrants may be located in the esplanade section of City streets only when it is not feasible to locate them between the right-of-way line and the back of the curb. In such case, it is preferable to locate the fire hydrants seven feet (7') behind the esplanade back of curb to provide access for parkway mowers; but in no instance shall they be located closer than three feet (3') from the esplanade back of curb or five feet (5') from the esplanade back of curb or five feet (5') from the esplanade of pavement.
- E. All fire hydrants shall be located in protected, but easily accessible, areas behind the curb.
- F. Fire hydrant elevation shall be measured from the center of the stem or nozzle to either the top of curb or natural ground, whichever applicable, and shall be a maximum of thirty-six inches (36") with a minimum clearance at the stem or nozzle of eighteen inches (18").

3.7.4 Depth of Bury - the depth of bury for all fire hydrants shall be established such that the bury line on the fire hydrant is installed at the ground line at each location or at the finished ground after pavement construction is completed. The depth of bury for fire hydrants shall be shown on the construction plans. Minimum cover for fire hydrant leads shall be four feet (4').

3.7.5 Fire hydrants shall not be installed within nine feet (9') of a sanitary sewer system under any conditions.

3.7.6 Fire hydrants shall be color coded on the fire hydrant bonnet and caps. The color coded paint shall be as follows:

<u>Color</u>	<u>Water Main Diameter (Inches)</u>
Green	12" and greater
White	8"
Yellow	6"

### 3.8 Fittings and Appurtenances

3.8.1 Fittings shall be Ductile-Iron Compact Fittings Three-Inch (3"), Twelve-Inch (12"), AWWA C153-/A21.53.84, conforming to the minimum requirements of "Ductile-Iron and Gray-Iron Fittings for Water," AWWA C110 (ANSI 21.10), current revision. Fittings shall be furnished with bituminous or cement mortar lined, AWWA C104 (ANSI A21.4).

3.8.2 All fittings shall be identified and described on the construction plans.

3.8.3 Fittings are not permitted in fire hydrant leads, except as specifically approved by the Department of Public Works.

3.8.4 Normally, all water main fittings have mechanical joints with Stainless Steel 304 hardware.

3.8.5 All plugs shall be provided with retention clamps.

3.8.6 Polyethylene tube encasement shall conform to the minimum requirements of "Polyethylene Encasement for Ductile Iron Pipe Systems," ANSI/AWWA C105, current revision. Soils within the project shall be tested in accordance with Appendix A of ANSI/AWWA C105 to adequately determine the requirements for encasement.

3.8.7 Concrete thrust blocking or restrained joints shall be required on all bends, tees, plugs, fire hydrants, and combinations thereof. Restrained joints are required in areas with less than 4' of cover.

### 3.9 Steel Water Pipe (Steel Water Pipe is not allowed)

### 3.10 Crossings

Installation of a water main across a proposed or existing highway, county road, public street, railroad, pipeline or drainage way shall conform to the requirements of Section 2.7.

### 3.11 Water Services

#### 3.11.1 Water Service in Type A Development

A. Water service from the main to the curb stop shall be installed using approved materials from the products list supplied by the Department of Public Works. All service saddles for water construction must be brass size on size.

B. Water service lines shall be placed at a minimum depth of thirty six inches (36") below final paving elevation.

- C. Water meters shall be five-eighths-inch (5/8") to two-inch (2") displacement type, magnetic drive, cold water meters. Meters will be purchased and installed by the city at the time of building construction on the lot.
- D. Meter boxes shall be located just within the public right-of-way along the projection of a lot line. Location of meters on open ditch streets shall be specifically approved by the Department of Public Works.
- E. All water service fittings and appurtenances for all projects shall be approved by the City and shall be listed on the Approved Products List provided by the Department of Public Works.
- F. City maintenance shall end at the water meter. The water meter box or vault shall be constructed to meet the City's requirements and will be maintained by the City.

### 3.11.2 Water Service in Type B Developments

- A. Detector check valves shall be required on fire lines.
- B. The location of the service line tee, valve, valve box and temporary plug shall be designated on the construction plans in the appropriate location to serve the "future meter".
- C. All apartments or townhomes proposed in a private street development shall have one or two master meters sized adequately to serve the entire development. Exceptions to this policy may be specifically approved by the Department of Public Works based on an unusual situation. Meters shall be installed in compliance with the City of Seabrook Construction Details.
- D. City maintenance shall end at the meter and check valve vaults. The vaults shall be constructed to meet the City's requirements and will be maintained by the City.

## 3.12 Overall System Layout

3.12.1 Layout and size of all water mains shall be consistent with the overall layout and phasing plan of the City's water system. Layout of the overall system and of all water mains within the City shall be approved by the Department of Public Works. The overall water system shall be designed to maintain adequate pressure throughout the system.

3.12.2 The layout of the water mains should provide maximum circulation of water to prevent future problems of odor, taste or color due to stagnant water.

- A. Provide a source of fresh-water at each end or at multiple points in a subdivision. Provide adequate circulation and place valves and fire hydrants, so that flushing of all mains will be simplified.
- B. Dead-ends should be avoided. All dead-ends should be isolated with a line valve, be as short as possible and be equipped with a fire hydrant or blow off at the end of the main as required in Section 1.2.

- C. In unavoidable permanent dead-end situations, reduce the sizes of pipe successively. Carry a six-inch (6") pipe to the last fire hydrant, then use four-inch (4") PVC to the end of the line. Provide a standard two-inch (2") blow off at the end of the main.
- D. Where a water main is stubbed out for future extensions, place a valve to isolate the dead-end and provide no customer services from the dead-end until it is extended. Provide a fire hydrant at the end of the main on lines six-inch (6") or greater, and on lines less than six-inches (6") provide a standard two-inch (2") blow off.

### 3.13 Additional Standards

3.13.1 Construction Features - In conjunction with the design, the engineer's developer shall determine the extent of, and fully exemplify on the plans, all special construction features required to complete the project in a manner of safety, convenience, and economics. All tapping sleeves for water connections are to be of stainless steel.

3.13.2 Bore and Jack or Trenchless Construction - Sections shall be clearly shown on plans by location and footage. The following criteria are generally used as a basis for setting bore and jack or trenchless construction sections.

- A. Public Streets - All public streets are to be bored and jacked or use trenchless construction regardless of surface. Bore and jack or trenchless length shall be computed as roadway width at proposed bore plus five feet (5') to either side.
- B. Driveways - Whenever it is cost effective, concrete driveways in good condition shall be bored and jacked or use trenchless construction. Bore and jack or trenchless length shall be computed as driveway width at bore plus one foot (1') to either side. Where driveways cross culvert pipe sections along open ditch streets and the proposed water main is in close proximity and parallel to the culvert pipe, the length of bore shall be the same as the length of culvert pipe.
- C. Sidewalks - When the water line crosses under a sidewalk four feet (4') or more in width and in good condition, the sidewalk shall either be bored and jacked, use trenchless construction, or the sidewalk shall be removed and replaced, whichever is cost effective. Bore and-jack or trenchless length shall be at least the width of the sidewalk. The proposed type of construction shall be noted on the plans.
- D. Trees - When saving trees and shrubs in a previously developed area is a consideration, all trees six inches (6") and larger in diameter within ten feet (10') of the centerline of the water main must be noted on the plans. The water main should be bored and jacked or use trenchless construction within the drip line of any tree larger than six inches (6") in diameter.
- E. Bore Pits - Bore pits shall be at least three feet (3') from back of curb and five feet (5') from back of curb on a major thoroughfare. Bore pits in highway, county road, or railroad right-of-way shall conform to these requirements and to the requirements of the crossing permit and/or use agreement. All bore pits shall be shored in accordance with OSHA requirements. Bore pits and/or receiving pits to

be located in street or driveway paving, shall be shown on plans.

- 3.13.3 Open Cuts - Where open cuts are required in street paving, plans should call for steel plate covers to be installed and maintained over the cut during periods when contractor is not actively engaged in work at the site. Streets that are open cut shall be "saw cut".
- 3.13.4 All existing developed areas shall be restored to original condition after construction.
- 3.13.5 Proper barricading and signage, conforming to the Texas Manual of Uniform Traffic Control Devices, must be required on all projects. Adequate signage for vehicular and pedestrian traffic will be installed.
- 3.13.6 Excavations - Maintain OSHA Excavation Safety Standards under provisions of 29CFR part 1926, latest edition.
- 3.13.7 Permits - Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist contractor, when necessary, in obtaining such permits and licenses.
- 3.13.8 Disinfection and Line Testing

A. Disinfection

Water lines constructed shall be promptly disinfected before any tests are conducted on water lines and before water lines are connected to City water distribution system. Water for disinfection and flushing will be furnished by City without charge. Use required temporary blind flanges, cast-iron sleeves, plugs, and other items needed to facilitate disinfection of new mains prior to connection to City water distribution system. Normally, each valved section of water line requires two each 3/4-inch taps. A 2-inch minimum blow-off is required for water lines up to and including 6-inch diameter. Fire hydrants shall be used as blow-offs to flush newly constructed water lines 8-inch diameter and above. Where fire hydrants are not available on water lines, locations and designs for blow-offs shall be as indicated on Drawings. Install temporary blow-off valves and remove promptly upon successful completion of disinfection and testing. Slowly fill each section of pipe with water in a manner approved by City Engineer. Average water velocity when filling pipeline should be less than one foot per second and shall not, under any circumstance, exceed 2 feet per second. Before beginning disinfection operations, expel air from pipeline. Excavations shall be backfilled immediately after installation of risers or blow-offs. Install blow-off valves at end of main to facilitate flushing of dead-end water mains. Install permanent blow-off valves according to Drawings. Use not less than 100 parts of chlorine per million parts of water. Introduce chlorinating material to water lines in accordance with AWWA C 651. After contact period of not less than 24 hours, flush system with clean water until residual chlorine is no greater than 1.0 parts per million parts of water. Open and close valves in lines being sterilized several times during contact period. If a chemical compound is used for a sterilizing agent, it shall be placed in pipes as directed by City Engineer.

After disinfection and flushing of water lines, bacteriological tests will be performed by City or testing laboratory. If test results indicate need for additional disinfection of water lines based upon Texas Department of Health requirements, assist City with additional disinfection operations. Upon completion of disinfection and testing, remove risers except those approved for use in subsequent hydrostatic testing, and

backfill excavation promptly.

B. Hydrostatic Line Testing

Disinfect water system pipelines prior to hydrostatic testing. Hydrostatically test newly installed water pipelines after disinfection and before connecting to City water distribution system. Water for testing will be charged to Contractor. Prior to hydrostatic testing, Contractor's meter shall be tested and approved by the City Engineer. For large-diameter water mains, test pipelines in lengths between valves, or plugs, of not more than 4400 feet. Small-diameter pipelines shall be tested in lengths between valves, or plugs, of not more than 1500 feet.

Furnish, install, and operate connections, pump, meter and gages necessary for hydrostatic testing. Allow pipeline to sit a minimum of 24 hours from time it is initially disinfected until testing begins, to allow pipe wall or lining material to absorb water. Periods of up to 7 days may be required for mortar lining to become saturated. For small-diameter pipelines, expel air and apply a minimum test pressure of 125 psi. For large-diameter water mains, expel air and apply a minimum test pressure of 150 psi. Begin test by 9:00 a.m. unless otherwise approved by City Engineer. Maintain test pressure for 8 hours. If a large quantity of water is required to maintain pressure during test, testing shall be discontinued until cause of water loss is identified and corrected. Keep valves inside pressure reducing stations closed during hydrostatic pressure test.

During hydrostatic tests, no leakage will be allowed for sections of water mains consisting of welded joints. Maximum allowable leakage for water mains with rubber gasketed joints: 10.63 gallons per inch nominal diameter per mile of pipe per 24 hours while testing at 125 psi or 11.65 gallons per inch nominal diameter per mile of pipe per 24 hours while testing at 150 psi. Repair joints showing visible leaks on surface regardless of total leakage shown on test. Check valves and fittings to ensure that no leakage occurs that could affect or invalidate test. Remove any cracked or defective pipes, fittings, and valves discovered during pressure test and replace with new items. City Engineer may require failed lines to be disinfected after repair and prior to retesting. Conduct and pay for subsequent disinfection operations in accordance with City requirements. Contractor shall pay for water required for additional disinfection and retesting. Repeat test until satisfactory results are obtained. Upon satisfactory completion of testing, remove risers remaining from disinfection and hydrostatic testing, and backfill excavation promptly.

# **CHAPTER 4**

## **SANITARY SEWER DESIGN**

## **CHAPTER 4- SANITARY SEWER DESIGN REQUIREMENTS**

### 4.1 General

- 4.1.1 Sanitary sewers within the City of Seabrook jurisdiction shall allow for orderly expansion of the system and shall conform to the comprehensive water and sewer plan for the City of Seabrook.
- 4.1.2 Sewers shall be sized based on the minimum requirements set out in this standard and the standard wastewater flow rates as established by the City of Seabrook.
- 4.1.3 All sewers shall conform to the minimum requirements of the Texas Commission on Environmental Quality, "Chapter 317 - Design Criteria for Sewerage Systems".
- 4.1.4 Sewers shall be separated from water lines by minimum of nine feet (9'). Where the minimum separation is not maintained, refer to Section 1.4 for allowable clearances. Sewers crossing utilities other than water, a minimum of six inches (6") of clearance must be maintained.
- 4.1.5 The public sanitary sewer, as maintained by the City of Seabrook, shall be defined as all sewers that serve more than one sewer connection, that are located in public easements or street right-of-way, and that are installed in accordance with these standards.
- 4.1.6 Design shall conform to the City of Seabrook Construction Details.

### 4.2 Sewer Design and Materials

- 4.2.1 Minimum design criteria for determining the size of a sewer shall be as follows:
  - A. Wastewater flows shall be based on the current, approved utility phasing plan for the area. The average day flow for the design of sanitary sewers shall be based on a minimum set by the plan in gallons per day per single family connection for residential areas. Commercial, industrial and office areas shall be designed for an average day flow that can be anticipated from the contributing area.
  - B. The peak design flow for sewers shall be four (4) times the average day flow of the fully developed service area. Sewers larger than eighteen-inch (18") may be sized using a peaking factor of less than four (4) with approval of the Department of Public Works. The minimum allowable values for the design peak factor are presented in Appendix C of these Standards.
  - C. Minimum size public sewer shall be eight-inch (8").
  - D. Service leads to be schedule 40 with no double services. Each lot needs

to have individual service. Service in new areas shall be brought up with a riser two feet (2') above ground. Minimum size sewer service lead shall be four-inch (4") and shall not serve more than one (1) residential service.

- E. Commercial sewer service lead shall be six-inch (6") pipe or larger and shall not serve more than one (1) commercial connection. Specific approval shall be required for lines less than six inches (6").

#### 4.2.2 Cement Stabilized Sand for Bedding and Backfill:

- A. Portland Cement, Type I, ASTM C150.
- B. Clean, durable sand, with less than 0.5 percent clay lumps, ASTM C142, with less than 0.5 percent lightweight pieces, ASTM C123; with organic impurities, ASTM C40, not showing a color darker than standard color and a plasticity index of less than six (6) when tested in accordance with ASTM D423 and ASTM D424.
- C. Compact to ninety-five percent (95%) Standard Proctor Density (ASTM D2922-78 and ASTM D3017-78) in lifts not greater than eight inches (8") thick. Actual testing may be required as deemed necessary by the City of Seabrook.
- D. The cement-sand mixture shall consist of at least 1.5 sacks of cement per ton of sand. The cement-sand mixture shall have a minimum unconfined compressive strength of one hundred pounds per square inch (100 psi) in forty-eight (48) hours, when compacted to ninety-five percent (95%) of Standard Proctor Density (ASTM D2922-78 and ASTM D3017-78), without additional moisture control, cured and tested in accordance with ASTM C31.

#### 4.3 Location of Sanitary Sewers

##### 4.3.1 Street Right-of-Way

Sanitary sewer with a maximum depth of ten feet (10'), measured from finished grade, shall be placed within the right-of-way at least seven feet (7') from the right-of-way line, except as provided herein. All sewers that are deeper than ten feet (10') shall be centered in an exclusive easement parallel and adjoining the right-of-way.

#### 4.4 Design Requirements

##### 4.4.1 Allowable Depths

Sewers shall be designed to meet or exceed the pipe manufacturer's recommendations for depth. The approved list of specific material and guidelines for sewers is available from the Department of Public Works.

- 4.4.2 Minimum depth of a sewer shall be four feet (4') below finished grade or top of curb, whichever is lower.
- 4.4.3 Sewer bedding will be cement stabilized sand or approved granular material. Bedding shall be compacted to ninety-five percent (95%) Standard Proctor Density prior to backfilling the trench. In water bearing sand, washed shell or other approved granular material will be required. Geotextile wrap will be required for water bearing soil as shown in the Construction Details. When water bearing sands are encountered, the City of Seabrook shall be notified immediately.
- 4.4.4 A mandrel test shall be performed prior to acceptance of all installed P.V.C. pipe. The initial mandrel test shall be performed thirty (30) days after the trench has been backfilled. The mandrel must move freely inside the pipe and will be pulled by hand from the upstream end of the pipe to the downstream end. Test equipment shall conform to the requirements set out in Appendix D. A second mandrel test, after settlement has occurred, may be required by the Department of Public Works to determine long term deflections. Deflections in P.V.C. pipe shall not exceed five percent (5%).

4.4.5 Hydraulic Requirements

A. Design velocity in a gravity sewer flowing full shall be a minimum of two feet (2') per second. Where sewers are anticipated to flow less than one-half full, consideration should be given to increasing the slope of sewer to provide two feet (2') per second velocity in the pipe for the anticipated flowrate.

B. Minimum acceptable slopes in sewers shall be:

Size of Pipe (Inches)	Fall in Feet Per 100 Feet of Sewer
6	0.5
8	0.33
10	0.25
12	0.20
15	0.15
18	0.11
21	0.09
24	0.08

C. Sewers are to be designed so that the crowns of the pipes are matched at manholes. The upstream sewer may be designed so that the flowline of the upstream sewer is higher than the flowline of the downstream sewer. When the flowline of the upstream sewer is raised more than three feet (3') above the flowline of the downstream sewer, a drop manhole connection is required, except as specifically approved by the Department of Public Works.

- D. Sanitary sewer service leads shall be laid at seven-tenths percent (0.7%) slope.

#### 4.4.6 Alignment

- A. Sewers should be laid in a straight alignment, where possible. Curved sewers may be allowed with specific approval of the Department of Public Works.
- B. Sewers less than eighteen-inch (18") in diameter may be curved by deflecting the pipe at the joint. Deflection shall not exceed one-half (1/2) of the pipe manufacturer's recommendations for joint deflection. Eighteen-inch (18") and larger sewers may be curved using manufactured bends with a maximum deflection of eleven and one-quarter degrees (11 - $\frac{1}{4}$ °). Deflected pipe joints and bends shall be shown and specifically located on the construction drawings. Televising shall be required by the City.

### 4.5 Test Procedures for Gravity Pipe Lines

#### 4.5.1 General

- A. Gravity mains less than 36 inches in diameter will be air tested. Gravity mains 36 inches in diameter and larger may be tested with air at each joint.
- B. All gravity mains shall be tested for deflections.

#### 4.5.2 Air Leakage Test

After backfilling and removing debris from each section of sewer line, conduct a line acceptance test under observation of an inspector. Where applicable and/or directed by the ENGINEER, the Contractor will test the sanitary sewer lines in strict accordance with the following leakage test using low-pressure air. If the test results indicate an unacceptable installation, locate the source of leakage, correct the defect, and retest until the installation is proven satisfactory.

- A. Minimum Requirements for Equipment:
  - 1. Control panel
  - 2. Low-pressure air supply connected to control panel
  - 3. Pneumatic plugs: Of acceptable size for diameter of pipe to be tested; capable of withstanding internal test pressure without leaking or requiring external bracing.
  - 4. Air hose from control panel to:

- (a) Air supply
- (b) Pneumatic plugs
- (c) Sealed line for pressurizing
- (d) Sealed line for monitoring internal pressure

B. Testing Pneumatic Plugs:

Test plugs before using in actual test installation. Place one length of pipe on ground and seal at both ends with pneumatic plugs to be checked. Pressurize plugs to 25 psig; then pressurize sealed pipe to 5.0 psig. The plugs are acceptable if they remain in place against the test pressure without external aids.

4.5.3 Compensating for Ground Water Pressure

When ground water exists, install a capped pipe nipple at the same time the sewer line is placed. Use a 1/2 inch capped nipple approximately 10 inches long. Make the installation through the manhole wall on top of the sewer line where the line enters the manhole.

Immediately before performing the line acceptance test, remove the pipe cap, clear the pipe nipple with air pressure, and connect a clear plastic tube to pipe nipple. Support the tube vertically and allow water to rise in the tube. After the water stops rising, measure the height in feet of water over the invert of the pipe. Divide this height by 2.3 feet/psi to determine the ground water pressure to be used in line testing.

4.5.4 Pressure Testing

Lines shall be tested with low pressure air testing.

A. Low Pressure Air Test

After pneumatic plugs have been checked, place plugs in line at manhole and inflate plugs to 25 psig. Introduce low-pressure air into the sealed line until the internal air pressure reaches 4.0 psig greater than the ground water pressure. Allow at least two minutes for air pressure to stabilize. If at least 3.5 psig over ground water pressure is maintained, disconnect the air hose from the control panel to the air supply and measure the time of the pressure drop between 3.5 and 2.5 psig above ground water pressure.

Time required for pressure to decrease from 3.5 to 2.5 psig (greater than average groundwater back pressure over pipe) to be not less than time shown for given diameter in following table. Times shown are based on loss of air not exceed 0.0015 cubic feet per minute per square foot of internal pipe surface tested at an average pressure of 3.0 psig greater than groundwater back pressure.

Since a K valve of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as follows:

Pipe Minimum Diameter (inches)	Length for Time (seconds)	Time for Minimum Time (feet)	Longer Length (seconds)
6	340	398	0.855(L)
8	454	298	1.520 (L)
10	567	239	2.374 (L)
12	680	199	3.419 (L)
15	850	159	5.342 (L)
18	1020	133	7.693 (L)
21	1190	114	10.471 (L)
24	1360	100	13.676(L)
27	1530	88	17.309(L)
30	1700	80	21.369(L)
33	1870	72	25.856(L)

Lines with a 27-inch average inside diameter and larger may be air tested at each joint. If the joint test is used, a visual inspection of the joint shall be performed immediately after testing. The pipe is to be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure has stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge shall be 10 seconds.

**B. Manhole Vacuum Testing**

Install vacuum test head assembly at top access point for manhole and adjust for proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to maximum inflation pressure; do not over-inflate. Evacuate manhole with vacuum pump to 10 inches mercury (Hg), disconnect pump, and monitor vacuum. If drop in vacuum exceeds 1 inch Hg over specified time period in the table below, locate leaks, and complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

Time in Seconds by Manhole Diameter

<u>Depth (ft)</u>	<u>48"</u>	<u>60"</u>	<u>72"</u>
4	10	13	16
8	20	26	32
12	30	39	48
16	40	52	64
20	50	65	80
24	60	78	96
*	5.0	6.5	8.0

\*Add T times for each additional 2-foot depth

4.5.5 Retest

Sanitary sewers failing to meet requirements of line tests to be tested again after CONTRACTOR has located and remedied defects causing failure. No sanitary sewer to be accepted until limits of test procedures are satisfied.

4.5.6 Deflection Test

- A. Deflection tests shall be performed on all flexible pipes. For pipelines with inside diameters less than 27 inches, a rigid mandrel shall be used to measure deflection. Other methods shall provide a precision of  $\pm 0.2\%$  deflection. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of 5%. If a pipe should fail to pass the deflection test, the problem shall be corrected and a second test shall be conducted after the final backfill has been in place an additional 30 days. The tests shall be performed without mechanical pulling devices.
- B. Mandrel Sizing - The rigid mandrel shall have an outside diameter (O.D.) equal to 95% of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thickness for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe. All dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.
- C. Mandrel Design - The rigid mandrel shall be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number. The barrel section of the mandrel shall have a length of at least 75% of the inside diameter of the pipe. A proving ring shall be provided and used for each size mandrel in use.

#### 4.5.7 Television Inspection of Gravity Sanitary Sewers

- A. Inspect newly-constructed and rehabilitated sewers, point repairs, service connections, and reconnects by closed-circuit color television inspection. Include a view of the beginning and ending manholes. This view shall consist of a pan of manhole walls, bench, and inverts.
- B. Provide DVD or VHS format video tapes at T-120 lengths at standard play. Use color television inspection equipment that has an accurate footage counter that displays on the monitor and records on the DVD or tape the distance of the camera from the center line of the starting manhole with an accuracy of 1%.
- C. Perform closed-circuit color television inspection on one manhole section at a time. Adjust camera height on skids so that the camera lens is centered (1/2 I.D. or higher) in the pipe being televised. If skids must be lowered to pass protruding service connections, so note inspection report.
- D. Permanently label each tape with the following information before submittal:
  - 1. Job number
  - 2. Location manhole numbers, size, and length of line
  - 3. Date televised
  - 4. Name of contractor
- E. DVDs and/or tapes shall become City property.

#### 4.6 Final Acceptance

- 4.6.1 No pipeline installation shall be accepted until all leaks have been repaired, whether or not the leakage is within the maximum allowable limits. CONTRACTOR's cost.
- 4.6.2 The ENGINEER will certify that all required tests have been successfully completed before the pipeline is accepted.

#### 4.7 Appurtenances

##### 4.7.1 Manholes

- A. Manholes should be placed at points of changes in alignment (except along a curved sewer), grade or size of sewers, at the intersection of sewers and at the end of all sewers. Clean-outs will not be permitted on public lines.
- B. Manholes should be spaced at a maximum distance of four hundred feet

(400') apart.

- C. Manholes at the end of sewers in rear lot easements should be placed in street right-of-way.
- D. Sewers laid in easements shall have a manhole in each street crossing.
- E. Manholes should be located to eliminate the inflow of storm water into the sanitary sewer. The top of manhole rim elevation shall be shown on the plans for all sanitary manholes except in the paved area. All manholes shall be furnished with inflow protectors.
- F. Manholes shall be constructed in accordance with the City of Seabrook Construction Details.
- G. A drop manhole should be constructed for any sewer twelve-inch (12") diameter or less that enters a manhole of greater than thirty-six inches (36") above the invert of the manhole. Sewers larger than twelve inches (12") shall be designed to accommodate a drop at the manhole using standard pipe fittings.
- H. Steps in manholes will not be permitted.
- I. Fiberglass manholes with precast, gasketed, concrete bottoms may be permitted for manholes that are less than eight feet (8') deep and are located within an easement. Fiberglass manholes are not allowed in street right-of-way.
- J. Manhole covers shall be cast iron, traffic bearing type ring and cover with the words "sanitary sewer" cast into the cover and in accordance with the Construction Details.
- K. All manhole adjustments shall be made with precast concrete rings.
- L. Spray coat manhole with 80 mil (new construction) or 125 mil (rehab) coating. Coat entire interior of manhole with material listed in Approved Products List; or use antimicrobial additive ConShield® or equal as listed in Approved Products.

#### 4.7.2 Lift Stations

Lift stations shall be designed in conformance with the Texas Commission on Environmental Quality (TCEQ) "Chapter 317 – Design Criteria for Sewerage Systems." Lift stations should be considered only when a gravity system cannot be achieved. All lift stations shall be specifically approved by the Department of Public Works. The Design Engineer shall provide design requirements and pertinent data with construction plans for review. A preliminary design meeting with the Department of Public Works is recommended. Lift stations shall be

designed as follows:

- A. Pumps shall be sized to operate at optimum efficiency. Minimum acceptable efficiency at the operating point will be sixty percent (60%), unless specifically approved by the Department of Public Works.
- B. Operation and maintenance should be considered in the design of the station and the location of the station.
- C. Wet well working volume should be sized to allow for the recommended pump cycle time of six (6) minutes for each pump.
- D. Controls and equipment shall be approved by the Department of Public Works. Pumps shall be manufactured by Flygt or approved equal. For equals, refer to the City of Seabrook Approved Products List.
- E. Emergency operations should be considered. Provide fittings and a blind flange that will be readily accessible for emergency bypass pumping.
- F. Lift station shall be designed such that the wet well storage volume is equal to 1.5 times the peak design flow to the lift station. Add 10% to account for volume displaced by pumps.
- G. The inlet structure shall be designed to minimize turbulence.
- H. The velocity in the Force Main and riser pipes shall be less than 8 fps and greater than 3 fps.
- I. The wet well shall be sized to provide adequate clearance between the pumps (refer to manufacturers recommended clearances).
- J. A peak factor of four (4) shall be used for Lift Station design.
- K. A startup package for the pumps shall be submitted to the Director of Public Works before final acceptance. This package should also include a completed start up log sheet with field data.
- L. Minimum site size shall be 40 feet by 40 feet. Smaller sites, that are adjacent to public rights-of-way are contiguous to green space or similar land use areas, may be approved when adequate odor control provisions are provided.
- M. A minimum of two (2) feet of clearance shall be provided between pumps and between pump and wall.
- N. Low water levels shall be at least six (6) inches above impeller; and higher if required by manufacturer.
- O. Complete immersion of submersible pump motor at low water level is

preferred, if possible.

- P. Tie steel in Lift Station bottom to wall (includes caisson construction situation) to provide water tight wet well.
- Q. Nuts, bolts, chains, and all other metal components within wet well shall be stainless steel, not carbon steel.
- R. Vent pipe shall be eight (8) inches minimum diameter equipped with odor control system.
- S. The following Hazen-Williams Coefficient shall be used for various pipe types:

PVC	New	C = 160
	10-year	C = 140
DI	New	C = 140
	10-year	C = 100
- T. Provide board fence (either cedar or heart redwood) with steel posts in concrete. Fence shall be at least eight (8) foot high.
- U. Entrance drive to be at least fourteen (14) feet wide concrete pavement. Provide enough room to park inside lift station site.
- V. Indicate method of drainage of site on site plan. Internal drainage, sheet flow, and valley gutter driveways are acceptable. Drain to street or storm sewer, never onto adjacent private property.
- W. Locate control panel and wet well hatch above 100-year flood plain. Call out the 100-year flood plain elevation on the plans.
- X. Stainless steel guide rails (or other pump removal method that avoids entering wet well) are required for submersible pumps.
- Y. A tee, plug valve (or gate valve), and blind flange assembly is required on the force main on the downstream side of the discharge valves and header. This is required so truck-mounted pumps can bypass the lift station pumps and piping while work is being done.
- Z. Bedding for PVC force main is cement stabilized sand.
- AA. PVC force mains must be AWWA C-900.
- AB. DI force mains are to be bedded in bank sand and polyethylene wrapped.
- AC. When calculating head loss in force main and piping, use of K factors on fittings, with the Hazen-Williams formula, is preferred.

- AD. Backfill structural excavations (wet well, etc.) with cement stabilized sand.
- AE. Lift station site plans shall be submitted in scales of 1-inch = 5-feet or 1-inch = 10-feet.
- AF. Provide a protective coating or concrete additive to interior walls of wet well. The Public Works Department shall approve coating or additive used.
- AG. Power supply to lift station shall be 3-phase (and 480 volts where possible).
- AH. A system of floats shall be provided to control pumps.
- AI. A pressure gauge suitable for application shall be installed on each discharge pipe.
- AJ. Lift stations shall be designed with a SCADA system and be equipped with the necessary sensors and hardware for connection to the City's monitoring system.
- AK. Lift stations shall be designed with a generator quick-connect receptacle and manual transfer switch.
- AL. For wet well rehabilitation, see the Approved List of Products in Appendix G for approved coating materials.

#### 4.8 Service Connections

4.8.1 Sewer service leads shall not exceed one hundred feet (100') in length.

##### 4.8.2 Single-Family Residential Lots

- A. Far side and near side service connections shall be installed at the time of construction of the sewer line. Individual service for each resident is required in which schedule 40 pipe is to be used.

##### 4.8.3 Multi-Family Residential, Commercial and Office Development

- A. Service connections shall not be made at top of sewer main pipe in manhole. Long service connections should be installed at the time of construction of the sewer.

##### 4.8.4 Service Connections at Manholes

- A. Service connections at manhole should not be made when possible. When a service connection stub-out is not provided, an opening shall be neatly cut out of the manhole at the required elevation. The service connection shall be made with a resilient connector rubber gasketed

sleeve and stainless steel clamp.

- B. Service connections at a concrete manhole shall be grouted in place using nonshrink grout, Fosroc Conbextra GP, or equal. For equals, refer to the City of Seabrook Approved Products List. When a hole for a service connection in a brick manhole exceeds eighteen inches (18"), the manhole shall be rebuilt above the disturbed area.
- C. Service connections at fiberglass manholes shall be drilled uniformly, through the manhole wall. A neoprene gasket shall be installed around the pipe to provide a water-tight seal through the wall. Where required, fiberglass mat and resin shall be used, in accordance with the manufacturer's recommendations, to repair wall openings.
- D. Service connections entering a manhole three feet (3') or more above the flowline of the manhole shall include a drop pipe with fittings outside the manhole. The drop shall be installed adjoining and anchored to the wall of the manhole, unless specifically approved otherwise.

4.8.5 Provide adequate markings on site and accurate as-built locations, so that the service connection stub-out can be recovered at the time that the connection to the service is made.

4.8.6 All connections to the public sewer system shall be approved by the Department of Public Works prior to construction. Actual connections to the public sewer system shall be inspected by a representative of the Department of Public Works.

4.8.7 Service connections that are installed after initial construction of a sewer shall be constructed using a PVC saddle with gasket and stainless steel straps as approved by the Department of Public Works.

#### 4.9 Unsewered Building Sites

Sanitary sewer shall be extended to all building sites prior to development. Septic systems are not allowed, except as specifically approved by the Department of Public Works.

#### 4.10 Grinder Pumps

4.10.1 When a Gravity Sewerline is not available, a grinder pump system may be installed.

4.10.2 Grinder pumps shall be Hydromatic, Myers, Flygt or approved equal.

4.10.3 A residence may use a single pump. Commercial installations require a minimum of two pumps. System must be approved by the Department of Public Works.

# **CHAPTER 5**

## **DRAINAGE DESIGN**

## **CHAPTER 5- DRAINAGE DESIGN REQUIREMENTS**

### 5.1 General

- 5.1.1 All drainage plans and construction shall meet or exceed the requirements of the City of Seabrook, Harris County Flood Control District, Texas Commission on Environmental Quality Stormwater Regulations, and U.S. Corps of Engineers when proposed outfall occurs within their jurisdiction.
- 5.1.2. All drainage systems that are to become a maintenance responsibility of the City of Seabrook shall be enclosed storm sewers, except as specifically approved by the Department of Public Works.
- 5.1.3 Public storm sewers are defined as sewers and appurtenances that provide drainage for a public right-of-way or more than one private tract, and are located within a public right-of-way or easement. Private storm sewers provide internal drainage for a reserve or other tract. Private storm sewer connections to public storm sewers shall occur at a manhole or at the back of an inlet as approved by the Department of Public Works. All private storm sewers within the public right-of-way shall be constructed in conformance with these Standards.
- 5.1.4 All construction shall conform to the City of Seabrook Construction Details.
- 5.1.5 All storm sewers shall meet or exceed the requirements of the “Drainage Criteria Manual for Harris County, Texas” and the requirements of the City of Seabrook. The City of Seabrook requires all development; irrespective of acreage, to ensure flows do not exceed the pre-developed or approved design discharge rate to the storm sewer system. If the existing system cannot handle the developed flows, detention will be required and discharge will be at the pre-developed rate. Design frequencies and outflow rates shall still follow Harris County criteria.
- 5.1.6 Design shall conform to the City of Seabrook Construction Details.

### 5.2 Storm Sewer Materials

- 5.2.1 Storm sewer and culvert pipe shall be precast reinforced concrete pipe, unless specifically approved by the Department of Public Works. Concrete pipe shall be manufactured in conformance with the requirements of ASTM C76, “Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe”, current revision. Reinforced concrete pipe shall be Class III or stronger. The design engineer shall provide for increased pipe strength when conditions of the proposed installation exceed the allowable load for Class III pipe. All concrete pipe constructed in waterbearing soil or thirty-six inches (36”) in diameter or larger, shall have rubber gasket joints meeting the requirements of ANSI/ASTM C443, “Joints for Concrete Pipe and Manholes, Using Rubber Gaskets”, current revision. Concrete pipe with a diameter of less than thirty-six inches (36”) may be installed using pipe with tongue and groove type joint and Ram-nek, or approved equal, as a joint filler. When specifically approved by the Department of Public Works, reinforced concrete arch and elliptical pipe conforming to ASTM C506 and C507, respectively, current revision, may be installed in lieu of circular pipe. Reinforced concrete box culverts shall meet the minimum requirements of ASTM C1433, “Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers”, current revision. Pipe joints for arch and elliptical pipe and box culverts shall be sealed using Ram-nek or approved equal.

- 5.2.2 Storm sewer outfalls into open channels shall be constructed using corrugated steel pipe. Corrugated steel pipe shall be manufactured in conformance with the requirements of AASHTO Designation M-36-82, current revision. Pipe material shall be Aluminized Steel Type 2, meeting the requirements of AASHTO Designation M-274-791, current revision, or Precoated Galvanized Steel, AASHTO M-246, 10 mil coating on both sides. All pipe shall have a full double coating, Type A, in accordance with AASHTO Designation M-190, current revision. Pipe joints and fittings shall meet the minimum requirements of these specifications and shall have an O-ring gasket seal meeting the requirements of AASHTO C-361, current revision.
- 5.2.3 Storm sewer outfalls shall have slope protection to prevent erosion. Slope protection may be constructed of slope paving or rip rap. Slope paving shall be four-inch (4") five (5) sack concrete with three-eighths-inch (3/8") steel rebar on twenty-four-inch (24") centers, each way. Rip rap shall be a minimum of six-inch (6") broken concrete rubble with no exposed steel or well-rounded stone and shall be a minimum of eighteen inches (18") thick. Slope protection texturing shall be required where public access is likely. Refer to the Construction Details for minimum dimensions.
- 5.2.4 Alternate materials may be used with specific approval from the Department of Public Works.

### 5.3 Location of Storm Sewer

- 5.3.1 Public storm sewers shall be located within a public street right-of way or a storm sewer easement, dedicated to the public and adjoining a public street right-of-way.
- 5.3.2 Recommended alignment within a public street right-of-way.
  - A. Boulevard pavement section with median - along centerline of the right-of-way.
  - B. Undivided pavement section - five feet (5') inside the right-of-way. For all storm sewer located in a public street right-of-way, a minimum distance of two feet (2') shall be maintained inside the right-of-way line to the outside edge of the storm sewer unless otherwise accompanied by an adjacent easement.
  - C. Alternate locations for a storm sewer will be permitted by the Department of Public Works.
- 5.3.3 Recommended alignment within an exclusive storm sewer easement.
  - A. Storm sewers within easements shall be placed no closer than five feet (5') measured from the outside edge of the pipe to the edge of an easement, except when adjoining another easement or public right-of-

way where the distance may be reduced to two feet (2'). The storm sewer shall be placed in the center of the easement. When the storm sewer easement adjoins a public right-of-way, the, easement may be reduced to a minimum of ten feet (10') and the storm sewer may be aligned closer to the right-of-way line, as long as required clearances are met, with specific approval of the Department of Public Works.

#### 5.4 Construction Plan Requirements

5.4.1 A drainage area map shall be included in the construction plans. The drainage area map shall include:

- A. Drainage areas, including areas draining from off-site onto or adjoining the project.
- B. Design storm runoff.
- C. 100-Year storm runoff.
- D. Route of overland flow including the overflow to a drainage way sized to accommodate the 100-year flow.
- E. Elevations for the 25-year and 100-year storms in the outfall channel.
- F. Flow per inlet.
- G. Maximum 100-year ponding elevation.
- H. Lot grading with flow along side lot lines from back to front of property lines.

5.4.2 Detailed drainage calculations shall be submitted with the construction plans.

5.4.3 The hydraulic gradient for the design storm may be shown on the construction drawings. Calculations for the elevation of the hydraulic gradient shall be provided with the design storm drainage calculations.

#### 5.5 Design Requirements

5.5.1 Minimum depth of a storm sewer (measured to the top of pipe) shall be twenty-four inches (24") below top of curb or finished grade, whichever is lower. Minimum size storm sewer for main and inlet lead shall be twenty-four inch (24").

5.5.2 Storm sewers shall be bedded using cement stabilized sand (See specification in Section 4.2.2.)

##### 5.5.3 Pipe Requirements

- A. Reinforced concrete pipe, as described in Section 5.2.1 shall meet or

exceed the following-minimum requirements:

<u>Pipe Class</u>	<u>Maximum Cover (Ft.)</u>
III	15'
IV	30'

Reinforced concrete pipe installed at a depth greater than thirty feet (30') shall be designed by the engineer for the specific installation and approved by the Department of Public Works. Reinforced concrete pipe shall be designed in accordance with the American Concrete Pipe Association, "Concrete Pipe Design Manual". Maximum cover on the pipe shall be measured from the top of pipe to the ultimate finished grade or natural ground, whichever is greater.

B. Corrugated steel pipe shall have a minimum thickness as follows:

<u>Pipe Size (Inches)</u>	<u>Corrugations</u>	<u>Minimum Thickness (Inches)</u>
24	2-2/3" X 1/2"	0.052
30-48	2-2/3" X 1/2"	0.064
54-72	3" X 1" or 5" X 1"	0.064
78-102	3" X 1" or 5" X 1"	0.079

Bedding for corrugated steel pipe shall be cement stabilized sand (See specification in Section 4.2.2.) and shall have a minimum density of ninety-five percent (95%) Standard Proctor. Corrugated steel pipe less than or equal to fifty-four inches (54") in diameter and less than thirty feet (30') deep shall have the minimum thickness given above. Corrugated steel pipe larger than fifty-four inches (54") in diameter and greater than thirty feet (30') deep shall be designed by the engineer for the specific installation and approved by the Department of Public Works. Corrugated steel pipe shall be designed in accordance with the American Iron and Steel Institute, "Handbook of Steel Drainage and Highway Construction Products".

5.5.4 Storm sewers shall have a minimum clearance of six inches (6") from all other utilities. The clearance shall be measured from the outside wall of the pipe.

5.5.5 Design storm runoff shall be calculated in accordance with the "Drainage Criteria Manual for Harris County, Texas".

5.5.6 Hydraulic Requirements.

A. Storm sewers shall be designed to have a minimum velocity of three feet per second (3 fps), when flowing full. Manning's formula should be used to compute the size of the storm sewer. Manning's coefficient, n, is 0.013 for concrete pipe and 0.024 for corrugated metal pipe.

- B. Inlet capacity for the design storm shall be computed using a maximum water surface elevation equal to the top of curb at the inlet. Design capacity for a Type B-B or H-2 inlet with a six-inch (6") standard curb shall be five (5) cubic feet per second. Design capacity for a Type B inlet shall not exceed two and one-half (2.5) cubic feet per second.
- C. Design storm flow in a street shall not exceed the capacity of the street, for the water surface equal to the top of curb, and shall not exceed the inlet capacity. Design storm flow shall meet Harris County criteria.
- D. Street ponding criteria shall meet minimum Harris County Drainage Criteria. The maximum allowable ponding level for minor or collector street is the lowest of the following: (1) one foot (1') above natural ground; (2) one foot (1') above top of curb; or (3) one foot (1') below the lowest slab elevation for a 100-year storm event. The storm sewer system must convey flows from a 100-year storm event without ponding water in the street at levels that exceed the maximum allowable level. In addition, for a major thoroughfare the minimum top of curb elevation shall be at or above the 100-year flood plain elevation. Drainage calculations, along with water surface or hydraulic grade line profiles, shall be submitted to the Department of Public Works for approval.
- E. All bridges must be a minimum of eighteen inches (18") above the 100-year water surface elevation or in accordance with the Federal Emergency Management Agency (F.E.M.A.) regulations, latest revisions, whichever is greater.

5.5.7 Storm sewers less than forty-two inches (42") in diameter shall be constructed on a straight horizontal and vertical alignment between manholes. Storm sewers greater than or equal to forty-two inches (42") in diameter may be laid along a curve using manufactured bends of less than or equal to 11-1/4'. Camera inspection may be required on storm sewers constructed along a curve.

## 5.6 Appurtenances

### 5.6.1 Manholes

- A. Manholes shall be placed at all changes in alignment (except sewers laid along a curve), grade and size of storm sewers; at the intersection of two or more storm sewers; at all inlet leads; and at the end of all storm sewers.
- B. Maximum spacing between manholes shall be five hundred feet (500').
- C. Manhole covers shall be cast iron, traffic bearing, show Seabrook logo, and in accordance with the Construction Details.

## 5.6.2 Inlets

- A. Curb inlets shall be spaced and sized to intercept the calculated runoff for the design storm. The water surface elevation at the inlet shall be less than or equal to the top of curb for the design storm flow.
- B. Maximum travel distance of water in the street to a curb inlet shall be three hundred feet (300') on a major thoroughfare and in a commercial area. The maximum travel distance of water in the street permitted in a single-family residential area shall be five hundred feet (500').
- C. Curb inlets should be located on the intersecting side street at an intersection with major thoroughfare. Locations on the major thoroughfare at intersections shall be specifically approved by the Department of Public Works.
- D. Grated inlets will not be permitted in an open ditch.
- E. Backslope swale interceptors shall be placed in accordance with the requirements of Harris County.
- F. Curb inlets shall have grate inlet lids.
- G. Backfill around inlets with 1.1 sacks per ton of cement stabilized sand and to the top of first stage inlet.

## 5.7 Stormwater Detention

- 5.7.1 The intention of stormwater detention is to mitigate the effect of new development, or redevelopment on an existing drainage system, and shall be required for any development that occurs and that increases the overall impervious character of the site; unless an adequate route to an ultimate bay or lake outfall is available. Stormwater detention volume is based on increased impervious cover and is calculated at the minimum rates set forth by Harris County or the Harris County Flood Control District.
- 5.7.2 Stormwater detention shall not be required in cases where the development can be served by an outfall that is capable of conveying the 100 year runoff to the bay or lake without impacting downstream properties.
- 5.7.3 If the development drains directly into a channel maintained by HCFCD, then HCFCD criteria prevails. If it drains directly to a roadside ditch, drainage ditch or storm sewer maintained by Harris County then the criteria in Regulations of Harris County, Texas for the Approval and Acceptance of Infrastructure governs. For cases of multiple regulatory jurisdictions, the most restrictive criteria shall govern.

#### 5.7.4 Pond Design

- A. All detention ponds shall be per HCFCD most current criteria.

## B. Wet Ponds

- i. Aeration and Recirculation Unit – Wet ponds shall be equipped with some type of aeration device (such as a fountain) which assists to enhance the dissolved oxygen concentration. Increased dissolved oxygen helps to prevent the pond from becoming anaerobic, hence minimizing problems with odor from bacterial decomposition.

### 5.7.5 Easements

- A. Ponds shall be maintained by the property owners through a permanent maintenance arrangement. In cases where public drainage facilities are routed to a pond, a continuous drainage easement shall be dedicated from the point of the end of the public drainage facility to the pond outfall point for use in the event that the pond is abandoned at a future date and there is a need to route the public storm sewer across the former pond site. This easement shall not be evidence of any agreement by the City to accept maintenance of the pond.

## 5.8 Stormwater Pollution Prevention Plan

The U.S. Environmental Protection Agency (EPA) and the Texas Commission on Environmental Quality (TCEQ) require that a Stormwater Pollution Prevention Plan (SW3P) be prepared for construction activities. Construction plans shall show proposed SW3P measures to control soil erosion and sediment pollution in storm water discharges during construction and shall be maintained through the duration of the project. Construction plans will include a note requiring contractor to comply with the construction permit including the SW3P and to provide a copy of the Notice of Intent (NOI) Form (TXR150000) to the City five (5) work days prior to the start of construction.

The Stormwater Pollution Prevention Plan shall be provided for all site development projects.

- A. Reinforced filter fabric fence shall be installed at the perimeter of the site before construction begins.
- B. A stabilized construction entrance/exit shall be established before construction begins.
- C. See Storm Water Pollution Prevention Plan (SW3P) details included with this document.

- D. Once construction is completed, at the back of all curbs, a minimum of either filter fabric fence, 2 feet of hydromulch or sod, or Best Management Practices shall be implemented/ installed.

**CHAPTER 6**  
**PAVING DESIGN**

## **DIVISION 6 - PAVING DESIGN REOUTREMENTS**

### 6.1 General

- 6.1.1 All paving plans and construction shall be approved by the City of Seabrook for all streets within the City of Seabrook.
- 6.1.2 All streets shall be concrete curb and gutter.
- 6.1.3 Street design should conform to all applicable planning tools, such as the City of Seabrook Subdivision Ordinance, the Texas Manual on Uniform Traffic Control Devices, major thoroughfare plans, City of Seabrook Comprehensive Plan, etc. Other considerations for design should include street function, street capacity, service levels, traffic safety, sight distance, pedestrian safety and utility locations. These additional considerations may effect the minimum requirements set forth herein. Refer to the City of Seabrook Major Thoroughfare Plan.
- 6.1.4. Design shall conform to the City of Seabrook Construction Details.

### 6.2 Roadway Types

- 6.2.1 P6D - Principal Arterial, Six (6) Lanes, Divided may be used for major thoroughfare streets.
- 6.2.2 P4D - Principal Arterial, Four (4) Lanes, Divided shall be used for major thoroughfare streets.
- 6.2.3 M4U - Minor Arterial, Four (4) Lanes, divided or undivided shall be used for minor thoroughfare commercial or industrial streets.
- 6.2.4 C4U - Major Collector, Four (4) Lanes, Undivided shall be used for major collector multi-family, commercial, or industrial streets and secondary streets.
- 6.2.5 C2U - Minor Collector, Two (2) Lanes, Undivided shall be used for minor collector single family residential streets or local multi-family residential, commercial, or industrial streets and secondary streets.
- 6.2.6 L2U - Residential, Two (2) Lanes, Undivided shall be used for local single family residential streets.

### 6.3 Geometric Street Design Standards

- 6.3.1. Minimum geometric street design standards for number of lanes, lane widths, right-of-way widths, median widths, and parkway widths shall conform to Appendix F of the Design Standards.
- 6.3.2 The design speeds shall conform to Appendix F of the Design Standards. The design speed does not necessarily indicate the posted speed.

- 6.3.3 The maximum grade refers to the vertical slope of the street and shall conform to Appendix F of the Design Standards.
- 6.3.4 Vertical curves shall be designed when algebraic difference in grades exceeds one percent (1%). Elevations shall be shown on the construction plans at ten-foot (10') intervals through vertical curves. The gradient for tangents to vertical curves at railroad crossings shall be a maximum of three and one-half percent (3.5%). All crest vertical curves shall be determined by sight distance requirements for the design speed. The minimum design speed on any vertical curve shall be based on the street classification.
- 6.3.5 Intersections and curves shall be evaluated for adequate sight distances.
- A. Minimum sight distances shall conform to Appendix F of the Design Standards.
  - B. Right-of-way sight visibility triangles shall be established at all intersections. Unless larger visibility triangles are indicated at a particular intersection, a twenty-foot (20' X 20') triangular public open space corner, measured at the property line, is required on corner lots at the intersection of two collector and/or arterial streets.
- 6.3.6 Horizontal curvature is defined as the centerline radius of the street right-of-way.
- A. Horizontal curvature shall conform to Appendix F of the Design Standards.
  - B. Major thoroughfares with a centerline radius of the right-of-way less than two thousand feet (2,000') shall be designed considering recommendations for super elevation in accordance with the American Association of State Highway and Transportation Officials, "A Policy on Geometric Design of Highways and Streets", 2004 or latest edition. Signage and design speed shall be considered for all curved thoroughfares. A maximum rate of super elevation should be 0.04 for urban conditions.
  - C. Collector and local street horizontal curves shall be designed without super elevation.
  - D. The minimum curvature for a local street less than two thousand (2,000') long shall be three hundred feet (300'). The minimum curvature for a local street two thousand feet (2,000') long or longer shall be four hundred and fifty feet (450'). Lengths shall be measured along the centerline of the road right-of-way between the centerline of the collector or thoroughfare pavement, the center of the right angle intersection, and/or the center of the cul-de-sac.
  - E. Right angle intersections may be used on local streets. The minimum centerline radius shall be fifty feet (50') and the angle of intersection shall

be ninety degrees (90°) plus or minus ten degrees (10°).

- 6.3.7 Each street shall be evaluated for adequate clearances from obstructions. Such obstructions could include retaining walls, abutments or bridge columns, sign posts, large trees, or held walls. Refer to Appendix F for minimum vertical and horizontal clearance requirements. Vertical clearances down to two feet (2') from the face of curb or two feet (2') beyond the edge of the paved shoulder may be considered for landscaping with specific approval.
- 6.3.8 Tangent length is defined as the distance between the point of tangency and the point of curvature of two adjacent curves along the centerline of the street right-of-way. The minimum tangent length between reverse curves shall be one hundred feet (100').
- 6.3.9 Intersections:
- A. Curve radii, measured from the face of curb, shall be twenty five feet (25') minimum on local residential streets and thirty feet (30') minimum on residential major thoroughfares. The minimum curb radii shall be fifty feet (50') or more, depending on an evaluation of vehicular types and volumes in commercial or industrial areas. Minimums should be increased at skewed intersections.
  - B. Streets and traffic lanes shall be properly aligned across an intersection. Proposed streets shall be aligned with existing streets.
  - C. When turnouts are provided at an existing street, the ultimate cross section is required to the end of curb return. Pavement transition is required to reduce the pavement width to the existing cross section.
  - D. Intersections should be designed as a high point in the drainage system, when possible.
  - E. Streets intersecting major thoroughfares shall maintain a minimum of three hundred feet (300') of separation. Separation is defined as the distance from pavement face of curb to face of curb. Streets intersecting collector streets shall maintain a minimum of two hundred and fifty feet (250') of clearance. Local streets shall maintain a minimum separation of two hundred and forty feet (240'). Collector and local street separation may be reduced with specific approval from the Department of Public Works.
  - F. Offset intersections are not permitted on any arterial if the offset distance (or clearance between streets) is less than three hundred feet (300'). The minimal allowable offset shall be two hundred and fifty feet (250') on collector streets and one hundred twenty five feet (125') on local streets.
  - G. Lane drop tapers shall extend 50 feet (50') to 100 feet (100') beyond the intersection.

- H. Except where existing conditions will not permit, all streets, major and minor, shall intersect at a ninety-degree (90°) angle. Variations of more than ten degrees (10°) on secondary and local streets and more than five degrees (5°) on arterials may be allowed with specific approval from the Department of Public Works.
- 6.3.10 Pavement width transitions shall conform to Appendix F-4 of the Design Standards. Minimum transition lengths shall meet or exceed requirements of the Texas Manual of Uniform Traffic Control Devices.
- 6.3.11 Left turn lanes shall conform to Appendixes F-2, F-3, and F-4 of the Design Standard. Minimum bay storage lengths may need to be calculated as per traffic analysis. The referenced standards are minimum requirements. Middle block left turns may be permitted when specifically approved by the Department of Public Works.
- 6.3.12 Median openings shall conform to Appendixes F-2, F-3, and F-4 of the Design Standards. On major thoroughfares, when areas adjoining the right-of-way are not planned for immediate development, esplanade openings may be spaced one thousand feet (1,000') apart when specifically approved by the Department of Public Works. Entrance medians on local roads used for landscaping purposes only may be modified with specific approval by the Department of Public Works. All landscaping must be maintained by the developer unless other entity accepts and files agreement with the city.
- 6.3.13 Cul-de-sac pavement:
- A. Single family residential – For roadways within a 50 foot right-of-way, pavement radius measured to the face of curb shall be forty feet (40').
  - B. Multi-family residential, commercial, and industrial - Pavement radius measured to the face of curb shall be fifty feet (50').
  - C. The minimum pavement radius for the cul-de-sac bulb without a median shall be forty feet (40') for residential and fifty feet (50') commercial. Right-of-way radius shall be clear of permanent obstructions. Unpaved medians on modified cul-de-sacs may be considered with specific approval from the Public Works when the request is accompanied by verification that the modification can accommodate a SU-30 turning path and landscaping is maintained by developer unless other entity accepts and files agreement with the city.
  - D. The distance from the face of the curb of a cul-de-sac to the right-of-way line shall be a minimum of ten feet (10').
  - E. Curb radii at the transition to the cul-de-sac shall have a minimum radius of twenty-five feet (25') in single family residential areas and thirty-five feet (35') in other areas, measured at the face of the curb.

- F. The length of a cul-de-sac is defined as the distance from the centerline of the intersecting pavement to the center of the cul-de-sac bulb measured along the centerline of the street right-of-way. Maximum length of cul-de-sac streets for residential subdivision shall be six hundred feet (600') or serve a maximum of twenty-four (24) residential lots, whichever is less. Maximum length of cul-de-sac streets for commercial or industrial developments shall be eight hundred feet (800'). A traffic analysis may be required in commercial or industrial areas to determine high traffic volumes that may be generated from the development, thereby reducing the maximum length of cul-de-sac allowed.

6.3.14 Guidelines for permitting on-street parking are given in Appendix F-5.

#### 6.4 Pavement Structure Requirements

- 6.4.1. Local residential streets shall have a minimum thickness of six inches (6") with number four (#4) rebar spaced at twenty-four inches (24") measured center to center of the rebar.
- 6.4.2 Residential, collector streets and all streets in multi-family residential, commercial, or industrial areas shall have a minimum thickness of seven inches (7") with number four (#4) rebar spaced at twenty-four inches (24") measured center to center of the rebar.
- 6.4.3 Major thoroughfares shall have a minimum thickness of seven inches (7") with number four (#4) rebar spaced at eighteen inches (18") measured center to center of the rebar.
- 6.4.4 The pavement structure for each roadway shall be designed based on soil data from the site and based on the anticipated traffic volume, loading and service life of the proposed pavement structure. The design engineer is responsible to ensure that the pavement structure is designed to withstand the anticipated loads that are expected on the roadway.
- 6.4.5 Hot-mix asphaltic concrete pavement shall be designed for each individual project based on wheel load requirements with a geotechnical analysis prepared by a registered engineer. Minimum requirements shall include two inches (2") of surface course, six inches (6") of base, and six inches (6") of lime stabilized subgrade.
- 6.4.6 Subgrade shall be stabilized with a minimum six percent (6%) lime by weight, six inches (6") thick and compacted to ninety-five percent (95%) standard proctor density. Alternative subgrade stabilization may be substituted when specific recommendations are made by the geotechnical engineer for the project and when specifically approved by the Department of Public Works.
- 6.4.7 Concrete pavement thickness design is required for all pavement industrial areas and on major thoroughfares. Concrete pavement thickness design shall be based

on American Association of State Highway and Transportation Officials design procedures for rigid pavements.

- 6.4.8 Horizontal dowels or saw cutting to expose existing steel are required to create a minimum ten-inch (10") overlap of reinforcing steel when making a connection of a proposed street to an existing concrete street or drive. When the existing concrete street has no exposed steel the following shall apply:
- A. Dowels should be number four (#4) bars, twenty-four inches (24") long, embedded twelve inches (12") and epoxied, and spaced in accordance with this section.
  - B. As an alternate to paragraph A above, saw cut to two inches (2") in depth and remove existing concrete to expose a minimum of twelve inches (12") of longitudinal steel, in good condition, with an equivalent cross section area of steel equal to the proposed pavement steel.
- 6.4.9 Dead-end streets or ends of concrete slabs designed to be extended in the future shall have paving headers and fifteen inches (15") of reinforcing steel exposed beyond the pavement, coated with asphalt and wrapped with burlap or paving headers and a dowel type expansion joint for future pavement tie. Temporary asphalt bulb for temporary turn around with ingress and egress easements.
- 6.4.10 Pavement extensions shall connect to the existing pavement with a pavement undercut and a minimum steel overlap often inches (10"). Refer to Construction Details.
- 6.4.11 All concrete to be removed shall be removed either to an existing or a sawed joint. Sawed joints shall meet the requirements set out in Section 6.4.8 B.
- 6.4.12 Materials:
- A. Concrete – five and a half (5-1/2) sack Portland cement per cubic yard concrete; 3,500 psi, unconfined compressive strength at twenty-eight (28) days.
  - B. Reinforcing steel - Grade 60, ASTM A615, current.
  - C. All materials and workmanship shall conform to the Texas Department of Transportation Standard Specifications, 2004, and the Texas Manual on Uniform Traffic Control Devices, 2006, and any revisions thereto.
  - D. All special, non-standard materials, such as bomanite or concrete pavers, and special signage that are installed by the developer shall be specifically approved by the Department of Public Works and shall be maintained by the developer or his assigns. Any maintenance of non-standard items by the City of Seabrook will be done using standard materials and methods.

## 6.5 Grading and Layout Requirements

- 6.5.1 Minimum gradient on gutter shall be 0.30 percent. For special conditions where the gutter must be placed at a flatter grade, the minimum grade may be 0.25 percent with specific approval of the Department of Public Works.
- 6.5.2 Inlet spacing as defined in Section 5.6.2.
- 6.5.3 Maximum cut measured from finished grade at the right-of-way line to top of curb shall be 1.75 feet. The recommended maximum slope for driveways shall be ten (10) to one (1) slope. Variation of this requirement may be allowed with specific approval of the Department of Public Works.
- 6.5.4 Minimum grade shall be one percent (1%) fall around intersection turnout for a minimum radius of twenty-five feet (25'). Grade for a larger radius shall be determined on an individual basis.
- 6.5.5 All streets shall have a six-inch (6") high concrete curb as shown in the City of Seabrook Construction Details. Other curb details may be allowed with specific approval of the Department of Public Works.
- 6.5.6 Minimum slope for the gutter of a cul-de-sac or of the long radius of an L-type Street shall be 0.60 percent.
- 6.5.7 The amount of cross slope over the pavement section should be shown on the plans. The usual cross slope is 2%.
- 6.5.8 When connecting to an existing curbed street, the gutter lines for the proposed and existing streets shall be matched.
- 6.5.9 Proposed top of curb elevations should be designed to match the top of the curb at an existing inlet.
- 6.5.10 Top of curb elevations shall be shown on the construction plans.
- 6.5.11 Gutter elevations are required for vertical curves where a railroad track is being crossed.
- 6.5.12 Where railroad crossings are not at right angles to the pavement slab, vertical curves should be calculated for each curb line and should be posted at ten-foot (10') intervals in the profile.

## 6.6 Traffic Control Devices

- 6.6.1 Standard barricades shall be permanently installed at the end of all dead-end streets not terminating in a cul-de-sac and at all turnouts. Barricades shall be in accordance with the Construction Details, and shall meet the requirements of the Texas Manual of Uniform Traffic Control Devices for Type III barricades.

- 6.6.2 Traffic and street signage locations shall be shown on the paving site plan in the construction plans. Traffic signs shall conform to the requirements of the Texas Manual of Uniform Traffic Control Devices as adopted by the City of Seabrook. Prior to final approval of a construction project, all signage shall be installed in accordance with the approved construction plans.
- 6.6.3 Standard signage shall be aluminum, covered with Scotch-Lite High Intensity Grade, or approved equal, mounted on a twelve-foot (12') long green u-channel post with two 2 1/2" by 5/16" zinc-coated nuts and bolts. Street name signs shall be six inches (6") high with green backing and white letters (four inches (4") tall, Series "C" letters). Traffic control signage shall meet the requirements of the Texas Manual for Uniform Traffic Control Devices. All posts shall be mounted in concrete eighteen inches (18") deep with a minimum of three inches (3") of concrete surrounding the post. Alternate color posts and sign backing may be an option with specific approval from the Department of Public Works.
- 6.6.4 Pavement markings shall be shown on the approved construction plans for the project. Reflectorized paint with supplemental reflectors, or approved alternate, shall be used on all major thoroughfares and on major collector streets. Reflectorized paint with supplemental reflectors may be used on local streets. Turn lanes shall have proper pavement markings. A blue reflectorized button is required at all fire hydrants located one foot (1') off the pavement centerline toward the fire hydrant. Pavement markings shall be installed as shown on the approved construction plans.

## 6.7 Sidewalks

- 6.7.1 Reinforced concrete sidewalks of four feet (4') in width are required on each side of all public residential streets. Sidewalks of four feet (4') in width, if located on the property line, or five feet (5') if located at back of curb are required on each side of a commercial street designated as a major thoroughfare. No sidewalks are required on a public commercial street designated as a collector or local street. All sidewalk construction will consist of a minimum of #3 bars at 18" O.C.E.W. reinforcing four inch thick, 3,000 psi, concrete at 28 days.
- 6.7.2 Sidewalk wheelchair ramps shall be required at all intersections and driveways, and shall have a light reflective value and texture that significantly contrasts with that of adjoining pedestrian routes.
- 6.7.3 Sidewalk construction in an esplanade: Transverse concrete sidewalk, six inches (6") thick with black or dark colored finish, shall be constructed in all esplanades as a pedestrian stacking area. All concrete sidewalks in esplanades shall be a minimum of six feet (6') wide as measured from the esplanade nose. Patterned concrete may be used with specific approval of the Department of Public Works.
- 6.7.4 All sidewalks are to be constructed in accordance with the City of Seabrook Construction Details.
- 6.7.5 Sidewalks shall be located two feet (2') within the street right-of-way or as

approved by Department of Public Works.

- 6.7.6 Construction of a sidewalk along a single family residential local street may be deferred to the home builder until a lot is improved, provided there is a note regarding sidewalk construction on the recorded subdivision plat. Sidewalk wheelchair ramps shall be constructed by the developer at the time of construction of the roadway.

# **APPENDIX A**

## **GRAPHIC STANDARDS**

FIGURE 3.1  
EXISTING IMPROVEMENTS  
PLAN VIEW

TEXT FOR EXISTING IMPROVEMENTS SHALL NOT BE SMALLER THAN 60 LEROY

		WT	LC
ROW LINE		3	0
PROPERTY LINE		3	0
THEORETICAL PROPERTY LINE		3	0
LOT LINES		1	0
EASEMENT LINE		0	2
CENTER LINE OF ROW		0	4
TRANSIT LINE		0	0
EDGE OF DITCHES		0	0
CENTER LINE OF DITCHES		0	2
EDGE OF DITCHES		0	0
FENCE LINE, WOOD		0	0
FENCE LINE, CHAIN LINK		0	0
FENCE LINE, BARBED WIRE		0	0
FENCE LINE, HOG WIRE		0	0
EDGE OF CONCRETE		0	0
CURB LINE		0	0
EDGE OF ASPHALT		0	0
EDGE OF SHELL OR GRAVEL		0	2
DIMENSION LINE		0	0
HL&P AERIAL LINE		0	0
HL&P UNDERGROUND LINE		0	6
GAS LINE		0	1
MISC UNDERGROUND LINES		0	8

WT	K & E PEN NO	LINE WEIGHT/WIDTH	METRIC
0	0	0.014"	0.35mm
1	1	0.020"	0.50mm
2	2	0.024"	0.60mm
3	3	0.031"	0.80mm
6	6	0.055"	1.40mm

**LEGEND:**

WT LINE WEIGHT  
LC LINE CODE

FIGURE 3.1 (CONTINUED)  
EXISTING IMPROVEMENTS  
PLAN VIEW

TEXT FOR EXISTING IMPROVEMENTS SHALL NOT BE SMALLER THAN 60 LEROY

		WT	LC
PIPELINE OR WESTERN UNION CONDUIT	(IDENTIFY CONDUIT)	0	1
SWBT CONDUIT		0	2
CABLE TV		0	2
MATCH LINE		3	0
RAILROAD LINE		0	0
WATER LINE		0	7
WASTEWATER SEWER LINE		0	3
STORM SEWER LINE		0	0
IRON PIPE OR IRON ROD MONUMENTS		0	0
POINT OF INTERSECTION (PI)		0	0
POINT OF CURVE (PC) POINT OF TANGENCY (PT)		0	0
POWER POLE		0	0
POWER POLE W/DOWN GUY		0	0
GAS METER		0	0
GAS VALVE		0	0
MISC UNDERGROUND PIPELINE LABEL		0	0

WT	K & E PEN NO	LINE WEIGHT/WIDTH	METRIC
0	0	0.014"	0.35mm
1	1	0.020"	0.50mm
2	2	0.024"	0.60mm
3	3	0.031"	0.80mm
6	6	0.055"	1.40mm

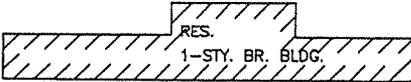
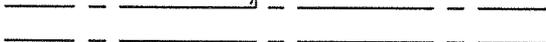
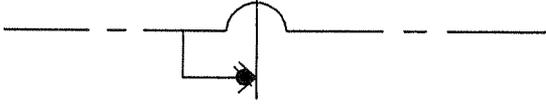
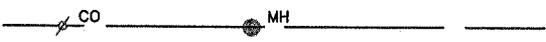
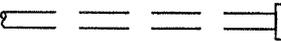
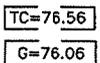
**LEGEND:**

WT LINE WEIGHT  
LC LINE CODE

Appendix A – Graphic Standards

FIGURE 3.1 (CONTINUED)  
EXISTING IMPROVEMENTS  
PLAN VIEW

TEXT FOR EXISTING IMPROVEMENTS SHALL NOT BE SMALLER THAN 60 LEROY

		WT	LC
PAVING HEADER		0	0
BUILDING, RESIDENTIAL		0	0
BUILDING COMMERCIAL		0	0
TREE (RADIUS OF TREE CANOPY SHALL BE 1 FOOT FOR EACH INCH OF TRUNK DIAMETER)		0	0
HEDGE		0	0
WATER METER		0	7
WATER VALVE (GATE)		0	7
WATER VALVE (BUTTERFLY)		0	7
FIRE HYDRANT/FLUSHING VALVE		0	7
TAPPING SLEEVE & VALVE		0	7
REDUCER		0	7
ROUND CONNECTION		0	7
WASTE WATER SEWER CLEANOUT AND MANHOLE		0	0
STORM SEWER MANHOLE		0	0
STORM SEWER INLETS		0	0
CULVERT PIPE AND HEADWALL		0	2
TOP OF CURB OR GUTTER LINE ELEV.		0	2
CONTOUR LINE		0	0

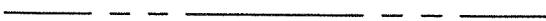
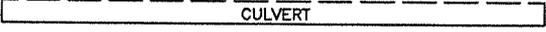
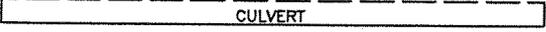
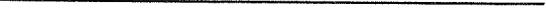
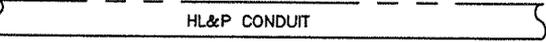
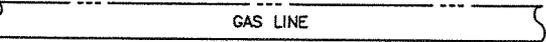
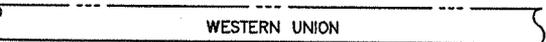
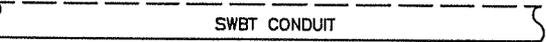
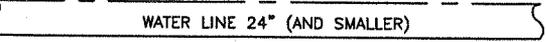
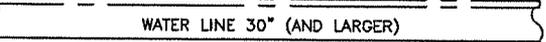
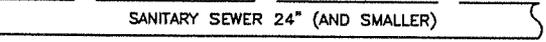
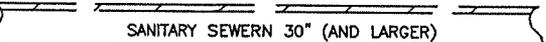
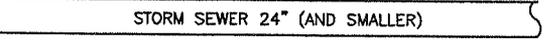
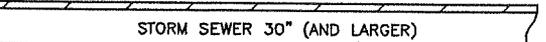
WT	K & E PEN NO	LINE WEIGHT/WIDTH	METRIC
0	0	0.014"	0.35mm
1	1	0.020"	0.50mm
2	2	0.024"	0.60mm
3	3	0.031"	0.80mm
6	6	0.055"	1.40mm

LEGEND:

WT LINE WEIGHT  
LC LINE CODE

FIGURE 3.1 (CONTINUED)  
EXISTING IMPROVEMENTS  
PROFILE VIEW

TEXT FOR EXISTING IMPROVEMENTS SHALL NOT BE SMALLER THAN 60 LEROY

		WT	LC
NORTH OR EAST PROPERTY LINE		1	5
SOUTH OR WEST PROPERTY LINE		1	6
NORTH OR EAST CURB		1	7
SOUTH OR WEST CURB		1	3
NORTH OR EAST DITCH		1	7
SOUTH OR WEST DITCH		1	3
NORTH OR EAST CULVERT		1	2
SOUTH OR WEST CULVERT		1	2
CENTERLINE OF ROW		1	0
HL&P CONDUIT		1	6
		1	0
GAS LINE		1	1
		1	0
WESTERN UNION		1	1
		1	0
SWBT CONDUIT		1	2
		1	0
WATER LINE		1	7
		1	0
		1	7
		1	0
WASTEWATER SEWER LINE		1	3
		1	0
		1	3
		1	0
STORM SEWER LINE		1	0
		1	0
		1	0

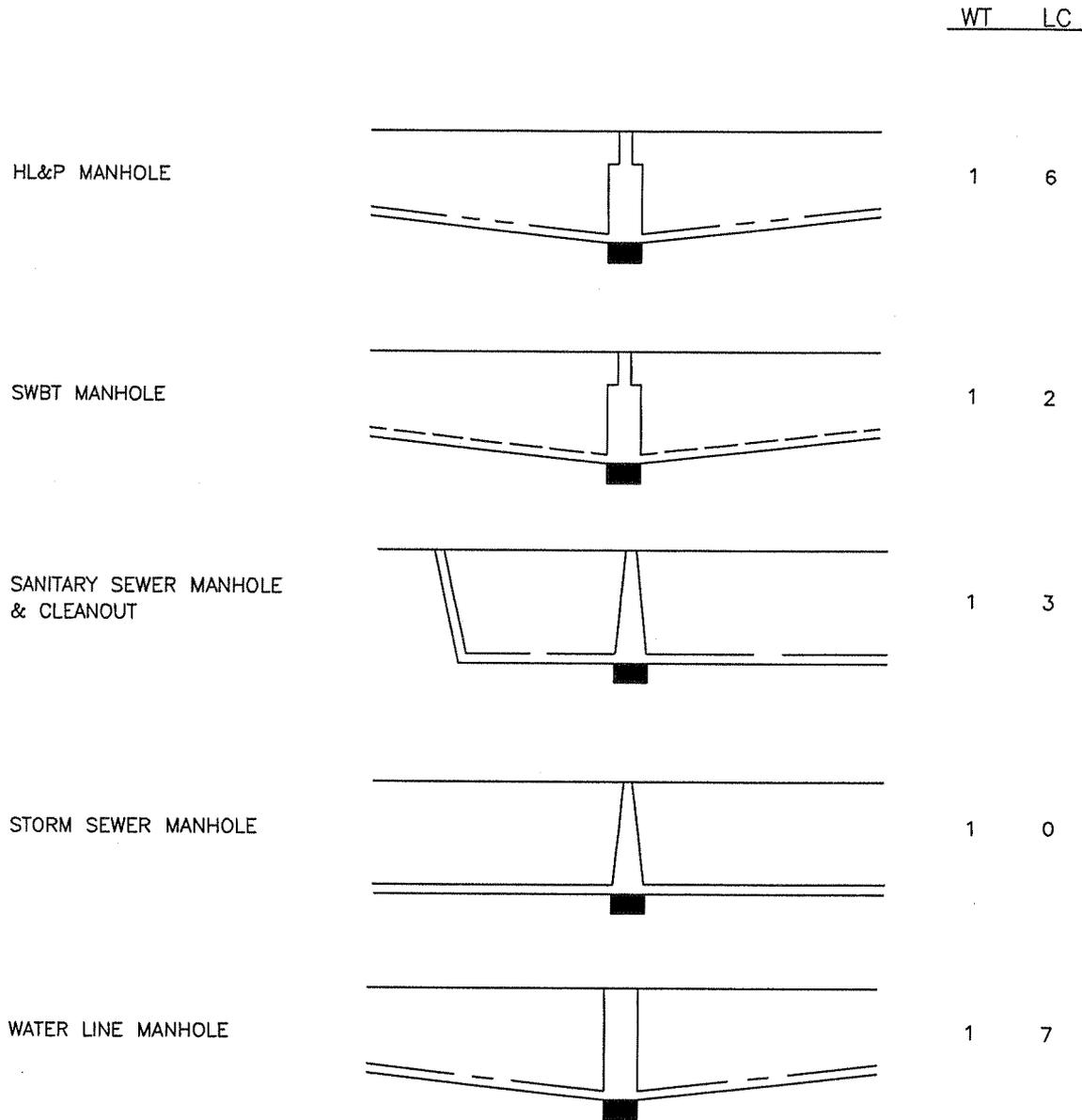
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0	0	0.014"	0.35mm
1	1	0.020"	0.50mm
2	2	0.024"	0.60mm
3	3	0.031"	0.80mm
6	6	0.055"	1.40mm

LEGEND:

WT LINE WEIGHT  
LC LINE CODE

FIGURE 3.1 (CONTINUED)  
EXISTING IMPROVEMENTS  
PROFILE VIEW

TEXT FOR EXISTING IMPROVEMENTS SHALL NOT BE SMALLER THAN 60 LEROY



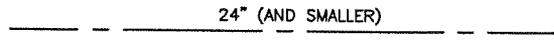
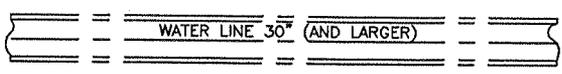
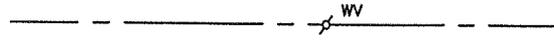
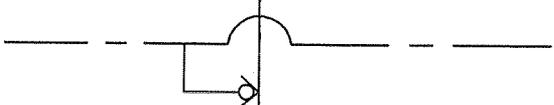
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1	1	0.020"	0.50mm
2	2	0.024"	0.60mm
3	3	0.031"	0.80mm
6	6	0.055"	1.40mm

LEGEND:

WT LINE WEIGHT  
LC LINE CODE

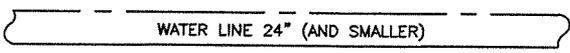
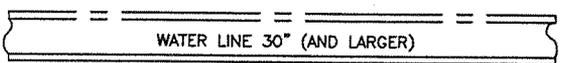
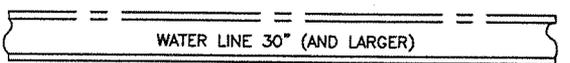
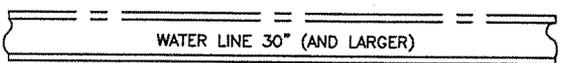
FIGURE 3.2  
PROPOSED IMPROVEMENTS – WATER LINES  
PLAN VIEW

TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

		WT	LC
WATER LINE		3	7
		3	7
WATER VALVE (GATE)		3	7
WATER VALVE (BUTTERFLY)		3	7
TAPPING SLEEVE & VALVE		3	7
		3	7
FIRE HYDRANT/FLUSHING VALVE		3	7
REDUCER		3	7
ROUND CONNECTION		3	7

PROPOSED IMPROVEMENTS – WATER LINES  
PROFILE VIEW

TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

		WT	LC
WATER LINE		3	7
		3	0
		3	7
		3	0

WT	K & E PEN NO	LINE WEIGHT/WIDTH	METRIC
0	0	0.014"	0.35mm
1	1	0.020"	0.50mm
2	2	0.024"	0.60mm
3	3	0.031"	0.80mm
6	6	0.055"	1.40mm

LEGEND:

WT LINE WEIGHT  
LC LINE CODE

FIGURE 3.2 (CONTINUED)  
PROPOSED IMPROVEMENTS – SANITARY SEWER LINES  
PLAN VIEW

TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

		<u>WT</u>	<u>LC</u>
SANITARY SEWER LINE		3	3
		3	3
MANHOLE		3	3

PROPOSED IMPROVEMENTS – SANITARY SEWER LINES  
PROFILE VIEW

TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

		<u>WT</u>	<u>LC</u>
SANITARY SEWER LINE		3	3
		3	0
		3	3
		3	0
MANHOLE		3 3	3 0

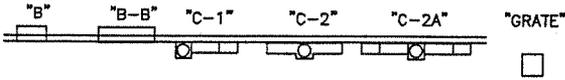
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0	0	0.014"	0.35mm
1	1	0.020"	0.50mm
2	2	0.024"	0.60mm
3	3	0.031"	0.80mm
6	6	0.055"	1.40mm

LEGEND:

WT LINE WEIGHT  
LC LINE CODE

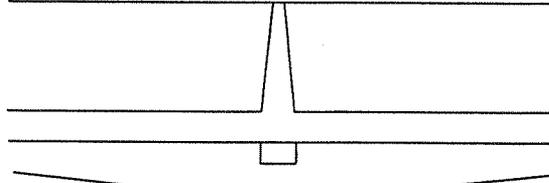
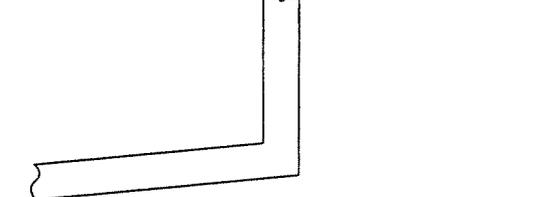
FIGURE 3.2 (CONTINUED)  
PROPOSED IMPROVEMENTS – STORM SEWER LINES  
PLAN VIEW

TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

		WT	LC
STORM SEWER LINES	24" (AND SMALLER)	3	0
	30" (AND LARGER)	3	0
MANHOLE		3	0
INLETS		3	0

PROPOSED IMPROVEMENTS – STORM SEWER LINES  
PROFILE VIEW

TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

		WT	LC
STORM SEWER LINES	24" (AND SMALLER)	3	0
	30" (AND LARGER)	3	0
MANHOLE		3	0
INLETS		3	0

WT	K & E PEN NO	LINE WEIGHT/WIDTH	METRIC
0	0	0.014"	0.35mm
1	1	0.020"	0.50mm
2	2	0.024"	0.60mm
3	3	0.031"	0.80mm
6	6	0.055"	1.40mm

LEGEND:

WT LINE WEIGHT  
LC LINE CODE

FIGURE 3.2 (CONTINUED)  
PROPOSED IMPROVEMENTS – PAVEMENTS  
PLAN VIEW

TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

		<u>WT</u>	<u>LC</u>
FACE OF CURB		6	3
EDGE OF PAVEMENT		6	0
CONCRETE WALK		3 2 3	3 0 3
CONCRETE HEADER		3	3
TOP OF CURB OR GUTTER LINE ELEVATION	<div style="border: 1px solid black; padding: 2px; display: inline-block;">TC=76.56</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">G=76.06</div>	2	0

PROPOSED IMPROVEMENTS – PAVEMENTS  
PROFILE VIEW

TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

		<u>WT</u>	<u>LC</u>
TOP OF CURB OR CENTERLINE FOR OPEN DITCH PAVING		2	3
		3	0

WT	K & E PEN NO	LINE WEIGHT/WIDTH	METRIC
0	0	0.014"	0.35mm
1	1	0.020"	0.50mm
2	2	0.024"	0.60mm
3	3	0.031"	0.80mm
6	6	0.055"	1.40mm

LEGEND:

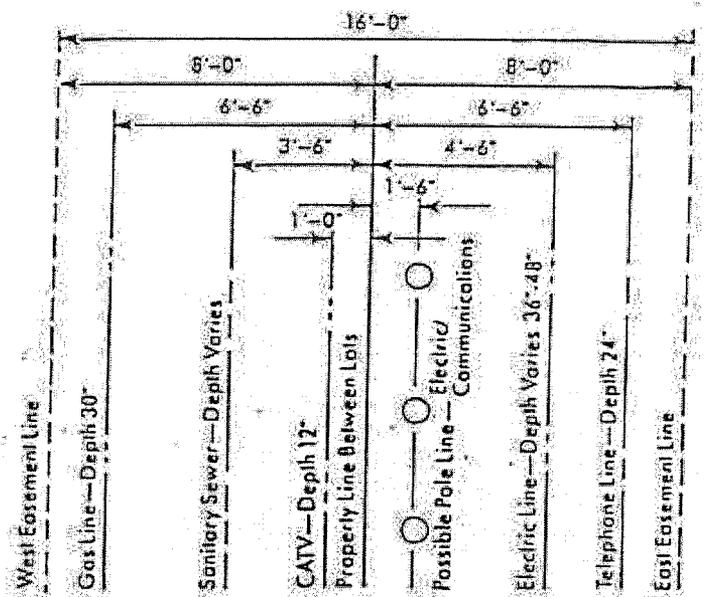
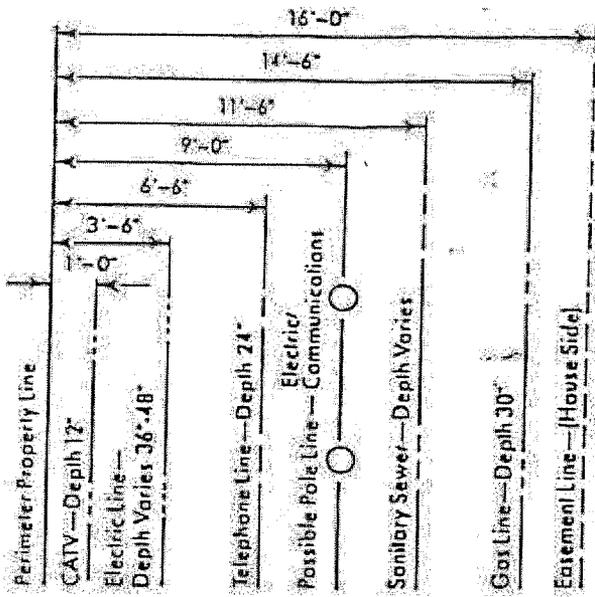
WT LINE WEIGHT  
LC LINE CODE

# **APPENDIX B**

## **UTILITY LOCATIONS**

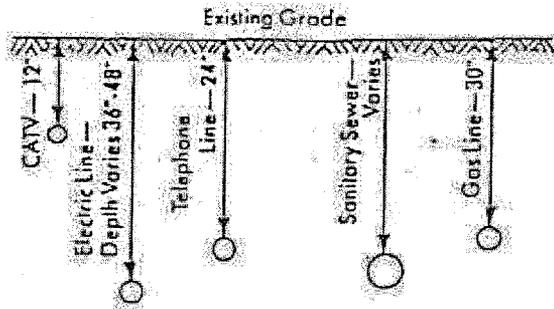
# Appendix B – Utility Locations

## SIXTEEN-FOOT (16') WIDE EASEMENT

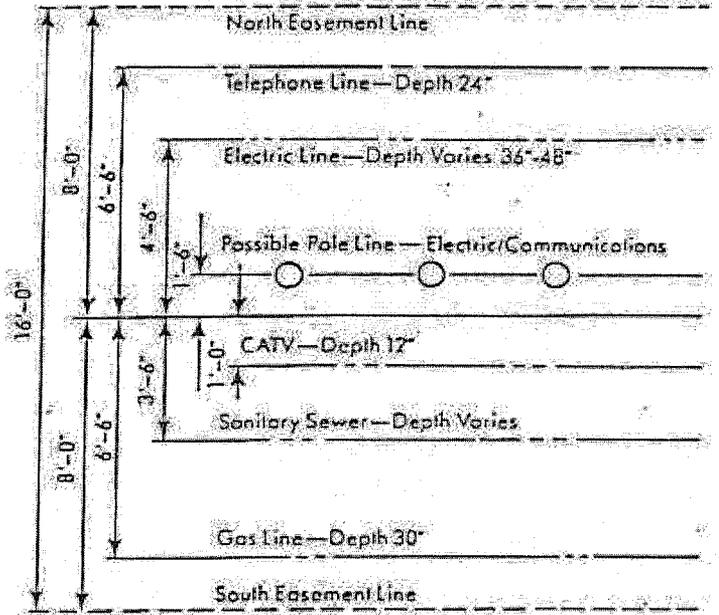


### BACK TO BACK EASEMENT

#### PERIMETER EASEMENT



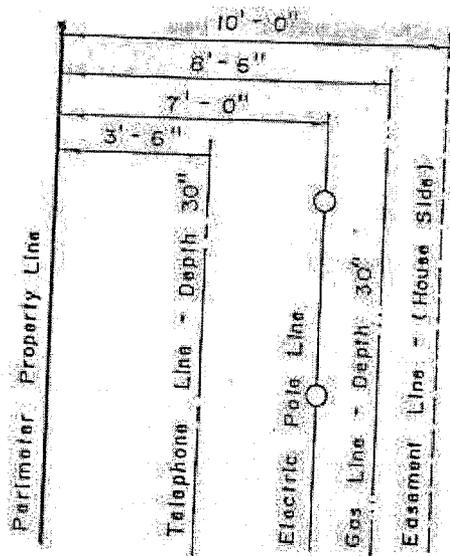
#### TYPICAL INSTALLATION DEPTHS



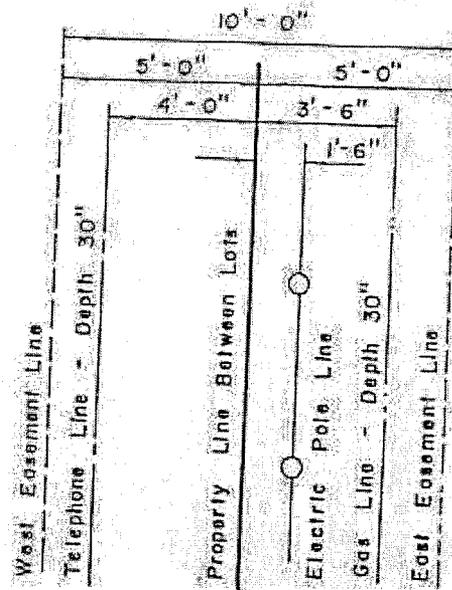
### BACK TO BACK EASEMENT

Utilities are normally installed as shown but depth may vary due to fill or cut by others.

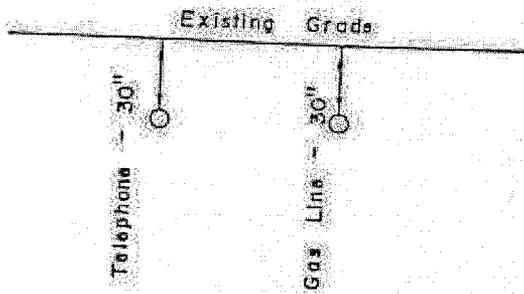
Maintain minimum 6" clearance between all utility lines extending from easement to house/building.



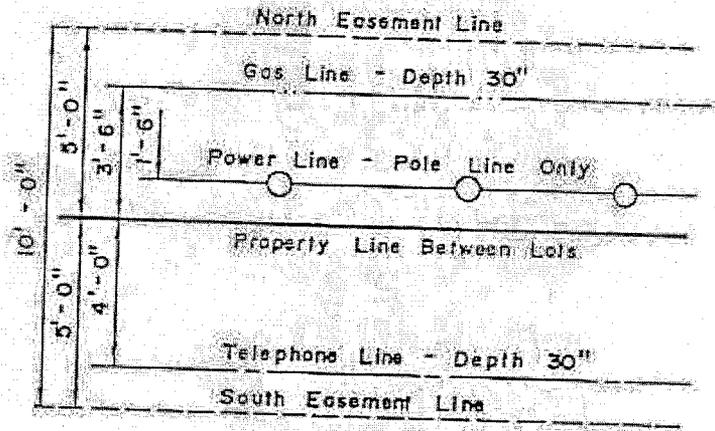
PERIMETER EASEMENT



BACK to BACK EASEMENT



TYPICAL INSTALLATION DEPTHS



BACK to BACK EASEMENT

UTILITIES ARE NORMALLY INSTALLED AS SHOWN BUT DEPTH MAY VARY DUE TO FILL OR CUT BY OTHERS.

MAINTAIN MINIMUM 6" CLEARANCE BETWEEN ALL UTILITY LINES EXTENDING FROM EASEMENT TO HOUSE - BUILDING.

10' UTILITY EASEMENT

## **APPENDIX C**

# **SANITARY SEWER DESIGN PEAKING FACTOR**

APPENDIX C

SANITARY SEWER - PEAK DESIGN FACTOR

All gravity sewers will be designed to accommodate the peak flow from the contributing drainage area. The peak flow will be computed using the appropriate peaking factor, F, multiplied by the average day flow for the contributing area. For non-residential areas, the peak flow should include consideration of flow characteristics from the anticipated development. In all cases, the design peaking factor, F, shall meet or exceed the values as follows:

An equivalent population less than 5,000 persons,

$$F = 4$$

An equivalent population greater than or equal to 5,000 persons,

$$F = (14 / (3.316 + P^{0.5})) + 1.5$$

for, P = equivalent population in thousands

Additional consideration of peak flow shall be given for design of pumping stations. The impact of pumping stations on the upstream and downstream sanitary sewer system shall be evaluated. The peak flow for design of a pumping station shall be based on the actual flow into the station. A reduced peak flow, based on the peaking factor presented above, may be used for design of larger pumping stations provided a detailed hydraulic analysis is performed on the sanitary sewer system. Specific approval by the Department of Public Works shall be required prior to use of a reduced peak flow for the design of a pumping station and related sanitary sewer system.

## **APPENDIX D**

# **MANDREL REQUIREMENTS**

APPENDIX D

MANDREL REQUIREMENTS

All gravity sanitary sewers, constructed using P.V.C. pipe, shall be tested using a Mandrel that will measure five percent (5%) deflection in the pipe. ASTM 3034, current, provides diameters for seven and one-half percent (7-1/2%) deflection. Five percent (5%) deflection requirements are listed below.

P.V.C. PIPE - SDR-35

Nominal Pipe Size (In.)	Average Inside Diameter (In.)	Base Inside Diameter (In.)	5% Deflection Mandrel (In.)
6	5.893	5.742	5.45
8	7.891	7.665	7.28
10	9.864	9.563	9.08
12	11.737	11.361	10.79
15	14.374	13.898	13.20

P.V.C. PIPE - SDR-26

Nominal Pipe Size (In.)	Average Inside Diameter (In.)	Base Inside Diameter (In.)	5% Deflection Mandrel (In.)
6	5.764	5.612	5.33
8	7.715	7.488	7.11
10	9.644	9.342	8.87
12	11.480	11.102	10.55
15	14.053	13.575	12.90

For P.V.C. pipe sizes larger than fifteen inch (15") diameter, specific requirements for the Mandrel will be established by the Department of Public Works.

# **APPENDIX E**

## **STREET LIGHTING REQUIREMENTS**

## **APPENDIX E - STREET LIGHTING REQUIREMENTS**

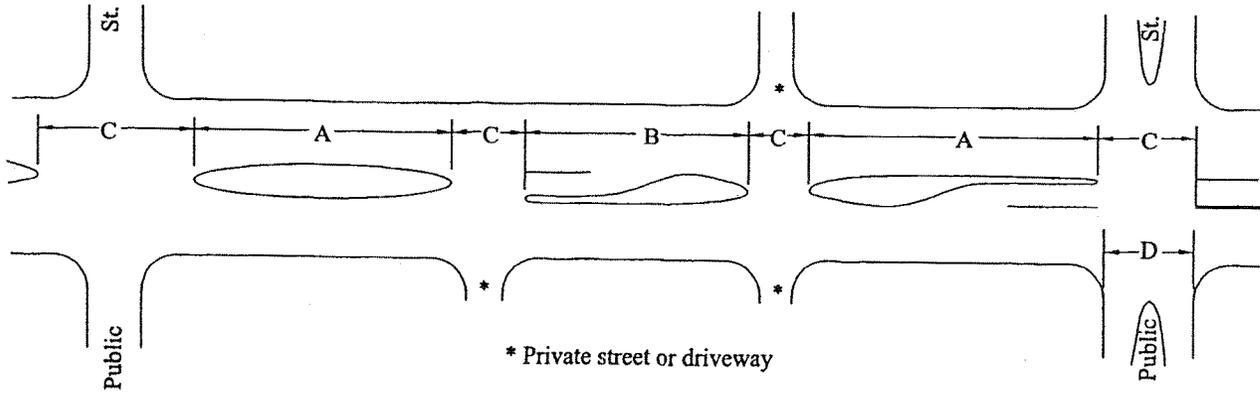
Notes:

1. CenterPoint Energy's guidelines for street lighting.
2. American National Standards Institute / Illuminating Engineering Society (ANSI / IES) guidelines for street lighting.
3. CenterPoint Energy provides street lighting layouts according to ANSI / IES criteria.
4. Developer is required to pay for installation and first year of service.

# **APPENDIX F**

## **PAVEMENT GEOMETRIC DESIGN GUIDELINES**

**TYPICAL LENGTH OF MEDIAN AND MEDIAN OPENING**



**TYPICAL LENGTH OF MEDIAN OPENING C**

MEDIAN INTERRUPTION	NO LTB <sup>(1)</sup>	1 LTB <sup>(1)</sup>	2 LTB <sup>(1)</sup>
PRIVATE DRIVE	45'	52.5' <sup>(1)</sup>	60'
UNDIVIDED STREET			
≤ 40'	45'	52.5' <sup>(2)</sup>	60'
44'	50'	55' <sup>(2)</sup>	60'
DIVIDED STREET			
ALL	D + 10'	D + 10'	D + 10'

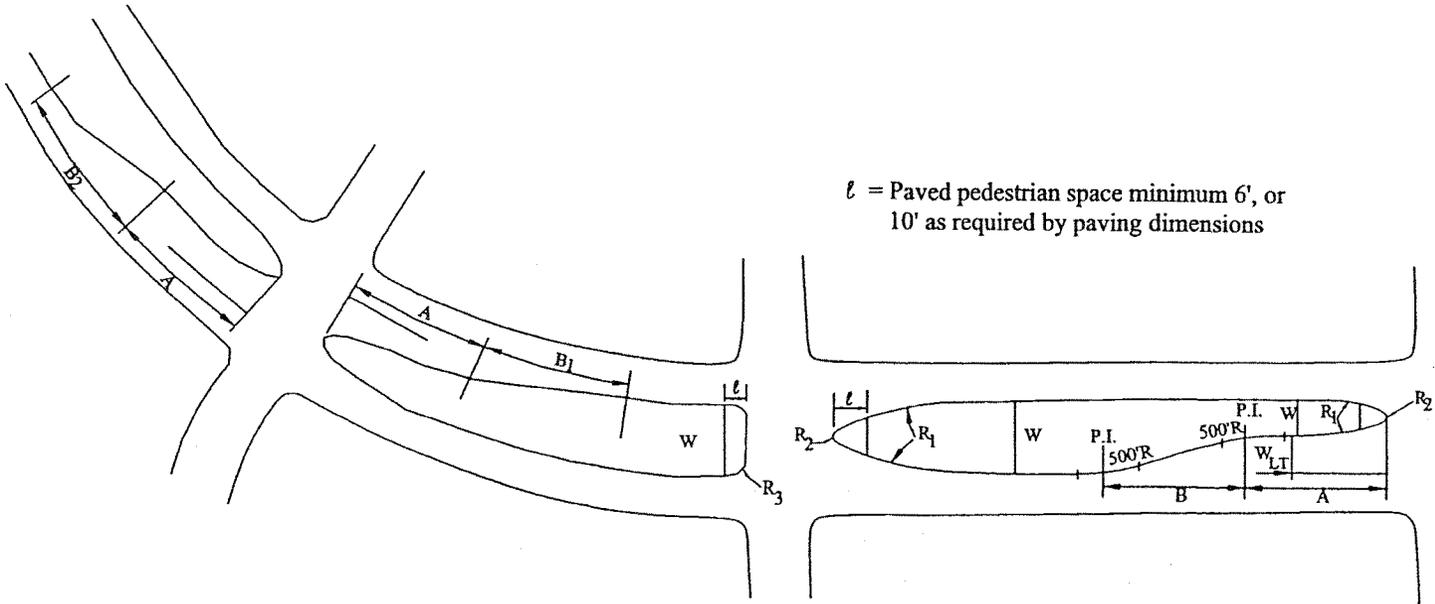
**NOTES:**

- (1) LTB-Left Turn Bay.
- (2) Distance from centerline of opening to median nose with left turn lane must be 30'.
- (3) See drawing titled ROADWAY TAPERS FOR SUBDIVISION STREETS.
- (4) Opening may be allowed, contact City Engineer.

**MINIMUM ACCEPTABLE MEDIAN LENGTH FOR TYPE OF STREET (3)**

IF PLANNED DIVIDED STREET IS:	PURPOSE OF MEDIAN INTERRUPTION			
	MAJOR STREET/ THOROUGHFARE (A)	COLLECTOR STREET (A)	LOCAL STREET (A)	PRIVATE STREET OR DRIVEWAY (B)
MAJOR STREET/ THOROUGHFARE	350'	300'	300' <sup>(4)</sup>	300' <sup>(4)</sup>
COLLECTOR STREET	300'	250'	250'	250'
LOCAL STREET	250'	250'	250'	200'

## MEDIAN NOSE AND LEFT TURN BAY DESIGN



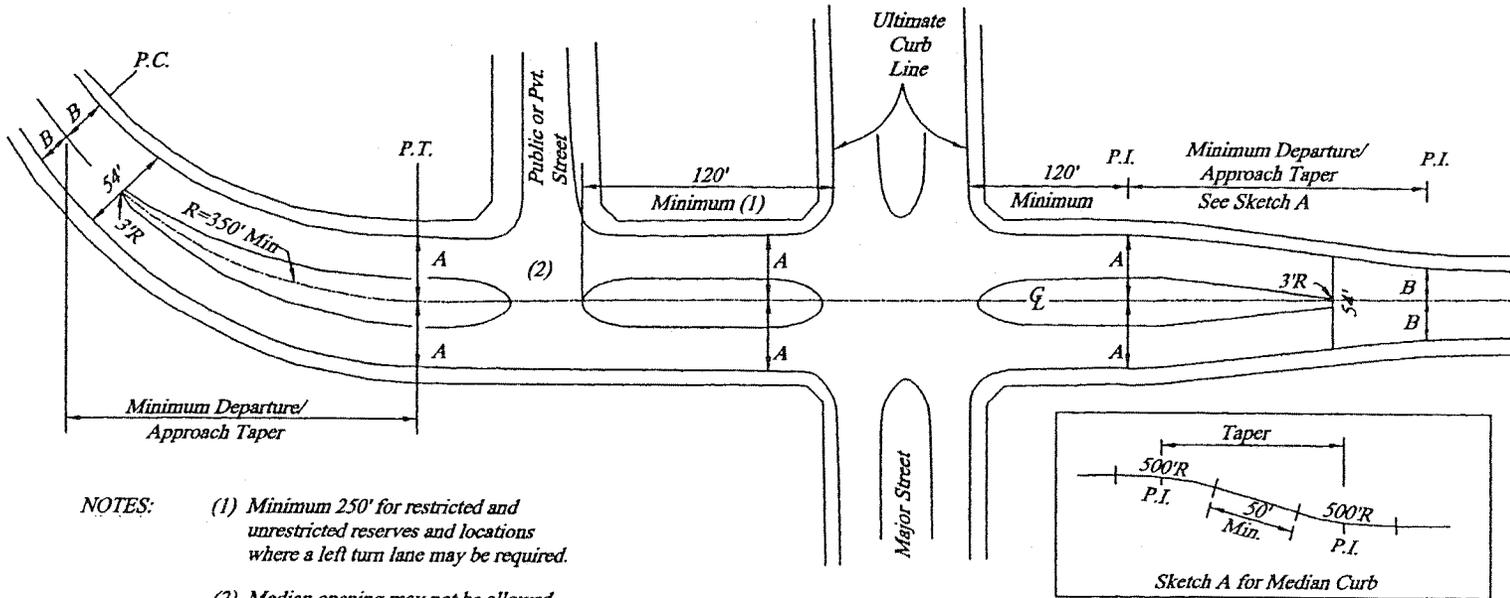
MEDIAN DIMENSIONS

W	$R_1$	$R_2$	$R_3$
$\leq 10'$	NONE	$\frac{W}{2}$	NONE
$>10' \leq 40'$	90	$\frac{W}{5}$	NONE
$>40'$	NONE	NONE	15

LEFT TURN BAY DIMENSIONS

$A$  = 150' minimum at intersection of two major streets.  
 = 100' minimum at all other intersections.  
 $B$  = 100' minimum on straight roadway.  
 $B_1$  = Taper length may be shorter if it is on a horizontal curve to the left.  
 $B_2$  = Taper length may be longer if curve is to the right.  
 $W_{LT}$  = 10' minimum  
 NOTE: Dimensions may be adjusted as determined by City Engineer.

## ROADWAY TAPERS FOR SUBDIVISION STREETS



- NOTES:**
- (1) Minimum 250' for restricted and unrestricted reserves and locations where a left turn lane may be required.
  - (2) Median opening may not be allowed if median becomes less than 250' in length on major street.
  - (3) Approach and Departure Taper Requirement:  

$$L = \frac{WS^2}{60}$$
 where L = length in feet  
 S = speed in m.p.h.  
 W = lateral offset in feet  
 S = 30 m.p.h. minimum design speed for subdivision streets  
 W = A - B
  - (4) 350' minimum centerline radius for horizontal curve with approach or departure tapers

### QUICK REFERENCE GUIDE

ROADWAY CROSS SECTION (FEET)		TAPER $L = \frac{WS^2}{60}$ (FEET)
A + A	B + B	
80	60	150
80	40	300
80	27	400
70	40	225
70	27	325
60	40	150
60	27	250
40	27	100

# **APPENDIX G**

## **APPROVED PRODUCTS LIST**

## APPENDIX G - APPROVED PRODUCTS LIST

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### APPROVED WATER AND SEWER PRODUCTS LIST

All Products must conform to ANSI/NSF standards 60 or 61, if available. **All hardware shall be Stainless Steel 304.**

1. Fire Hydrants (Flushing Valves, AWWA C 502) (Fire Hydrant shall be installed with 5" STORZ™ Quick Connect Steamer Nozzle and Pumper 2.5" N.S.T., Nozzle should be pressed onto hydrant at factory, not placed as an adapter in the field)
  - A. Mueller – Model: Super Centurion
  - 250 B. American Darling – Model: B84B
  
2. Gate Valves (3/4 inch thru 2 inch, AWWA Approved, Bronze)
  - A. Hammond B. Watts
  - C. Red and White D. Matco
  - Norca
  - E. Eagle
  - F. C and F
  
3. Gate Valves (3 inch and larger, AWWA C 509, Resilient Wedge Type, Open Left)
  - A. Mueller B. Waterous C. American Darling D. Kennedy E. M & H
  - F. US Valve G. Clow
  
4. PVC Pipe (AWWA C 900, C 905, C 909)
  - A. J-M Manufacturing
  - B. Certain Teed Corp. C. Diamond Plastics Corp. D. Carlon Company
  
5. Mechanical Joint Restraints
  - A. Smith Blair Cam Lock
  - B. EBAA Iron Inc.
  - C. Megalug
  - D. Star Pipe Products
  
6. Ductile Iron Fittings For C 900, C 905 Pipe (AWWA C 110, AWWA C 153)
  - A. All manufacturers compliant with AWWA and/or ASTM standards.
  
7. Steel Pipe (AWWA C 200)
  - A. All manufacturers compliant with AWWA and/or ASTM standards.
  
8. Steel Pipe Coatings, Exterior (AWWA C 203)
  - A. All manufacturers compliant with AWWA and/or ASTM standards.

9. Steel Pipe Coatings, Interior (AWWA C 210, D 102, TNRCC NSF 61)
  - A. All manufacturers compliant with AWWA and/or ASTM standards.
10. Curb Stop – Bronze, Ball Valve, 360° Rotation, Locking Wing
  - A. Ford
  - B. Mueller – Model: Mark II Oriseal
11. Corporation Stop – Bronze
  - A. Ford – Model: F100 1" CC Tapered Thread
  - B. Mueller – Model: H-15008 or H-15013 1" CC Tapered Thread
12. Service Saddle – Single or Dual Strap, Stainless Steel, Bronze
  - A. Ford S-90 for PVC 1" CC Tapered Thread
  - B. Ford Single or Dual Strap for AC Pipe 1" CC Tapered Thread
13. U Branch
  - A. Mueller ¾" Full Port Ball Valves
14. Water Meter
  - A. Neptune MACH 10 V5 and HPP3
15. Service Tubing (3/4 inch thru 2 inch Polyethylene SDR 9, AWWA C-901)
  - A. NuMex
  - B. Envot
  - C. Vrisco Pipe
  - D. ADS
16. Polyethylene Encasement Tubing for Ductile Iron Systems (AWWA C 105)
  - A. All manufacturers compliant with AWWA and/or ASTM standards.
17. Air Release Valve, 2 inch (Bonney Forge 3,000# Threadolet)
  - A. APCO – No. 200
  - B. GA Industries – Fig. 2- AR
  - C. Val-matic, 2 inch
18. Meter Boxes
  - A. Concrete
    - a. Brooks Products
    - b. Southern Precast
19. SCADA
  - A. Zetron – RTU Model 1700 MTU Compatible
20. Coatings (Manholes & Lift Stations) (80 mil required for new construction; 125 mil required for rehabilitation jobs)
  - A. Raven 405
  - B. Spectra Shield Liner

C. Alternative to coating: Antimicrobial additive, ConShield® or approved equal, used to render the concrete uninhabitable for bacteria growth. The amount to be used shall be as recommended by the manufacturer of the antibacterial additive. This amount shall be included in the total water content of the concrete mix design. The additive shall be added into the concrete mix water to insure even distribution of the additive throughout the concrete mixture. The antibacterial additive shall have successfully demonstrated prevention of microbiologically induced corrosion in sanitary sewers for ten or more years. The antibacterial agent shall be used by factory certified precast concrete plants, and treated products shall be color marked by having colorant added at the precast plant to manufacturer standards to achieve adequate tint.

21. Tapping Sleeves – All Stainless

- A. JCM 432 or approved equal to be ANSI/NSF Standard 61 Certified

22. Sign Post

- A. Green U-Channel 12 Ft.
- B. Vandal-Proof Mounting Brackets

23. PVC Pipe (Sewer)

- A. SDR 26 ASTM D 3034

24. Lift Station Control Panels

- A. E. G. Controls
- B. Consolidated Electric
- C. Murphymatic
- D. Sta-Con, Inc.
- E. Automatic Control Systems
- F. Mercer Controls Division
- G. Motor Controls, Inc.

25. Lift Station Pumps

- A. Flygt

26. Grinder Pumps

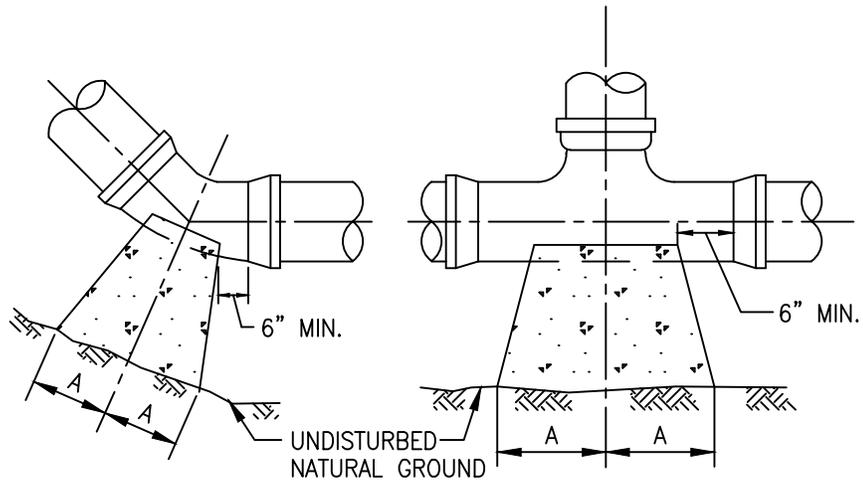
- A. Hydromatic
- B. Myers

## APPROVED STORM SEWER PRODUCTS LIST

1. Manhole Covers and Rings (ASTM A 48, AASHTO H-20 Load Rating)
  - A. Vulcan Foundry – 32 Inch diameter; Model V-2420
  - B. Neenah Foundry – 32 Inch diameter; Model R-1741-F
  - C. East Jordan Iron Works – 32 Inch diameter; Model V-1420
  - D. Star Pipe Products – 32 Inch diameter
  
2. Storm Inlet Grates and Frames (ASTM A 48, AASHTO H-20 Load Rating)
  - A. Vulcan Foundry
  - B. Neenah Foundry
  - C. East Jordan Iron Works, Inc.
  
3. Pipe Materials
  - A. RCP, 24 inch and larger at all depths – ASTM 76 with rubber gasketed joints conforming to ASTM 433 (Various Manufacturers)
  - B. HDPE, 24 inch and larger at all depths (Outside City of Seabrook Public Right-of-Way Only) – AASHTO CM-294 (Various Manufacturers)
  
4. Reinforced Concrete Box Culverts (ASTM C 789, C 850, AASHTO M259, M273 – Various Manufacturers)
  - A. RCB, 24 inches x 24 inches and larger having minimum 2 feet to maximum 12 feet of cover – ASTM C789/AASHTO M259 joined with “Ramnek” joint sealing compound by K.T. Snyder Co.
  - B. RCB, 24 inches x 24 inches and larger having less than 2 feet of cover or greater than 12 feet of cover – ASTM C850/AASHTO M276 joined with “Ramnek” joint sealing compound by K.T. Snyder Co.
  
5. Manholes and Storm Inlets (Precast Concrete)
  - A. More-Tex
  - B. Southern Precast
  - C. Calvert
  - D. Gifford Hill
  - E. Brooks Products
  - F. Dalworth
  - G. Precast Systems, Inc.
  - H. Koastal Precast, Inc.
  
6. Geotextile Fabric Wrap
  - A. Trevira S1114
  
7. Pipe Casing Spacers & End Seals for Bored Crossings
  - A. Pipeline Seal and Insulator (PSI)
  
8. Stormceptors
  - A. Park
  
9. Pop-up PVC Yard Drains
  - A. 4” PVC Drain, Model # NDS 422G

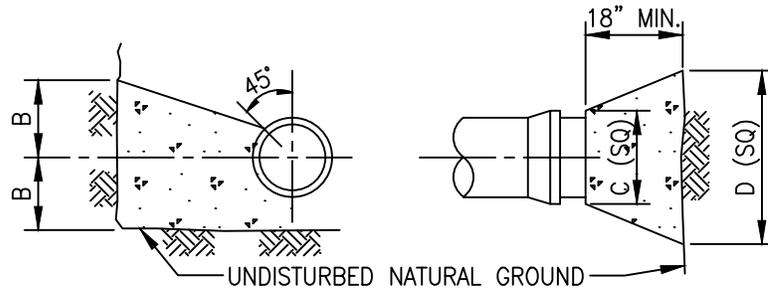
## APPROVED STREET PRODUCTS LIST

1. Raised Pavement Markers (Class A, B, C, & D)
  - A. Apex Universal
2. Type Y and Type W Traffic Buttons (Ceramic Only)
  - A. Apex Universal
3. Raised Pavement Marker Adhesive
  - A. Bundy Raised Pavement Marker Adhesive
  - B. TxDOT Approved Epoxy
4. Thermoplastic Pavement Markings (125 mil thick)
  - A. Flint Trading Inc. – Premark LKF Roadmarking Material
5. Prefabricated Pavement Markings (125 mil thick)
  - A. Flint Trading Inc. – Premark LKF Roadmarking Material
6. Thermoplastic Adhesive
  - A. Ashland Chemicals – Pliobond 10
7. Crack and Joint Sealant
  - A. Elastometric-Type, Hot pour joint sealant conforming to TxDOT Item 433 and TxDOT Departmental Material Specification D-9-6310
8. Paints (Various Manufacturers)
  - A. Only water based conforming to TxDOT specifications are approved for use in the City of Seabrook
9. Road Marker Posts
  - A. Carsonite #CRM-375
10. Replaceable Delineator Post w/ Base (Epoxy or 8” Bundy Adhesive)
  - A. Repo TM Model
11. Concrete Curing Membranes (Various Manufacturers)
  - A. Liquid membrane-forming curing compound conforming to TxDOT Item 526 and TxDOT Departmental Material Specification D-9-8120
12. Chemical Stain for Use on Ramps for Handicapped Access (Cola Color, ADA Texas Accessibility Standards)
  - A. Kemiko Concrete Products
13. Traffic Control Signalization, Lighting and Appurtenances
  - A. All materials and manufactured products pertaining to traffic control signals, lighting, and associated appurtenances shall conform to current TxDOT specifications and shall be listed in the TxDOT Prequalified Master List of Approved Products at time of installation.



BEND

TEE



24" MIN.-12" & LARGER PIPE  
18" MIN.-10" & SMALLER PIPE

BEND & TEE

PLUG

SIZE	90° BEND		45° BEND		22 1/2° BEND		TEES		PLUGS	
	A	B	A	B	A	B	A	B	A	B
2 1/2"	12"	7"	6"	7"	6"	6"	7"	8"	8"	14"
6"	16"	10"	9"	10"	6"	12"	10"	12"	10"	21"
8"	22"	13"	12"	13"	8"	10"	13"	16"	12"	29"
10"	26"	17"	14"	17"	10"	13"	16"	20"	14"	36"
12"	29"	21"	16"	21"	11"	16"	18"	24"	16"	41"
14"	35"	24"	19"	24"	12"	20"	22"	27"	18"	48"
16"	38"	27"	21"	27"	12"	24"	24"	30"	20"	54"

NOTE: THRUST BLOCKS AT TRENCH FACE MUST HAVE A MINIMUM BEARING SURFACE OF 1.0 SQ. FOOT AND THE LEAST DIMENSION SHALL BE NO SMALLER THAN 1.5 TIMES PIPE DIAMETER, BUT NOT LESS THAN 1.0 FT.

DATE: JANUARY 2015

APPROVED BY:

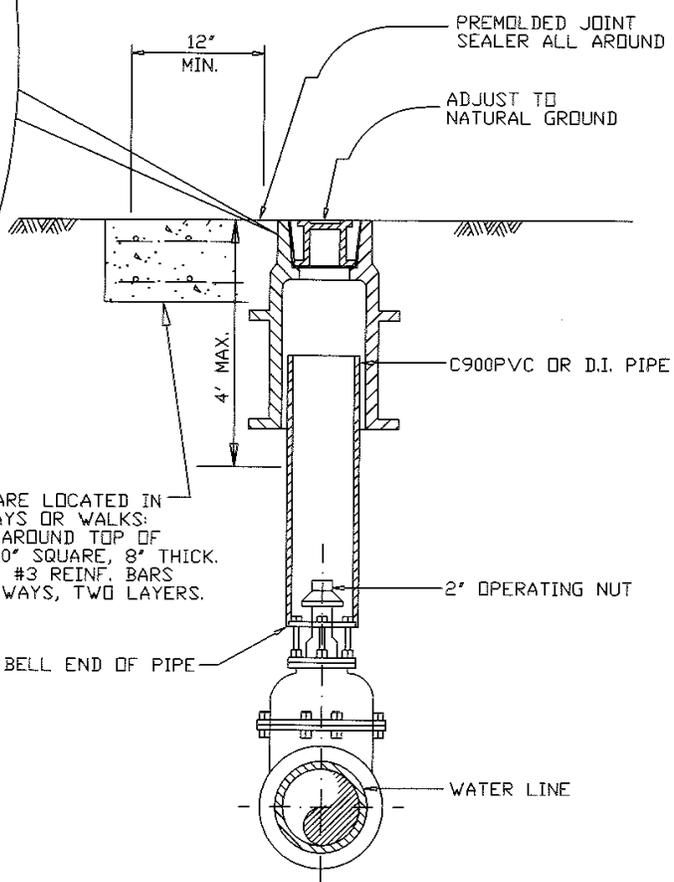
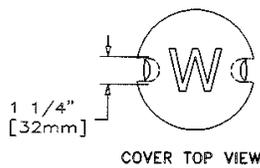
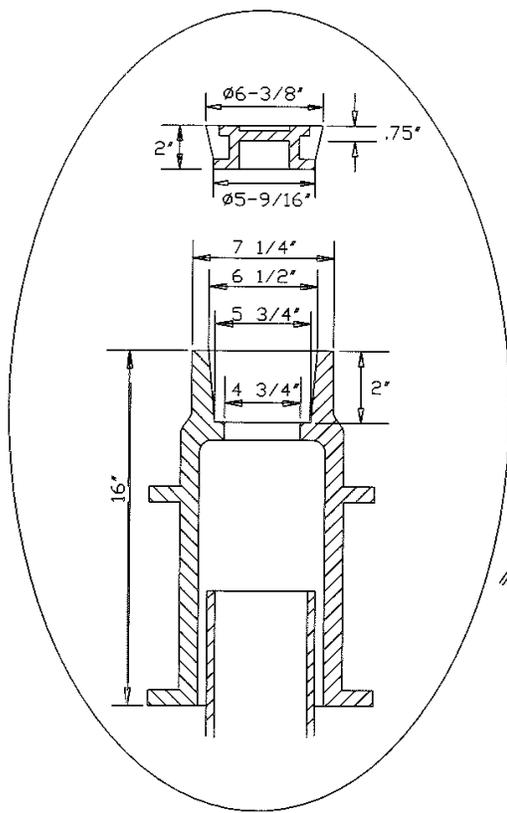
DESIGN BY:

SCALE: N.T.S.

DRAWING NO.: W-100

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

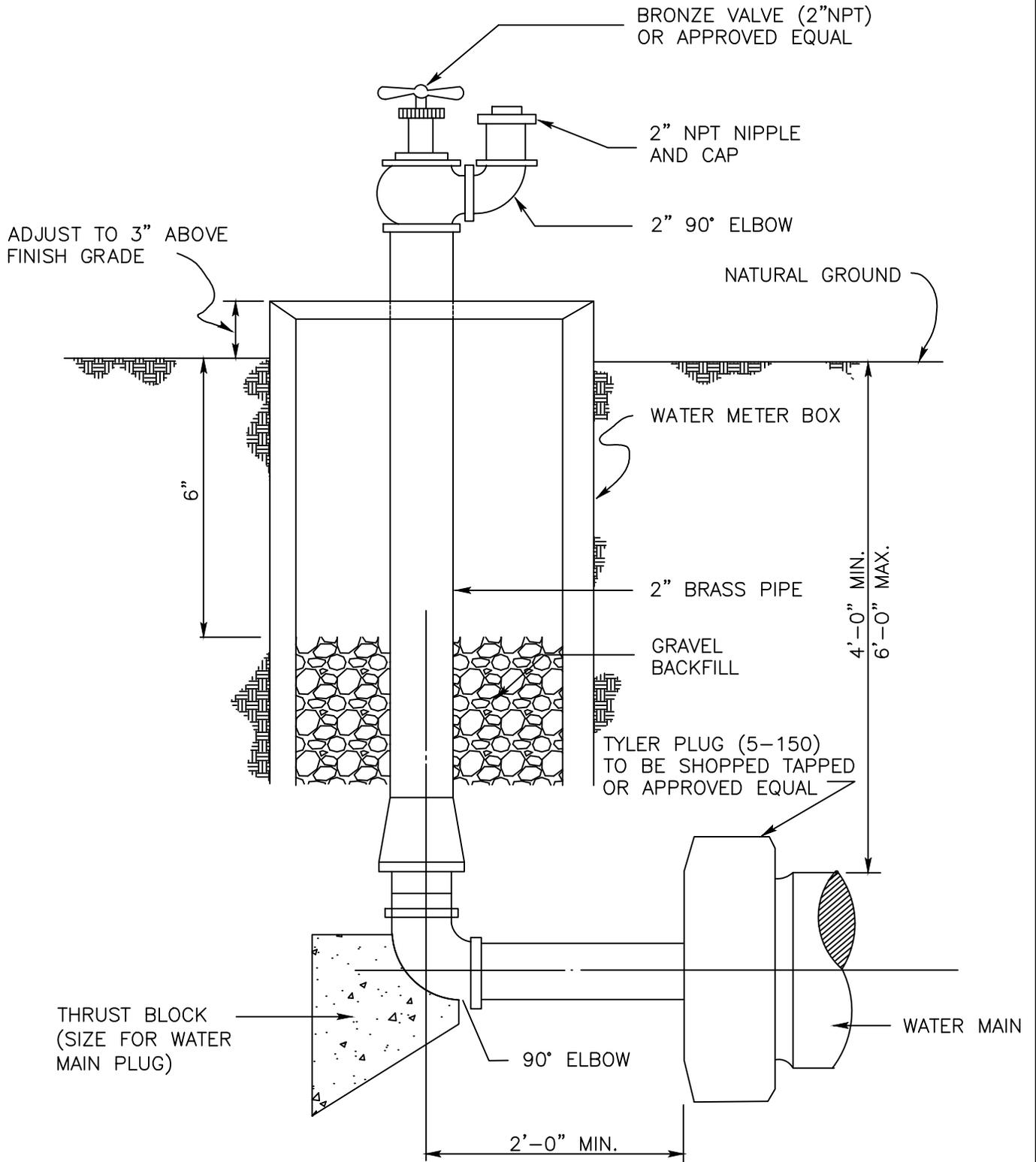
THRUST BLOCK



WHEN VALVES ARE LOCATED IN ROADS, DRIVEWAYS OR WALKS: CONCRETE DISC AROUND TOP OF VALVE BOXES 30" SQUARE, 8" THICK. REINFORCE WITH #3 REINF. BARS @ 8" C-C BOTH WAYS, TWO LAYERS.

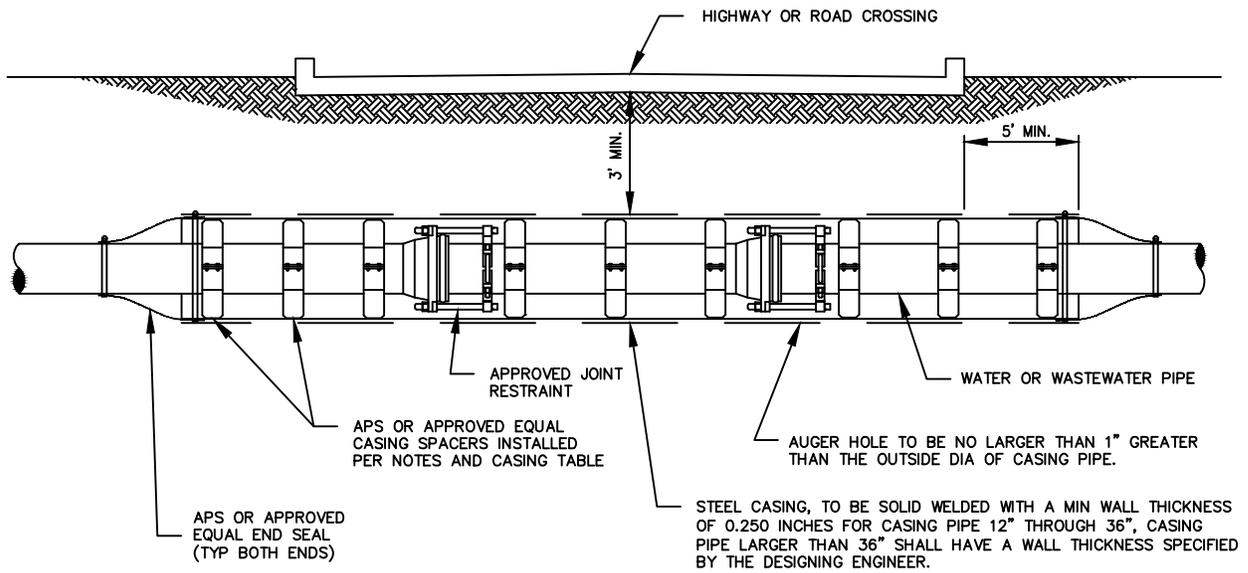
NOTE:  
 1) APPROXIMATE WEIGHTS.  
     FRAME— 46 LBS  
     COVER— 10 LBS  
 2) MATERIAL— GRAY IRON ASTM A48 CL35B

DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: W-101		<h1>GATE VALVE &amp; BOX</h1>
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS			



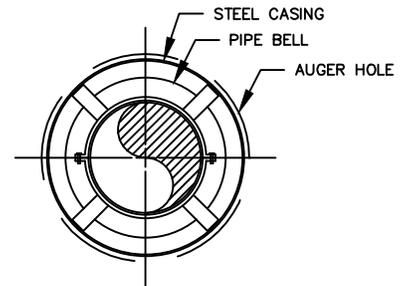
NOTE: ALL FITTINGS AND  
PIPE SHALL BE BRASS

DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: W-102		
CITY OF SEABROOK DEPARTMENT OF PUBLIC WORKS			BLOW-OFF ASSEMBLY



LONGITUDINAL SECTION

CASING TABLE		
NOMINAL PIPE SIZE DIA IN INCHES	MIN CASING SIZE INSIDE DIA IN INCHES	MAX SKID SUPPORT SPACING IN FEET
4	12	4.7
6	12	6.3
8	16	7.4
10	18	8.5
12	20	9.6
15	22	11.0
18	26	12.0
21	30	12.0
24	33	12.0
27	36	12.0



CROSS SECTION

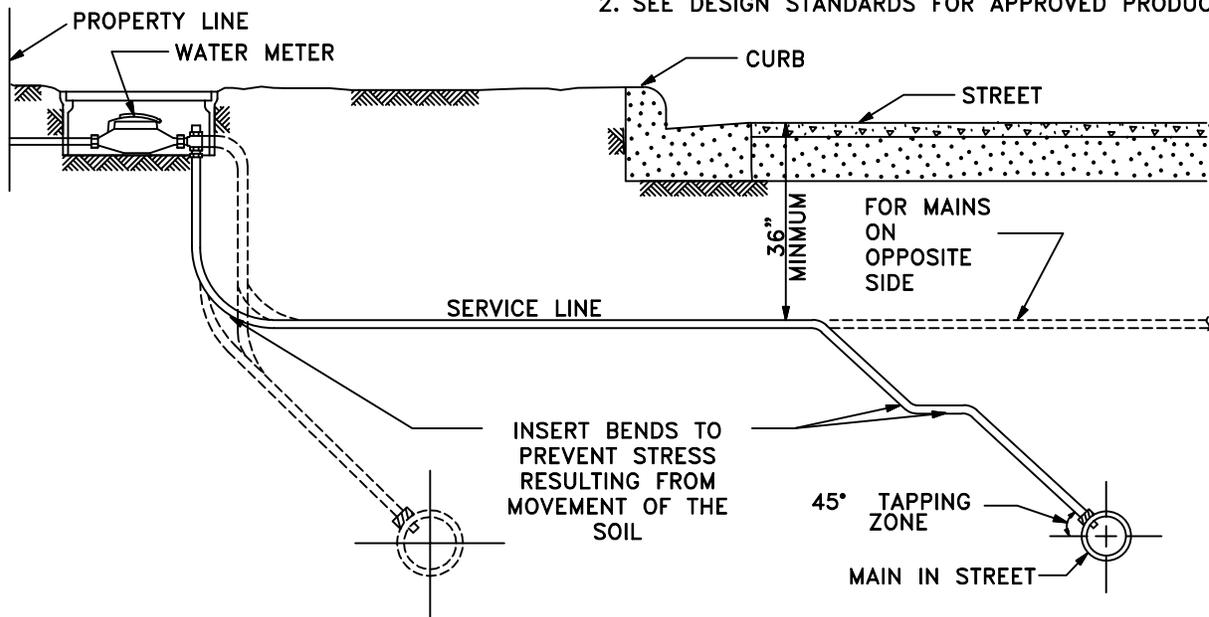
NOTES:

1. SPACERS FOR CARRIER PIPE SHALL BE STAINLESS STEEL, NEOPRENE OR APPROVED EQUAL AND SHALL BE INSTALLED TO CENTER CARRIER PIPE WITHIN CASING WITH A MAX TOLERANCE OF 1/2" BETWEEN RUNNER AND CASING INSIDE AS WELL AS PREVENT THE CARRIER PIPE FROM RESTING ON THE BELLS WITHIN THE CASING. SEE CASING TABLE FOR SPACER DISTANCE AND NUMBER OF SPACERS.
2. CONTRACTOR TO TAKE INTO CONSIDERATION THE SIZE AND LIMITS OF PIPE RESTRAINTS WHEN ORDER AND INSTALLING CASING PIPE TO ALLOW FOR ADEQUATE CLEARANCE.
3. SPACERS TO BE PLACED A MIN OF 1' BACK FROM EACH JOINT THAT FALLS WITHIN CASING, A GREATER SET BACK MAY BE REQUIRED FOR LARGER PIPE. SEE CASING TABLE FOR ADDITIONAL INFO ON SPACING OF SUPPORTS.
4. WHEN INSTALLING GRAVITY PIPE WITH CASING CONTRACTOR SHALL TAKE INTO CONSIDERATION PIPE GRADE SO THAT THE SEWER PIPE MAINTAINS THE PROPER FALL.
5. JOINT RESTRAINTS ARE REQUIRED ON ALL JOINTS THAT FALL UNDER OR WITHIN 10' OF HIGHWAY CROSSINGS REGARDLESS OF PIPE MATERIAL, CASED OR NOT.

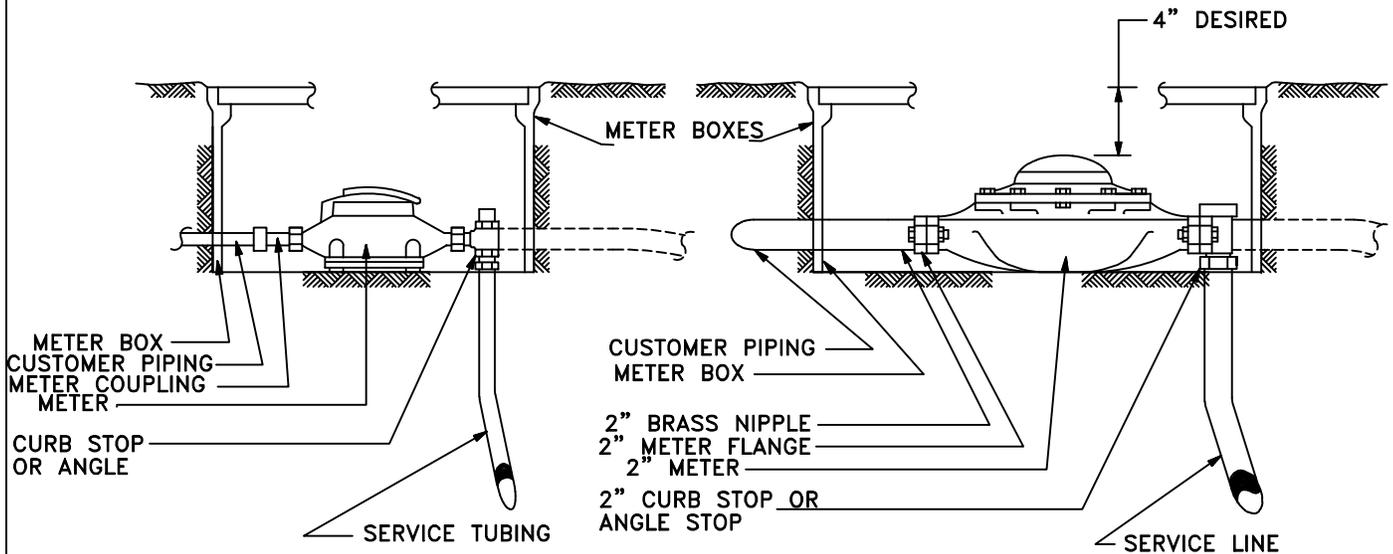
DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: W-103		<p>WATER MAIN ENCASEMENT</p>
<p><i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS</p>			

**NOTE:**

1. FOR MINIMUM SIZE WATER SERVICE LINE & FITTINGS, SEE SECTION 3.11-WATER-SERVICE.
2. SEE DESIGN STANDARDS FOR APPROVED PRODUCTS LIST.



**TYPICAL SECTION SERVICE LEAD**



**3/4" AND 1" METER SET**

**2" METER SET**

DATE: JANUARY 2015 | APPROVED BY: | DESIGN BY:

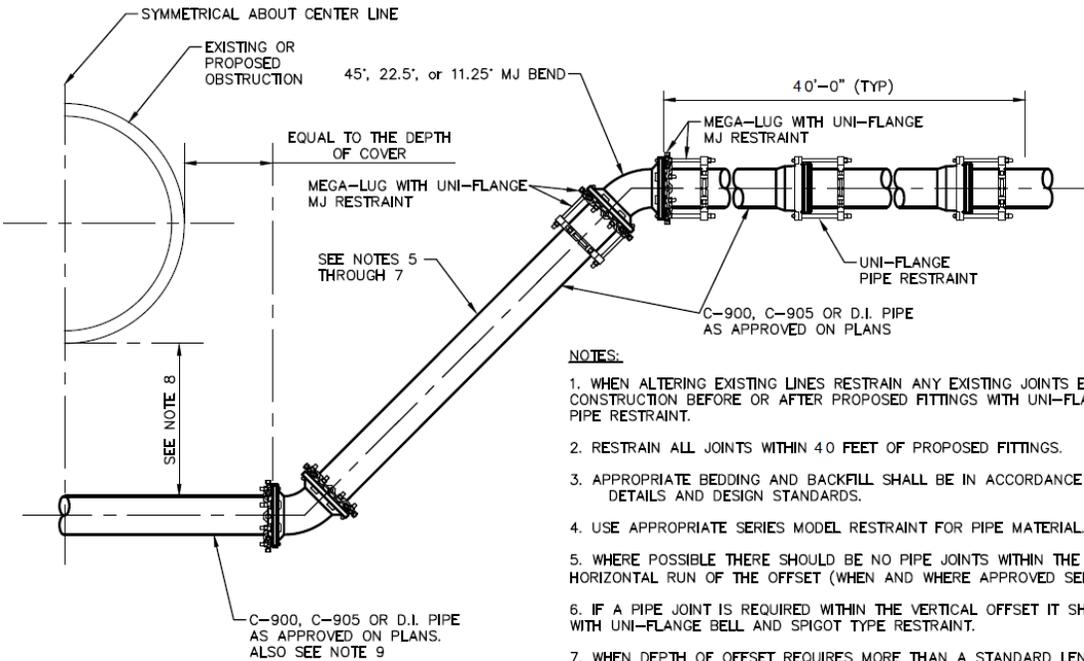
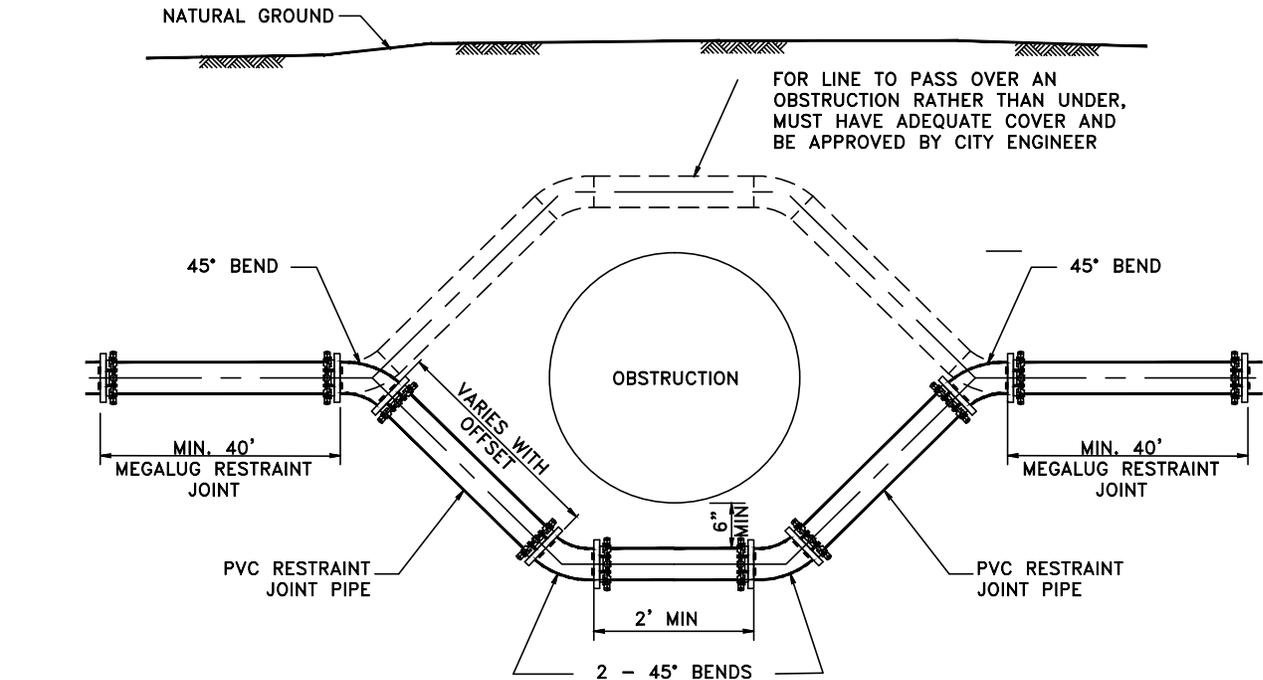
SCALE: N.T.S. | DRAWING NO.: W-104

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

WATER METER  
RESIDENTIAL

NOTES:

1. ALL MATERIALS AND COATINGS TO BE IN ACCORDANCE WITH DEPARTMENT OF PUBLIC WORKS SPECIFICATIONS.
2. CONTRACTOR TO USE MEGALUG RESTRAINT JOINTS AT ALL BENDS AND DIPS.



NOTES:

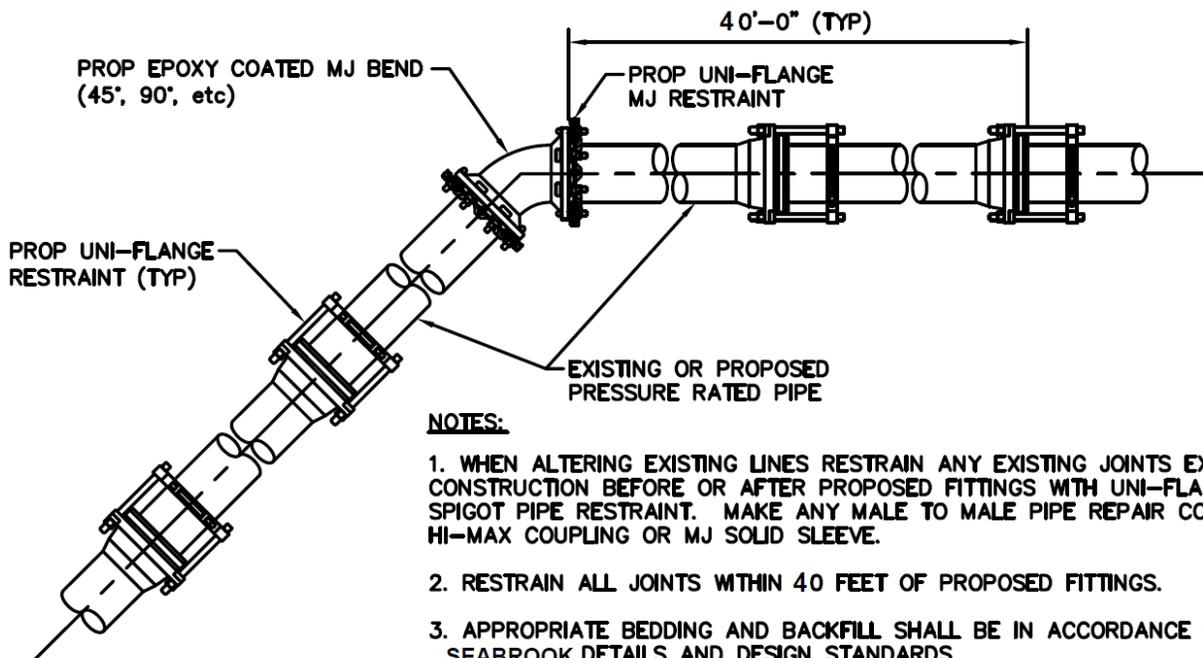
1. WHEN ALTERING EXISTING LINES RESTRAIN ANY EXISTING JOINTS EXPOSED BY CONSTRUCTION BEFORE OR AFTER PROPOSED FITTINGS WITH UNI-FLANGE BELL AND SPIGOT PIPE RESTRAINT.
2. RESTRAIN ALL JOINTS WITHIN 40 FEET OF PROPOSED FITTINGS.
3. APPROPRIATE BEDDING AND BACKFILL SHALL BE IN ACCORDANCE WITH CITY OF SEABROOK DETAILS AND DESIGN STANDARDS.
4. USE APPROPRIATE SERIES MODEL RESTRAINT FOR PIPE MATERIAL.
5. WHERE POSSIBLE THERE SHOULD BE NO PIPE JOINTS WITHIN THE VERTICAL OR HORIZONTAL RUN OF THE OFFSET (WHEN AND WHERE APPROVED SEE NOTE 6 AND 7).
6. IF A PIPE JOINT IS REQUIRED WITHIN THE VERTICAL OFFSET IT SHALL BE RESTRAINED WITH UNI-FLANGE BELL AND SPIGOT TYPE RESTRAINT.
7. WHEN DEPTH OF OFFSET REQUIRES MORE THAN A STANDARD LENGTH OF PIPE NO SEGMENT SHALL BE LESS THAN 5' IN LENGTH.
8. THE MINIMUM CLEARANCE SHALL BE DETERMINED BY THE AMOUNT OF BEDDING AND BACKFILL REQUIRED BY THE PROSPECTIVE PIPE AND THEIR USAGE. SEE THE BEDDING AND BACKFILL DETAILS FOR DIMENSIONS.
9. A SOLID CONTINUOUS JOINT OF PIPE SHALL BE USED AT ALL TIMES FOR THE HORIZONTAL SECTION OF THE OFFSET. IF THE MINIMUM SIDE CLEARANCE DISTANCES PLUS THE DIMENSION OF THE OBSTRUCTION IS GREATER THAN A STANDARD JOINT OF PIPE AN APPROPRIATELY SIZED AND CONTINUOUS LENGTH OF HDPE SHALL BE USED WITH TRANSITION FITTING OR GASKETS AS SPECIFIED BY THE MANUFACTURER IF NEEDED.

DATE: JANUARY 2015      APPROVED BY:      DESIGN BY:

SCALE: N.T.S.      DRAWING NO.: W-105

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

WATER PIPE  
OFFSET ASSEMBLY



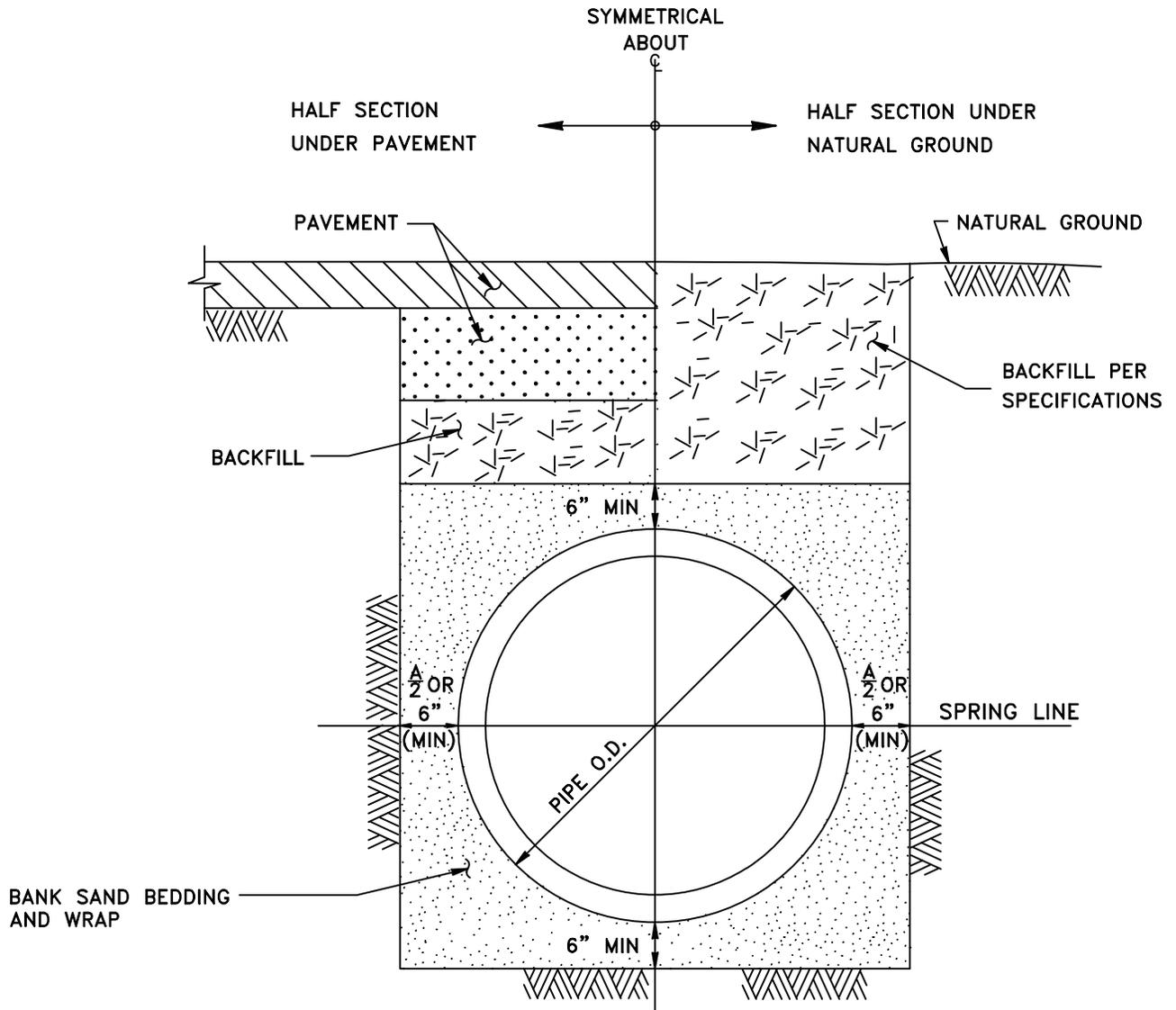
**NOTES:**

1. WHEN ALTERING EXISTING LINES RESTRAIN ANY EXISTING JOINTS EXPOSED BY CONSTRUCTION BEFORE OR AFTER PROPOSED FITTINGS WITH UNI-FLANGE BELL AND SPIGOT PIPE RESTRAINT. MAKE ANY MALE TO MALE PIPE REPAIR CONNECTION WITH HI-MAX COUPLING OR MJ SOLID SLEEVE.
2. RESTRAIN ALL JOINTS WITHIN 40 FEET OF PROPOSED FITTINGS.
3. APPROPRIATE BEDDING AND BACKFILL SHALL BE IN ACCORDANCE WITH CITY OF SEABROOK DETAILS AND DESIGN STANDARDS.
4. USE APPROPRIATE SERIES MODEL RESTRAINT FOR PIPE MATERIAL.

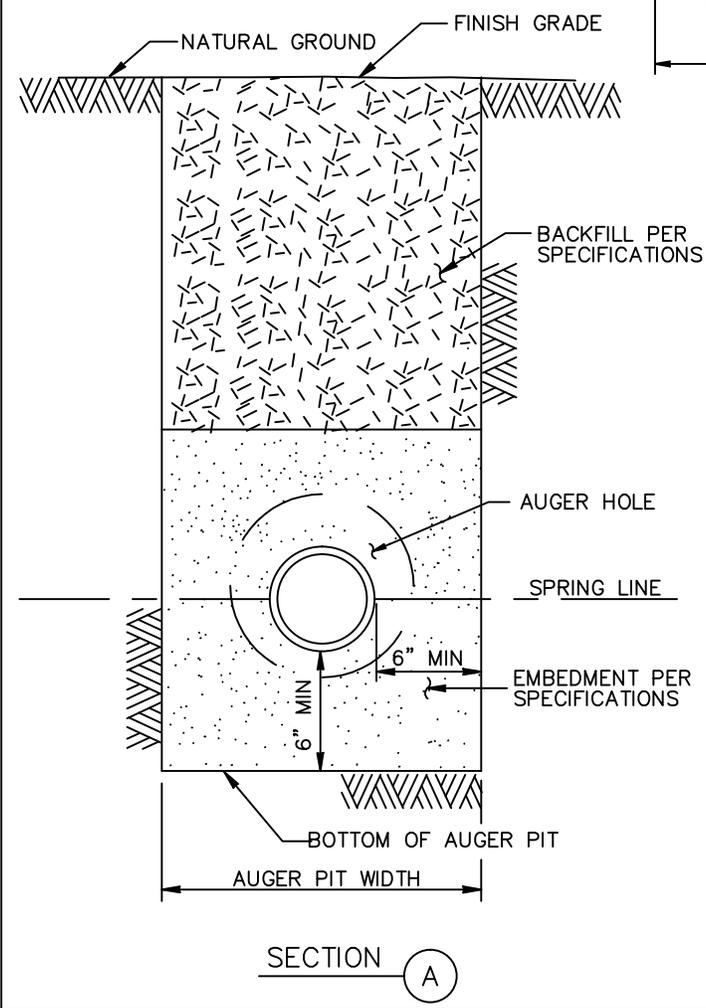
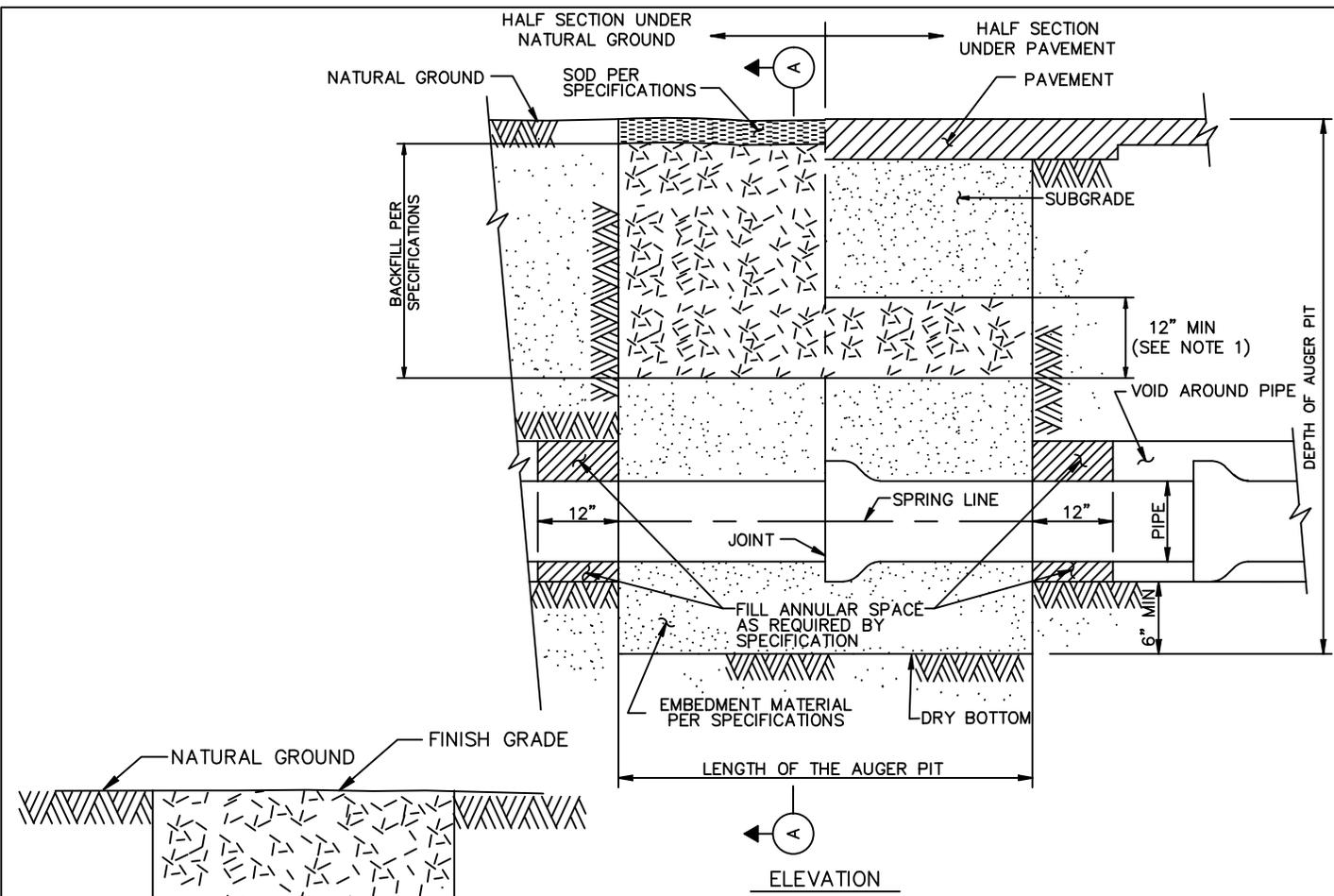
DATE: OCTOBER 2025	APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: W-114	
<p><i>CITY OF SEABROOK</i></p> <p>DEPARTMENT OF PUBLIC WORKS</p>		<p>HORIZONTAL ADJUSTMENT RESTRAINT DETAIL</p>

**NOTES:**

1. BACKFILL SHALL BE NATIVE SOIL, FREE OF DEBRIS, COMPACTED TO 90% STANDARD PROCTOR DENSITY EXCEPT AS REQUIRED BELOW.
2. BACKFILL UNDER DRIVEWAY AND PUBLIC STREETS SHALL BE CEMENT STABILIZED SAND (1.5 SACKS OF CEMENT PER TON OF SAND), COMPACTED TO 95% STANDARD PROCTOR DENSITY."
3. TRENCH SHORING IN ACCORDANCE WITH OSHA, SHALL BE INSTALLED WHERE REQUIRED.



DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: W-106		WATER MAIN BEDDING & BACKFILL FOR OPEN CUT TRENCHES
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS			



**NOTE:**  
 1. SELECT BACKFILL FOR RIGID PAVEMENT;  
 FLEXIBLE BASE MATERIAL FOR ASPHALT  
 PAVEMENT.

DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: W-107		WATER MAIN BEDDING & BACKFILL AUGER PIT & AUGER HOLE
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS			

**NOTES:**

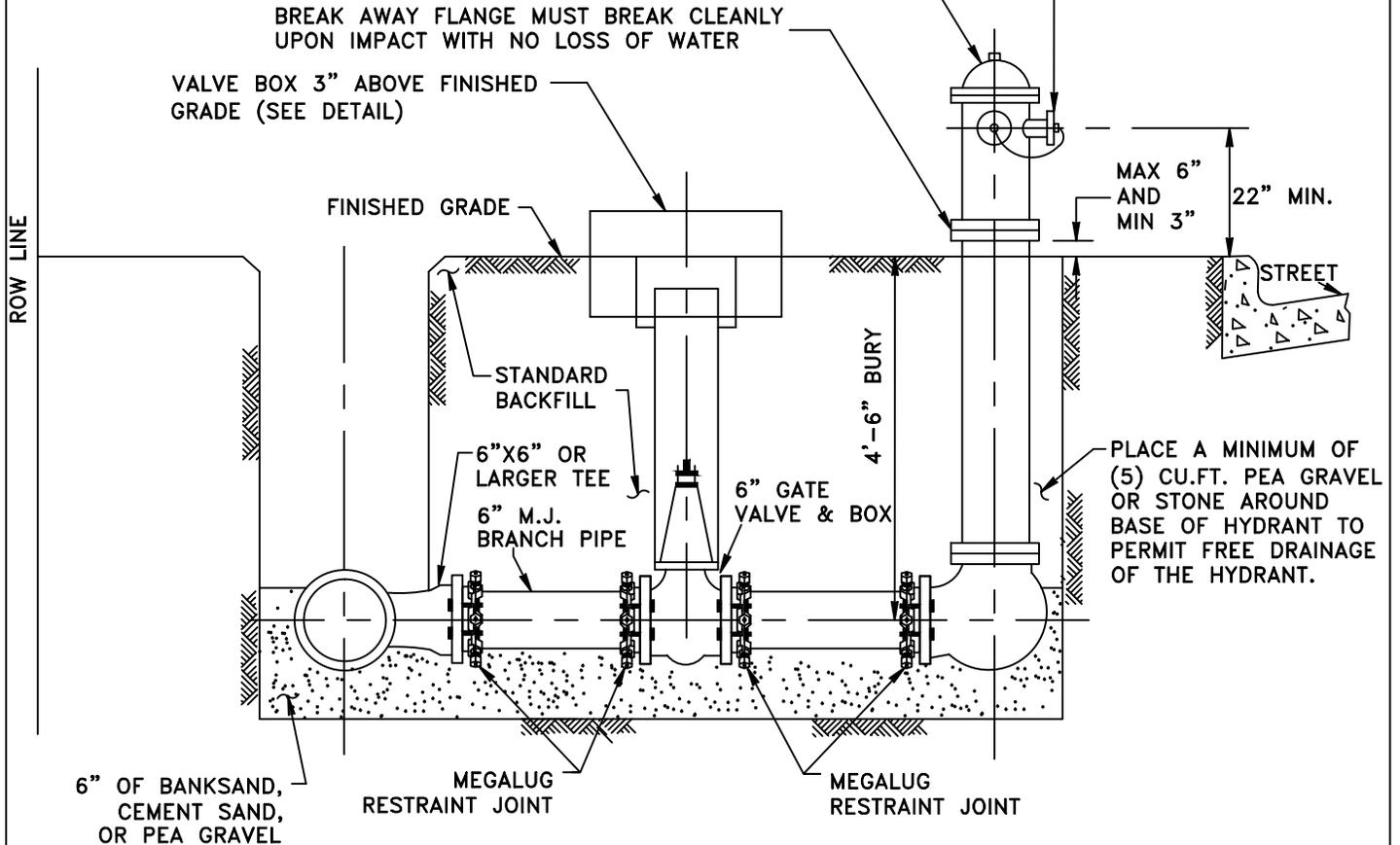
1. LOCATE FIRE HYDRANTS AT PC<sub>s</sub> OF THE INTERSECTION CURB RADIUS, 3 FEET BEHIND CURB OR PROJECTED FUTURE CURB.
2. ON OPEN-DITCH ROADWAYS, SET THE FIRE HYDRANTS WITHIN 3 FEET OF RIGHTS-OF-WAY LINES.
3. THE FIRE HYDRANT STEAMER NOZZLE SHALL FACE THE STREET.
4. FIRE HYDRANTS SHALL BE FACTORY PAINTED SW 4086 SAFETY BLUE SEMI-GLOSS. IF FACTORY PAINT IS NOT POSSIBLE THE CONTRACTOR SHALL SANDBLAST, PRIME COAT AND PAINT SW 4086 SAFETY BLUE.

FIRE HYDRANT SHALL BE MUELLER CENTURION OR AMERICAN DARLING WITH FACTORY INSTALLED 5" STORZ™ QUICK CONNECT STEAMER NOZZLE AND PUMPER 2.5" N.S.T. (NOZZLE SHOULD BE PRESSED ONTO HYDRANT AT FACTORY NOT PLACED AS AN ADAPTER IN THE FIELD)

STEAMER NOZZLE TO FACE STREET, FACTORY INSTALLED STORZ™ QUICK CONNECT WITH BLIND CAP.

BREAK AWAY FLANGE MUST BREAK CLEANLY UPON IMPACT WITH NO LOSS OF WATER

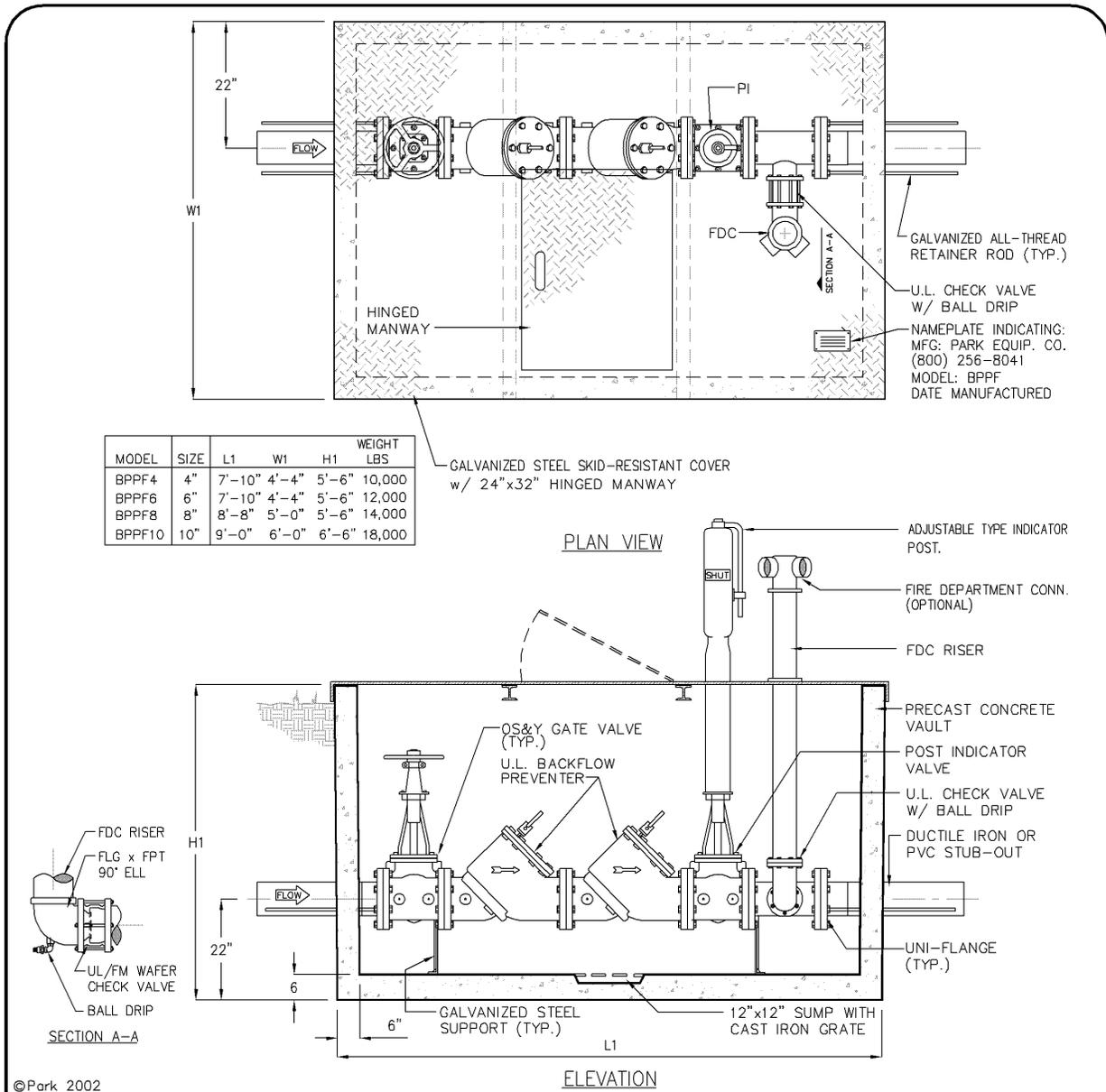
VALVE BOX 3" ABOVE FINISHED GRADE (SEE DETAIL)



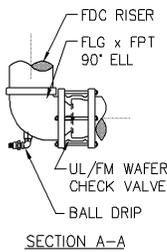
ROW LINE

STREET

DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: W-108		
<i>CITY OF SEABROOK</i>		FIRE HYDRANT DETAIL	
DEPARTMENT OF PUBLIC WORKS			



MODEL	SIZE	L1	W1	H1	WEIGHT LBS
BPPF4	4"	7'-10"	4'-4"	5'-6"	10,000
BPPF6	6"	7'-10"	4'-4"	5'-6"	12,000
BPPF8	8"	8'-8"	5'-0"	5'-6"	14,000
BPPF10	10"	9'-0"	6'-0"	6'-6"	18,000



©Park 2002

**Specifications**

**CONCRETE :** Class 1 concrete with design strength of 4500 PSI at 28 days. Unit is of monolithic construction at floor and first stage of wall with sectional riser to required depth.

**REINFORCEMENT:** Grade 60 reinforced. Steel rebar conforming to ASTM A615 on required centers or equal.

**STEEL COVER:** 1/4" steel skid-resistant floor plate welded to 3" angle frame with (2) 3"x2-3/8" I beam supports.

**Engineering Data**

The backflow assembly shall be factory assembled in vault & hydrostatically tested prior to delivery. Field excavation & preparation shall be complete prior to delivery. Pipe, valves and fittings of the assembly shall be approved by one or more of the following associations:



PROJECT : \_\_\_\_\_

CUSTOMER : \_\_\_\_\_

LOCATION: \_\_\_\_\_

ENGINEER : \_\_\_\_\_

ORDER # : \_\_\_\_\_

DATE : \_\_\_\_\_

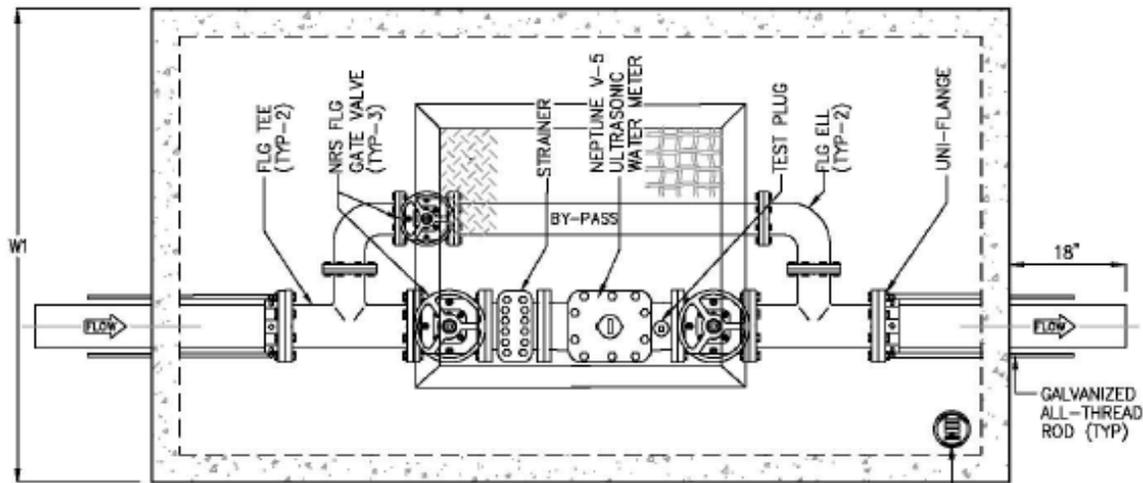
**PARK** ENVIRONMENTAL EQUIPMENT  
 800-256-8041  
 www.park-usa.com

*"Expect the Best"*

**4" THRU 10" DOUBLE CHECK BACKFLOW PREVENTER ASSEMBLY w/ PIV & FDC**

SCALE	NONE	DWG. NO.	BPPF-1	REV.
DATE	01/02			<b>A</b>

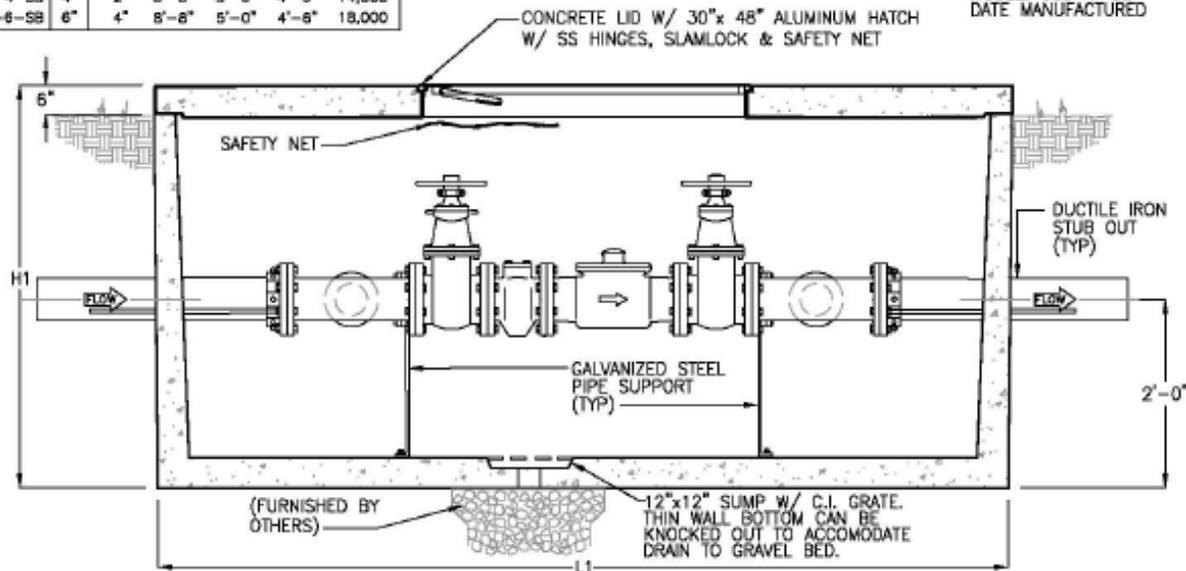
DATE: JANUARY 2015	APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: W-109	
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS		4" THRU 10" DOUBLE CHECK BACKFLOW PREVENTER W/PIV & FDC



PLAN VIEW

MODEL	SIZE	BY PASS	L1	W1	H1	WEIGHT LBS
USD-3-SB	3"	2"	8'-8"	5'-0"	4'-6"	13,000
USD-4-SB	4"	2"	8'-8"	5'-0"	4'-6"	14,000
USD-6-SB	6"	4"	8'-8"	5'-0"	4'-6"	18,000

NAMEPLATE INDICATING:  
 MFG: ParkUSA  
 888-611-PARK  
 WWW.PARK-USA.COM  
 MODEL: USD-1-SB  
 DATE MANUFACTURED



ELEVATION

Specifications

CONCRETE: Class I/II concrete with design strength of 4500 PSI at 28 days. Unit is of monolithic construction at floor and first stage of wall with sectional riser to required depth.

REINFORCEMENT: Grade 60 reinforced. Steel rebar conforming to ASTM A615 on required centers or equal.

GALV STEEL HATCH: Galvanized, bolt down hatchway. Door leafs shall be a 1/4" thick steel diamond plate reinforced with 2 1/2"x2 1/2"x1/2" angle to an AASHTO H-20 wheel load.

Engineering Data

The meter assembly shall be factory assembled in vault & hydrostatically tested prior to delivery. Field excavation & preparation shall be complete prior to delivery. Pipe, valves and fittings of the assembly shall be approved by one or more of the following associations:



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REV	DATE	BY	DESCRIPTION
A	-	-	-

PROJECT: .  
 CUSTOMER: .  
 ENGINEER: .  
 ORDER # . PROJ # .  
 DATE: . LOCATION: .

**SEABROOK** **PARK USA**  
 www.parkusa.com 888-611-PARK

DOMESTIC ULTRASONIC WATER METER ASSEMBLY  
 w/ BYPASS - 3" THRU 6"

PM	PC	DRN	ENG	DWG. NO.	REV.
				USD-1-SB	A

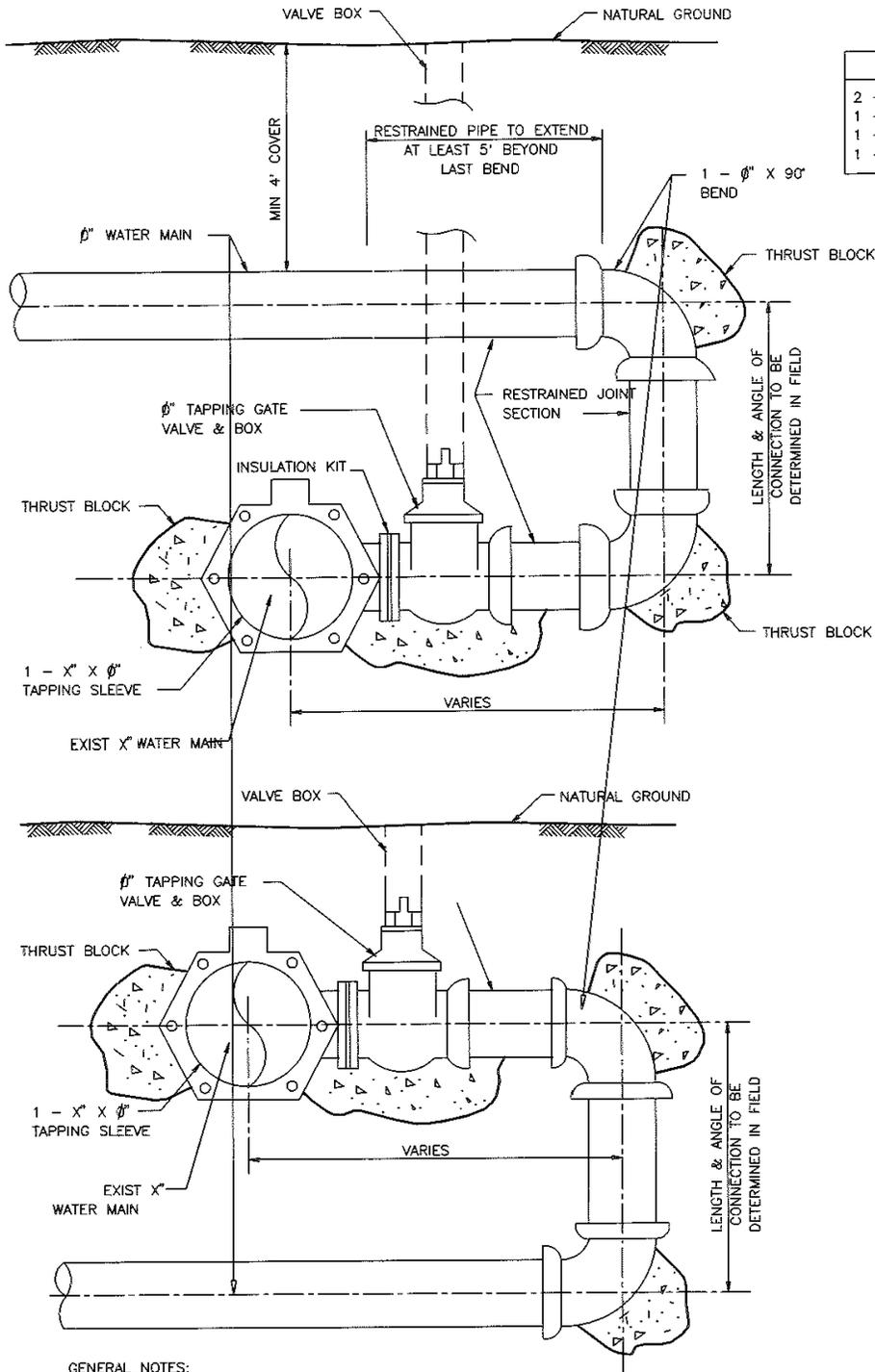
DATE 2021

DATE: January 2022 APPROVED BY: DESIGN BY:

SCALE: N.T.S. DRAWING NO.: W-110

CITY OF SEABROOK  
 DEPARTMENT OF PUBLIC WORKS

3" - 6" DOMESTIC ULTRASONIC WATER  
 METER ASSEMBLY W/BYPASS



FITTINGS	
2	- $\phi$ 90 DEGREE BEND
1	- $\phi$ TS&V WITH BOX
1	- $\phi$ INSULATING KIT
1	- $\phi$ FLANGE X M.J.

**GENERAL NOTES:**

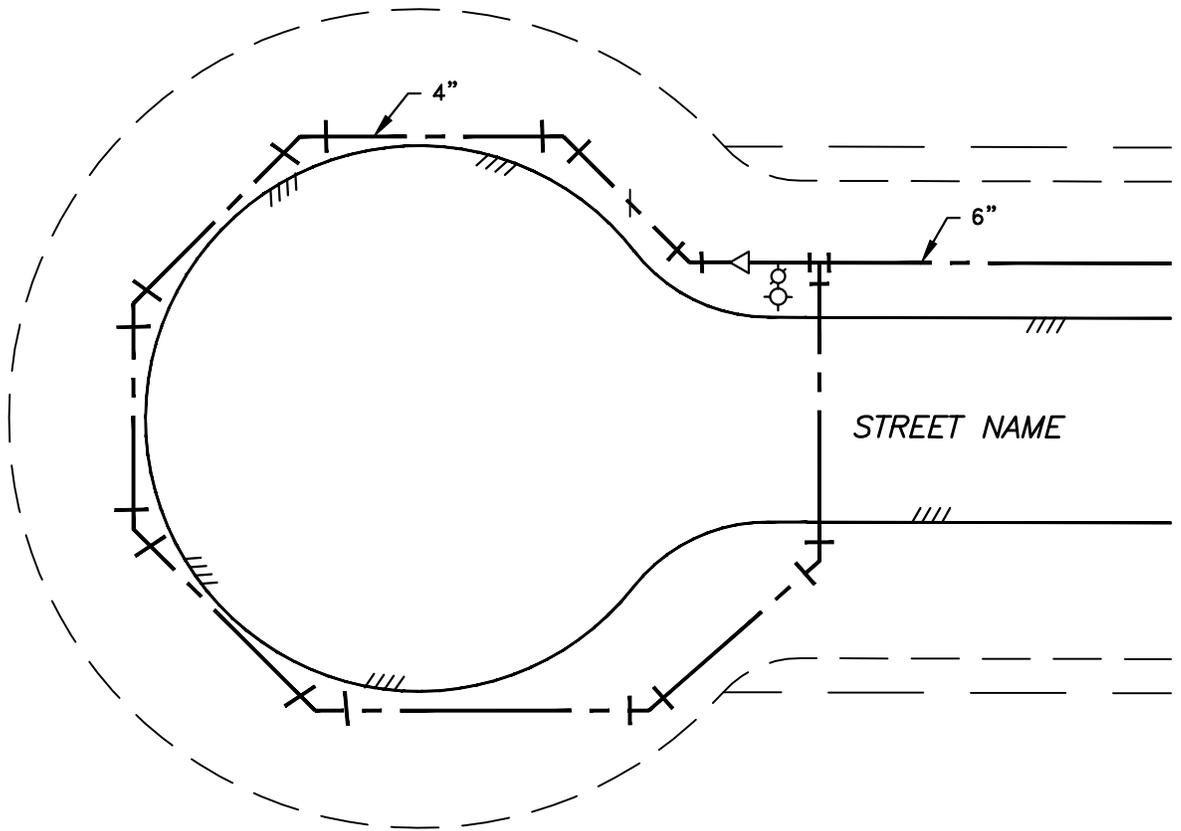
1. X" AND  $\phi$ " DENOTE RUN AND BRANCH LINE SIZES RESPECTIVELY.
2. 90° BENDS ARE TO BE ROLLED TO PROVIDE CLEARANCE FOR VALVE BOX.
3. WATER MAIN ASSEMBLY FOR BACK TAP SAME FOR PROPOSED WATER MAIN UNDER EXISTING MAIN. (SEE INSERT)
3. PROVIDE RESTRAINED JOINT PIPE AS SHOWN.

DATE: JANUARY 2015      APPROVED BY:      DESIGN BY:

SCALE: N.T.S.      DRAWING NO.: W-111

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

BACK TAP ON  
EXISTING WATER LINE



DATE: JANUARY 2015

APPROVED BY:

DESIGN BY:

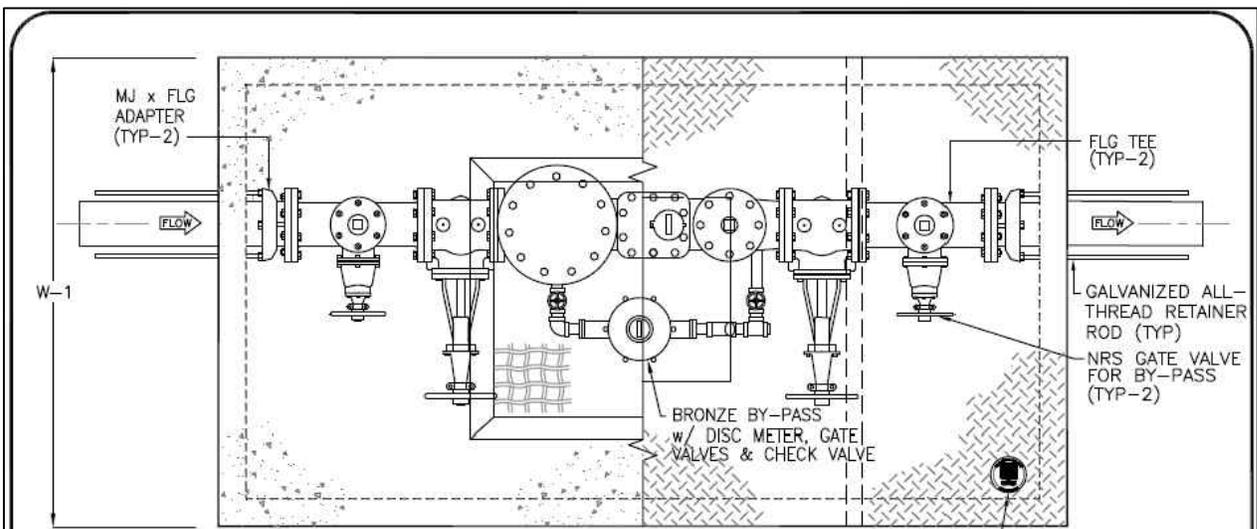
SCALE: N.T.S.

DRAWING NO.: W-112

*CITY OF SEABROOK*

DEPARTMENT OF PUBLIC WORKS

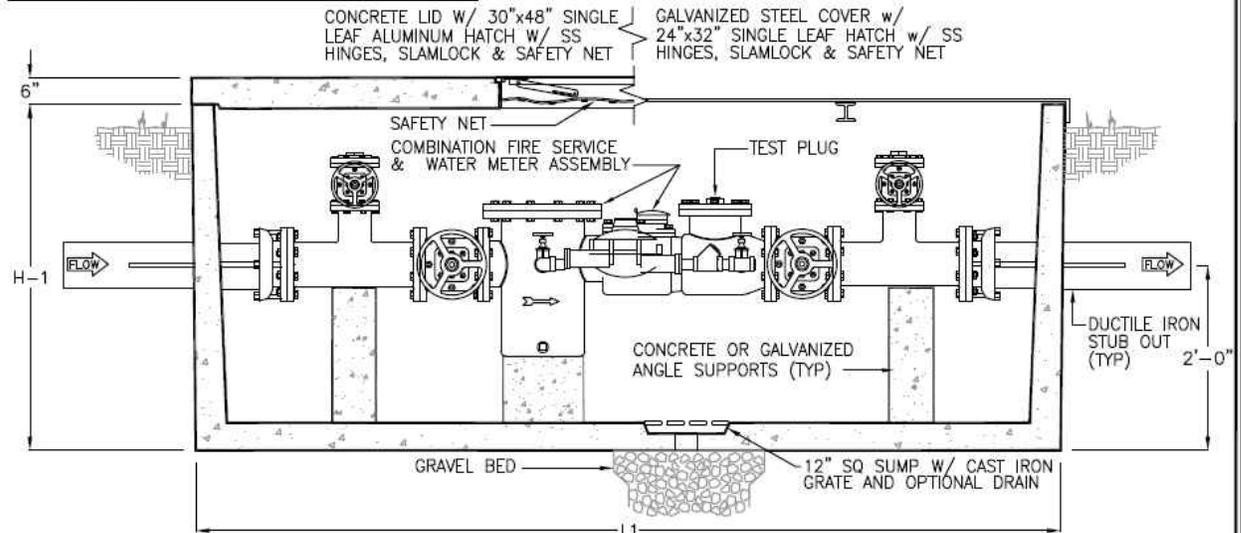
WATER LINE LOOP  
AROUND CUL-DE-SAC



MODEL	SIZE	BY-PASS SIZE	L1	W1	H1	WEIGHT LBS
FMC-4	4"	2"	11'-6"	6'-0"	4'-3"	18,000
FMC-6	6"	3"	11'-6"	6'-0"	4'-3"	18,000
FMC-8	8"	4"	13'-6"	6'-0"	4'-3"	20,000
FMC-10	10"	4"	16'-0"	7'-0"	4'-6"	40,000

PLAN VIEW

NAMEPLATE INDICATING:  
MFG: PARK ENVIRONMENTAL  
888-611-PARK  
WWW.PARK-USA.COM  
MODEL: FMC-AL-SL  
DATE MANUFACTURED



ELEVATION

© Park 2010

**Specifications**

- CONCRETE :** Class II concrete with design strength of 4500 PSI at 28 days. Unit is of monolithic construction at floor and first stage of wall with sectional riser to required depth.
- REINFORCEMENT:** Grade 60 reinforced. Steel rebar conforming to ASTM A615 on required centers or equal.
- STEEL COVER:** 1/4" steel skid-resistant floor plate welded to 3" angle frame with (2) 3"x2-3/8" I beam supports (300 PSF).
- HATCHWAY:** 1/4" Aluminum diamond plate cover with extruded aluminum frame. Hatch to be furnished with 316 stainless steel snap lock & brass hinges.

**Engineering Data**

The backflow assembly shall be factory assembled in vault & hydrostatically tested prior to delivery. Field excavation & preparation shall be complete prior to delivery. Pipe, valves and fittings of the assembly shall be approved by one or more of the following associations:



PROJECT :

CUSTOMER :

ARCHITECT :

ENGINEER :

ORDER # :

DATE :



888-611-PARK  
www.park-usa.com

"Expect the Best"

**FIRE & DOMESTIC COMBINATION WATER METER ASSEMBLY  
MODEL FMC - 4" THRU 10"**

SCALE NONE

DWG. NO.

REV.

DATE 2010

FMC-AL-SL

A

DATE: JANUARY 2015

APPROVED BY:

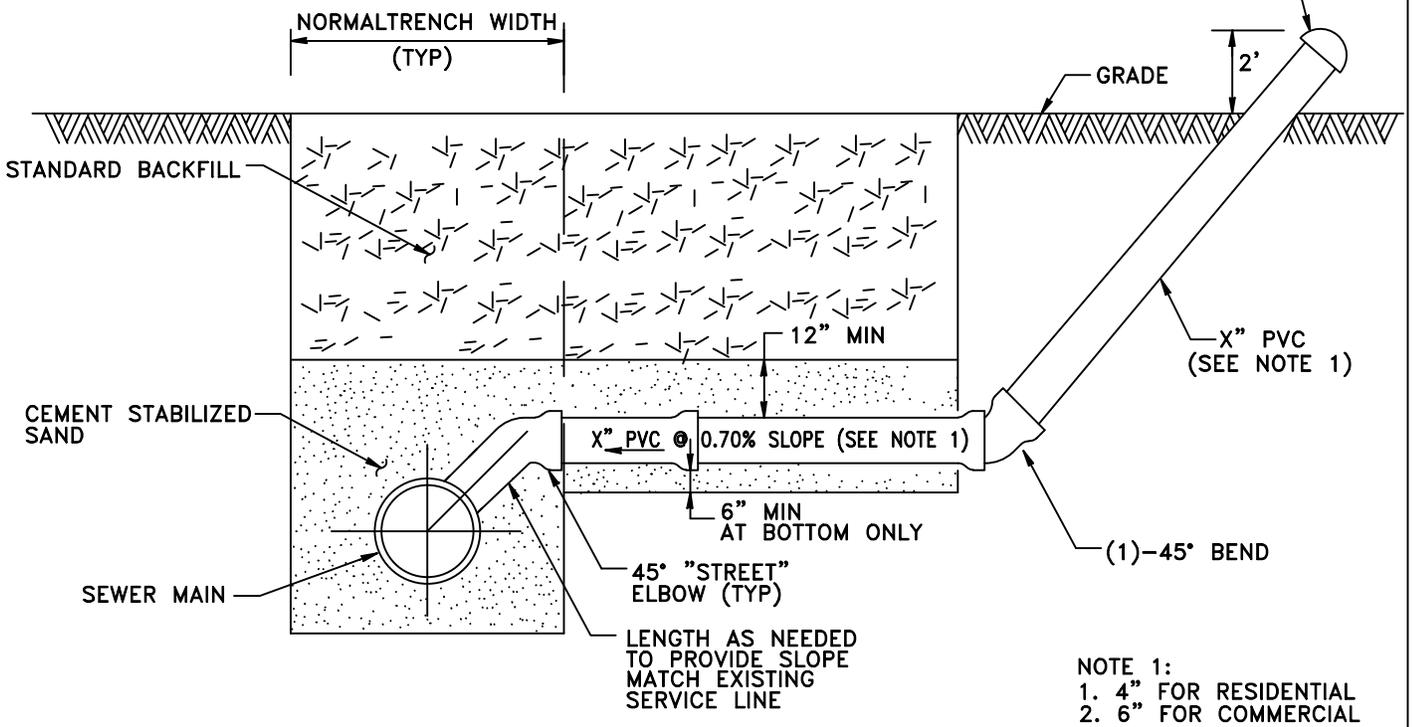
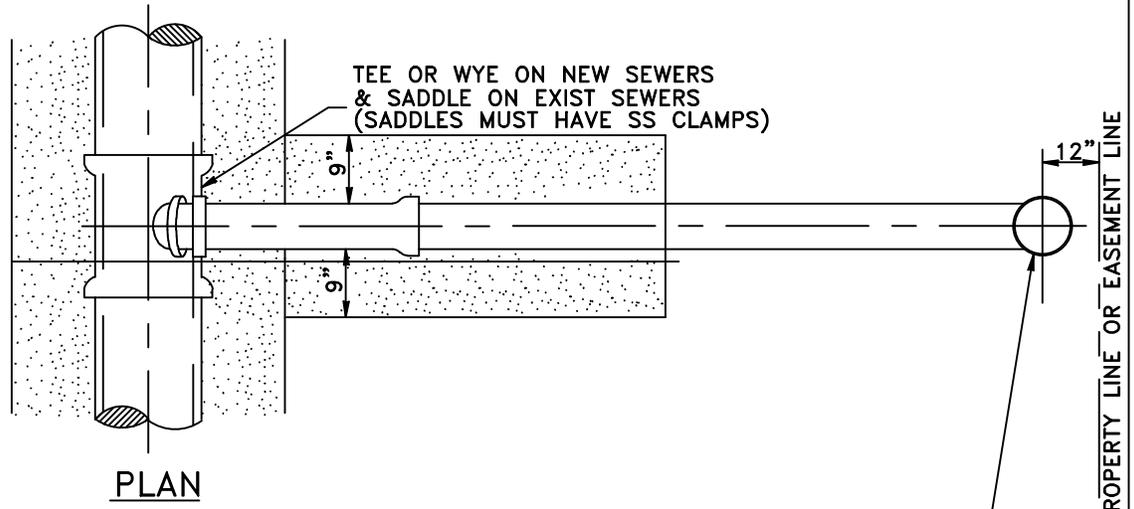
DESIGN BY:

SCALE: N.T.S.

DRAWING NO.: W-113

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

FIRE & DOMESTIC COMBINATION  
WATER METER ASSEMBLY

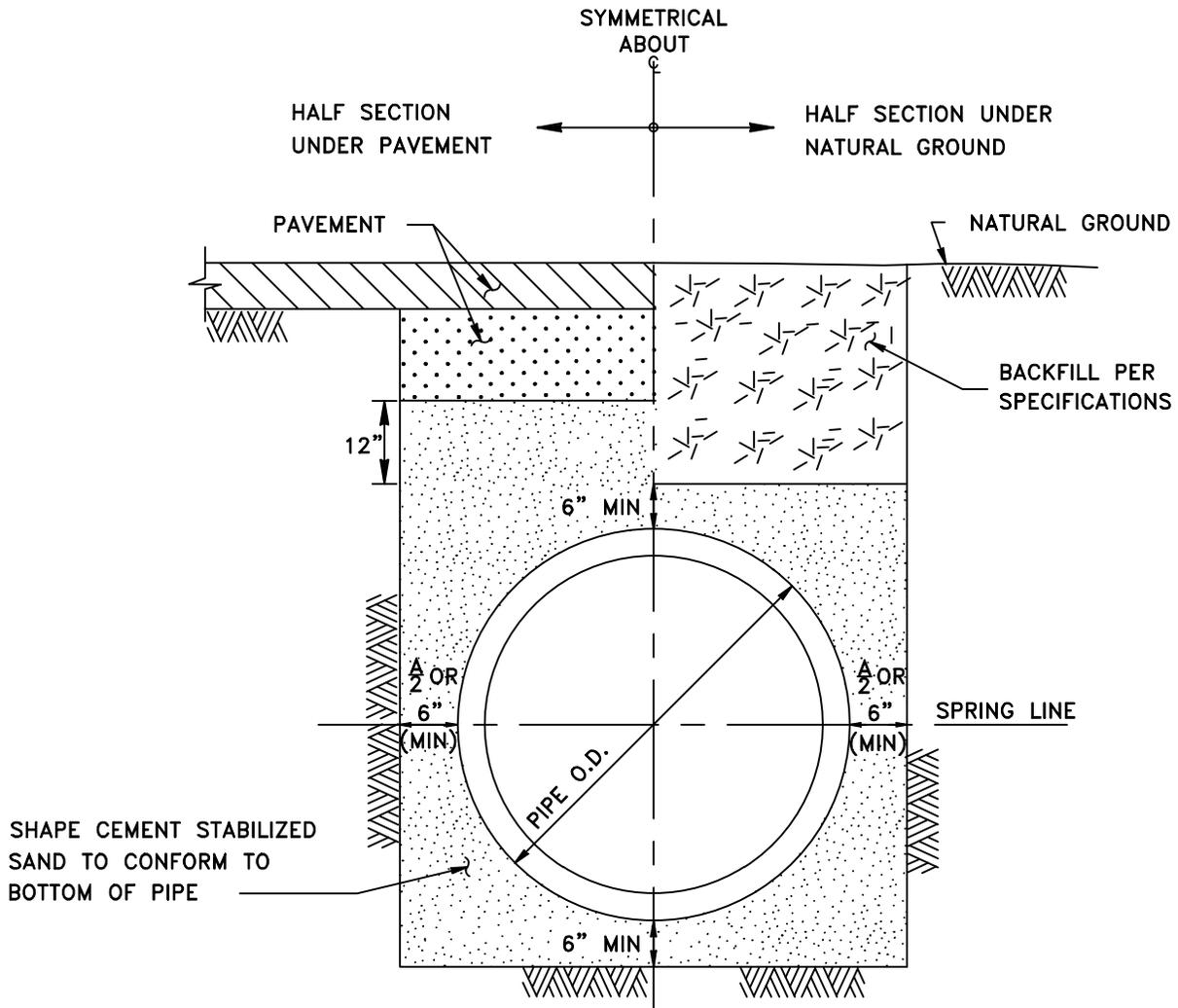


**CROSS-SECTION OF SEWER  
AT SERVICE CONNECTION**

DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: S-100		
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS		SANITARY SEWER SERVICE LEAD	

**NOTES:**

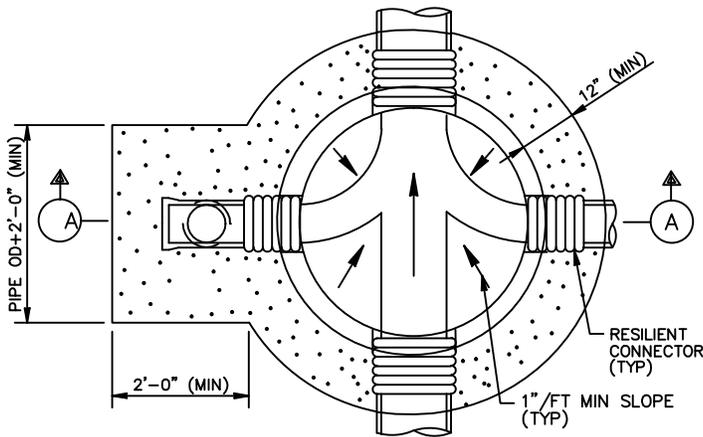
1. BACKFILL SHALL BE NATIVE SOIL, FREE OF DEBRIS, COMPACTED TO 95% STANDARD PROCTOR DENSITY.
2. INITIAL BACKFILL SHALL BE UNIFORMLY GRADED MATERIAL (MAXIMUM SIZE, 3" DIAMETER), PLACED IN 8" LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
3. EMBEDMENT SHALL BE CEMENT STABILIZED SAND (1.5 SACKS PER TON), COMPACTED TO 95% STANDARD PROCTOR DENSITY
4. UNDER PAVING OR WITHIN 3' OF PAVEMENT, THE INITIAL BACKFILL AND ALL BACKFILL UP TO THE PAVEMENT SUBGRADE SHALL BE CEMENT STABILIZED SAND (1.5 SACKS PER TON) COMPACTED TO 95% STANDARD PROCTOR DENSITY.
5. TRENCH SHORING IN ACCORDANCE WITH OSHA, SHALL BE INSTALLED WHERE REQUIRED.
6. SOIL IN THE PIPE ZONE SHALL CONSIST OF NON-WATERBEARING, COHESIVE SOILS WITH A SHEAR STRENGTH OF 1000 PSI OR GREATER. WHEN WET SAND EXISTS IN PIPE ZONE, MODIFIED BEDDING SHALL BE INSTALLED.



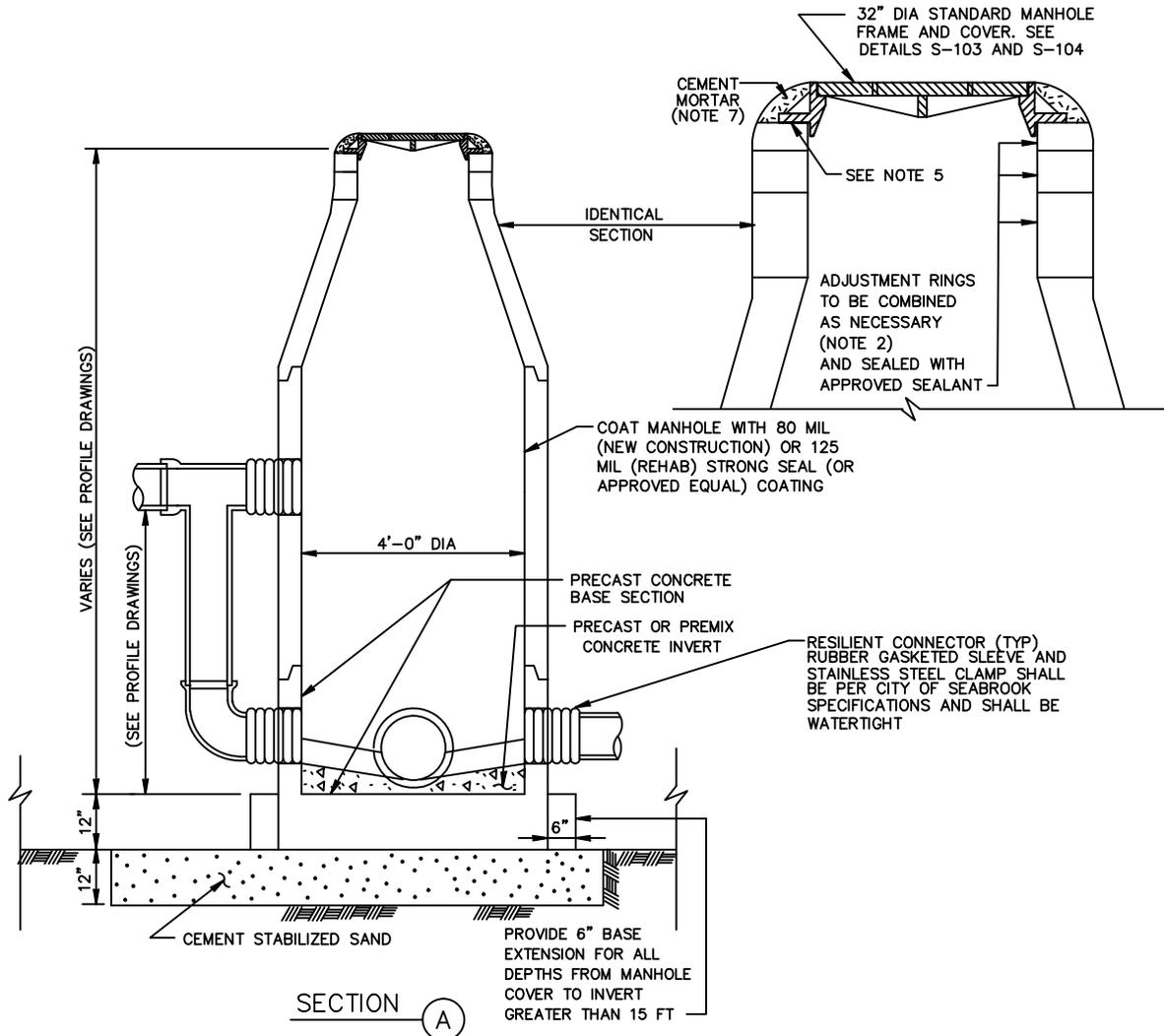
DATE: JANUARY 2015	APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: S-101	
<p><i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS</p>		<p>SANITARY SEWER BEDDING &amp; BACKFILL</p>

**NOTES:**

1. DEPTH OF MANHOLE DETERMINES SECTIONS REQUIRED.
2. PRECAST CONCRETE RINGS SHALL BE PROVIDED FOR A COMBINED ADJUSTMENT HEIGHT OF AT LEAST 12". THE TOTAL HEIGHT OF THE ADJUSTMENT RINGS SHALL NOT EXCEED 1'-6".
3. MANHOLE WALL THICKNESS FOR DEPTH EXCEEDING 12'-0" SHALL BE DETERMINED TO MEET LOADING CONDITIONS. MIN THICKNESS 5".
4. MANHOLE DROP AND INTERSECTING PIPES SHALL BE INSTALLED ONLY WHEN CALLED FOR IN PLAN AND PROFILE DRAWING.
5. SEAT MANHOLE FRAME IN SEALANT PER CITY OF SEABROOK STANDARD SPECIFICATION.
6. ECCENTRIC PRECAST CONCRETE MANHOLE MAY BE USED.
7. OMIT CEMENT MORTAR WHEN MANHOLE IS LOCATED IN PAVED AREAS.
8. MIN REINFORCING IN THE PRECAST CONCRETE BASE SHALL BE # 5 @ 8 EW.
9. PROVIDE BACKFILL TO MATCH ADJACENT PIPE TRENCH BACKFILL PER CITY OF SEABROOK STANDARD SPECIFICATION.
10. MANHOLE TESTING SHOULD BE IN ACCORDANCE WITH CITY OF SEABROOK DESIGN STANDARD.



**FOUNDATION PLAN**



**SECTION A**

DATE: JANUARY 2015      APPROVED BY:      DESIGN BY:

SCALE: N.T.S.      DRAWING NO.: S-102

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

SANITARY SEWER  
MANHOLE

**EAST JORDAN  
IRON WORKS, INC.**  
P.O. BOX 439  
EAST JORDAN, MI. 49727  
1-800-874-4100  
FAX 231-536-4458

DRAWN TCL	DATE 11/19/04
APPROVED	DATE

**MANHOLE  
COVER**

PRODUCT NO.  
**41420171**

CATALOG NO.  
**V-1420-1**

REF. LOCO DRAWING  
41420171

EST. WT.

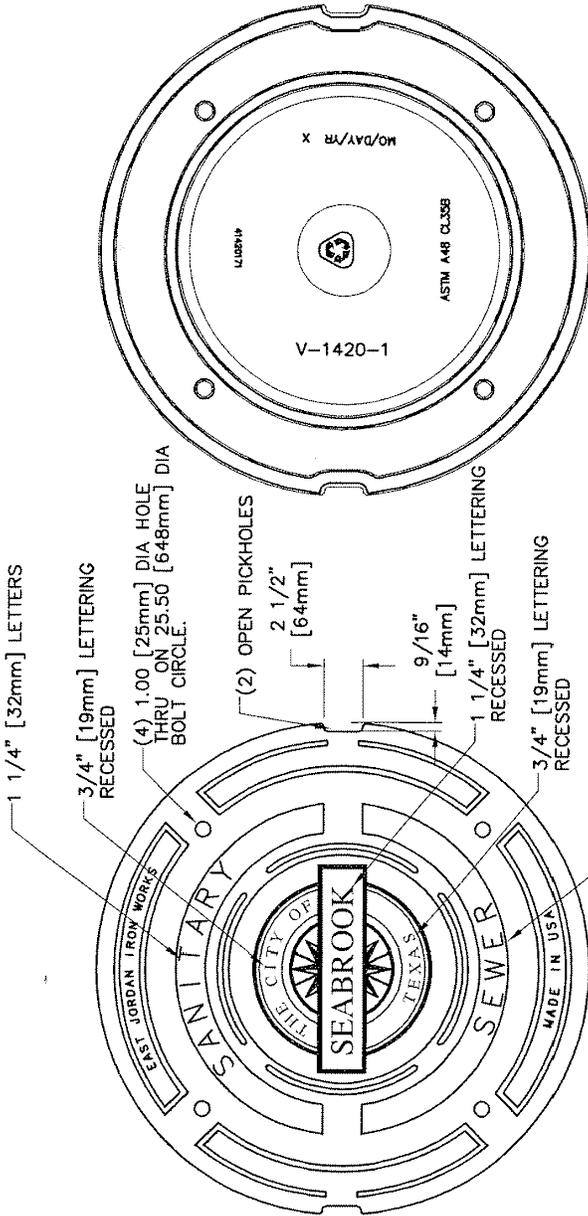
OPEN AREA  
N/A

MAT'L SPEC.

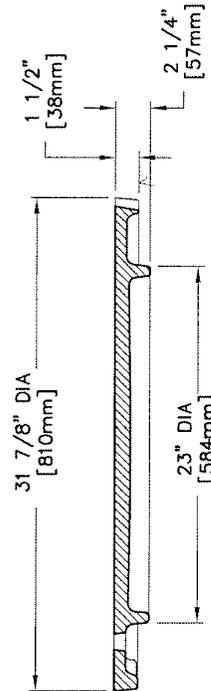
COVER - GRAY IRON  
ASTM A48 CL35B

LOAD RATING

**HEAVY DUTY**



**BOTTOM VIEW**



**COVER SECTION**

✓ MACHINED SURFACE

*See order book name S-103*

DATE: JANUARY 2015	APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: S-103	
<p><i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS</p>		<p>SANITARY SEWER MANHOLE COVER</p>

EAST JORDAN  
IRON WORKS, INC.  
P.O. BOX 439  
EAST JORDAN, MI. 49727  
1-800-874-4100  
FAX 231-536-4458

DRAWN	DATE
DEW	01/18/00
APPROVED	DATE

V-1420\1480Z1  
FRAME WITHOUT  
MUD RING

PRODUCT NO.  
**41420012**

CATALOG NO.  
V-1420\1480Z1

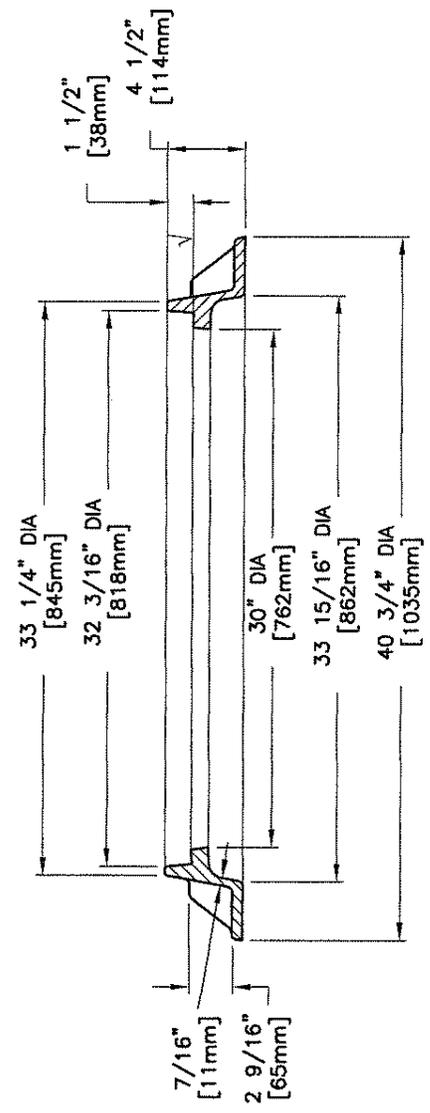
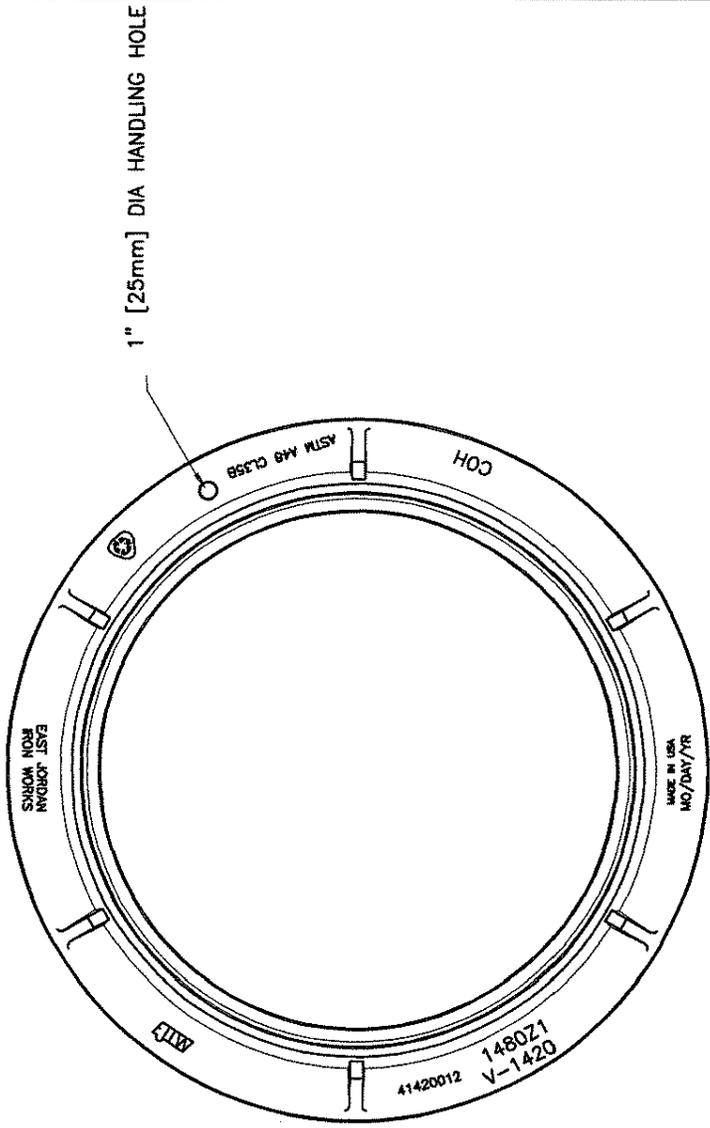
REF. PRODUCT DRAWING  
41420012

EST. WT.  
FRAME: 170 LBS 77kg

OPEN AREA  
N/A

MAT'L SPEC.  
FRAME - GRAY IRON  
ASTM A48 CL35

LOAD RATING  
**HEAVY DUTY**



FRAME SECTION

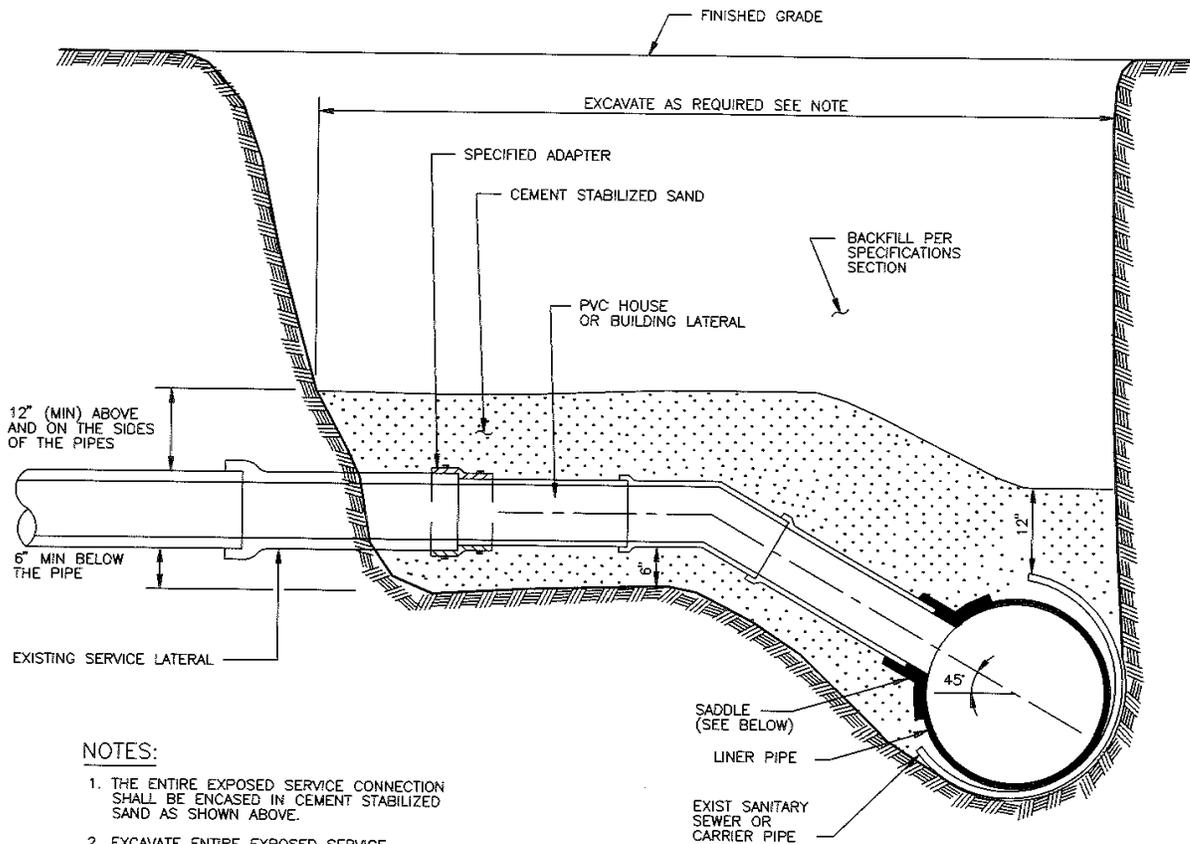
✓ MACHINED SURFACE

DATE: JANUARY 2015      APPROVED BY:      DESIGN BY:

SCALE: N.T.S.      DRAWING NO.: S-104

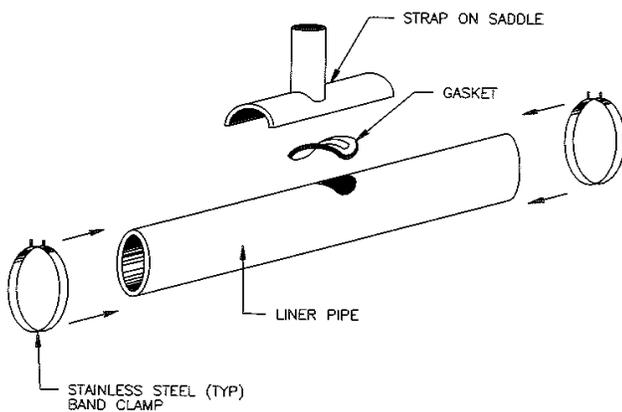
*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

SANITARY SEWER  
MANHOLE FRAME



**NOTES:**

1. THE ENTIRE EXPOSED SERVICE CONNECTION SHALL BE ENCASED IN CEMENT STABILIZED SAND AS SHOWN ABOVE.
2. EXCAVATE ENTIRE EXPOSED SERVICE CONNECTION SHALL BE ENCASED IN CEMENT STABILIZED SAND AS SHOWN ABOVE.



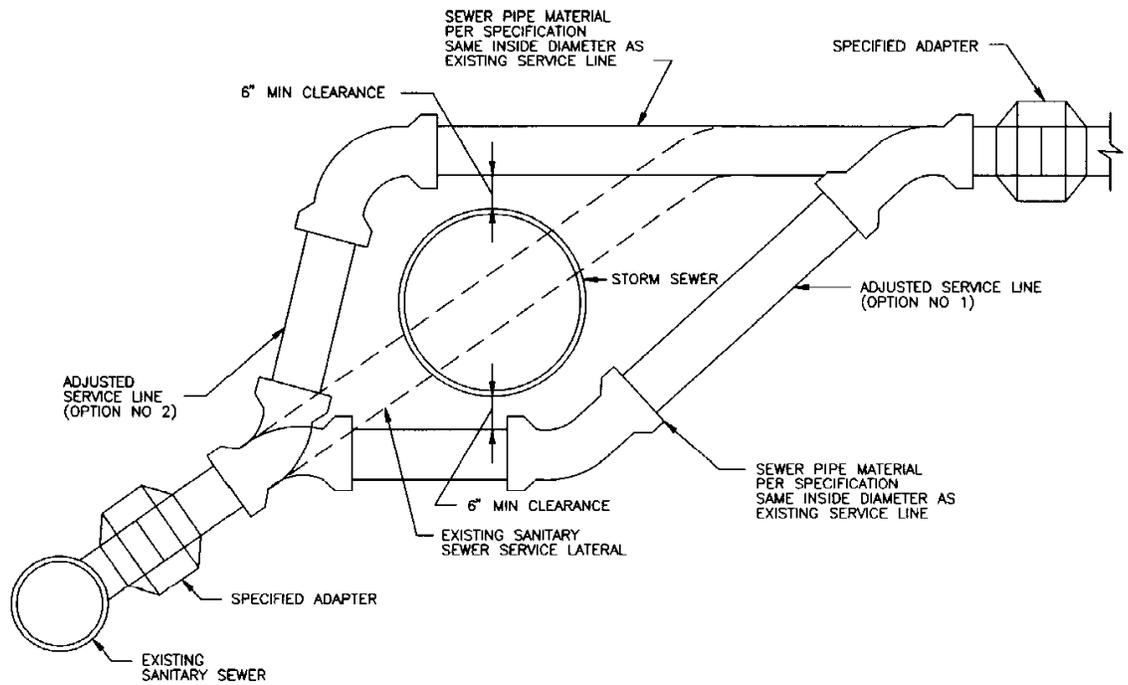
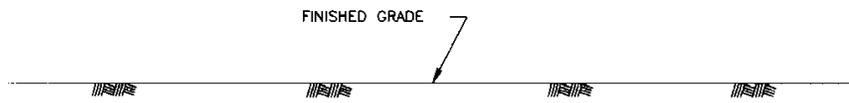
LATERAL STRAP-ON SADDLE

DATE: JANUARY 2015      APPROVED BY:      DESIGN BY:

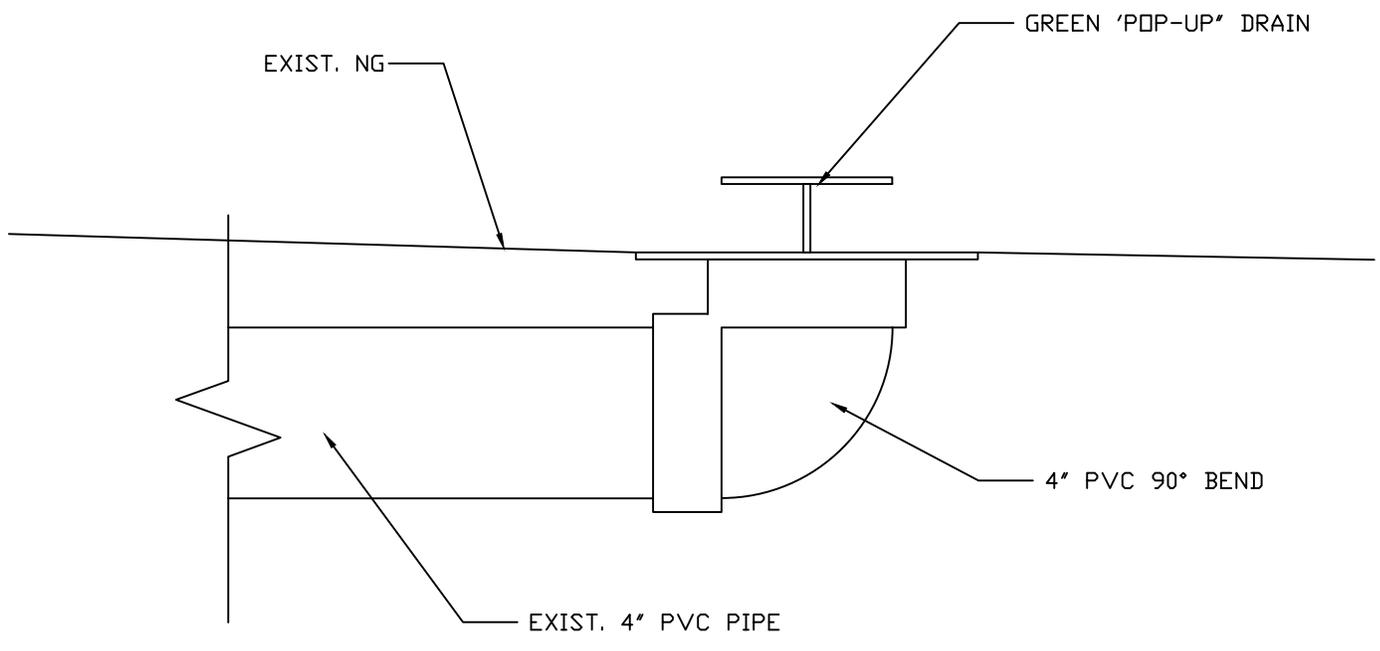
SCALE: N.T.S.      DRAWING NO.: S-105

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

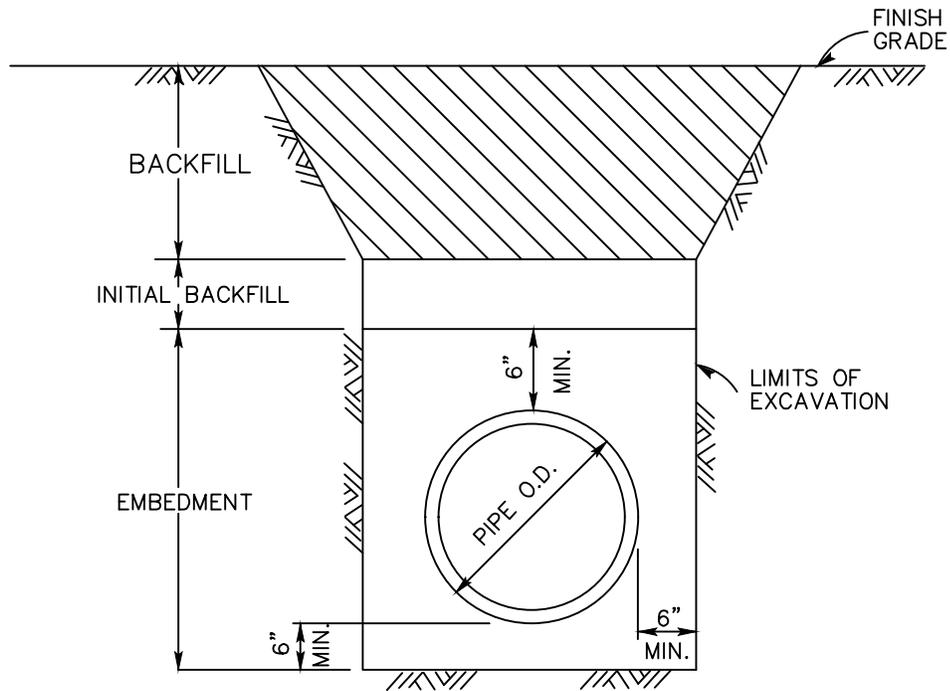
SANITARY SEWER SERVICE  
RECONNECTION FOR LINER PIPE



DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: S-106		SANITARY SEWER SERVICE RECONNECTION FOR STORM SEWER CONFLICTS
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS			



DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: S-107		
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS		4" POP-UP PVC YARD DRAIN MODEL # NDS 422G	



NOTES:

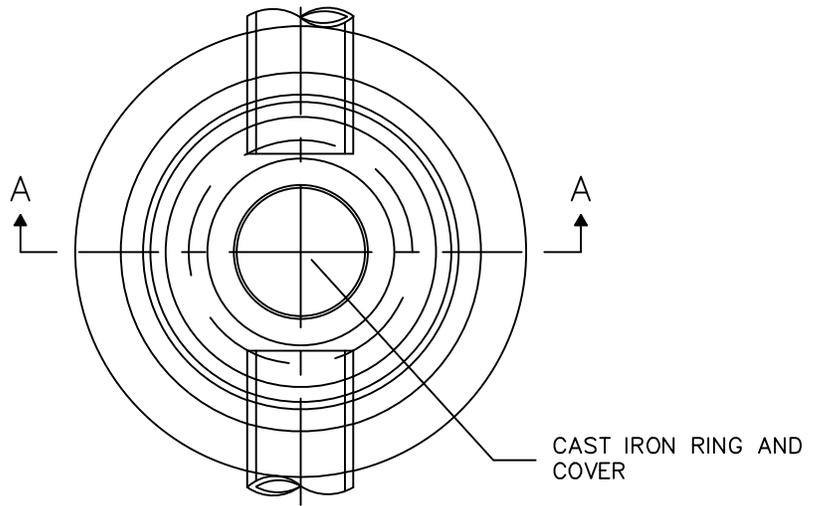
1. BACKFILL SHALL BE; NATIVE SOIL, FREE OF DEBRIS, PLACED IN 8" LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
2. INITIAL BACKFILL SHALL BE UNIFORMLY GRADED MATERIAL (MAXIMUM SIZE, 3" DIAMETER), PLACED IN 8" LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
3. EMBEDMENT SHALL BE CEMENT STABILIZED SAND (1.5 SACKS PER TON COMPACTED TO 95% STANDARD PROCTOR DENSITY.
4. UNDER PAVING OR WITHIN 3' OF PAVEMENT, THE INITIAL BACKFILL AND ALL BACKFILL UP TO THE PAVEMENT SUBGRADE SHALL BE CEMENT STABILIZED SAND (1.5 SACKS PER TON) COMPACTED TO 95% STANDARD PROCTOR DENSITY. TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO PLACEMENT OF THE PAVEMENT.
5. TRENCH SHORING, IN ACCORDANCE WITH OSHA, SHALL BE INSTALLED WHERE REQUIRED.
6. SOIL IN THE PIPE ZONE SHALL CONSIST OF NON-WATERBEARING, COHESIVE SOILS WITH A SHEAR STRENGTH OF 1000 PSI OR GREATER. WHEN WET SAND EXISTS IN THE PIPE ZONE, MODIFIED BEDDING SHALL BE INSTALLED.

STORM SEWER  
BEDDING & BACKFILL

DATE: JANUARY 2015	APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: D-100	
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS		STORM SEWER BEDDING & BACKFILL

NOTES:

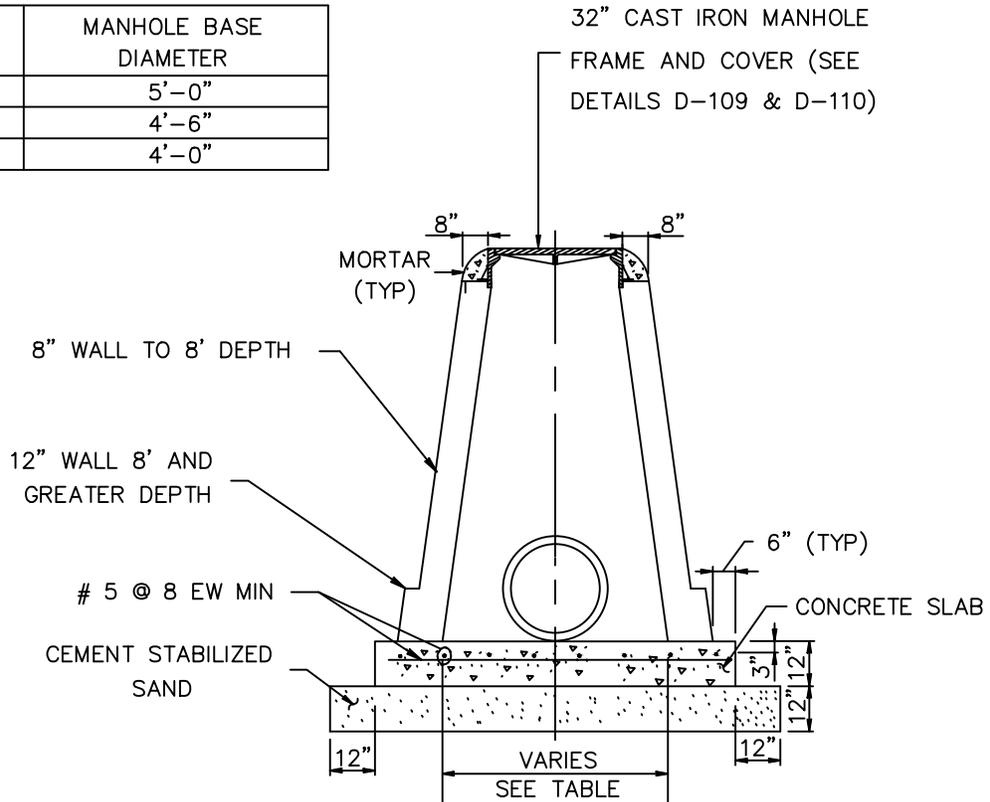
1. MANHOLES SHOULD BE CONSTRUCTED OF PRECAST CONCRETE. BRICK MANHOLES WILL NOT BE PERMITTED IN THE CITY OF SEABROOK.



PLAN VIEW  
(COVER NOT SHOWN)

**TABLE**  
**SEWER SIZE VS MANHOLE SIZE**

SEWER SIZE	MANHOLE BASE DIAMETER
42"	5'-0"
36"	4'-6"
30" AND LESS	4'-0"



SECTION "A-A"

DATE: JANUARY 2015      APPROVED BY:      DESIGN BY:

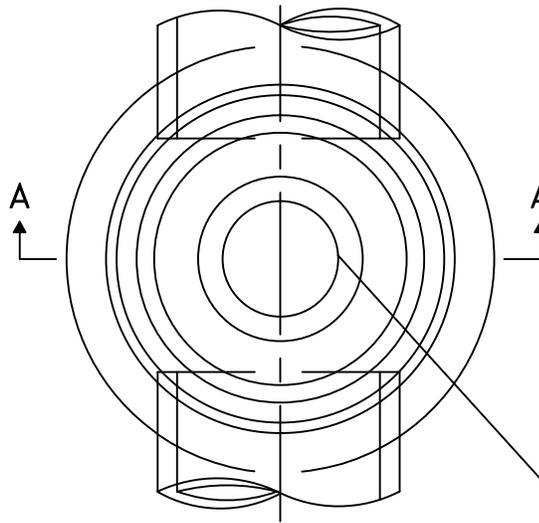
SCALE: N.T.S.      DRAWING NO.: D-101

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

STORM MANHOLE  
18" - 42"

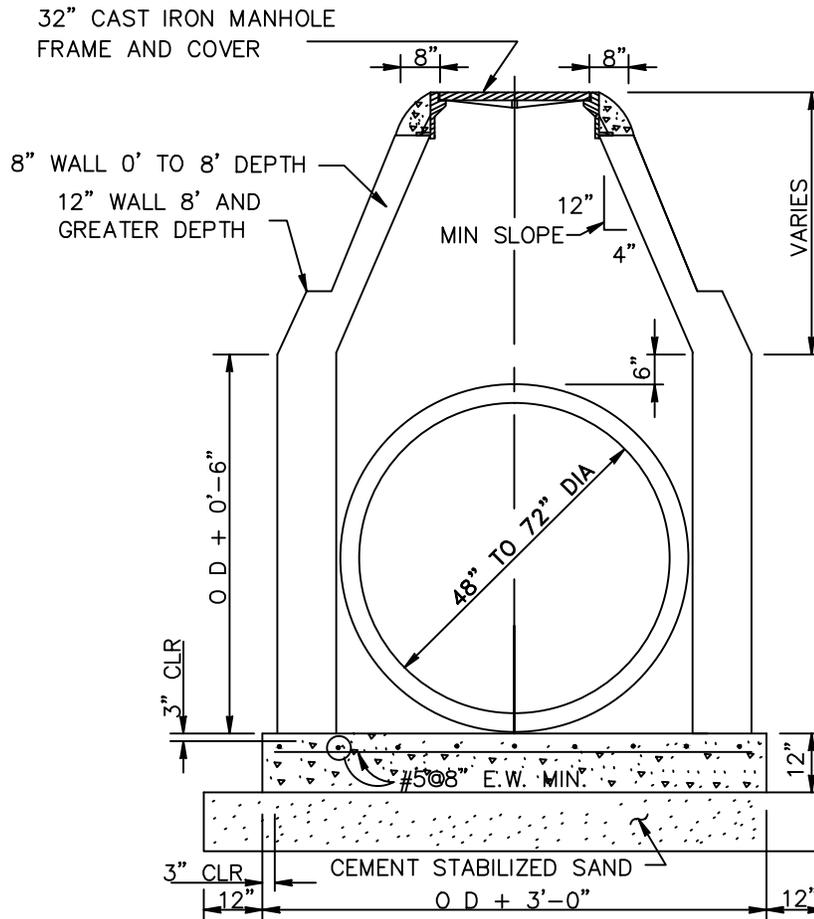
NOTES:

1. MANHOLES SHOULD BE  
PRECAST CONCRETE.  
BRICK MANHOLES WILL  
NOT BE PERMITTED IN THE  
CITY OF SEABROOK.



CAST IRON RING AND COVER  
LABELED "STORM SEWER"

STANDARD PLAN  
(COVER NOT SHOWN)



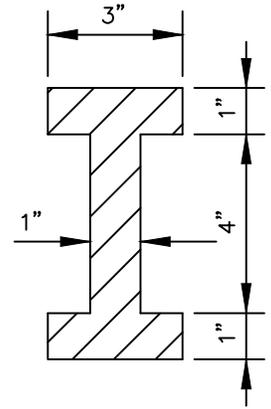
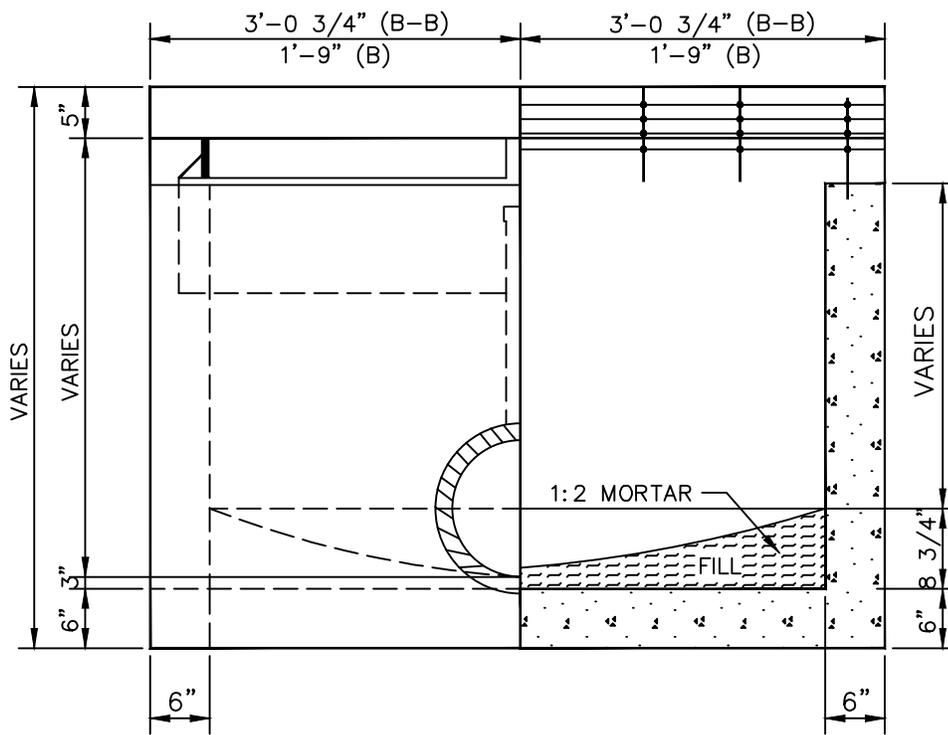
SECTION "A-A"

DATE: JANUARY 2015      APPROVED BY:      DESIGN BY:

SCALE: N.T.S.      DRAWING NO.: D-102

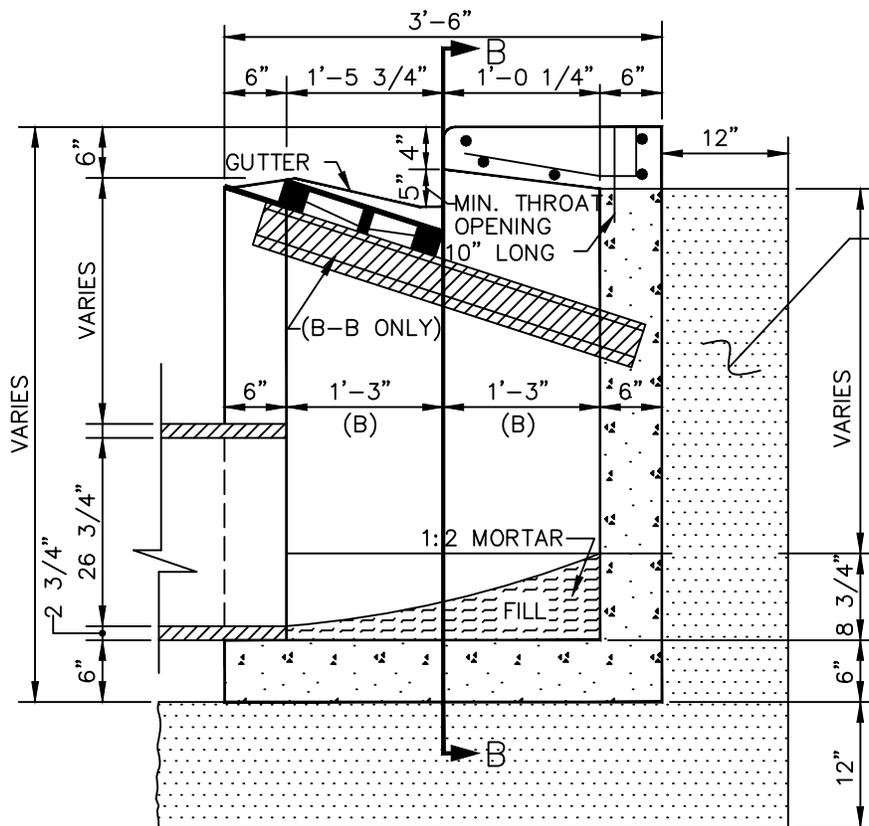
*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

TYPE "C" MANHOLE  
48" - 72"



**I BEAM SECTION  
N.T.S.**

**HALF FRONT ELEV. HALF SECTION B-B**



1.5 SACK CEMENT PER TON  
STABILIZED SAND TO BE PLACED  
CONTINUOUSLY AROUND AND  
BELOW INLET

**SECTION B-B**

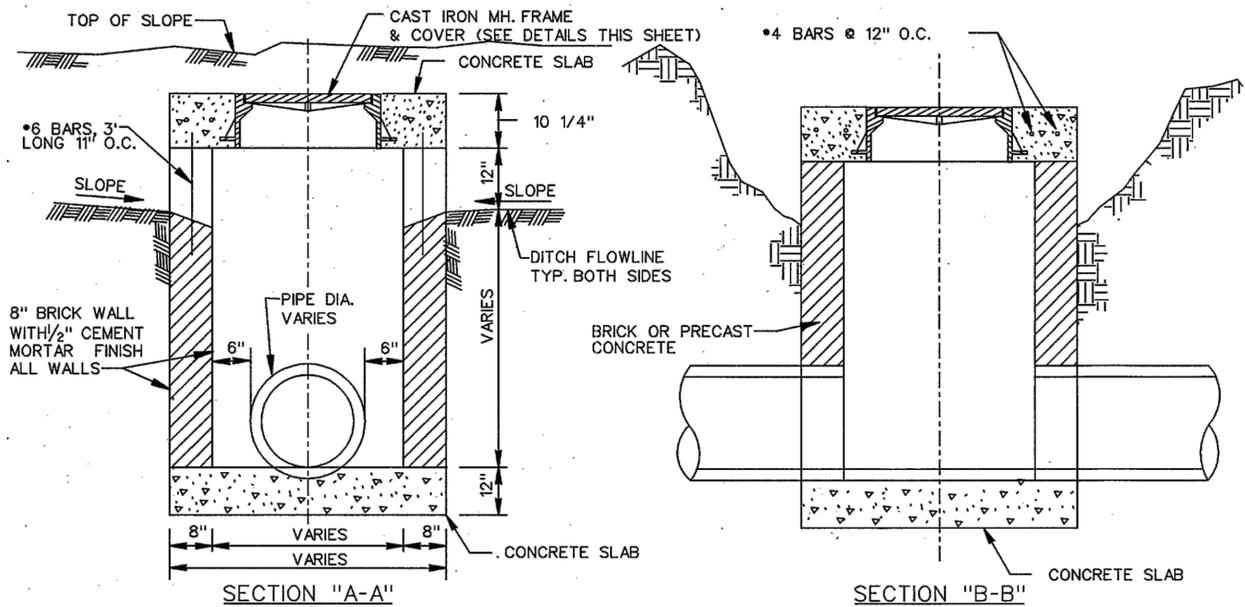
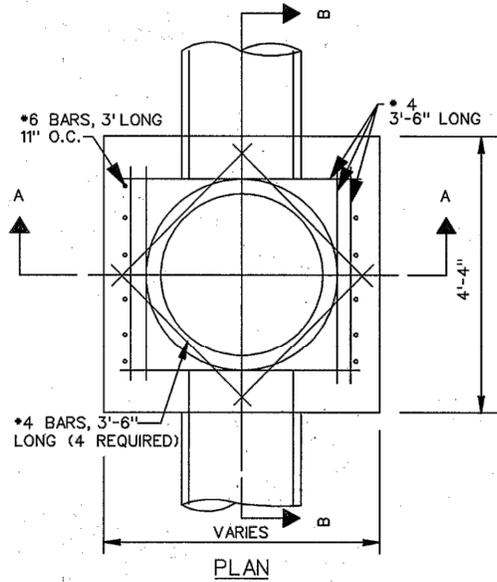
BAR LIST					
TYPE	No	SIZE	LENGTH	SHP	LOC
B	4	1/2"∅	3'-3"	SR	HORZ
	4	1/2"∅	0'-10"	SR	VERT
	4	3/8"∅	1'-6"	BR	
B-B	4	1/2"∅	5'-10"	SR	HORZ
	7	1/2"∅	0'-10"	SR	VERT
	7	3/8"∅	1'-6"	BR	

DATE: JANUARY 2015      APPROVED BY:      DESIGN BY:

SCALE: N.T.S.      DRAWING NO.: D-103

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

TYPE B-B INLETS



DATE: JANUARY 2015

APPROVED BY:

DESIGN BY:

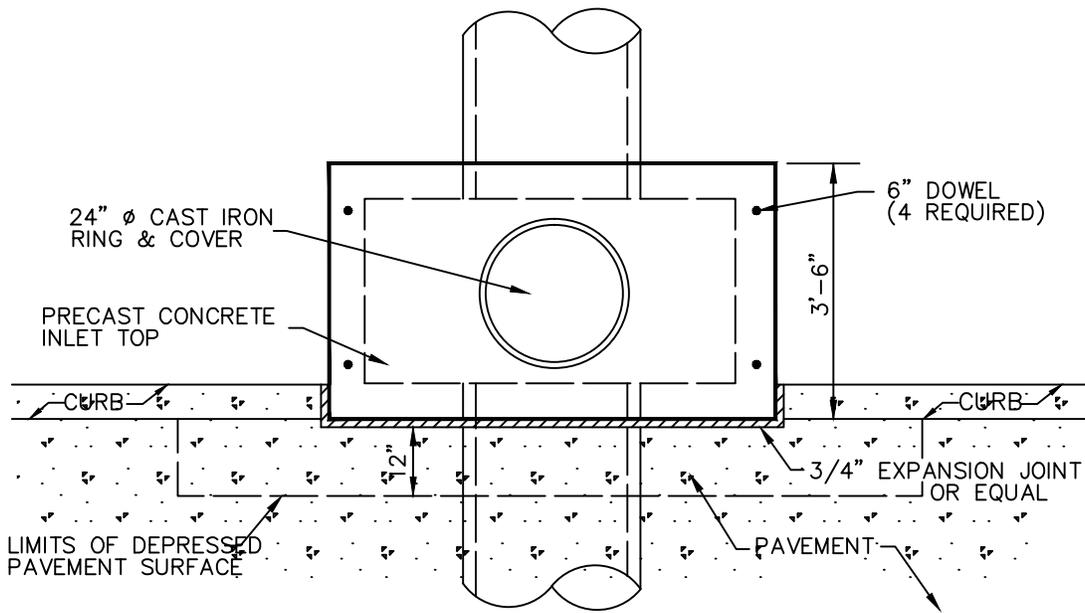
SCALE: N.T.S.

DRAWING NO.: D-104

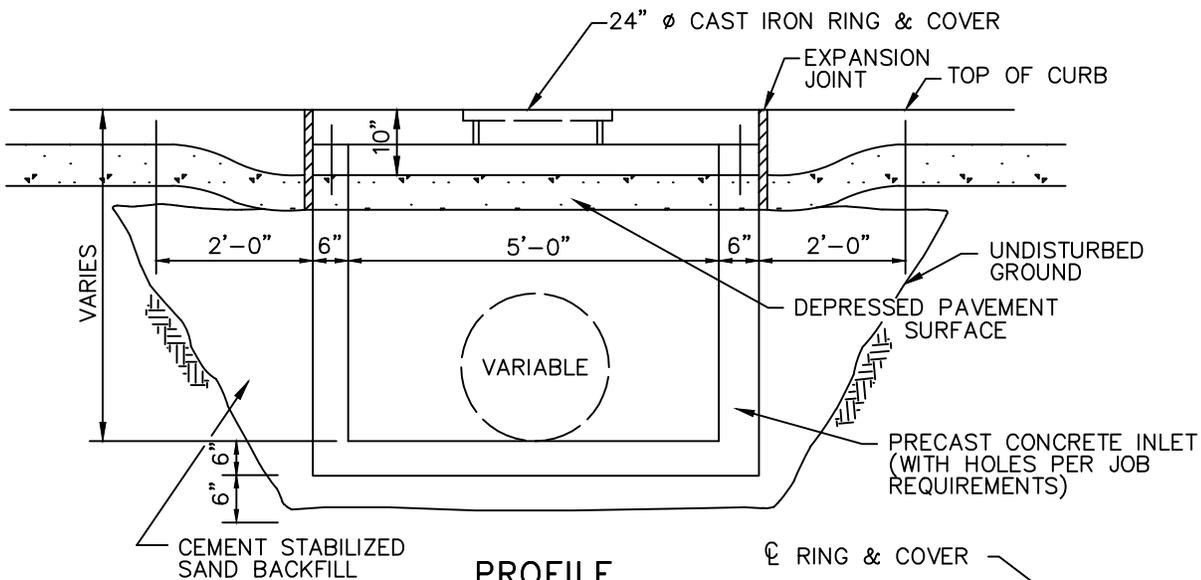
CITY OF SEABROOK  
DEPARTMENT OF PUBLIC WORKS

TYPE E INLET

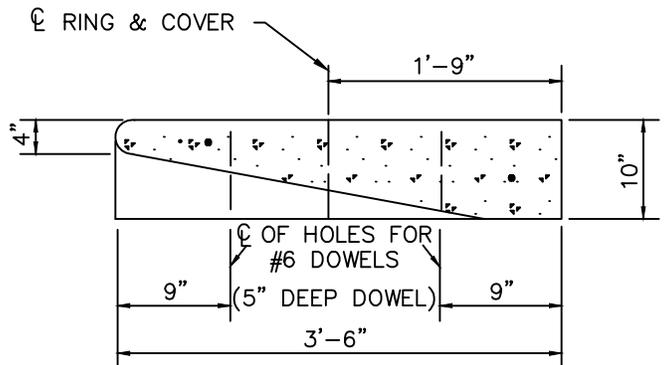
# TYPE H-2 INLET



**PLAN**



**PROFILE  
N.T.S.**



**INLET TOP CROSS SECTION**

**NOTES:**

1. INLET WALLS MAY BE EXTENDED USING PRECAST RISER SECTION.
2. INLET TOPS MUST BE SECURED TO THE INLET WALL USING #6 DOWELS AND GROUTED A MINIMUM DEPTH OF 5" INTO THE INLET WALL.
3. INLET BACKFILL SHALL BE CEMENT STABILIZED SAND TO THE TOP OF INLET FIRST STAGE.
4. GRADE 60 REINFORCED #4 STEEL REBAR TO CONFORM TO ASTM A615 ON REQUIRED CENTERS OR EQUAL.

DATE: JANUARY 2015

APPROVED BY:

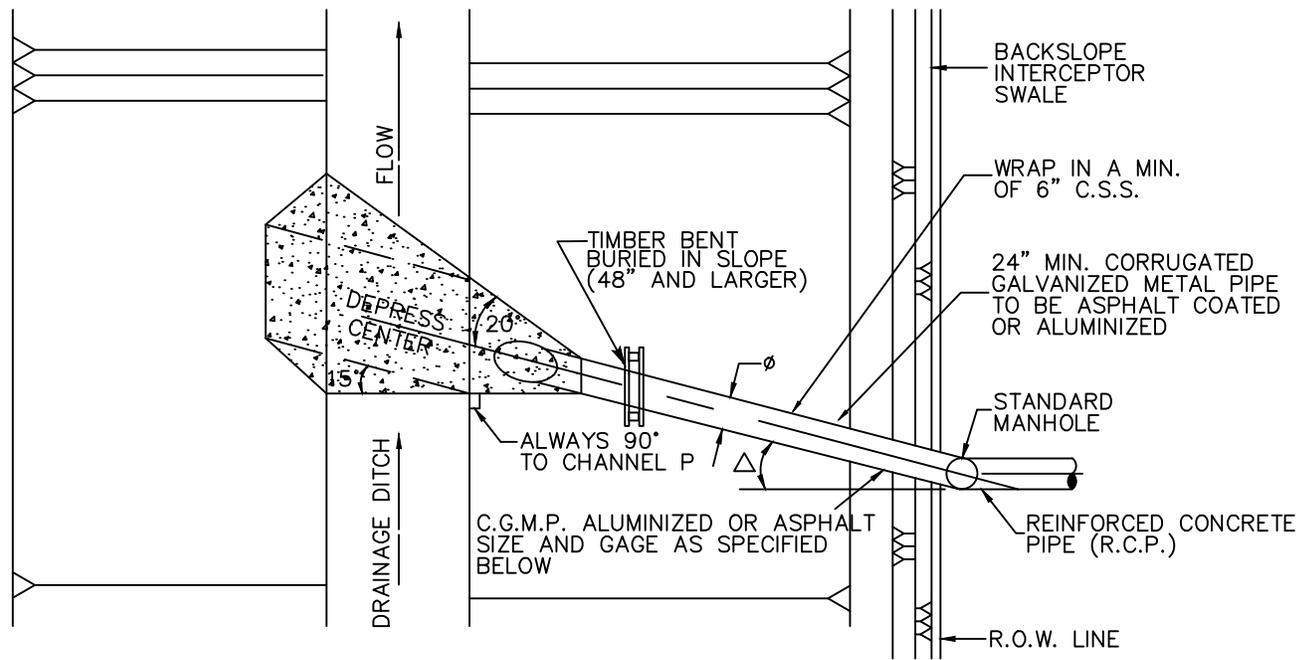
DESIGN BY:

SCALE: N.T.S.

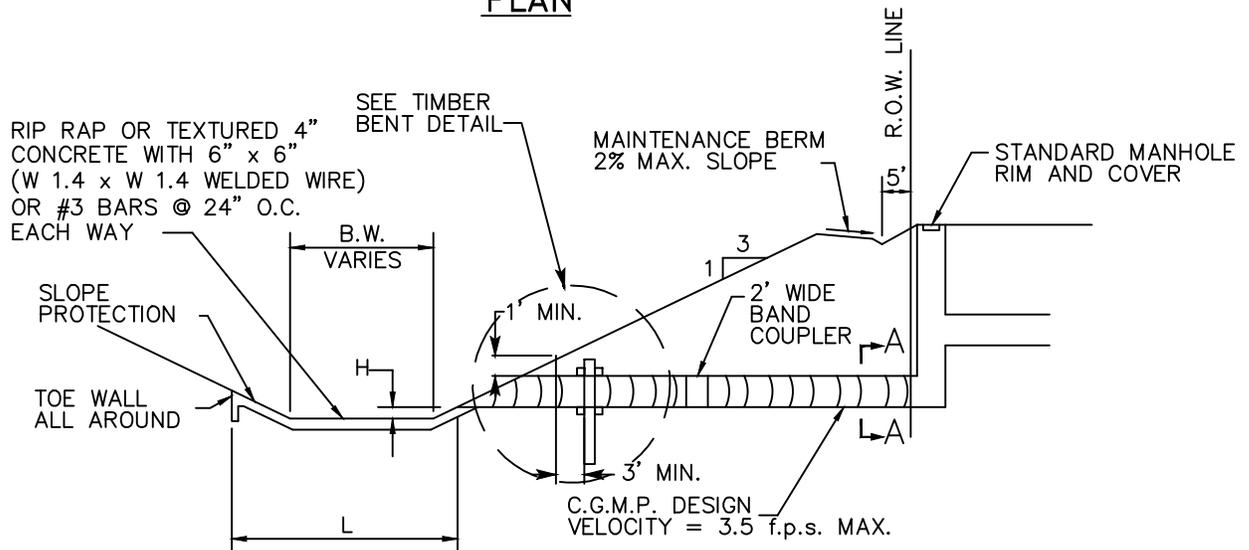
DRAWING NO.: D-105

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

TYPE H-2 INLET



**PLAN**



**PROFILE**

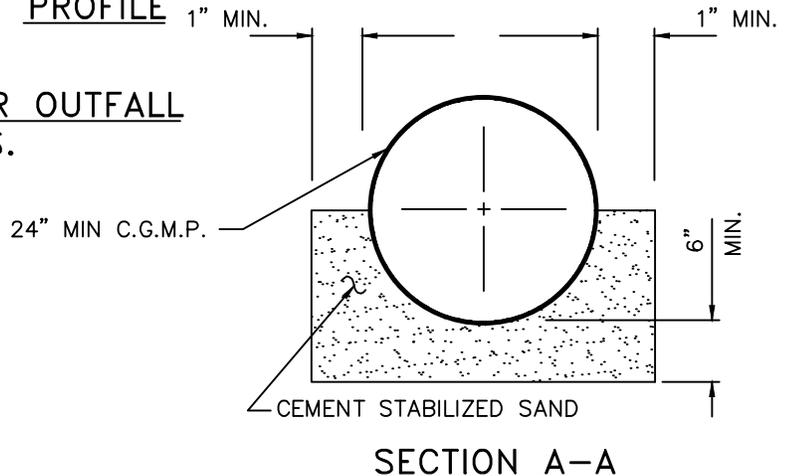
$\Delta$ : PROP. 24" TO 42"  $\Delta = 15^\circ$   
 PROP. 48" AND LARGER  $\Delta = 30^\circ$

**STORM SEWER OUTFALL**  
 N.T.S.

H : FOR PIPE SIZES 24" TO 42"  
 H=3' MAX.. AND 1' MIN.  
 FOR PIPE SIZES 48" AND LARGER  
 H=1' MAX. AND MIN.

L :  $\frac{B.W.}{PIPE \ \phi} \leq 7'-6" \Rightarrow$  L WILL EXTEND ONE PIPE  $\phi$  ABOVE  $\epsilon$  ON OPPOSITE BANK (MIN).

$\frac{B.W.}{PIPE \ \phi} > 7'-6" \Rightarrow$  L = 6  $\phi$  OR MIN. 1'-6" INTO B.W. WHICHEVER IS GREATER

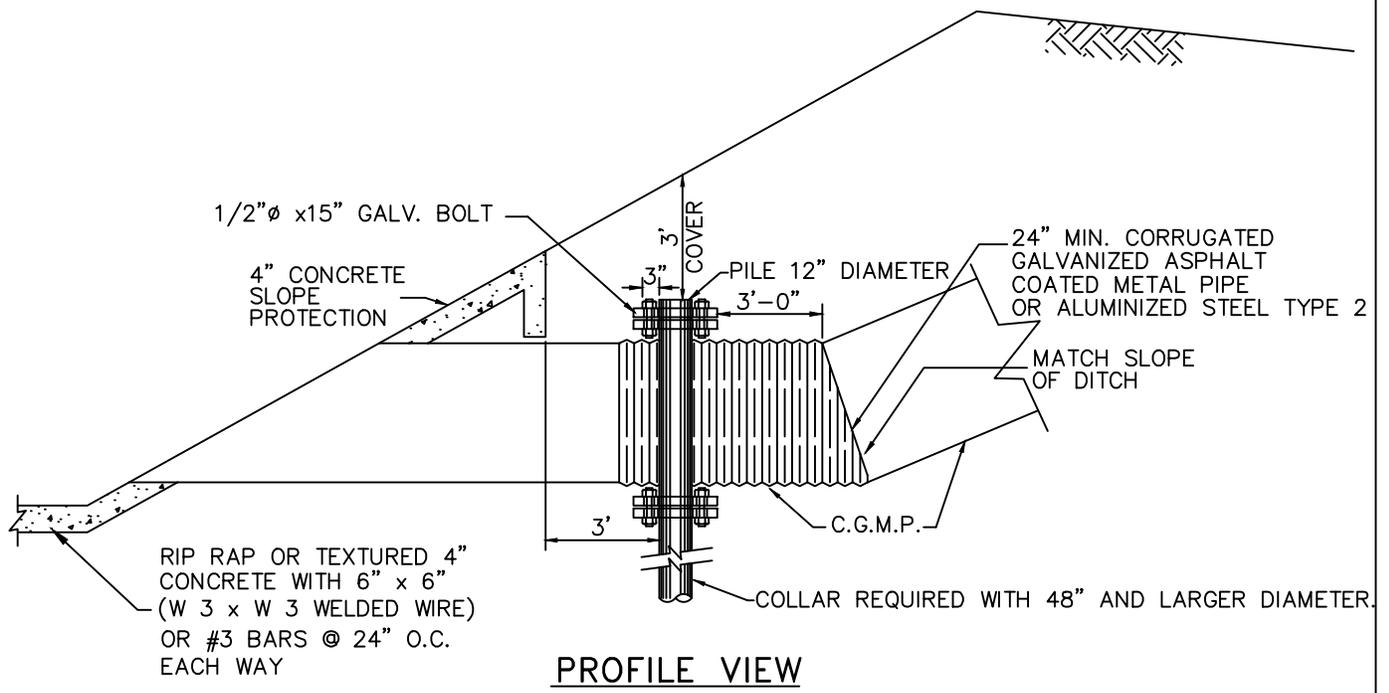


DATE: JANUARY 2015      APPROVED BY:      DESIGN BY:

SCALE: N.T.S.      DRAWING NO.: D-106

*CITY OF SEABROOK*  
 DEPARTMENT OF PUBLIC WORKS

STORM SEWER  
 OUTFALL



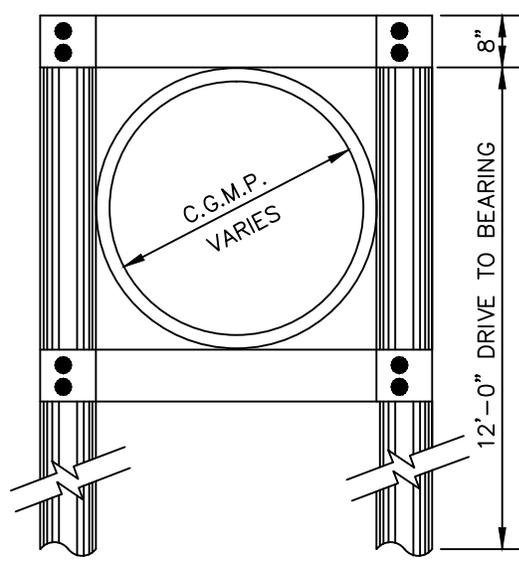
**PROFILE VIEW**

**NOTES:**

PAY FOR THIS ITEM TO BE INCLUDED IN THE UNIT PRICE BID FOR VARIOUS DIAMETER OF CORRUGATED METAL PIPE IN PLACE. STONE AND SHALL BE INSTALLED A MINIMUM OF 18" THICK. RIP RAP SHALL BE A MINIMUM OF 6" BROKEN CONCRETE RUBBLE WITH NO EXPOSED STEEL OR WELL-ROUNDED STONE AND SHALL BE INSTALLED A MINIMUM OF 18" THICK.

PILING CUTOFF SUBJECT TO APPROVAL BY CITY

PILING & TIMBER TO BE TREATED WITH AN APPROVED PRESERVATIVE



**END VIEW**

**TIMBER BENT FOR CORRUGATED METAL PIPE OUTFALL  
N.T.S.**

DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: D-107		
CITY OF SEABROOK DEPARTMENT OF PUBLIC WORKS		TIMBER BENT	

**EAST JORDAN  
IRON WORKS, INC.**  
P.O. BOX 439  
EAST JORDAN, MI. 49727  
1-800-874-4100  
FAX 231-536-4458

DRAWN	DATE
TCL	11/19/04
APPROVED	DATE

**MANHOLE  
COVER**

PRODUCT NO.  
**41420172**

CATALOG NO.  
**V-1420-1**

REF. LOGO DRAWING  
41420171

EST. WT.

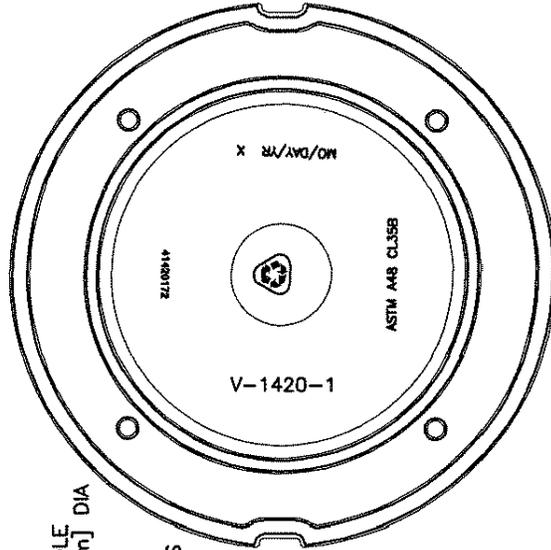
OPEN AREA  
N/A

MAT'L SPEC.

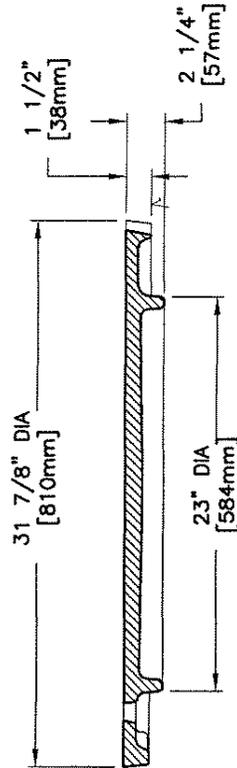
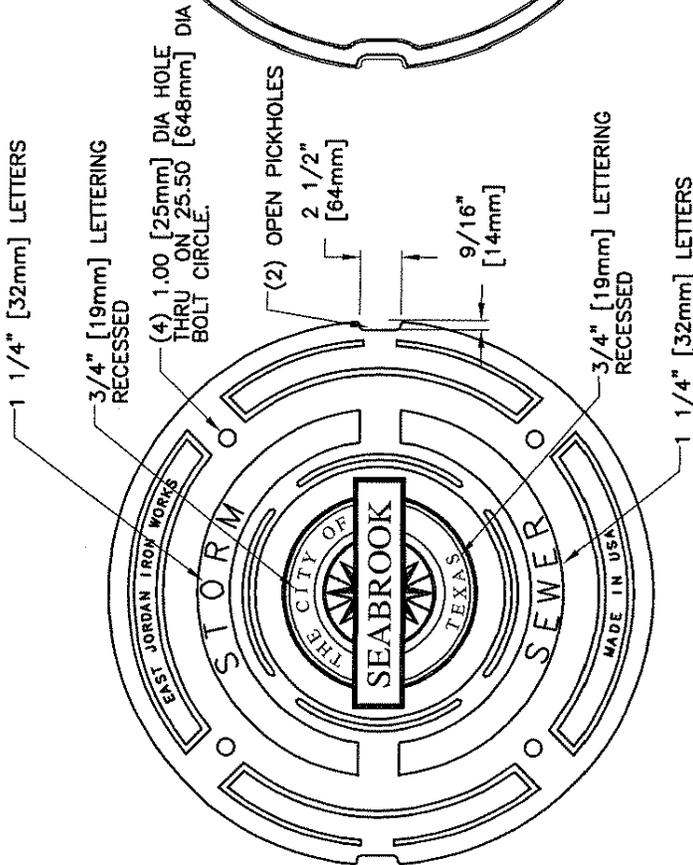
COVER - GRAY IRON  
ASTM A48 CL35B

LOAD RATING

**HEAVY DUTY**



**BOTTOM VIEW**



**COVER SECTION**

✓ MACHINED SURFACE

DATE: JANUARY 2015

APPROVED BY:

DESIGN BY:

SCALE: N.T.S.

DRAWING NO.: D-108

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

STORM SEWER  
MANHOLE COVER

EAST JORDAN  
IRON WORKS, INC.  
P.O. BOX 439  
EAST JORDAN, MI. 49727  
1-800-874-4100  
FAX 231-536-4458

DRAWN	DATE
DEW	01/18/00
APPROVED	DATE

V-1420\1480Z1  
FRAME WITHOUT  
MUD RING

PRODUCT NO.  
**41420012**

CATALOG NO.  
**V-1420\1480Z1**

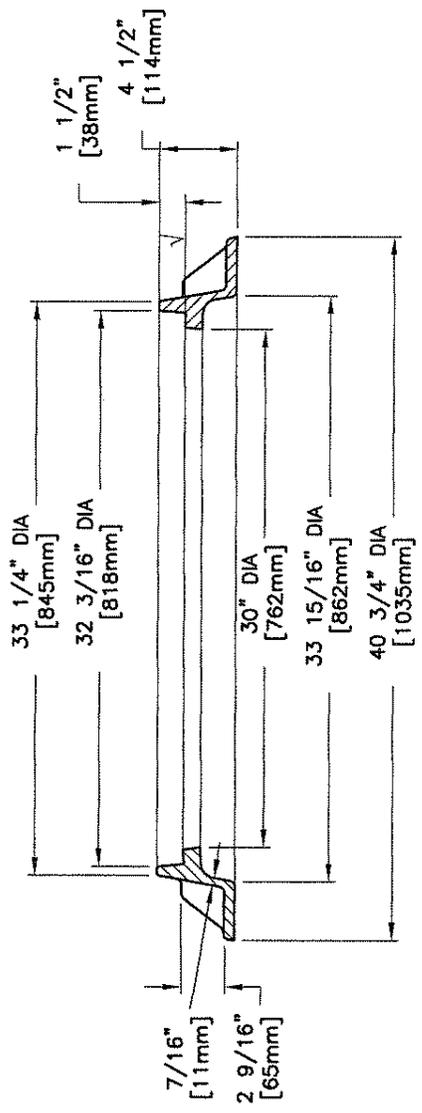
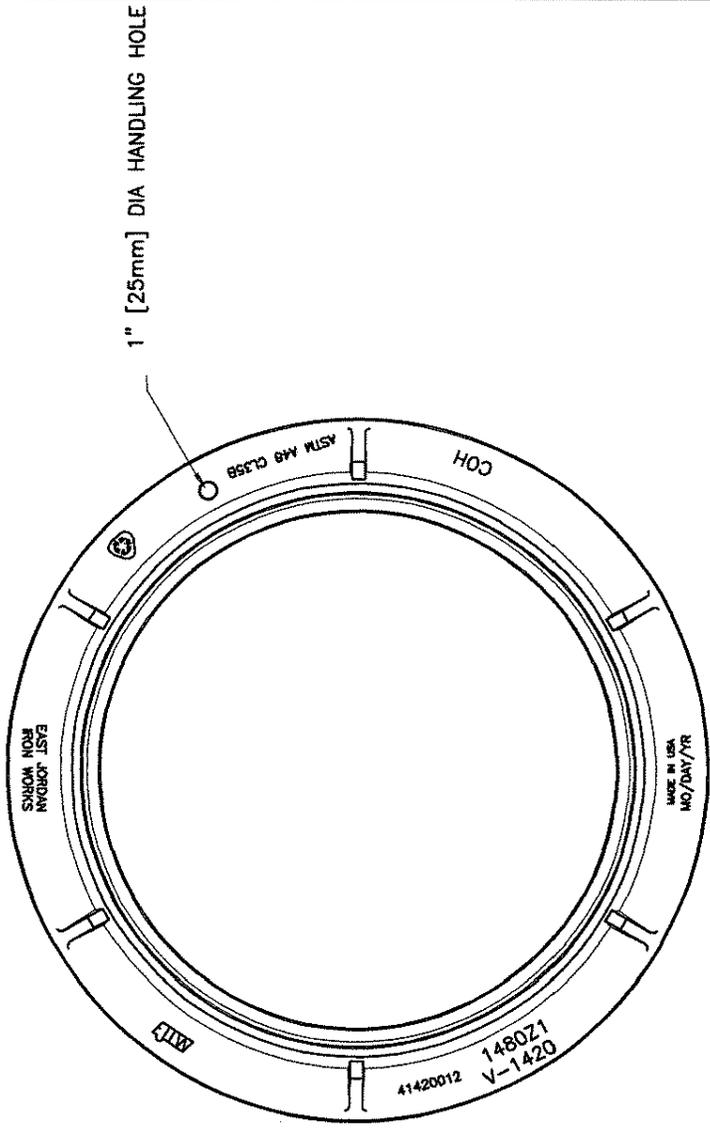
REF. PRODUCT DRAWING  
**41420012**

EST. WT.  
**FRAME: 170 LBS 77kg**

OPEN AREA  
N/A

MAT'L SPEC.  
FRAME - GRAY IRON  
ASTM A48 CL35

LOAD RATING  
**HEAVY DUTY**



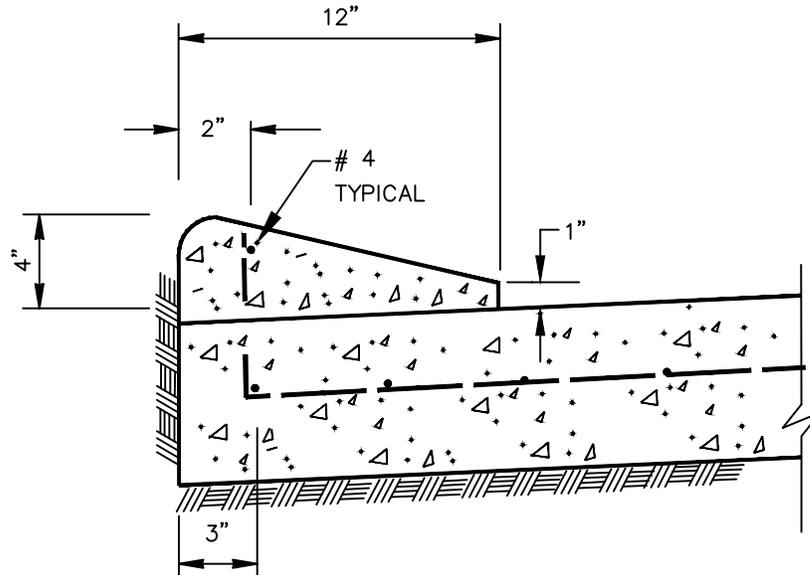
FRAME SECTION

DATE: JANUARY 2015 APPROVED BY: DESIGN BY:

SCALE: N.T.S. DRAWING NO.: D-109

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

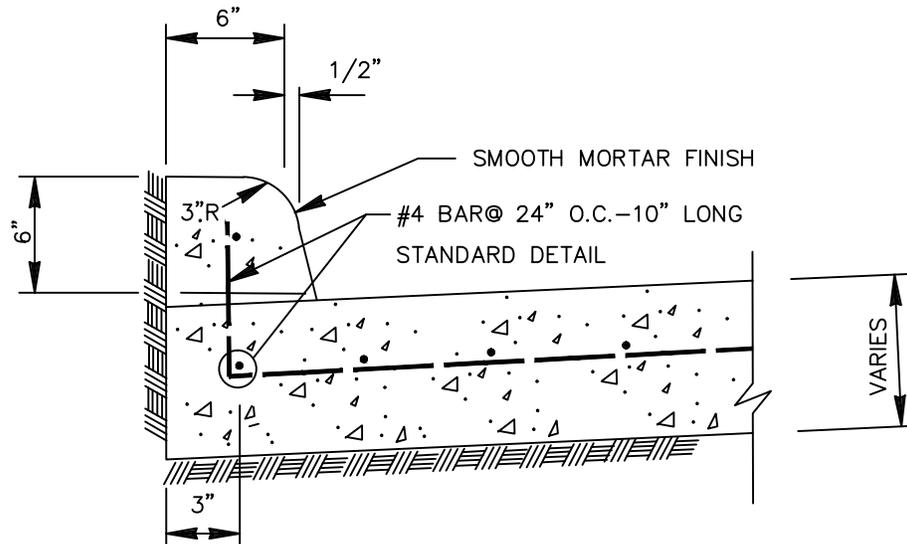
STORM SEWER  
MANHOLE FRAME



### 4" MONOLITHIC CURB

**NOTE:**

WHEN MOUNTABLE CURB IS NOT POURED MONOLITHICALLY WITH PAVEMENT, PROVIDE CONTINUOUS LONGITUDINAL #4 BARS OR #4x12"x6" STIRRUPS AT 24-INCHES ON CENTER.



### 6" CONCRETE CURB

**NOTES:**

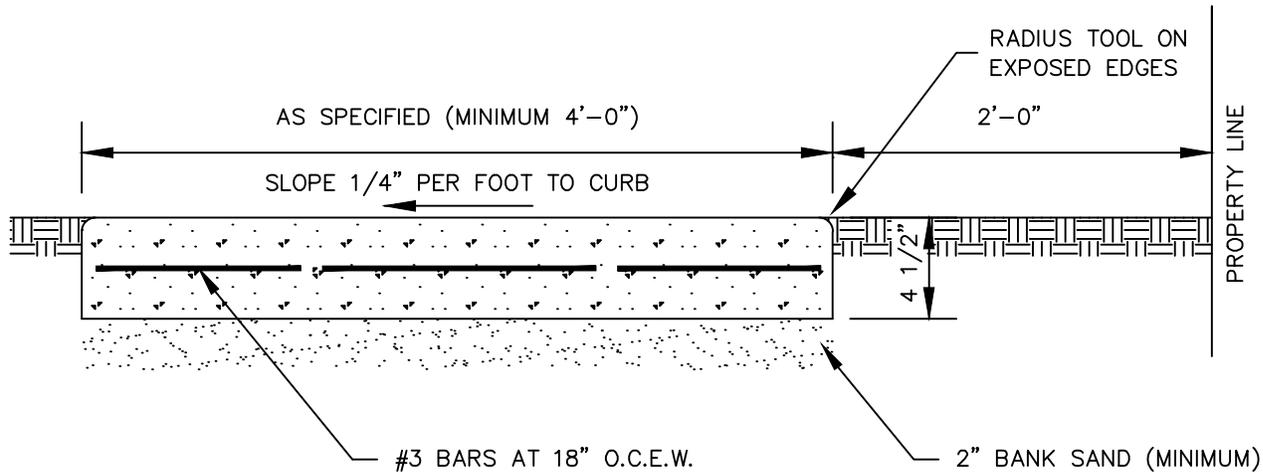
1. MORTAR FINISH NOT REQUIRED WHEN CURB IS POURED BY A MACHINE, BUT CURB WILL HAVE THE SAME OUTSIDE DIMENSIONS.
2. WHEN CONCRETE CURB IS TO BE PLACED ON EXISTING CONCRETE BASE #4 DEFORMED BARS, 10" LONG, 24" O.C. DOWELLED AND SET IN QUICK SETTING CEMENT.
3. REDWOOD EXPANSION JOINTS SHALL BE INSTALLED AT ALL PAVEMENT EXPANSION JOINTS.

DATE: JANUARY 2015	APPROVED BY:	DESIGN BY:
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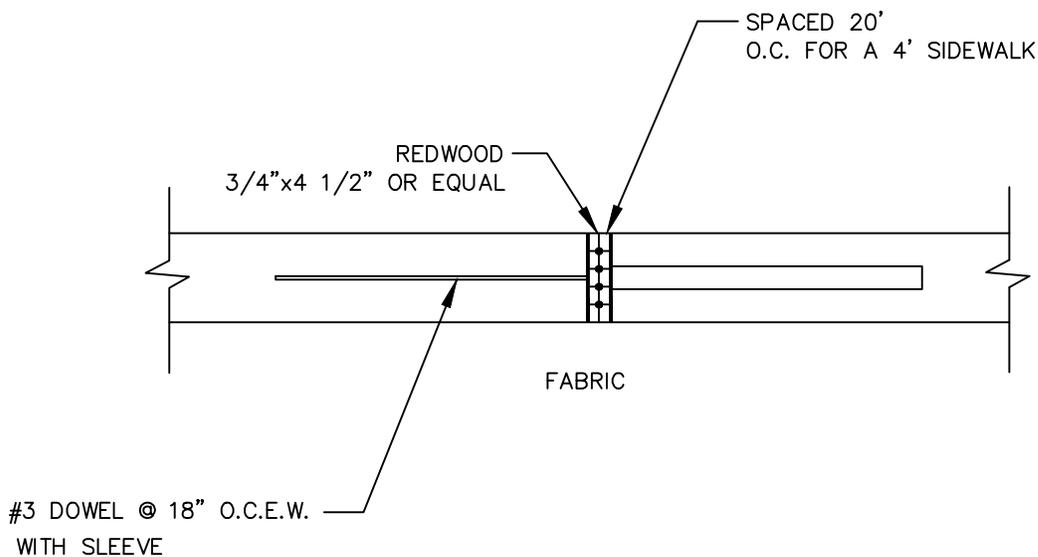
SCALE: N.T.S.	DRAWING NO.: P-100
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*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

4" MONOLITHIC CURB  
& 6" CONCRETE CURB



**CONCRETE SIDEWALK**  
N.T.S.

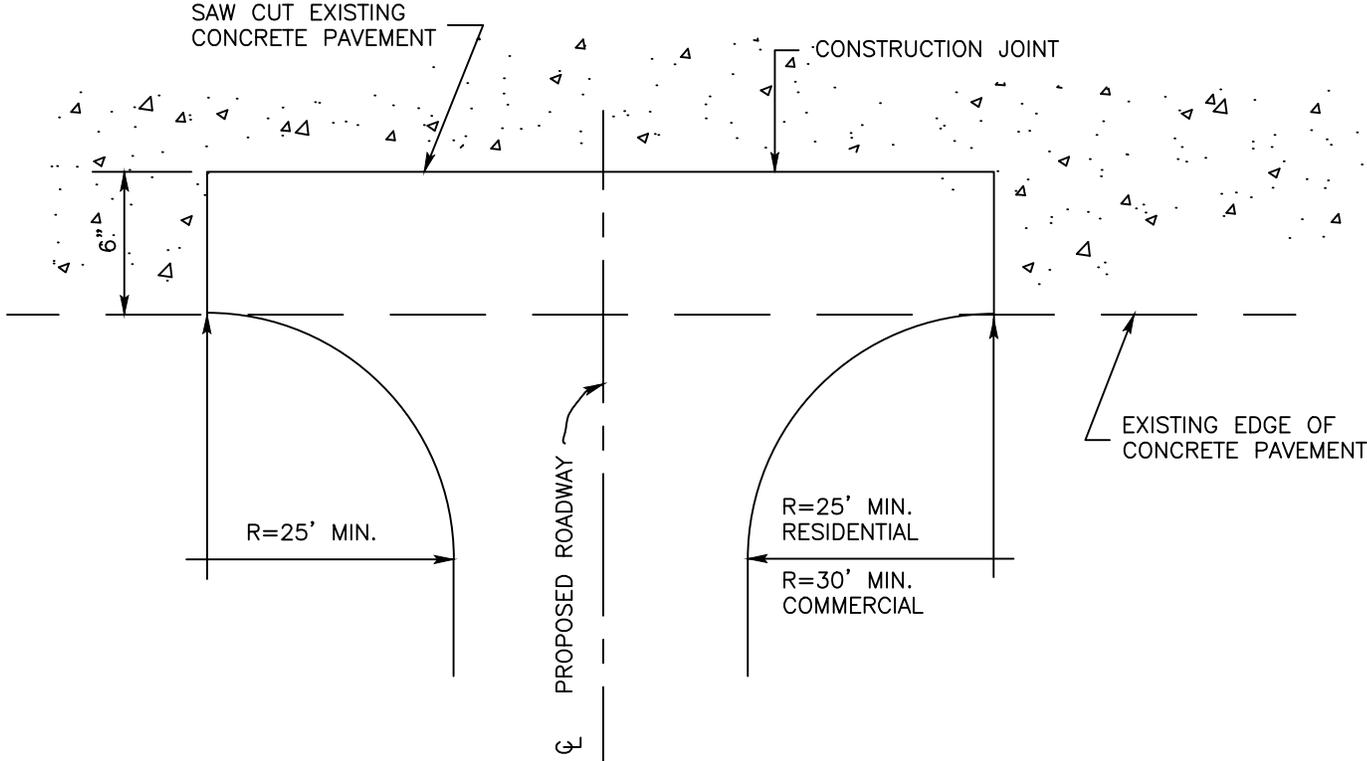


**EXPANSION JOINT**

NOTES:

CONTRACTION JOINTS SHALL BE SPACED 4' O.C. FOR A 4' SIDEWALK  
 CONCRETE SHALL HAVE FIVE SACKS OF CEMENT/CUBIC YARD OF CONCRETE.  
 CONTRACTION JOINTS SHALL BE SPACED BASED ON THE WIDTH OF THE SIDEWALK.

DATE: JANUARY 2015	APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: P-101	
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS		CONCRETE SIDEWALK



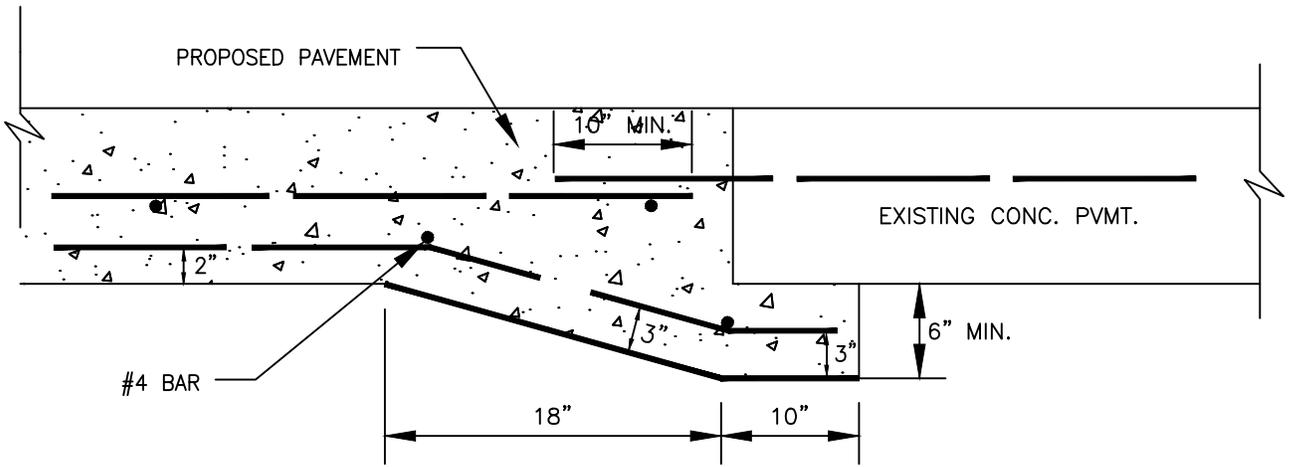
**NOTE:**  
 PROVIDE A MINIMUM OF 10" OF  
 REINFORCING STEEL OVERLAP.

DATE: JANUARY 2015 | APPROVED BY: | DESIGN BY:

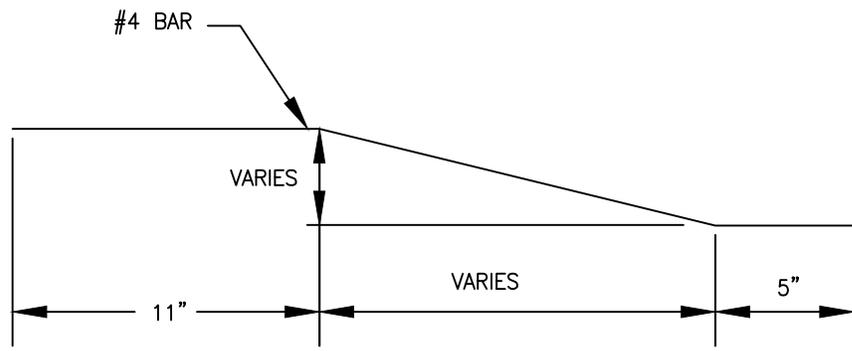
SCALE: N.T.S. | DRAWING NO.: P-102

*CITY OF SEABROOK*  
 DEPARTMENT OF PUBLIC WORKS

METROPOLITAN  
 INTERSECTION



UNDERCUT DETAIL  
N.T.S.



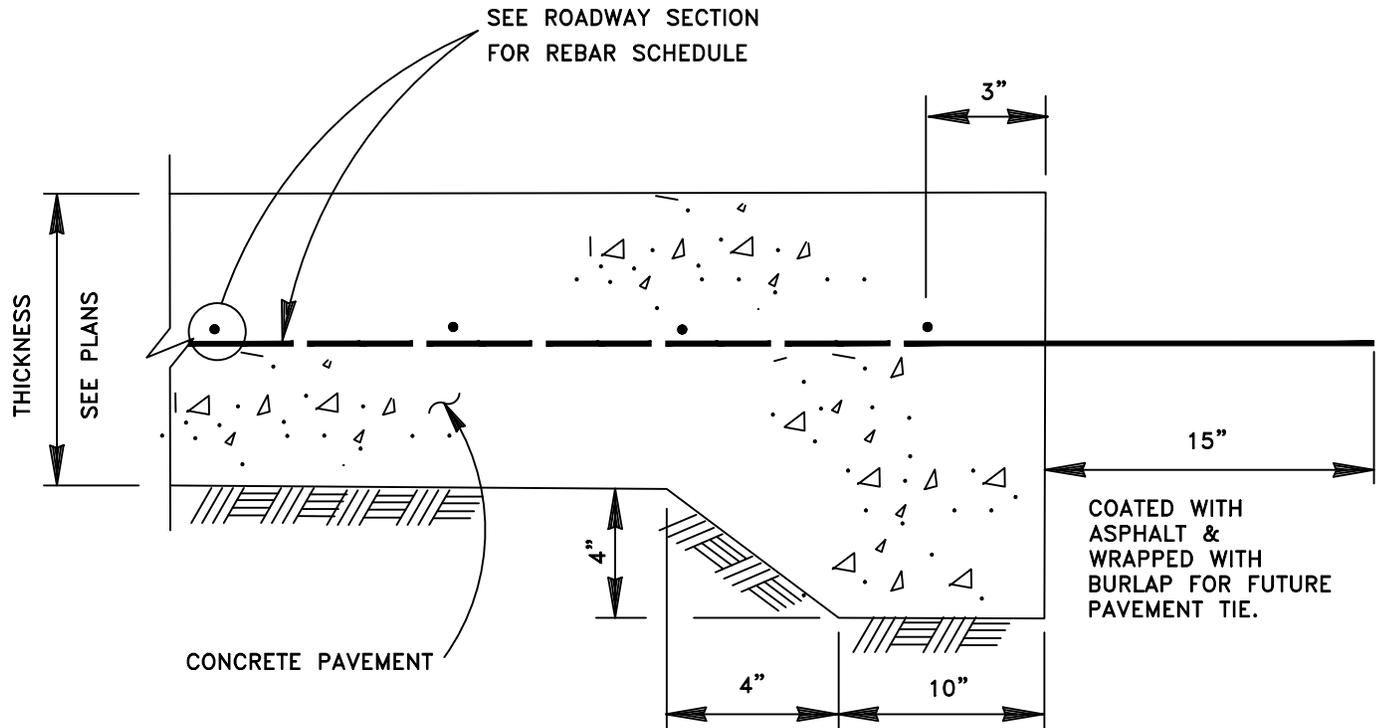
UNDERCUT BAR LAYOUT

DATE: JANUARY 2015 | APPROVED BY: | DESIGN BY:

SCALE: N.T.S. | DRAWING NO.: P-103

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

PAVEMENT UNDERCUT



STANDARD CONCRETE PAVING HEADER

DATE: JANUARY 2015 | APPROVED BY: | DESIGN BY:

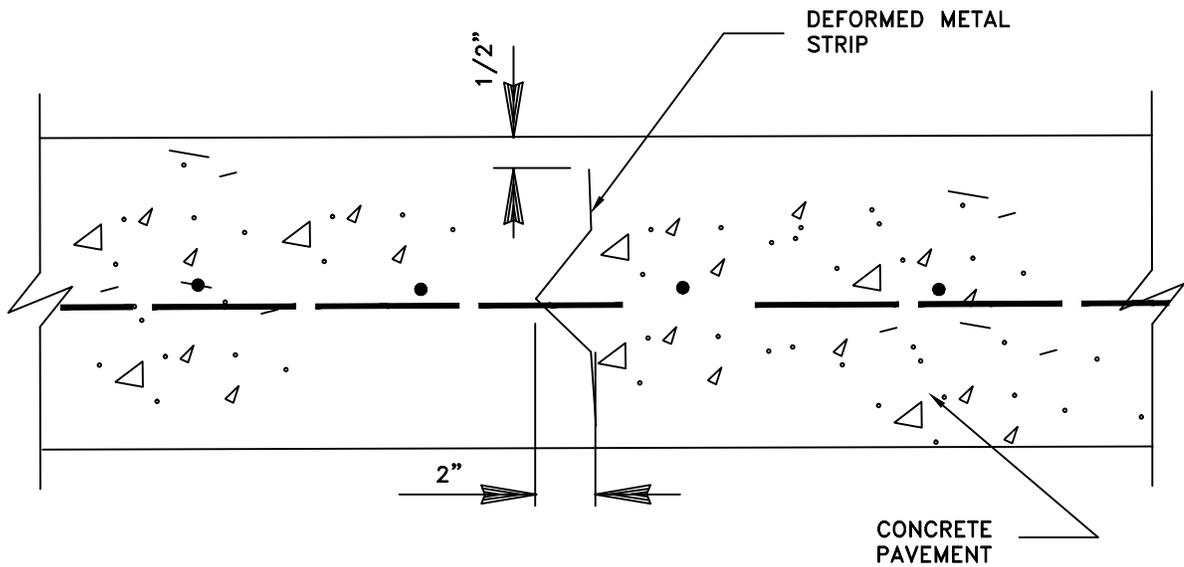
SCALE: N.T.S. | DRAWING NO.: P-104

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

PAVEMENT HEADER

**NOTE:**

THE LOCATION OF DEFORMED STRIPS MAY BE VARIED, WITH THE APPROVAL OF THE DEPARTMENT OF PUBLIC WORKS, TO SUIT THE PROPOSED CONSTRUCTION METHODS OF THE CONTRACTOR. MAXIMUM LONGITUDE SPACING FOR DEFORMED STRIPS IS 14'-0". DEFORMED METAL STRIPS SHALL BE PLACED VERTICALLY ALONG A STRAIGHT ALIGNMENT.



SECTION  
DEFORMED METAL STRIP

DATE: JANUARY 2015 | APPROVED BY: | DESIGN BY:

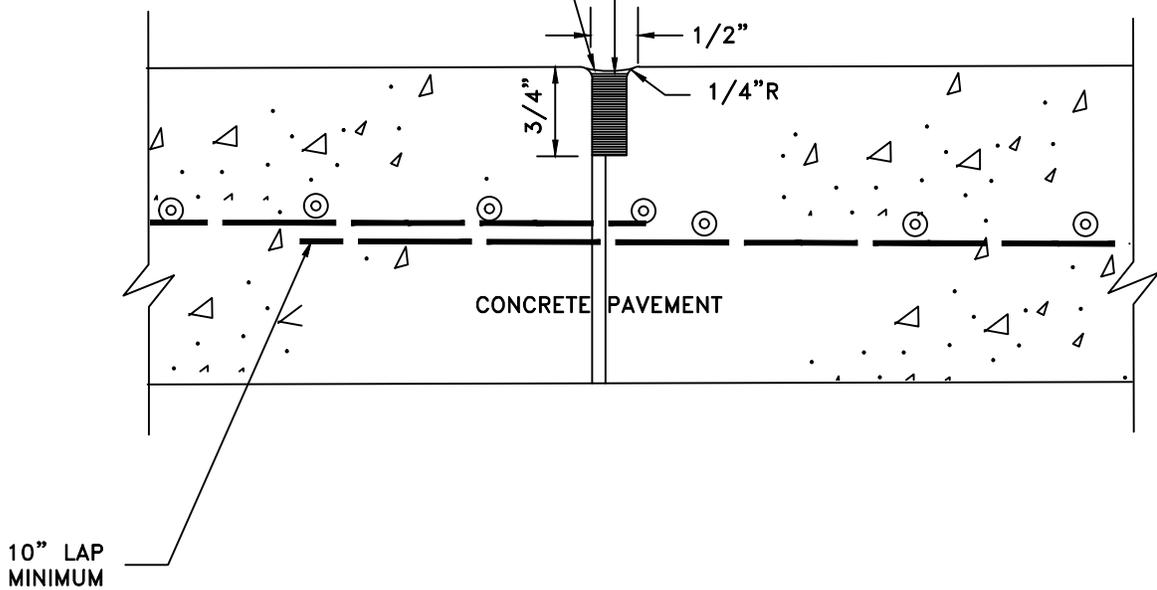
SCALE: N.T.S. | DRAWING NO.: P-105

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

DEFORMED  
METAL STRIP

JOINT SEALANT, HOT POURED  
RUBBER ASPHALT (TXDOT ITEM  
360.2 CLASS 2) FLUSH WITH  
PAVEMENT SURFACE

HOT POURED  
ELASTOMERIC



SECTION

CONSTRUCTION JOINT SEAL

DATE: JANUARY 2015

APPROVED BY:

DESIGN BY:

SCALE: N.T.S.

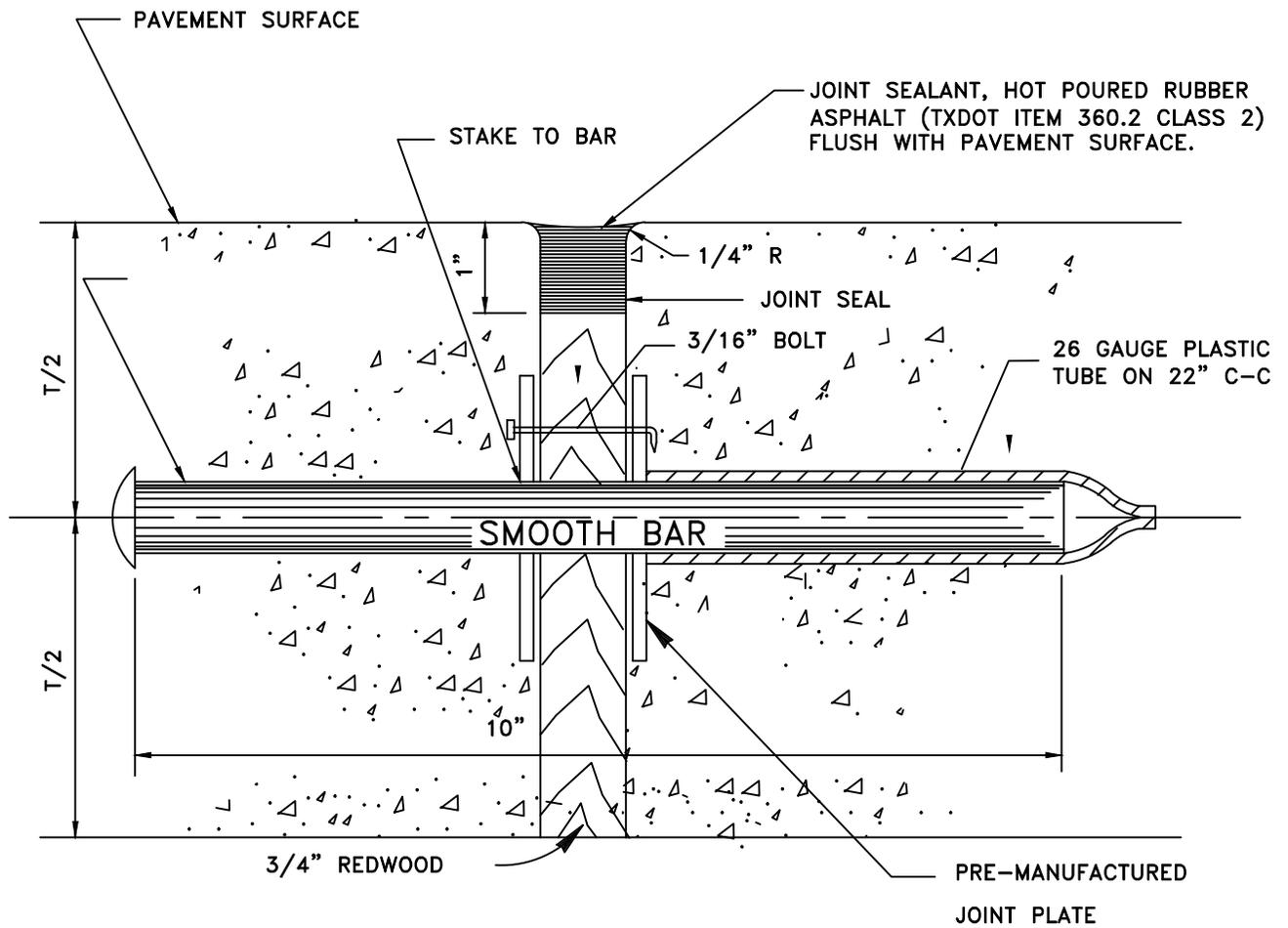
DRAWING NO.: P-106

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION  
JOINT

**NOTES:**

1. EXPANSION JOINT TO BE PLACED AT THE END OF EACH CURB RADIUS AND SPACED A MAXIMUM OF 60'-0" APART.
2. STAKES FOR TRANSVERSE JOINTS SHALL NOT BE PLACED CLOSER THAN 6" TO A LONGITUDINAL JOINT. THE TOP OF EACH STAKE SHALL NOT BE LESS THAN 1" BELOW THE FINISH SURFACE.
3. ALTERNATIVE DOWEL IS A CANTILEVER TYPE, CAST MALLEABLE IRON LOAD TRANSMISSION UNIT, STAR-LUG, MODEL D-27, OR EQUAL, ON 22" C-C.

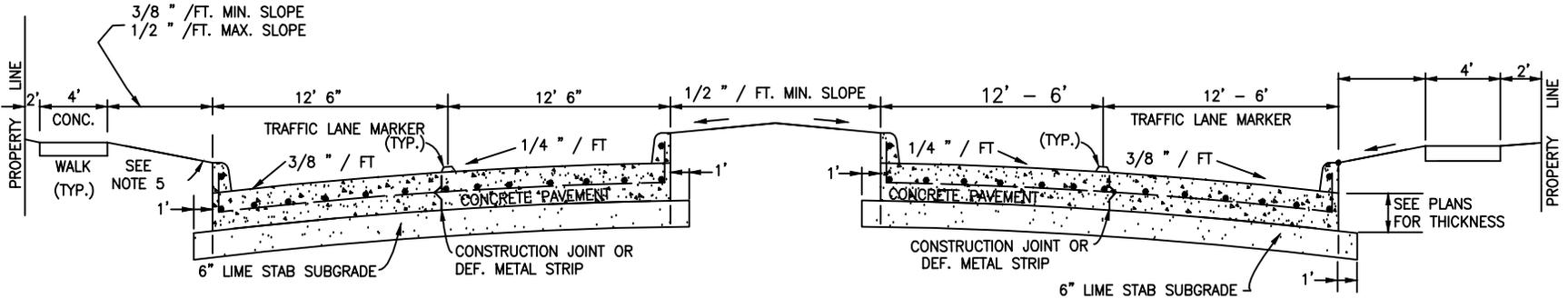


**SECTION**  
**DOWEL TYPE EXPANSION JOINT**

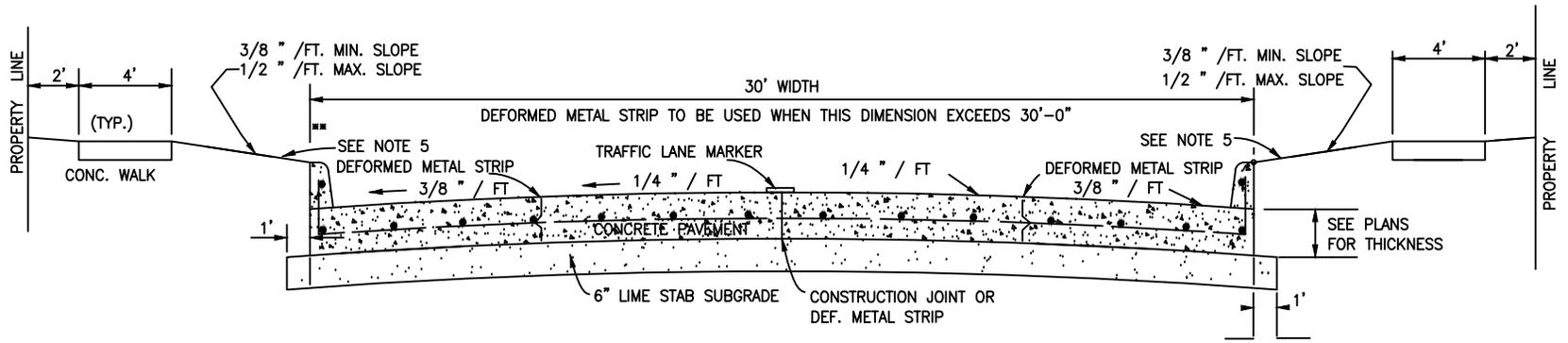
DATE: JANUARY 2015	APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: P-107	
<p><i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS</p>		<p>DOWEL TYPE EXPANSION JOINT</p>

DATE: JANUARY 2015  
SCALE: N.T.S.  
DRAWING NO.: P-108  
APPROVED BY:

DESIGN BY:



TYPICAL DOUBLE ROADWAY SECTION



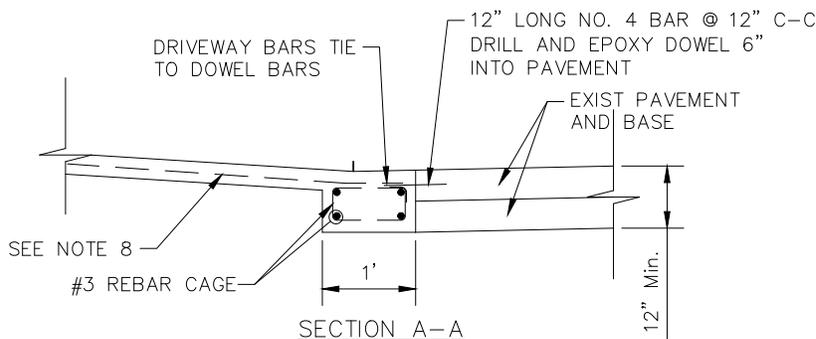
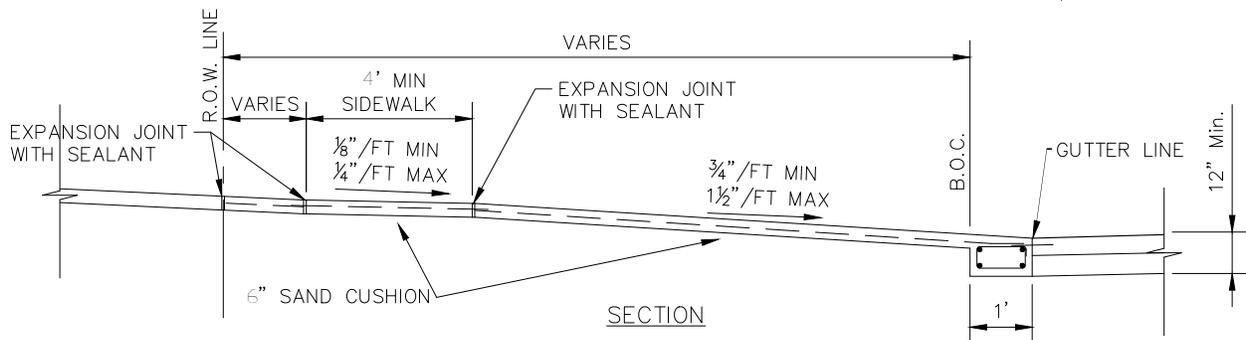
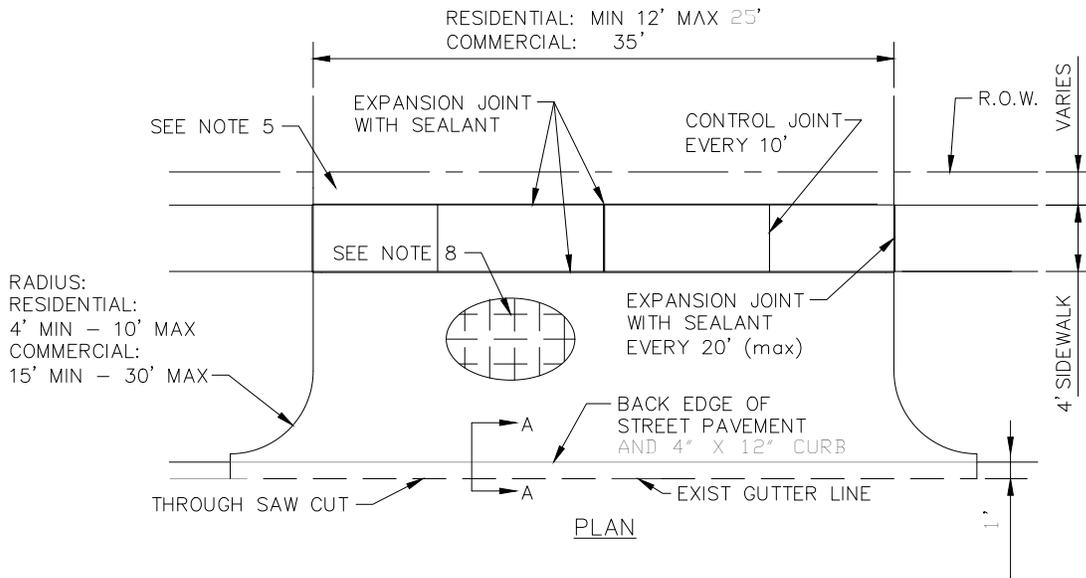
TYPICAL SINGLE ROADWAY SECTION

NOTES:

1. All reinforcing steel shall conform to ASTM A-615, current grade 40. Minimum lap at all splices shall be a minimum of 10".
2. Concrete shall be a minimum of five and a half (5-1/2) sacks of cement per cubic yard of concrete, compressive strength 3500 psi at 28 days.
3. The location of construction joints and deformed metal strips may be varied, with the approval of the Department of Community Services, to suit the proposed construction methods of the Contractor. The minimum width between longitudinal joints shall not exceed 14'-0".
4. 6" lime stabilized subgrade shall be a minimum of 6% lime, unless specifically approved by the Department of Community Services.
5. The slope behind pavement may be increased, with approval of Public Works.
6. Once construction is completed, at the back of all curbs, a minimum of either filter fabric fence, 2 feet of hydromulch or sod, or Best Management Practices shall be implemented/installed.

MINIMUM REINFORCEMENT SCHEDULE

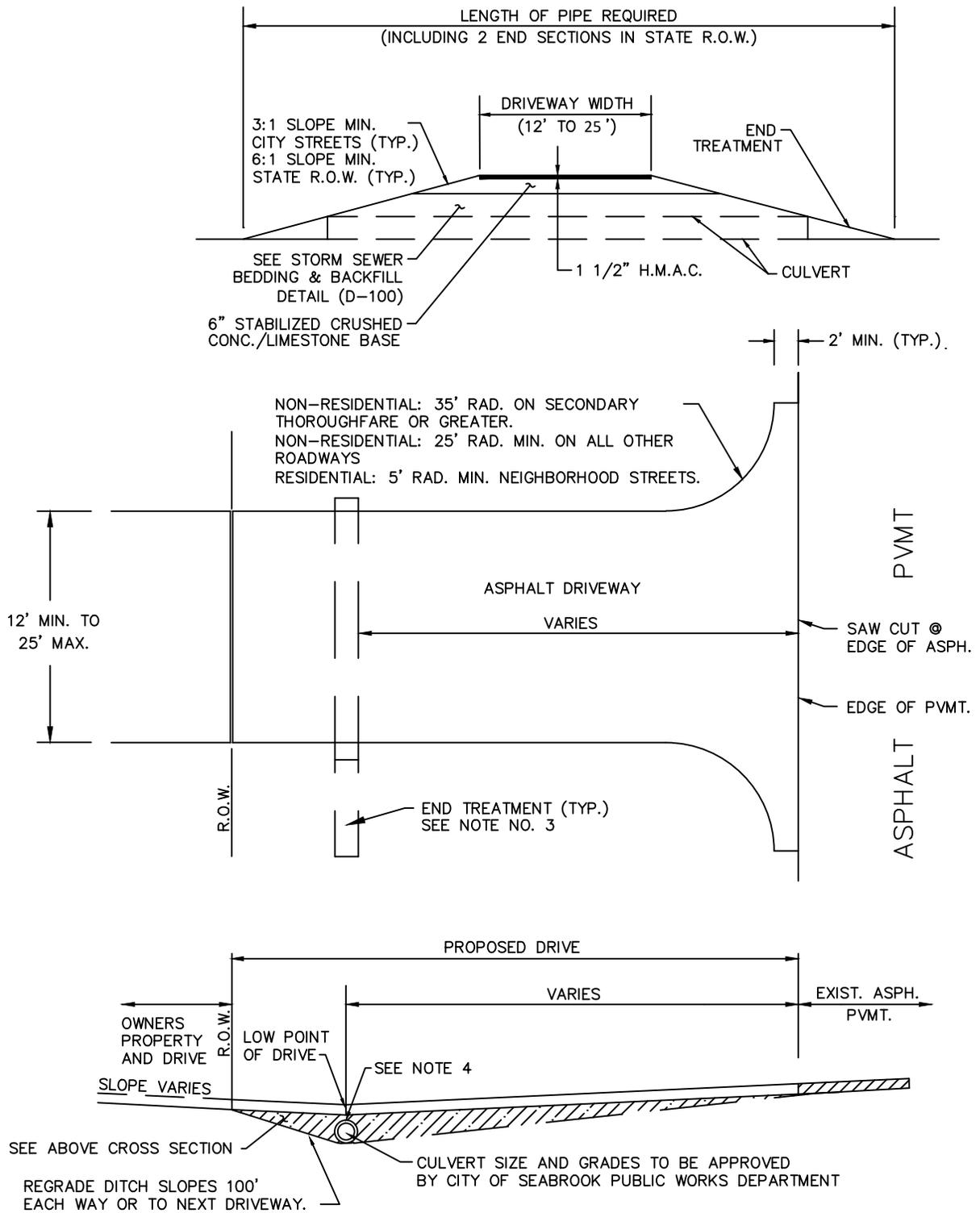
- Six (6) inch pavement ~ # 4 - 24" O.C.E.W.  
Seven (7) inch pavement # 4 - 18" O.C.E.W.



**NOTES:**

1. ON PRIVATE SIDE: DRIVEWAYS SHALL INCLUDE DOWELED EXPANSION JOINTS AT 20' SPACING AND CONTROL BREAK JOINTS AT 10' SPACING. REINFORCING TO BE #4 REBAR ON 24" CENTERS
2. PROVIDE A MIN OF 10" OVERLAP ON REINFORCING.
3. CONSTRUCT DRIVEWAYS WITH 5½ SACK PORTLAND CEMENT.
4. ALL EXPANSION JOINT TO BE SEALED WITH HOT POURED ELASTIC TYPE SEALER MEETING ASTM D1190 OR APPROVED EQUIV.
5. PROVIDE EXPANSION JOINT WITH SEALANT WHEN CONNECTING TO EXIST DRIVE.
6. SIDEWALKS SHALL MATCH THICKNESS OF DRIVEWAYS IN THE CONFINES OF DRIVEWAY WIDTH.
7. DRIVEWAY THICKNESS TO BE 6" MIN OR AS CALLED OUT ON APPROVED ENGINEERED PLANS.
8. ON PUBLIC SIDE, WITHIN ROW: DRIVEWAY REINFORCING SHALL BE #4 REBAR ON 24" CENTERS E.W.

DATE: <b>October 2023</b>	APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: P-109	
<p><i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS</p>		<p>CONCRETE DRIVEWAY @ PROP. CURB AND GUTTER ROADWAY</p>



\* NOTES:

1. ALL DRIVEWAYS IN STATE R.O.W. REQUIRE TXDOT APPROVAL PRIOR TO BEGINNING CONSTRUCTION.
2. SAW CUT AT EDGE OF ASPHALT.
3. SPECIAL END TREATMENTS ARE REQUIRED ON ALL CULVERTS IN THOROUGHFARES.
4. MIN. 6" CLEARANCE BETWEEN PAVEMENT AND TOP OF PIPE.

DATE: JANUARY 2015

APPROVED BY:

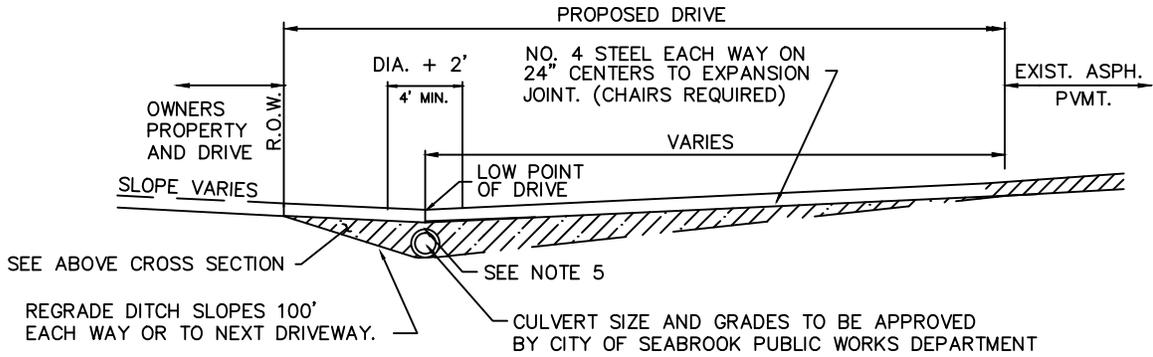
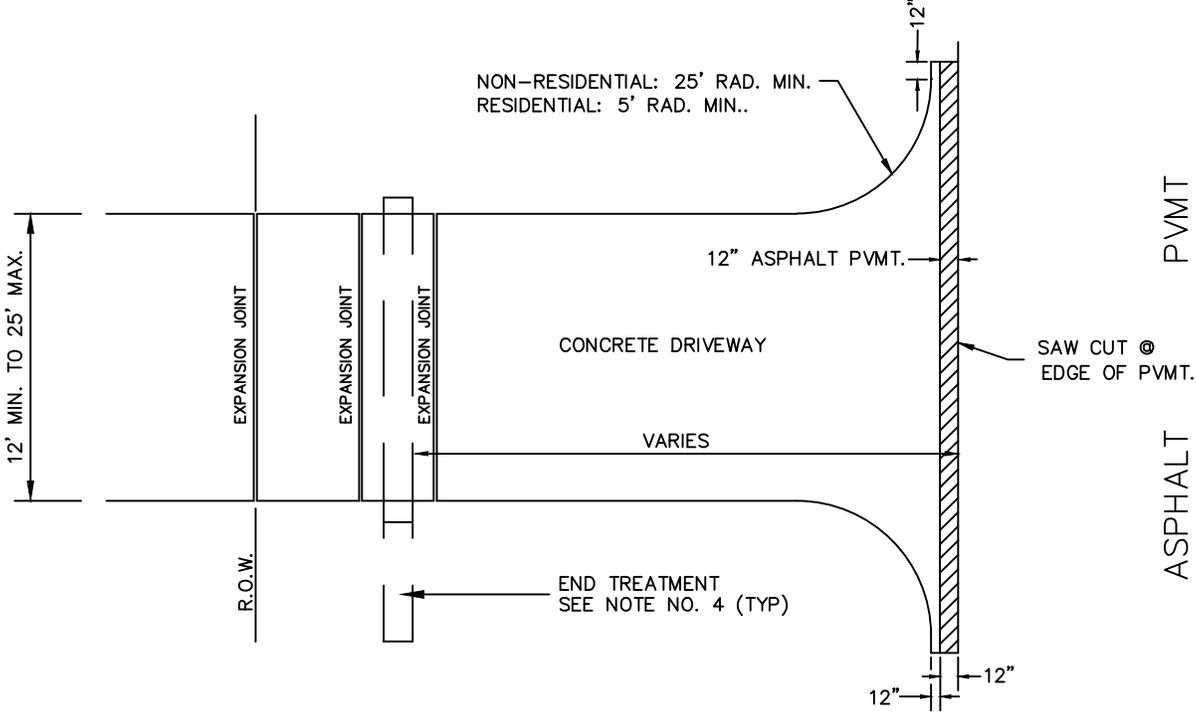
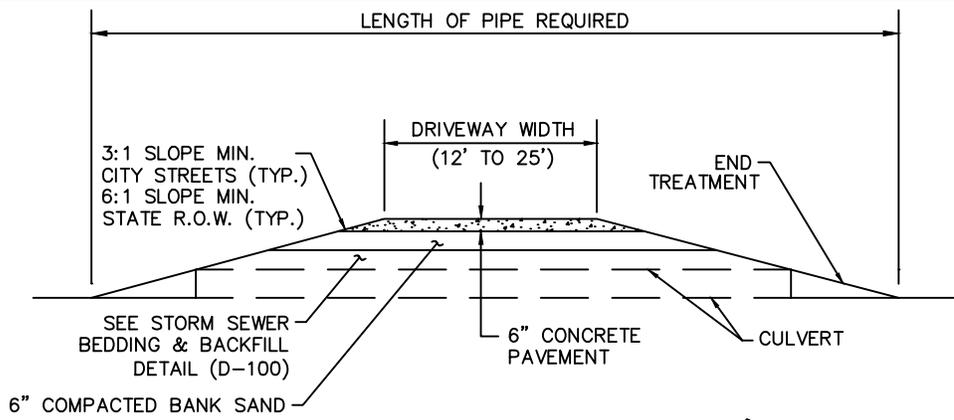
DESIGN BY:

SCALE: N.T.S.

DRAWING NO.: P-110

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

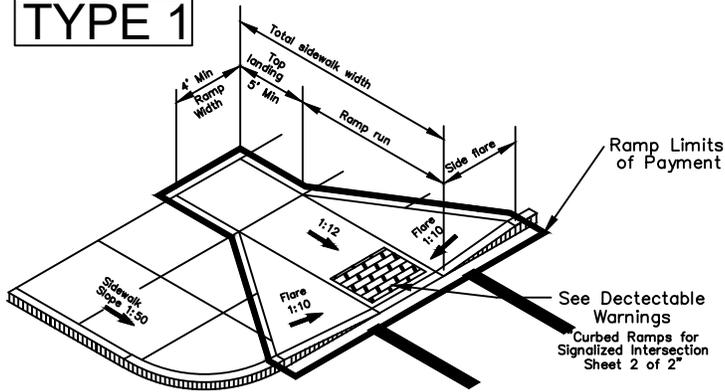
ASPHALT DRIVEWAY  
TO ASPHALT STREET  
(OPEN DITCH)



- \* NOTES:
1. ALL DRIVEWAYS IN STATE R.O.W. REQUIRE TXDOT TRAFFIC CONTROL PLAN PRIOR TO BEGINNING CONSTRUCTION.
  2. SAW CUT AT EDGE OF ASPHALT.
  3. STABILIZED SAND TO BE PIPE DIAMETER PLUS 2' AND 2" ABOVE TOP BELL ON PIPE.
  4. SPECIAL END TREATMENTS ARE REQUIRED ON ALL CULVERTS IN THOROUGHFARES.
  5. MIN. 6" CLEARANCE BETWEEN PAVEMENT AND TOP OF PIPE.

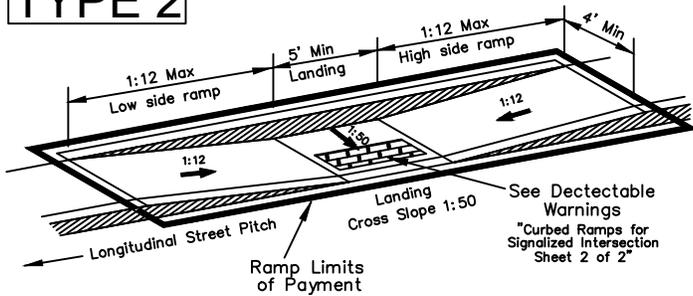
DATE: JANUARY 2015		APPROVED BY:		DESIGN BY:	
SCALE: N.T.S.		DRAWING NO.: P-111		<p style="text-align: center;">CONCRETE DRIVEWAY TO ASPHALT STREET (OPEN DITCH)</p>	
<p><i>CITY OF SEABROOK</i></p> <p>DEPARTMENT OF PUBLIC WORKS</p>					

**TYPE 1**



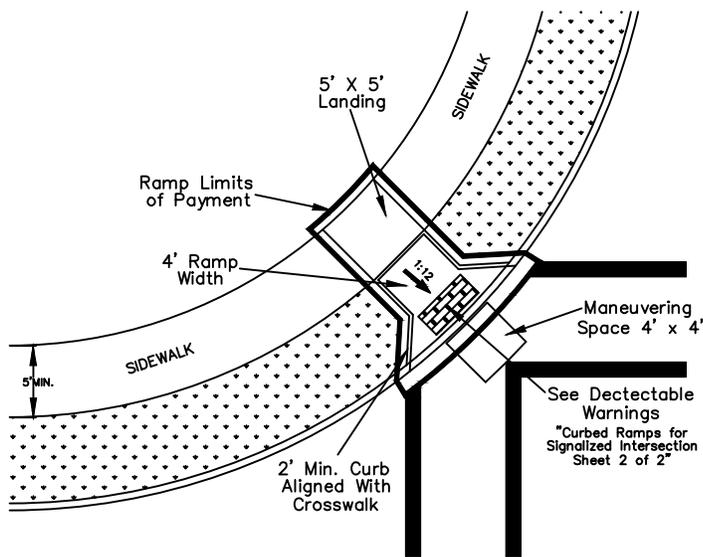
PERPENDICULAR CURB RAMPS

**TYPE 2**



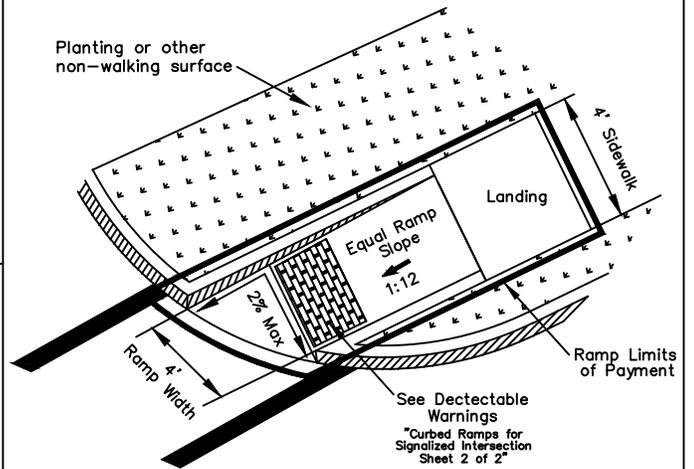
PERPENDICULAR CURB RAMPS

**TYPE 9**



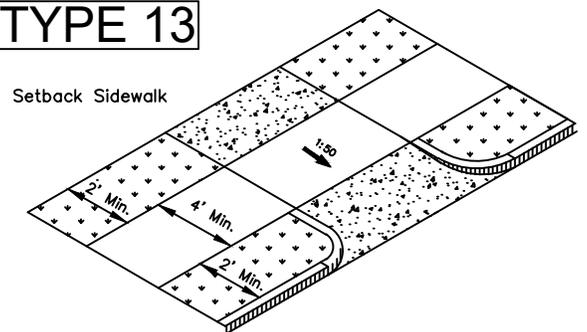
DIAGONAL CURB RAMP (RETURNED CURB)

**TYPE 7**



DIRECTIONAL RAMP WITHIN RADIUS

**TYPE 13**



DRIVEWAY APRONS

DATE: JANUARY 2015

APPROVED BY:

DESIGN BY:

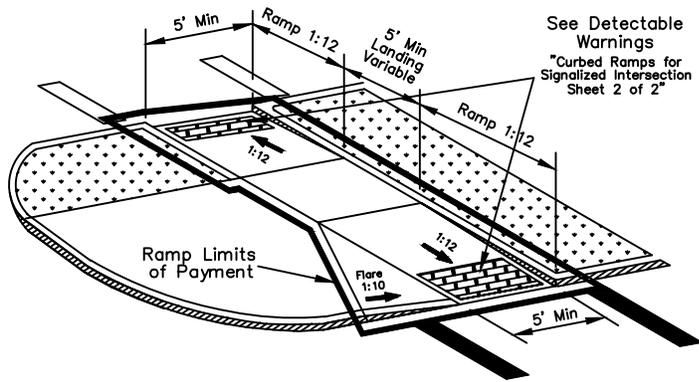
SCALE: N.T.S.

DRAWING NO.: P-112

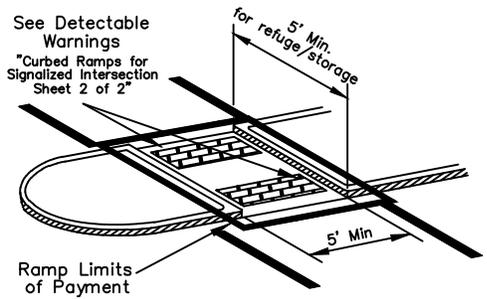
CITY OF SEABROOK  
DEPARTMENT OF PUBLIC WORKS

SIDEWALK RAMP  
(P. 1 OF 2)

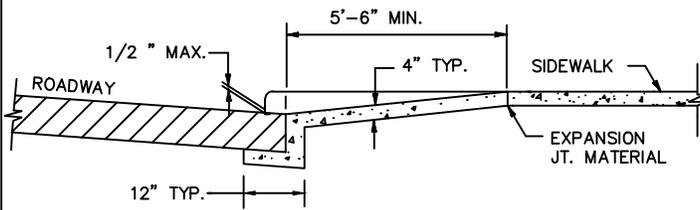
# TYPE 10



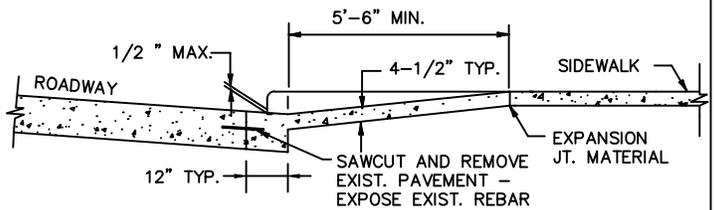
# TYPE 11



## CURB RAMPS AT MEDIAN ISLANDS



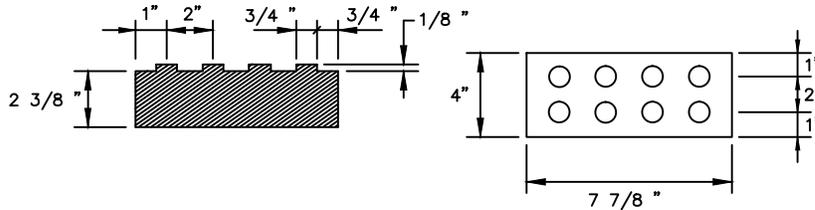
TYPICAL WHEELCHAIR RAMP SECTION  
ASPHALT PAVEMENT



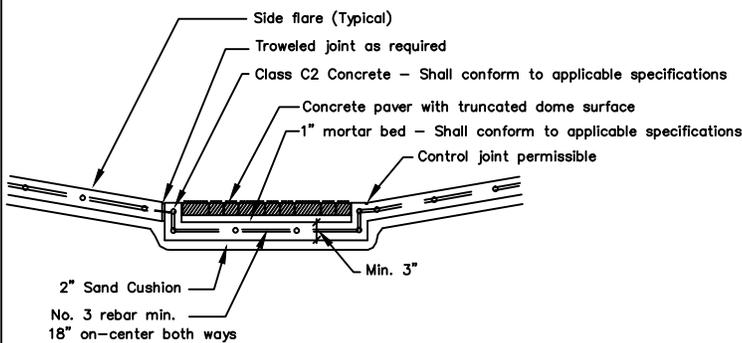
TYPICAL WHEELCHAIR RAMP SECTION  
PC CONCRETE PAVEMENT

## DETECTABLE WARNINGS

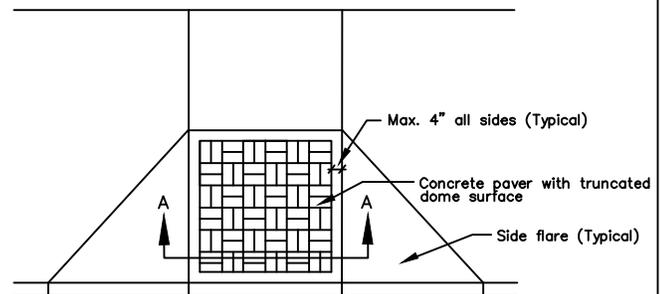
### Truncated Dome Pattern Curb Ramp



Concrete paver with truncated dome surface



Section A-A



TYPE A

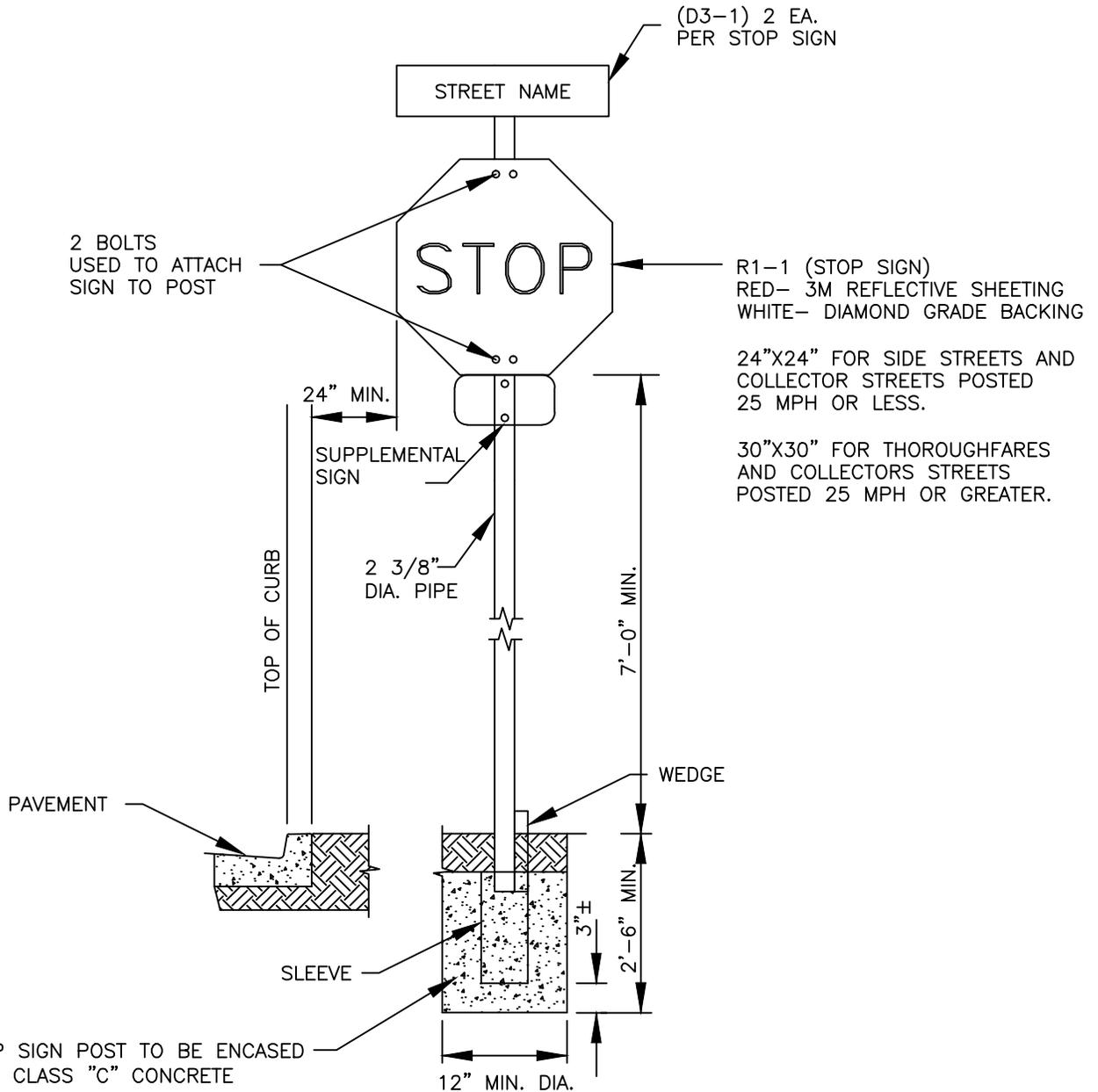
DATE: JANUARY 2015      APPROVED BY:      DESIGN BY:

SCALE: N.T.S.      DRAWING NO.: P-113

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

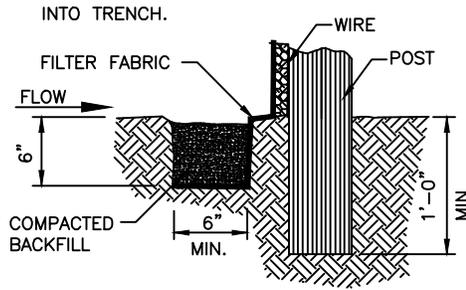
SIDEWALK RAMP  
(P. 2 OF 2)



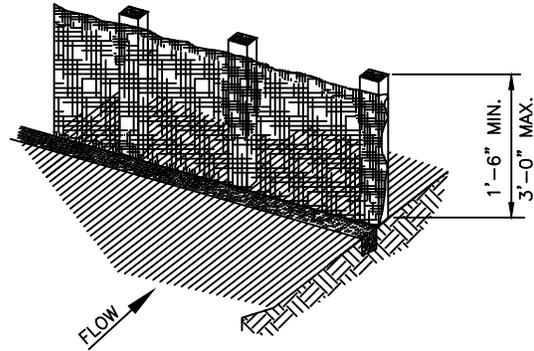


**SIGN MOUNTING DETAIL**

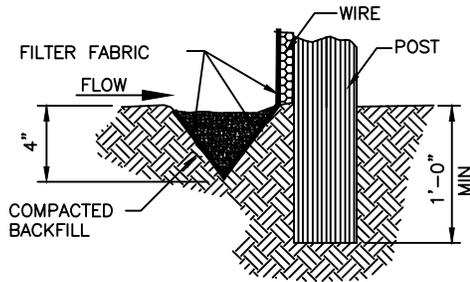
DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: P-115		TYPICAL SIGN MOUNT
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS			



COMPACT THE EXCAVATED SOIL.



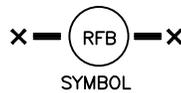
ALTERNATE V-TRENCH EXTENSION  
OF FABRIC INTO TRENCH



GENERAL NOTES:

1. SECURELY FASTEN MESH FENCING TO POSTS WITH STAPLES OR TIE WIRES.
2. SECURELY FASTEN FILTER FABRIC TO MESH FENCING.
3. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER, OVERLAP 6 INCHES AT A POST, FOLD TOGETHER, AND ATTACH TO A POST.
4. REMOVE SEDIMENT DEPOSITS WHEN SILT REACHES ONE-THIRD OF THE HEIGHT OF THE FENCE IN DEPTH.

REINFORCED  
FILTER FABRIC BARRIER

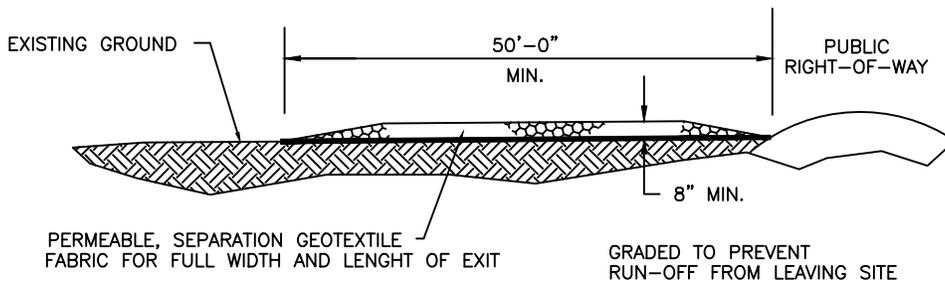


DATE: JANUARY 2015	APPROVED BY:	DESIGN BY:
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SCALE: N.T.S.	DRAWING NO.: SW-100
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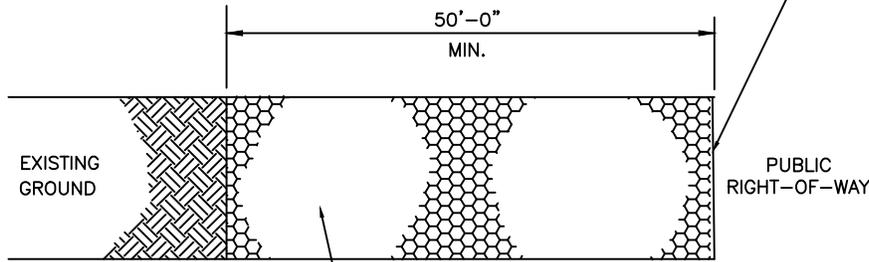
*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

REINFORCED FILTER  
FABRIC BARRIER



PROFILE

PROVIDE APPROPRIATE TRANSITION BETWEEN STABILIZED CONSTRUCTION ENTRANCE AND PUBLIC RIGHT-OF-WAY



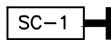
PLAN VIEW

COARSE AGGREGATE - 2" TO 5" GRANULAR FILL (BROKEN CONCRETE IS NOT PERMITTED)

GENERAL NOTES:

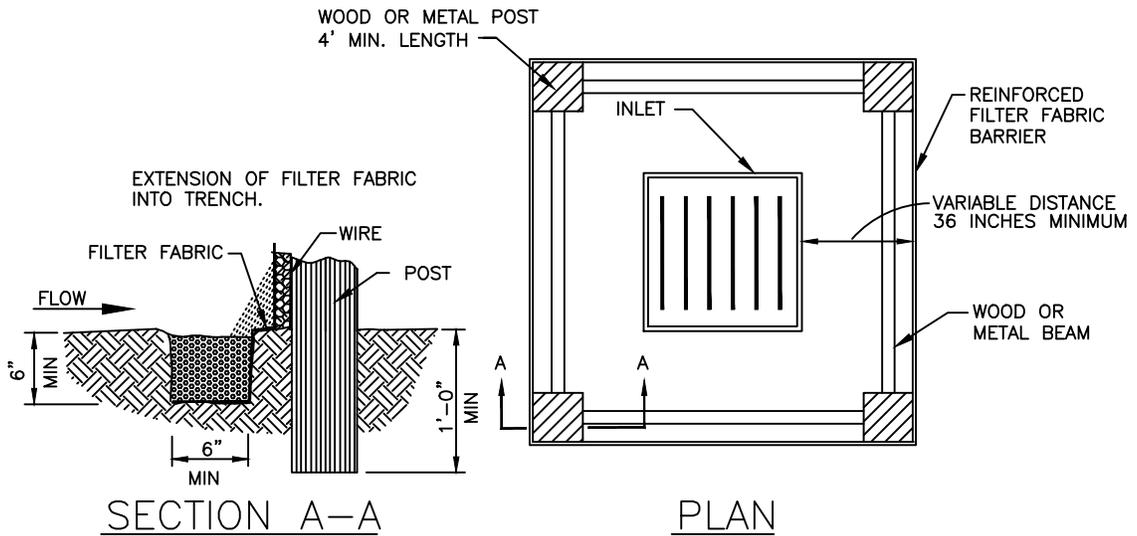
1. MINIMUM LENGTH IS AS SHOWN ON CONSTRUCTION DRAWINGS OR 50 FEET, WHICHEVER IS MORE.
2. CONSTRUCT AND MAINTAIN CONSTRUCTION EXIT WITH CONSTANT WIDTH ACROSS ITS LENGTH, INCLUDING ALL POINTS OF INGRESS OR EGRESS.
3. UNLESS SHOWN ON THE CONSTRUCTION DRAWINGS, STABILIZATION FOR OTHER AREAS WILL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION EXIT.
4. WHEN SHOWN ON THE CONSTRUCTION DRAWINGS, WIDEN OR LENGTHEN STABILIZED AREA TO ACCOMMODATE A TRUCK WASHING AREA. PROVIDE OUTLET SEDIMENT TRAP FOR THE TRUCK WASHING AREA.
5. PROVIDE PERIODIC TOP DRESSING WITH ADDITIONAL COARSE AGGREGATE TO MAINTAIN THE REQUIRED DEPTH OR WHEN SURFACE BECOMES PACKED WITH MUD.
6. PERIODICALLY TURN AGGREGATE TO EXPOSE A CLEAN DRIVING SURFACE.
7. ALTERNATIVE METHODS OF CONSTRUCTION INCLUDE
  - CEMENT STABILIZED SOIL: COMPACTED CEMENT STABILIZED SOIL, LIMESTONE AGGREGATE, OR OTHER FILL MATERIAL IN AN APPLICATION OF THICKNESS OF 8 INCHES.
  - WOOD MATS: OAK OR OTHER HARDWOOD TIMBERS PLACED EDGE TO EDGE AND ACROSS SUPPORT WOODEN BEAMS WHICH ARE PLACED ON TOP OF EXISTING SOIL IN AN APPLICATION THICKNESS OF 6 INCHES.
  - STEEL MATS: PERFORATED MATS PLACED ACROSS PERPENDICULAR SUPPORT MEMBERS.
8. MINIMUM 14' WIDTH FOR ONE WAY TRAFFIC AND 20' WIDTH FOR TWO WAY TRAFFIC.

STABILIZED CONSTRUCTION ACCESS



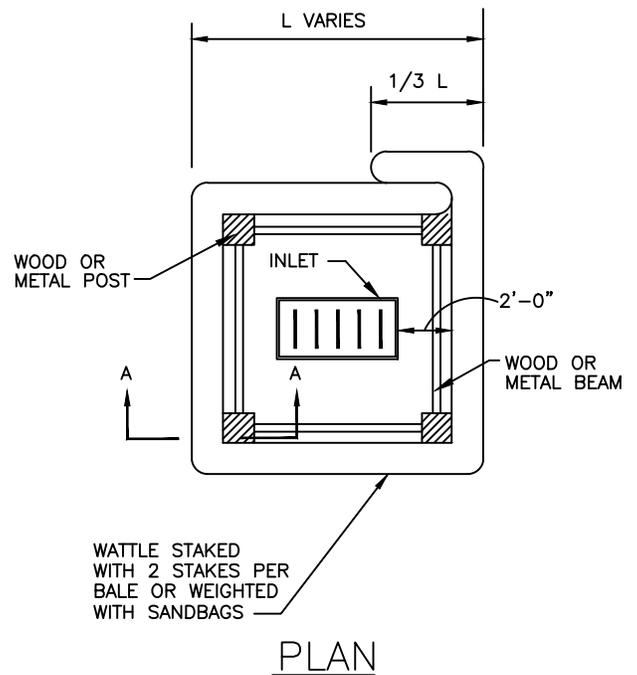
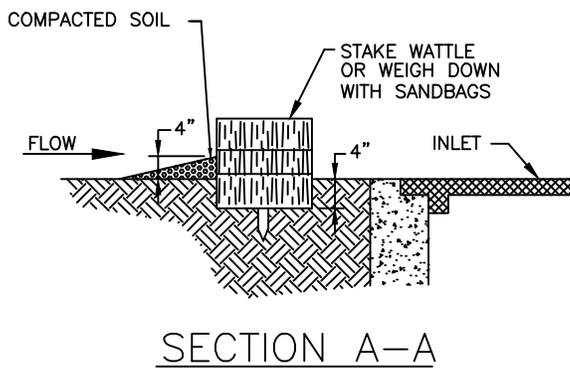
SYMBOL

DATE: JANUARY 2015		APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: SW-101		
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS		STABILIZED CONSTRUCTION ACCESS	



NOTES:

1. SEE REINFORCED FILTER FABRIC BARRIER DETAIL.
2. MAXIMUM POST SPACING OF 4 FEET.

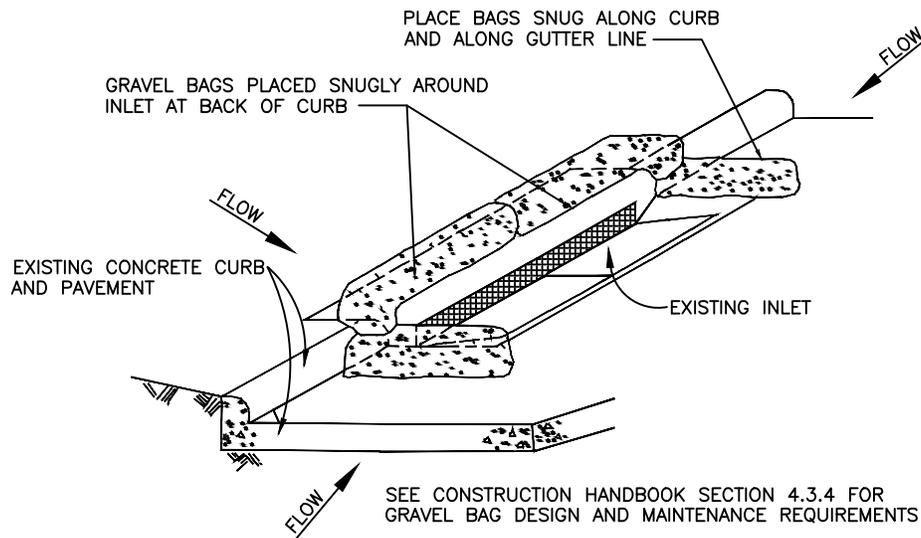


NOTE:  
TYPICALLY STRAW BALES ARE NOT RECOMMENDED FOR INLET PROTECTION BARRIERS.

## INLET PROTECTION BARRIERS FOR STAGE I INLETS

IPB  
SYMBOL

DATE: JANUARY 2015	APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: SW-102	
<p><i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS</p>		<p>INLET PROTECTION BARRIER STAGE I</p>



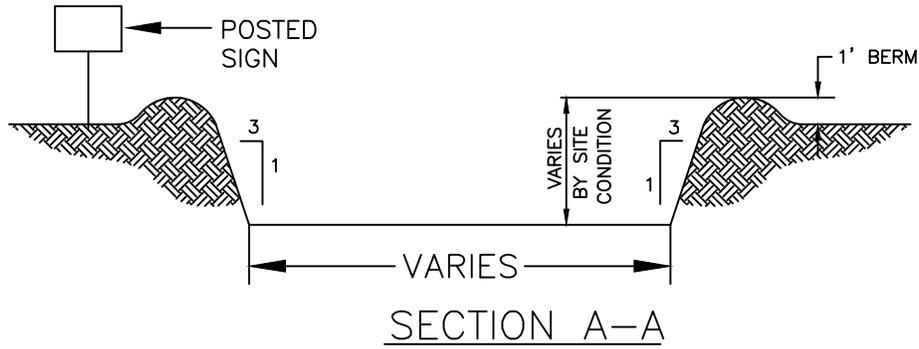
GENERAL NOTES:

1. REMOVE SEDIMENT DEPOSIT WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-THIRD THE HEIGHT OF THE BARRIER.
2. GRAVEL BAGS SHALL NOT BLOCK THROAT OF INLET UNLESS DIRECTED BY ENGINEER.

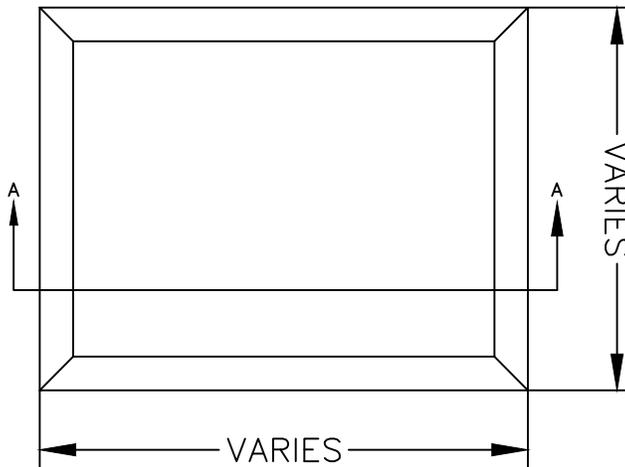
INLET PROTECTION  
BARRIERS FOR  
STAGE II INLETS

IPB-II  
SYMBOL

DATE: JANUARY 2015	APPROVED BY:	DESIGN BY:
SCALE: N.T.S.	DRAWING NO.: SW-103	
<i>CITY OF SEABROOK</i> DEPARTMENT OF PUBLIC WORKS		INLET PROTECTION BARRIER STAGE II



N.T.S.



N.T.S.

GENERAL NOTES:

1. POST A SIGN READING "CONCRETE WASH OUT PIT" NEXT TO THE PIT.
2. VERBALLY INSTRUCT THE CONCRETE TRUCK DRIVERS WHERE THE PIT IS AND TO WASH OUT THEIR TRUCKS IN THE PIT AND NO WHERE ELSE.
3. UPON THE CONCRETE SETTING UP (CURING, DRYING OUT), THE CONCRETE WASTE SHALL BE REMOVED FROM THE PROJECT SITE AND DISPOSED OF PROPERLY BY THE CONTRACTOR. AFTER REMOVAL OF THE CONCRETE WASTE, THE WASH OUT PIT SHALL BE FILLED WITH CLEAN FILL MATERIAL AND COMPACTED TO IN-SITU CONDITIONS, OR AS DIRECTED BY THE PROJECT SPECIFICATIONS.
4. CONCRETE WASH OUT PITS SHALL NOT BE LOCATED DIRECTLY ADJACENT TO, NOR AT ANY TIME DRAIN INTO THE STORM SEWER SYSTEM OR ANY OTHER SWALE, DITCH, OR WATERWAY.
5. CONSTRUCT ENTRY ROAD AND BOTTOM OF WASHOUT AREA TO SUPPORT EXPECTED LOADINGS FROM TRUCKS EQUIPMENT.

CONCRETE TRUCK WASHOUT AREA



DATE: JANUARY 2015 | APPROVED BY: | DESIGN BY:

SCALE: N.T.S. | DRAWING NO.: SW-104

*CITY OF SEABROOK*  
DEPARTMENT OF PUBLIC WORKS

CONCRETE TRUCK  
WASHOUT AREA