

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

# DESIGN STANDARDS AND STANDARD PLANS



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REVISED JANUARY 2008

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DESIGN STANDARDS

CHAPTER 1  
GENERAL REQUIREMENTS



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# CHAPTER 1 – GENERAL REQUIREMENTS

## PART 1 – Purpose and Use

### 1.00 Purpose

The purpose of these Design Standards is to provide a consistent policy under which certain physical aspects of street design, storm drains, water distribution design, and sanitary sewer design will be implemented. Most of the elements contained in this document are Public Works oriented and most are related to public improvements and City contract projects; however, it is intended they apply to both public and private work designated herein.

These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals. It is expected engineers will bring to each project the best of skills from their respective disciplines.

The Standards are also not intended to limit unreasonably any innovative or creative effort which could result in better quality, better cost savings, or both. Any proposed departure from the Standards will be judged; however, on the likelihood such variance will produce a compensating or comparable result, in every way adequate for the user and City resident.

Following from the above purpose, the Standards have the objective of developing utilities which will:

- a) Be consistent with the Monmouth City Code and adopted Water, Sewer, and Transportation Master Plans;
- b) Be safe and economical to maintain and which maximize practical design life;

Alternate materials and methods will be considered for approval on the basis of these objectives.

### 1.01 Revisions to These Standards

It is anticipated revisions to these Standards will be made from time to time. The date appearing on the title page is the date of the latest revision. Users should apply the latest published issue to the work contemplated.

### 1.02 Shortened Designation

These City of Monmouth Design Standards shall be cited routinely in the text as the “Standards”.

### 1.03 Applicability

These Standards shall govern all construction and upgrading of all public and private utilities in the City of Monmouth and applicable work within its service areas.

### 1.04 References

The Standards are intended to be consistent with the most currently adopted provisions of:

- a) Monmouth City Code
- b) City of Monmouth Comprehensive Plan
- c) City of Monmouth adopted Water, Sewer, and Transportation Master Plans
- d) Oregon Statewide Planning Goals and Guidelines
- e) Oregon Administrative Rules Chapter 340 Division 52
- f) Polk County Fire District #1 – Fire Code Applications Guide
- g) DEQ Rules
- h) U.S. Environmental Protection Agency
- i) Clean Water Act
- j) Safe Drinking Water Act
- k) Endangered Species Act 4(d) Rule

### 1.05 Standard Specifications

Except where the standards provide otherwise, design detail, workmanship, and materials shall be in accordance with the current edition of the “City of Salem Standard Construction Specifications” as adopted by the City of Monmouth.

### 1.06 Abbreviations

ABS – Acrylonitrile Butadiene Styrene  
AC – Asbestos Cement  
APAO – Asphalt Pavement Association of Oregon  
API – American Petroleum Institute  
AASHTO – American Associate of State Highway and Transportation Officials  
BMP – Best Management Practice  
CC – Concrete Steel Cylinder  
CFS – Cubic Feet Per Second

CI – Cast Iron  
CIP – Capital Improvement Program  
DEQ – Department of Environmental Quality  
DIP – Ductile Iron Pipe  
HDPE – High Density Polyethylene  
ISO – Insurance Service Office  
MZDO – Monmouth Zoning and Development Ordinance  
N/A – Not Applicable  
NPDES – National Pollutant Discharge Elimination System  
NRCP – Nonreinforced Concrete Pipe  
N/R – Not Recommended  
ODSL – Oregon Division of State Lands  
ORS – Oregon Revised Statutes  
OSPSC – Oregon State Plumbing Specialty Code  
OTFDC – One- and Two-Family Dwelling Code  
PE – Polyethylene  
PVC – Poly-Vinyl Chloride  
RCP – Reinforced Concrete Pipe  
R/D – Retention and Detention  
STL – Steel  
TMDL – Total Maximum Daily Load  
UBC – Uniform Building Code  
UIC – Underground Injection Control  
UPC – Uniform Plumbing Code  
USGS – United States Geological Survey  
VC – Vitrified Clay

#### 1.07 Definitions and Terms

The following definitions and terms are in effect, in addition to those in the Monmouth Zoning and Development Ordinance.

Air Gap Separation – A physical vertical separation between the free-flowing discharge end of a potable water supply pipeline and the rim of an open, nonpressurized receiving vessel.

Approved Backflow Prevention Assembly – An assembly that has been investigated and approved by the State of Oregon Department of Human Resources Health Division for preventing backflow.

Approved Point of Discharge – A location downstream from a development the Director has deemed adequate to accept stormwater flows from all or a portion of the development area.

As-Built Plans – Plans prepared by the Project Engineer, signed and dated by the Director indicating that the plans have been reviewed and revised, if necessary, to accurately show all as-built construction details.

Backflow – The flow of water or other fluids in a direction opposite to the normal flow. (See Back-siphonage.)

Back-Siphonage – The flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel into a water supply pipe due to a negative or reduced pressure in such pipe.

Bike Lanes – A designated travel-way for bicyclists which is established within the roadway directly adjacent to the outside vehicular lane or on the shoulder.

Bike Path – A designated travel-way for bicyclists which is completely separated from the vehicular travel lanes and is within independent right-of-ways.

Bike Route – A designated travel-way for bicyclists which is shared with vehicular traffic. The roadway is designated with signs for bicycling (no pavement markings for the bike route or delineation of parking spaces is used).

Building Drain – The building drain is that part of the lowest piping of the drainage system which receives the discharge from waste and other drainage pipes inside for walls of the building and conveys it to the building sewer, which begins five feet outside the building wall (building foundation).

Building Envelope – The building and other perimeter areas as defined in the UBC, OSPSC, OTFDC, or other applicable codes.

Building Sewer – That part of the horizontal piping of the drainage system which extends from the end of the building drain and which receives the discharge of the building drain and conveys it to a public sewer, private sewer, individual sewage disposal system, or other point of disposal.

Building Storm Drain – See private storm system.

Building Supply – The building supply is the pipe carrying potable water from the water meter or other source of water supply to a building or other point of use or distribution on the lot. Building supply shall also mean customer line.

Channel – A linear topographic depression that contains moving water and has a bottom and sides that serve to confine the water.

City – Means the City of Monmouth, Oregon

Collection Systems – Facilities maintained by the City of Monmouth connected thereto for the collecting, pumping, conveying, and controlling of wastewater.

Commercial User – Any user of the sanitary sewer who is neither a residential nor industrial user.

Cooling Water – Water other than sewage or industrial waste which is used as a medium for carrying away excess heat from any apparatus, appliance, mechanism or device in which, in the course of such cooling process, is not mixed to co-mingled with any other substance or used as a means of carrying off any other substance, in suspension or in solution, thereby exiting such cooling process in substantially the same condition, save for temperature, as when it entered.

Creek – See “Waterway.”

Cross Connection – A cross connection is any connection or arrangement, physical or otherwise, between a potable water supply system and any plumbing fixture or any tank, receptacle, equipment or device, through which it may be possible for nonpotable, used, unclean, polluted and contaminated water, or other substances, to enter into any part of such potable water system under any condition.

Cut Sheets – Sheets of tabulated data, indicating stationings, structures, fittings, angle points, beginning of curve, points on curve, end of curves, sewer slope, staking offset, various elevations, offset cuts, and sewer depths.

Definition of Words – Wherever, in these Standards, the words "directed," "required," "permitted," "ordered," "designated," or words of like importance are used, they shall be understood to mean the direction, requirement, permission, or order of designation of the Director. Similarly, the words "approved," "acceptable," "satisfactory," shall mean approved by, acceptable to, or satisfactory to the Director.

Design Storm – The distribution of rainfall intensity over time, identified to have a probability of recurrence, given in years (i.e., five-year design storm). Often, the term “design storm” is truncated when describing design storm characteristics (i.e., five-year flow).

Detention – The temporary restriction, storage, and gradual release of runoff.

Developer – Any individual, partnership, firm, or corporation by whom the project engineer has been retained or who, as a property owner or owner’s representative, is making arrangements with the City.

Development – Improvements to private property including: grading, placement of structures, excavation/fill, installation of utilities, etc.

Director – The Director of Public Works of the City of Monmouth or his/her authorized representative.

Distribution System – Distribution main pipelines, pumping stations, valves, and ancillary equipment used to transmit water from the supply source to the service line.



Ditch – See “Waterway.”

Domestic Sewage – The liquid and water borne waste derived from the ordinary living processes, free from industrial wastes, and of such character to permit satisfactory disposal, without special treatment into the public sewer or by means of private sewage disposal system.

Double Check Valve Assembly – An assembly composed of two single, independently acting, check valves, including tightly closing shut-off valves located at each end of the assembly and fitted with properly located test ports.

Double Detector Check Valve Assembly – A line-sized approved double check valve assembly with a parallel meter and meter-sized approved double check valve assembly. The purpose of this assembly is to provide double check valve protection for the distribution system and at the same time provide partial metering of the fire system showing any system leakage or unauthorized use of water up to 3.0 gpm flow.

Downstream Intersection – The nearest intersection from a driveway located in the direction of traffic flow of the nearest lane of the abutting street.

Drainage Facilities – Pipes, catch basins, waterways, detention basins, culverts, and other related facilities, used singularly or in combination for purpose of collecting, conveying, and storing surface runoff.

Drainage Waste – Stormwater, groundwater, surface drainage, subsurface drainage, spring water, well overflow, roof drainage, or other like drainage other than sewage or industrial waste.

Easement – An area outside public right-of-way in which the property owner (grantor) conveys a privilege to a second party (grantee) the right to construct, operate, and maintain utility facilities on such property. The City is typically grantee for public easements, and a neighboring property owner is typically grantee for private easements.

Expansion Joint – A joint to control cracking in the pavement structure and filled with preformed expansion joint filler.

Fire Hydrant Assembly – The fire hydrant.

Fire Protection Service – A connection to the public water main intended only for the extinguishment of fires and the flushing necessary for its proper maintenance. All fire services shall have a detector check.

Fixture Unit Equivalents – The unit flow or demand equivalent of plumbing fixtures as tabulated in Chapter 4 of the Uniform Plumbing Code and the Oregon State Plumbing Specialty Code.

Flow – The wastewater flow from an industry, institution or house connection (daily average).

Half-Street – A 50 percent portion of the ultimate width of a street, usually along the edge of a subdivision, where the remaining portion of the street shall be provided when adjacent property is subdivided.

Hillside Lot – A lot having an average cross slope of 15 percent or more, and zoned or developed for one or two family residential use.

Hydrant Lead – The line connecting the fire hydrant assembly to the City main or private fire line with an auxiliary valve.

Impervious – Areas or surfaces located aboveground, at the ground surface, or belowground which retard saturation of direct rainfall into the land subsurface or otherwise cause stormwater to run off the land surface at an increased rate of flow from that present under natural, undeveloped conditions. Common surfaces include impervious and semi-pervious materials such as roofs, concrete, asphalt, or other surfaces as determined by the Director.

Industrial Waste – A water borne waste and wastewater from an industrial user.

Infiltration system – A drainage system designed to allow stormwater to percolate into the soil.

Inlet – A structure or other appurtenance (i.e., catch basin) that collects stormwater runoff from the ground surface for the purpose of conveying it through a piped storm system. Also used to describe the connection point of a pipe conveying stormwater into a junction structure.

Irrigation Service – A metered connection intended for seasonal use and delivering water which is not discharged to the sanitary sewer.

Junction – A structure (i.e., catch basin or manhole) within a storm system for the purpose of combining multiple pipe inlets, facilitating changes in horizontal or vertical alignment, providing access for operation and maintenance, or other related function.

Lateral Sewer – Any public sewer to which a building sewer connects or may connect (normally eight (8) inches in diameter).

Longitudinal Joint – A joint which follows a course approximately parallel to the centerline of the roadway.

Major Partitioning – A partition which includes the creation of a road or street.

Major Street – Any arterial or collector street identified as such in the Monmouth Master Transportation Plan.

Manufacturer's Name – Any manufacturer's name, specification, catalog number, or type used herein is specified by make in order to establish the standard requirements of the City. Other equivalent makes will be considered for approval, providing they are comparable with this established standard.

Mini-Subdivision – To divide a five-acre parcel of land into smaller lots within a calendar year when such area existed as a contiguous unit of land under a single ownership at the beginning of such year. Special conditions inherent in the property exist so that the property could not be developed as a subdivision.

Natural Grade – The grade with the land in an undisturbed state.

Natural Location – The location of channels, swales, sheet flow, or other non-man-made conveyance systems as defined by the earliest available topographic contours.

One-Way Driveway – A driveway of either ingress or egress, but not both.

Peak Discharge – The maximum volumetric flow for a given design storm.

Plans – Construction plans, including system plans, sewer plans and profiles, cross sections, detailed drawings, etc., or reproductions thereof, approved or to be approved by the Director, which show the location, character, dimensions, and details for the work to be done, in which constitute a supplement to these Standards.

Plumbing System – All plumbing fixtures and traps, or soil, waste, special waste, and vent pipes within a building and to a point five feet outside the building foundation thereof.

Preliminary Review – Plans stamped "Preliminary Review," dated, and signed by the Director, indicates that the plans have been reviewed and may now be submitted as a part of the requirements for approval for construction.

Potable Water – Water which is satisfactory for drinking, culinary, and domestic purposes and meets the requirements of the health authority having jurisdiction.

Private Collection System – A privately owned and maintained sewer system installed to serve multiunit structures on single ownership properties, which cannot legally be further divided, such as apartments, mobile home parks, and schools or installed in commercial or industrial subdivisions. A single family residence with an unattached garage or shop with sanitary facilities is exempt from this definition.

Private Distribution System – A privately owned and maintained water distribution system serving an industrial or commercial subdivision or a multibuilding development on a single lot served through a master meter installed at the approved location.

Private Storm System – Operated and maintained by a private property owner, a storm collection and conveyance system located outside the building envelope which serves one or multiple building storm drains, catch basins, area drains, or other drainage facilities. Generally synonymous with private storm sewer and private storm drain.

Project Engineer – The engineer licensed by the State of Oregon as a professional Engineer under whose direction plans, profiles, and details for the work are prepared and submitted to the Director for review and approval, and who is covered by a professional liability insurance policy with minimum coverage of \$1 million per occurrence.

Public Sewer – Any sewer in public right-of-way or easement operated and maintained by the City.

Public Storm System – Any portion of the storm collection and conveyance system operated and maintained by the City. Generally synonymous with public storm sewer and public storm drain.

Residential User – The owner, lessee, or occupant of a single dwelling unit in one structure.

Retention – The restriction and storage of runoff without direct release to a point of disposal.

Service Line – The line or pipe connecting from the City water main to the water meter.

Sewage – The wastewater derived from human habitation and use of buildings for residential, institutional, or commercial purposes, excluding storm waters and industrial waste.

Sidewalk – A right-of-way deeded, dedicated, and designated for the use of non-motorized vehicles and pedestrians.

Standard Plans – The drawings of structures or devices commonly used on City work and referred to on the plans (see standard construction specifications).

Standards – These City of Monmouth Design Standards in their entirety, including supplements, addenda, or revisions thereto.

Stream – See “Waterway.”

Superelevation – The vertical distance between the heights of the inner and outer edges of highway pavement.

Swale – A minor depression in the natural ground which concentrates and conveys water.

Transition and Taper – Taper for acceleration or deceleration of turning vehicles is provided on high speed roads in order to improve traffic flow conditions. Tapers are so designed that an entering vehicle can accelerate to the speed of through traffic before it begins the actual merging maneuver, and that a diverging vehicle need not begin to decelerate until it has completely left the through lane.

Transverse Joint – A joint which follows a course approximately perpendicular to the centerline of the roadway.

Traveled Way – That portion of the roadway for the movement of vehicles, exclusive of shoulder and auxiliary lanes.

Trunk Sewer – A public sewer ten (10) inches or larger which has been or is being constructed to accommodate more than one main sewer or lateral sewer. It may, in some cases, serve as a lateral sewer.

Turnaround Area – A paved area of a sufficient size and configuration that a motor vehicle having a curb-to-curb turning radius of 30 feet or less may maneuver around to head in the opposite direction without having to move in reverse more than once.

Turnpike Street – Any public street, road, or right-of-way which has been paved for vehicular movement and doesn't have curbs, sidewalks, or storm drainage facilities.

Two-Way Driveway – A driveway functioning as both an exit and entrance.

Uniform Plumbing Code – The Uniform Plumbing Code adopted by the International Association of Plumbing and Mechanical Officials, current edition as revised by the State of Oregon, called the "Oregon State Plumbing Specialty Code."

Upstream Intersection – The nearest intersection from a driveway located in the direction opposite the traffic flow of the nearest land of the abutting street.

Water Main – The water main (street main) is a water-supply pipe for public or community use.

Water Supply System – The water supply system of a building or premises consists of the building supply pipe, the water-distributing pipes, and the necessary connecting pipes, fittings, control valves, and all appurtenances carrying or supplying potable water in or adjacent to the building premises.

Waterway – A surface water route consisting of a channel having a bed, banks, and/or sides in which surface water flows, draining from higher to lower elevations. May also refer to a closed pipe system or bridge structure under limited circumstances. A generic term commonly described as a ditch, creek, or stream; waterways are classified based on drainage area as described in Stormwater.

Wetlands – As defined by the ODSL, those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

#### 1.08 Engineering Policy

The engineering policy of the City of Monmouth requires strict compliance with Oregon Revised Statute 672 for professional engineers.

All engineering plans, reports, or documents shall be prepared by a registered professional engineer, or by a subordinate employee under his/her direction, and shall be signed by and stamped in accordance with ORS 672.

It shall be the project engineer's responsibility to review any additions or modifications to public utilities with the Director prior to engineering or proposed design work to determine any special requirements or whether the proposal is permissible. A "Preliminary Review" and/or a "Plans Approved for Construction" stamp of the Director does not in any way relieve the project engineer of his/her responsibility to meet all requirements of the Director or obligation to comply with other State and Federal laws. The plan for any project shall be revised or supplemented at any time it is determined the full requirements of the Director have not been met.

An Engineer having submitted to the city false or inaccurate information of a material nature, will be warned of their conduct and the Oregon State Board of Engineering Examiners will also be advised.

#### 1.09 Approval of Alternate Materials or Methods

Any alternate material or method not explicitly approved herein will be considered for approval on the basis of the objectives set forth in Section 1.00 Purpose. Persons seeking such approvals shall make application in writing. Approval of any major deviation from these Standards will be in written form. Approval of minor matters will be made in writing, if requested.

Any alternate must meet or exceed the minimum requirements set in these Standards.

The written application is to include, but is not limited to, the manufacturer's specifications and testing results, design drawings, calculations, and other pertinent information.

Any deviations or special problems shall be reviewed on a case-by-case basis and approved by the Director. When requested, full design calculations shall be submitted for review with the request for approval.

#### 1.10 Requirement for Provision of Service

Permanent utilities shall be provided to all properties (legal lots of record created by a major or minor partitioning or subdivision of land as per Monmouth Zoning and Development Ordinance) within the City of Monmouth per these Standards.

#### 1.11 Special Facilities

The design of the following are considered special facilities and are not covered in detail in these Standards:

- a) Sewage / Water Distribution Pump Stations
- b) Force Mains
- c) Reservoirs
- d) Siphons
- e) Relining of Existing Sewers / Water Mains
- f) Internal Sealing of Existing Sewers
- g) Treatment Plants
- h) Energy Dissipators
- i) Pressure Regulating Devices
- j) Flow Measurement Devices
- k) Hydrogen sulfide and/or hazardous gases.

Review and approval of the above special items by the Director of Public Works shall be required. When requested, full design calculations shall be submitted for review prior to approval.

# CHAPTER 1 – GENERAL REQUIREMENTS

## PART 2 – Plan Submittal Requirements

### 1.20 Construction Plans

#### a) General

Complete plans and specifications for all proposed improvements, including any necessary dedications and easements, shall be submitted to the Department of Public Works for approval and must receive the required approval prior to construction permit issuance and beginning of construction. See Figure 1 – Development Flowchart, and the Development Check-Off List.

#### b) Plan Preparation

Construction plans and specifications shall be prepared by a professional engineer licensed in the State of Oregon in accordance with the following requirements:

- (i) Dimensions: Construction plans shall be 24 by 36 inches white bond with a 1-1/2 inch clear margin on the left edge and one-half inch margins on all other edges.
- (ii) Scale: As indicated in Plans, Sections, and Profiles.
- (iii) Units: Construction drawings, specifications, and calculations shall be prepared in non-metric units (i.e., inches, feet, or cubic feet per second).
- (iv) Form: Construction plans for subdivisions shall be organized as follows:
  - A) Title Sheet
  - B) General and Special Notes
  - C) Overall Site Plan
  - D) Streets and Stormwater
  - E) Sanitary Sewer
  - F) Water
  - G) Existing Grading Plan
  - H) Final Grading Plan
  - I) Erosion Control
  - J) Details



c) Record Drawings

Record drawings shall be prepared and submitted by the design engineer and must be approved prior to final plat approval. Record drawings shall identify all changes to the original approved design. Changes shall be enclosed in a revision cloud. Design elevations, when revised, shall be shown as strike-out with the revised elevation shown adjacent. Provide three (3) sets of record drawings for review.

d) Electronic Record Drawings

The design engineer shall provide to the Director an electronic version of the final approved as-built drawings in accordance with the following requirements:

Format: AutoCad v.2005 or DXF File

Layer Assignments: Sanitary Lines  
Sanitary Manhole  
Sanitary Cleanout  
Storm Main  
Storm Lines  
Storm Manhole  
Storm Catch Basin  
Water Main  
Water Valves  
Water Valve/Hydrants

Blocks: Valves, manholes, hydrant/valve assemblies, etc. shall be shown as blocks with insertion points at connection to utility line.

Colors: Sanitary – Green, color 100  
Water – Blue, color 160  
Storm – Red, color 10

Block Symbology: See Standard Plans

## 1.21 Drawing Requirements

### Title Sheet

- a) Plan view (Site Plan) of the entire project shall be required showing street right-of-way and/or subdivision layout to a scale of 1" = 100'. A smaller scale may be used on large projects upon approval of the Director. A project is considered too large when a minimum dimension of two (2) inches cannot be maintained between the title, system site plan, and vicinity map. A scale of 1" = 200' may be used in this case.

The site plan shall be a composite plan showing all complete properties to be served by the proposed improvements as well as properties adjacent to and within 250 feet of those served. The site plan shall also show the following:

- (i) Existing natural or artificial streams, swales, wetlands, floodways, and floodplains;
  - (ii) Utilities, line sizes, and designations;
  - (iii) Existing structures;
  - (iv) Lot numbers;
  - (v) Street names;
  - (vi) Lot size;
  - (vii) Location of water courses, stream, and railroad crossings, culvert, and storm drains that cross the alignment within 250 feet of the proposed development in order to prevent future grade conflicts. All water course crossings must show the 100-year flood plain.
  - (viii) Location of wells, water main valves, pump stations, and blow-offs within a 100-foot radius of the proposed extension. All manholes, water mains, services, gas mains, underground power, and other utilities either crossing the alignment within 250 feet of the terminus of the proposed extension or adjacent to the proposed extension within the right-of-way or within ten (10) feet of the easement line. The intent is to prevent grad conflicts of all future extensions.
- b) Index of Sheets.
- c) Complete legend of symbols used.
- d) Vicinity Map to a scale of not less than 1" = 800' showing the project location.

- e) Title Block located in lower right hand corner or right edge of paper with scale, north point, total acreage, date, drawing number, the engineer's name, address and official stamp, and where applicable, the owner/developer's name and address.
- f) Temporary and permanent bench marks including their descriptions.
- g) A statement that vertical datum used is NAVD 88.
- h) A statement referencing the City of Monmouth Standard Construction Specifications.
- i) A statement alerting contractors that Oregon Law requires that the contractor follow the rules adopted by the Oregon Utility Notification Center.

ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules set fourth in OAR 952-001-0010 through OAR 952-001-0090. You may obtain copies of the rule by calling the center. (Note: The telephone number for the Oregon Utility Notification Center is 530-232-1987)

### **General and Special Notes**

General and special notes relating to construction methods or other pertinent information.

### **Overall Site Plan**

- a) An overall site plan of the entire project, generally showing street rights-of-way and/or subdivision layout and prepared with the north arrow facing the top of the page. The site plan shall be a composite plan at sufficient scale to show adjacent properties within 250 feet of the proposed development.
- b) The overall site plan shall include proposed contours, waterways, utilities, appurtenances, natural features, and other pertinent information.
- c) The overall site plan shall include any 100 year floodplain that exists in the project area.

### **Streets & Stormwater**

- a) Plan

Plan view of streets shall be to a scale of 1" = 20' for all street improvements except subdivisions where 1" = 50' is allowable and shall contain the following information:

- (i) Adjacent street curbs, driveways, and property lines, right-of-way, and utility easements referenced to property corners, street intersections, or section lines. On construction permit projects, 50-foot minimum cross sections and curb elevations shall be required to determine if finish grade design meets existing ground line, and to determine if curb line or property line walks will be required. Also, curb and gutter elevations for beginning and end of project, and curb elevations at existing side street intersections shall be required to show how new curbs will join existing curbs.
- (ii) Catch points and limits of slope easements for all cuts and fills over four (4) feet.
- (iii) Location of water courses, stream and railroad crossings, water mains, culverts, sanitary sewers, and storm sewers within 250 feet of the proposed project. Use arrows on both existing water courses and storm drains, and on proposed storm drains, indicating direction of flow.
- (iv) Location of wells, gas mains, underground power, and any other utility within 100 feet of the proposed project.
- (v) On horizontal curves, show stationing of the point of tangency and the point of curvature. Show the length of tangent, length of centerline curve, the delta angle, radius point, and centerline radius distance.
- (vi) On half street improvements show existing centerline, edge of pavement, and the extent of the proposed widening.
- (vii) Show all bicycle and wheelchair ramps on each curb radii.
- (viii) The location of each manhole, catchbasin, beginning and end of radius, point of curvature, and point of tangent shall be stationed to facilitate checking the plans with the profiles. The stationing shall be tied to existing property corners, centerline, centerline of intersections, and/or street monuments. Side streets shall be stationed either from north to south, or east to west.

b) Cross-Sections

- (i) Typical Design Section

Provide typical design cross section for each street design showing the following:

- A) ROW Width
- B) Street Width

- C) Sidewalk Location / Width
- D) Asphalt Depth
- E) Base Aggregate Depth
- F) Geotextile (if used)
- G) Cross Slope

(ii) Street Sections

Provide street sections at 50 foot intervals for all streets and include the following:

- A) Existing Grade
- B) Proposed Finish Grade
- C) Width of section shall be as required to include catch point between existing and final grades.
- D) Location of curbs, sidewalks, retaining walls, ditches, etc.

(iii) Open Channels

- A) For open channels, cross-sections shall be shown to adequately convey the variety of channel cross-sections being constructed, generally one section at each 50-foot interval.

b) Profiles

Profiles for the individual street shall be to the same horizontal scale on the same sheet and drawn immediately below the corresponding plan view to a vertical scale of 1" = 5' reading from 0+00 left to right (where conditions warrant, right to left may be approved as well as a different vertical scale), and shall contain at least the following information:

- (i) Profile of existing and finished ground line at proposed centerline.
- (ii) Percent of all street grades.
- (iii) Beginning of all vertical curves, points of vertical intersection, end of vertical curve, and low point of vertical curve if a sag curve and length of vertical curve.
- (iv) Design speed used and "K" value applied.

- (v) On half street improvements show elevations of the centerline, edge of pavement and proposed top of curb 250 feet each side of the improvement.
- (vi) Profiles on stub streets shall be shown 250 feet past the terminus of the street.
- (vii) Location of catch basins, manholes, and other appurtenances with each numbered and stationed.
- (viii) Backfill type and extent shown at top of profile view.
- (ix) For underground conveyance systems, profile of the existing and proposed ground and/or pavement surface, storm drain invert, and hydraulic grade line if applicable. For open channel conveyance systems, profile of the existing and proposed ground surface at the flow-line, existing and proposed ground surface at the tops of bank, and the maximum water surface of the design storm.

### **Sanitary Sewer**

#### a) **Plan**

Plan view of sanitary sewer lines shall be to a scale of 1" = 50' and shall contain the following information:

- (i) Adjacent street curbs and property lines, right-of-way and utility easements referenced to property corners, street intersections, or section lines. On construction permit projects include two (2) foot contour lines or property corner and curb elevations to help determine if existing basements or proposed daylight basements in new subdivisions can or should be served.
- (ii) Location of each manhole and sewer appurtenance shall be numbered and stationed to facilitate checking the plans with the profiles. The stationing shall be tied to existing property corners and/or street monuments with the relationship of each manhole and cleanout shown to the property corners (minimum two directions). Each line with a separate designation shall be stationed continuously upgrade from Station 0+00 at its point of connection to another line (0+00 represents the centerline of the existing manhole or existing plug or cleanout if a main extension). Also to be shown is each service tee stationed with the size and depth at property line indicated.

#### b) **Profiles**

Profiles for the individual sanitary sewer lines shall be to the same horizontal scale on the same sheet and drawn immediately below the

corresponding plan view to a vertical scale of 1" = 5' (or as approved) reading from 0+00 left to right, and shall contain at least the following information:

- (i) Location of manholes and other appurtenances with each manhole numbered and stationed the same as the plan view.
- (ii) Profile of the existing and proposed ground and/or pavement surface and sewer invert.
- (iii) Size, slope, length, and type of material of the line between consecutive manholes. Type of pipe may be designated by appropriate abbreviations.
- (iv) Backfill type and extent shown at top of profile view.
- (v) Elevation of proposed rim elevation, and sewer inverts at each manhole.
- (vi) Railroad, culverts, ditch or stream crossings with elevations of the ditch or streambed and the 100-year flood elevation, pipe profile and casing details.
- (vii) Utility crossings that conflict with the proposed sewer installation.
- (viii) All existing facilities upon which work is to be performed, i.e., installation, repair, or removal.

### Water

#### a) Plan

Plan view of water system lines shall be to a scale of 1" = 50' and shall contain the following information:

- (i) Adjacent street curbs and property lines, right-of-way and utility easements referenced to property corners, street intersections, or section lines. On construction permit projects, adequate two (2) foot contour lines or property corner and curb elevations to help determine service levels and whether existing or proposed lots in new subdivisions can be served. All existing franchise utilities shall be shown on the plan view of water plans.
- (ii) Location of water mains, service lines, meter boxes, thrust blocks, and appurtenances with each fitting and branch line stationed to facilitate coordination in locating appurtenances. A detail will be required at all locations where three (3) or more fittings are used. The stationing shall be tied to existing property corners or street monuments with the relationship of each valve and fitting shown to

the property corners (minimum two directions). Each line with a separate designation shall be stationed continuously from 0+00 at its point of connection to another line and each service line stationed.

- (iii) Size, length, service level, type of material, and class of pipe between fittings. All private water lines connected to the City system shall be shown and so designated as private on the plans.
- (iv) Location of water courses, stream and railroad crossings, gas mains, culverts, sanitary and storm drains, underground power and other utilities, that either cross the alignment within 250 feet of the terminus of the proposed extension or are adjacent to the proposed extension within the right-of-way or within ten (10) feet of the easement line, and existing hydrants within 500 feet of the proposed extension. The intent is to prevent grade conflicts of all future extensions and fire hydrant requirements. All water course crossings must show the 100-year floodplains.

b) Profiles

Profiles are required for all individual water lines and shall be to the same horizontal scale on the same sheet and drawn immediately below the corresponding plan view. Special profiles shall be required in the following instances:

- (i) Railroad, culvert, ditch or stream crossings: Detail shall include elevations, 100-year flood elevation, profile and casing details. Horizontal scale 1"=20', vertical scale "1"=2'."
- (ii) Utility crossings that conflict with the proposed water line installation or proposed utility installations that conflict with an existing water main location. Same horizontal and vertical scale as (i) above.
- (iii) Other locations where Public Works review determines that additional profile information is needed to accurately depict the vertical location of the water main in relation to existing or proposed grades, existing or proposed utilities, or other features specific to the project.

**SPECIAL NOTE:** The project engineer shall field locate and verify the alignment, depth, and inverts of all existing facilities shown on the plans that will be crossed by proposed facilities which might cause a grade or alignment change of the sewer and shall certify them with a note on the plans. City as-builts are only to be used as an aid to the design engineer when field verifying the existing facilities.



### **Existing Grading Plan**

A topographical contour map clearly defining existing conditions:

- a) Existing contours of the land, at an appropriate interval to delineate drainage, with the location of existing buildings, structures, and public and private utilities on the property.
- b) All areas within 250 feet of the site, improved or unimproved, lying upstream and draining to or through the proposed development;
- c) Location of existing drainage facilities which transport surface water onto, across, or from the site, including natural watercourses, artificial channels, drain pipes, or culverts.
- d) Locations of springs or other subsurface water outlets; and
- e) Arrows indicating drainage direction in all public and private property and for all hydraulic conveyance systems.

### **Final Grading Plan**

A topographic contour plan clearly defining proposed conditions:

- a) Proposed contours of the land after completion of the project at two-foot intervals or as approved by the Director. This shall include elevations, dimensions and location, extent, and slopes of all grading work proposed to be done.
- b) Identify cut and fill areas, desilting facilities, interceptor waterways (channels), velocity check dams, soils, topography, vegetation, and areas of proposed reseeded.
- c) Location of proposed drainage facilities which transport surface water across or from the site, including natural watercourses, artificial channels, under drain pipes, and culverts.
- d) Boundaries of all areas that will be paved or otherwise altered in a manner that will increase surface water runoff and boundaries of all areas to remain in an existing or natural condition.
- e) For subdivisions, the point of disposal (i.e., curb, pipe, or waterway) shall be identified for each proposed lot.
- f) Flow arrows identifying the direction of surface water drainage.

## **Erosion Control**

Provide plans and details required to adequately define what contractor shall construct in order to provide erosion control and maintain compliance with state laws and regulations governing runoff from new construction.

### **Details**

Appropriate references to City of Monmouth Standard Plans may be used in lieu of details actually shown on the plans.

Detailed drawings shall be included for all utility appurtenances including:

#### **Stormwater**

- a) Manholes
- b) Catch Basins
- c) Culverts
- d) Head Walls
- e) Orifice Controls
- f) Detention Diversion Structures

#### **Sanitary Sewer**

- a) Manholes
- b) Pump Stations
- c) Siphons
- d) Stormwater Diversion

#### **Water**

- a) Fire Hydrants
- b) Thrust Blocks
- c) Valve Boxes
- d) Blow Offs
- e) Service Installations

### 1.22 Plan Submittal

Five sets of construction plans with quantity and cost estimates shall be submitted to Public Works/Engineering for checking to ensure compliance with these Standards, City of Monmouth Ordinances, and good engineering practice. Submitted plans shall include specifications, test data, a materials list, design recommendations, easement and right-of-way descriptions, tie to City of Monmouth Bench Mark and Monument System, description of vertical datum used, and other material as requested by the Director. Drainage calculations and a soils report may be required by the Director. A plan check fee will be levied at the time plans are submitted.

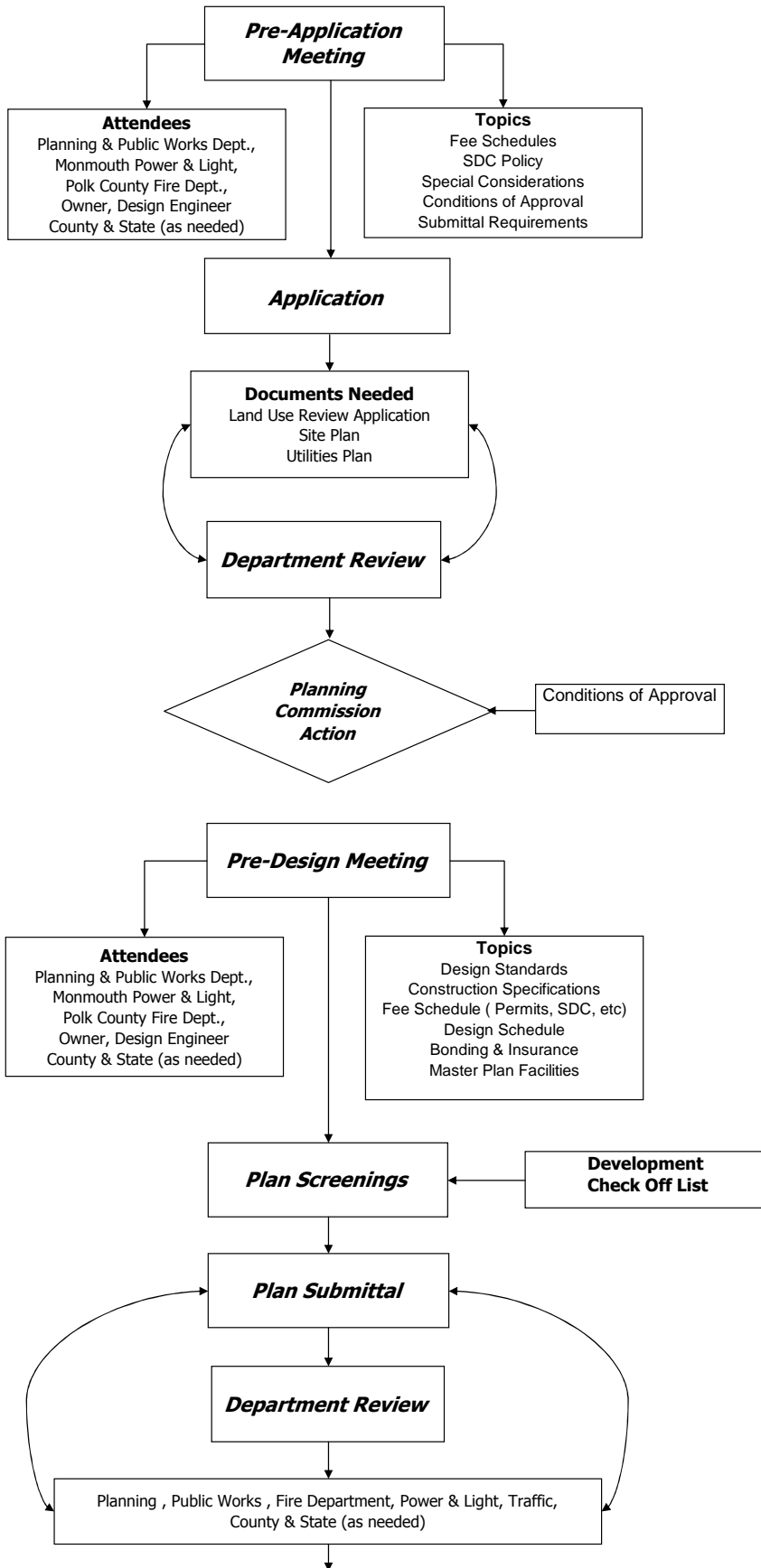
All plan submittals shall be accompanied by a letter from the responsible design engineer certifying that he/she has reviewed the plans prior to submittal and has found them to be in compliance with the City of Monmouth design standards. Where exceptions to the City of Monmouth design standards are taken, the design engineer shall specifically identify each exception and provide an explanation.

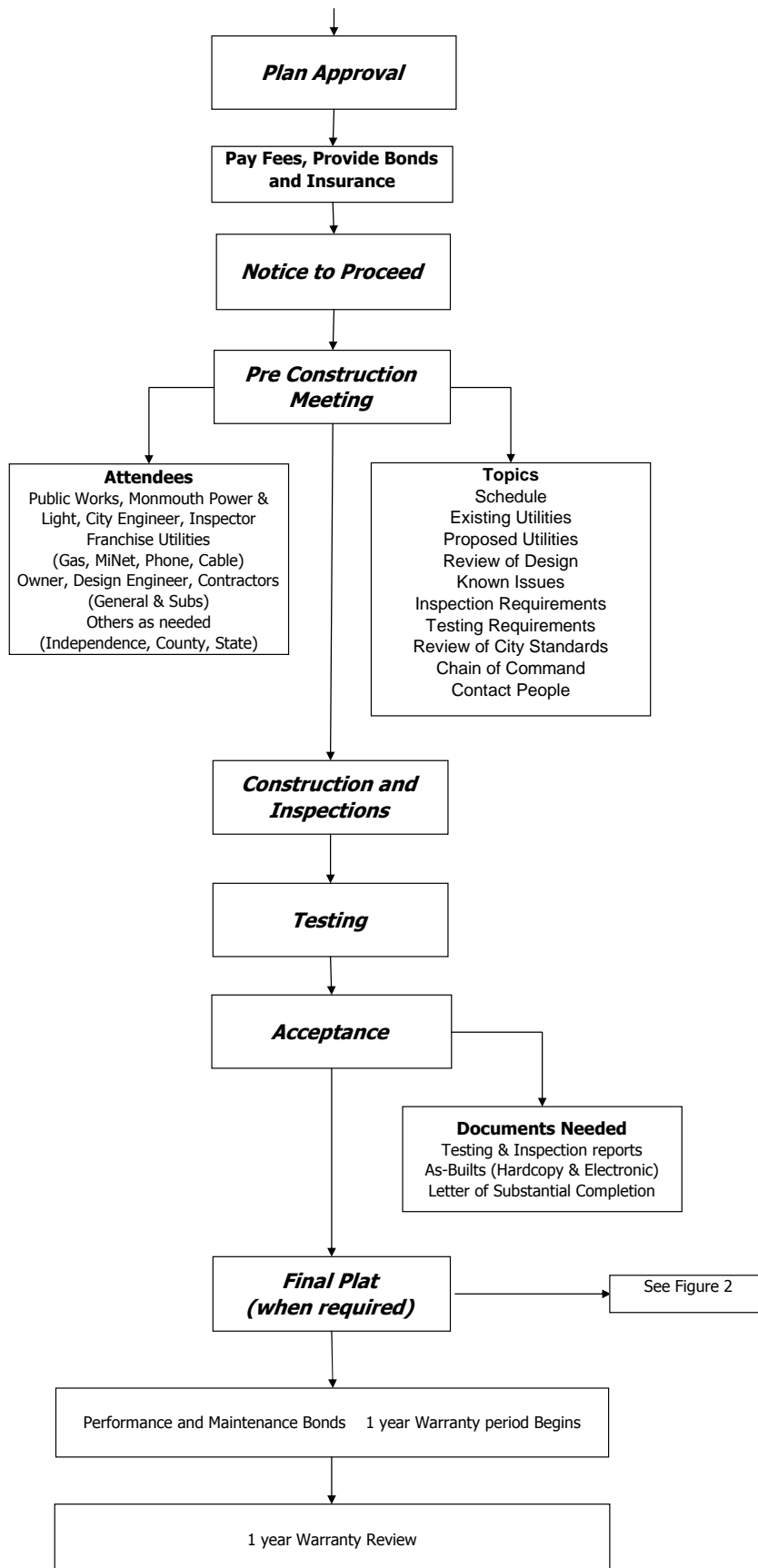
Once the plans are approved and the construction permit issued, the consulting engineer shall be responsible for providing all surveying services necessary to stake the project and prepare the as-built drawings when the project is complete.

### 1.23 Final Plat Submittal

See Figure 2 for information regarding the approval process for subdivision final plats.

**Figure 1  
Development Flowchart**





**DEVELOPMENT CHECK-OFF LIST**  
**The following checked items will be required to  
process your application.**

**Prior to Review**

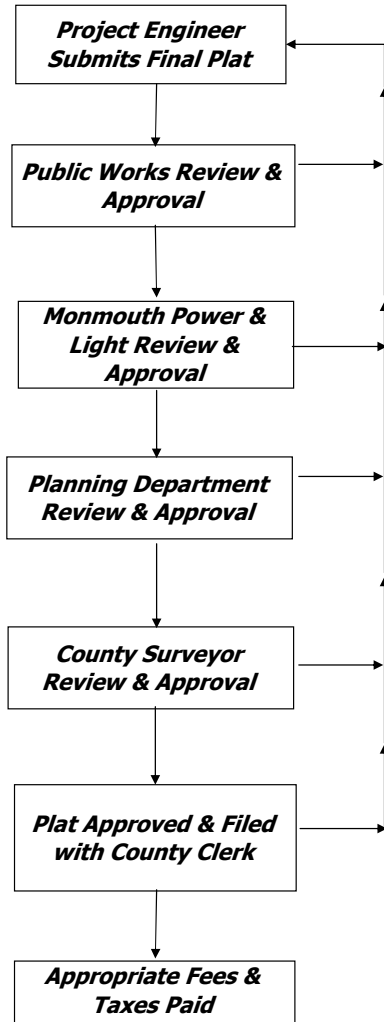
**5 Sets of:**

- Preliminary plat approval
- Title Sheet  
Must include vertical control information
- General and Special Notes
- Overall Site Plan (include area features & utilities within 250'  
of proposed project)
- Street Construction Plans, Profiles, & Details
- Stormwater System Plans, Profiles, & Details
- Sanitary System Plans, Profiles, & Details
- Water System Plans, Profiles, & Details
- Existing Grading Plan
- Final Grading Plan
- Erosion Control Plan
- Details

**Prior to Notice to Proceed**

- DEQ Approval (if required)
- NPDES 1200 - C Permit (if required)
- Soils Report (if required)
- Construction Cost Estimate
- Payment of Permit Fee
- Removal/Fill Permits (if required)

**Figure 2**  
**Final Plat Approval Process**  
**Flowchart**



CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS  
DESIGN STANDARDS

CHAPTER 2  
SANITARY SEWER



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REVISED JANUARY 2008



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## 2.00 General Design Considerations

Sanitary sewers shall be designed to remove the domestic sewage and industrial wastes from basements of houses, commercial or industrial buildings, and all public and private establishments where possible.

Storm water, including street, roof, or footing drainage, shall not be discharged into the sanitary sewer system but shall be removed by a system of storm drains or by some other method separate from the sanitary sewer system.

Unpolluted cooling waters shall not be discharged into sanitary sewers. The overflow drains and filter backwash lines of swimming pools and "hot tubs" shall drain into a sanitary sewer.

In general, sewer systems shall be designed to care for future loads and for ultimate development of the specific drainage area concerned.

As a condition of sewer service, all developments will be required to provide public sewers to serve adjacent upstream parcels in order to provide for an orderly development of the drainage area. This shall include the extension of sewer mains in easements across the property to adjoining properties and across the street frontage of the property to adjoining properties when the main is located in the street right-of-way. This shall include trunk sewers that are oversized to provide capacity for upstream development.

## 2.01 Sanitary Sewer System Capacity

Design flows shall be determined by using the factors of the Sewer Master Plan in which the development is situated.

In the absence of Master Plan and flow data or other reliable information, the following factors may be assumed:

Per Capita Peak Hourly Flow: 400 gpcd (lateral sewers)<sup>1</sup>

It is recommended that design calculations include estimates of average maximum and minimum daily flows. The submission of design calculations will not ordinarily be required, but designers should be prepared to substantiate pipe sizes, layout, population estimates, land uses, or other design assumptions.

These factors may be used to estimate the peak daily flow which includes an allowance for infiltration.

<sup>1</sup>Per capita peak hourly flows are the sum of peaked average daily domestic flows and infiltration inflow. The per capita peak hourly flows for trunk sewers must be computed for each case because of variable peaking factors.

Design capacity of main and trunk sewers shall be designated on the following basis:

- a) Lateral sewers: Design capacity shall be based on sewers flowing one-half (1/2) full.
- b) Trunk sewers: Design capacity shall be based on sewers flowing full, without head.

## 2.02 Sanitary Sewer Requirements

This chapter contains the physical design requirements for public sanitary sewer systems in the city. These design requirements may be used for private systems when plumbing code requirements cannot be met, provided the system is designed and appropriately certified by a professional civil engineer.

## 2.03 Pipe Materials

Pipe materials shall conform to the Standard Construction Specifications.

## 2.04 Size

Lateral sewers shall not be less than eight (8) inches inside diameter and shall begin at a manhole and shall terminate at a manhole except as provided in Section 1.10 (b).

## 2.05 Minimum Slope

- a) All sanitary sewers shall be laid on a slope which will produce a mean velocity, when flowing half full of at least two (2) feet per second, which is based upon Manning's pipe friction formula, using a roughness coefficient, valued at not less than 0.013, or the pipe manufacturer's recommendations, whichever is greater. The minimum acceptable slope for various pipe sizes with an "n" value of 0.013 are listed in Table 2.1.

<b>Table 2.1</b>	
<b>Inside Pipe Diameter (inches)</b>	<b>Percent of Grade (feet per 100 feet)</b>
(private sewers only) 6	0.60 to 0.75
8	0.40
10	0.30
12	0.22
15	0.15
18	0.12
21	0.10
24	0.09
27 (and larger)	0.08

In general, gradients greater than those shown above are desirable and are particularly recommended on the upper ends of lateral sewers.

In theory, new PVC sewers have a manufacturer's "n" value of 0.009; however, sand and grit as well as slime build-up on the pipe walls renders a true "n" value with time of 0.013; hence, an "n" value of less than 0.013 will not be considered for approval.

Engineers are cautioned not to specify sewers of sizes which are obviously larger than is necessary for satisfactory carrying capacity but which are specified in order to meet grade requirements, i.e., a ten-inch pipe for an eight-inch pipe to acquire a decrease in slope.

- b) Grades (slopes) shall be determined using the elevation and distance to the center of the manhole. The average between any inlet Slope (Si) and outlet Slope (So) in percent across the manhole shall not exceed 25 percent.

$$\frac{S_i + S_o}{2} = \text{less than 25 percent (feet per 100 feet)}$$

- c) Generally, a vertical offset in grade exceeding twenty-five hundredths (0.25) of a foot will not be permitted. Exceptions will be the following:
  - (i) When a smaller diameter connects to a larger diameter sewer. (The guidance is to match the crown elevation.)
  - (ii) When a grade conflict exists with an existing utility, the maximum vertical drop may be one (1) foot or as approved. (This is intended to provide flexibility of design only where the standard general rule of 0.25 maximum cannot be applied. The designer may offset the elevations up to one foot without prior approval, but only in those cases where the utility conflicts cannot be avoided. It is not intended to be the standard practice).
  - (iii) When a vertical drop greater than two (2) feet is approved, an outside drop must be installed as per standard plans.

The intent is to maintain accessibility to TV camera equipment.

#### 2.06 Anchor Walls

Sewers on slopes of 20 percent or more shall be secured by anchor walls in accordance with standard plans.

Where velocities greater than fifteen (15) feet per second are attained, the pipe material shall be ductile iron and special provision shall be made to protect manholes against erosion and displacement by shock. This may be accomplished by installing one additional manhole to decrease the slope or to split a 90° horizontal direction change into two (2) 45° incremental changes.

#### 2.07 Minimum Depth

All sanitary sewers shall be laid at a depth sufficient to drain building sewers, to protect against damage by frost or traffic, and to drain basement sewers where practical. Sufficient depth shall mean the minimum cover from the top of the pipe to finish grade at the sewer alignment.

Under normal conditions, sanitary sewers in residential areas shall be placed in the street with the following minimum cover:

Lateral Sewer - Six (6) feet

Trunk Sewer:

- in the roadway - Eight (8) feet
- in easements - Eight (8) feet

Where the topography is relatively flat and existing sewers are shallow (five (5) feet or less), the minimum cover may be three (3) feet. Less than three (3) feet of cover

will require the installation of ductile iron pipe. See Table 2.2 for class of pipe required.

In a new designated residential hillside subdivision, mainline and lateral sewers shall be placed in the street at a depth sufficient to drain building sewers on the low side of the street.

Deviation from the above standards will be considered on a case-by-case basis when one of the following circumstances exists and the required documentation is submitted:

- a) Underlying rock strata required: A request in writing to the Director together with a soils report including a plan and profile certifying bed rock exists three (3) feet below the undisturbed ground surface at all investigated alignments.
- b) A ditch or stream must be crossed required: A plan and profile; horizontal scale 1" = 20', vertical scale 1" = 2'.

<b>Table No. 2.2 Pipe Class Requirement (Sewer less than 3' of Cover)</b>			
<b>Pipe Size (In.)</b>	<b>Depth of Cover (Ft.)</b>	<b>In Fills Use D.I. Class</b>	<b>Standard Trench Use D.I. Class</b>
4 (Service Lines)	0.5	51	51
	1.0	51	51
	1.5	51	51
	2.0	51	51
6 (Service Lines)	0.5	53	50
	1.0	51	50
	1.5	50	50
	2.0	50	50
8	0.5	54	50
	1.0	52	50
	1.5	50	50
	2.0	50	50

## 2.08 Location

### a) Relation to Water Lines and Other Utilities

Sanitary sewers shall be separated from water pipes and sources of domestic water in accordance with OAR Chapter 333.

### b) Sewers in Streets or Easements

Unless approved by the Director, sewers shall be located in the street right-of-way within five (5) feet of the street centerline on the low side of the street. Sewers in easements will be allowed only after all reasonable attempts to place the mains in the right-of-way have been exhausted. All easement installations must be approved by the Director on a case-by-case basis. If streets have curved alignments, the center of the manhole shall not be less than six (6) feet from the curb face on the outside of the curve nor the sewer centerline less than six (6) feet from the curb face on the inside of the curve. The intent is to prevent a conflict with new storm drain lines while still providing for the least number of manholes required to traverse a curve.

When it is approved by the Director to locate sewers in easements, the sewer shall be centered in the easement and the conditions of the easement shall be such that the easement shall not be used for any purpose which would interfere with the unrestricted use for sewer main purposes. Under no circumstances shall a building or structure, tree, or fence be placed over a sanitary sewer main or sewer easement. This shall include overhanging structures with footings located outside the easement. All manholes within easements and pipelines over 24-inch diameter regardless of location shall have lock down lids.

Easements for sewers less than 12 inches in diameter shall have a minimum width of ten (10) feet. Sewers 12 to 15 inches in diameter shall have a minimum easement width of 15 feet, and sewers greater than 15 inches in diameter, shall have a minimum easement width of 20 feet.

Easement locations for public sewer mains serving a PUD, apartment complex, or commercial/industrial development shall be in parking lots, private drives, or similar open areas which will permit an unobstructed vehicle access for maintenance by City forces.

Sewers with more than six (6) feet of cover and/or inside diameters 24 inches or greater will require wider easements. A slope of one horizontal to one vertical from the sewer invert to ground surface will be used in determining easement width. Easement widths shall vary from the ten (10) foot minimum by five (5) foot increments, i.e., 10, 15, 20 feet, etc.

Common placement in the easement of sewer and storm drain line may be allowed under certain conditions subject to approval by the Director.

Common easements will be reviewed on a case-by-case basis. Separation of utilities must meet Oregon State Department of Environmental Quality (DEQ) requirements.

All easements must be furnished to the City for review and approval prior to recording.

c) Relation to Streams and Drainage Channels

Generally, the top of all sanitary sewers entering or crossing streams shall be at a sufficient depth below the natural bottom of the streambed to protect the sewer line. One (1) foot of cover is required where the sewer is in rock, three (3) feet of cover is required in other materials. In paved channels, the top of the sewer line shall be placed at least six (6) inches below finish grade of the bottom of the channel, except as provided above.

Sewers located along streams shall be located outside of the streambed and sufficiently removed therefrom to provide for future possible stream channel widening. All manhole covers shall be leakproof at or below the 100-year flood elevation.

Sewers crossing streams or drainage channels shall be designed to cross the stream as nearly perpendicular to the stream channel as possible and shall be free from change of grade.

Pipe material shall be ductile iron Class 50 with an 18-foot length of pipe centered on the stream or drainage channel centerline. The ductile iron pipe shall extend to a point where a one-to-one slope, that begins at the top of the bank and slopes down from the bank away from the channel centerline, intersects the top of the pipe.

Concrete encasement will be required when the above cover requirements cannot be met. Each deviation from the above requirements will be reviewed on a case-by-case basis.

2.09 Alignment

Sewer lines shall be laid on a straight alignment and uniform slope between consecutive manholes.

Horizontal and vertical curves in sanitary sewers are not permitted.

2.10 Manholes and Cleanouts

a) Cleanouts

Cleanouts will not be approved as substitutes for manholes, except at the upper end of lateral or main sewers that will be extended on the same grade



and alignment during the next construction phase. All cleanouts will be considered on a case-by-case basis and approved by the Director of Public Works.

b) Manhole Taps

When an existing manhole is tapped to install a new sewer which will drain into the manhole, the new sewer shall enter the manhole with the invert a minimum 0.25 feet below the shelf elevation of the manhole and a channel shall be formed in the shelf of the manhole to the invert of the existing sewer.

c) Manhole Location

Manholes shall be placed at the following locations:

- (i) Every change in grade (grade break) or alignment of a sewer.
- (ii) Every point where there is a change in size or abrupt change in invert elevation (drop) change of a sewer.
- (iii) Each intersection or junction of a sewer.
- (iv) Upper end of all lateral sewers, except as provided in (b) above.
  - A) Adjacent to the radius point of a cul-de-sac which has three (3) or more parcels of land fronting on the cul-de-sac.
  - B) In front of the last property or lot being served, ten (10) feet past the common lot line of the adjoining parcel served.
- (v) At intervals of 400 feet or less. Deviation from this requirement shall be reviewed on a case-by-case basis for approval, considering whether or not flushing and cleaning equipment can adequately service the proposed sewer line.
- (vi) At any point where a service or private sewer of 8 inches or larger intersects a sewer main.

Manholes shall not be located in the curb or in the gutter. Placement of manholes behind the curb shall be reviewed on a case-by-case basis for approval. Consideration shall be given to those sewer lines which already exist behind the curb.

Two (2) manholes shall be installed when the horizontal deflection angle between a lateral or main connection to an existing sewer is less than or equal to 75°. Spacing of such manholes shall be a minimum of ten (10) feet outside to outside.

The intent is to prevent a new lateral sewer connection from discharging into an existing sewer opposing the existing flow.

Where practical, manholes shall be located at street intersections. All manholes from which future sewer line extensions are anticipated, shall have a pipe stub designed and installed at the grade and direction of the anticipated sewer main extension. Pipe stubs shall be a minimum of eight (8) inches in size and shall protrude at least one (1) foot outside of the manhole base.

Risers shall be used to bring casting to grade. Combined riser sections shall not exceed six inches in height between cone and casting.

d) Drop Manholes

Outside drop assemblies shall be provided for pipe lines 12 inches in diameter and smaller when entering a manhole at a distance of more than 24 inches above the invert of the outlet line. The vertical displacement shall be measured at the inside manhole walls and not the manhole centerline. Larger pipe lines shall be introduced into the manhole at the manhole invert.

SPECIAL NOTE: Drop manholes shall only be used in extreme cases of slope difference between existing and proposed sewer lines or when very special conditions exist such as a conflict with existing facilities which cannot be relocated.

Approval of the Director after review of the plans by appropriate design, construction, and maintenance sections is required to construct a drop manhole.

e) Drop Across the Structure

The drop across the structure shall normally be one-tenth (0.10) of a foot. Where there is to be more than 60° of horizontal deflection angle between any inlet and outlet line of a structure, the vertical drop from said inlet and outlet line of a structure shall be at least two-tenths (0.20) of a foot.

Maximum drop across the structure shall be limited to one (1) foot.

f) Metering Manhole

A metering manhole shall be installed on all systems meeting one of the following criteria:

- (i) A private sewer which contributes more than 10,000 gallons per day to the public sewer.

- (ii) A private sewer which serves more than one structure on the same premises,

g) Other Requirements

Manholes and wet wells over 20 feet in depth or with pipes over 36 inches in diameter shall have structurally sound grated working platforms (nonmetallic covered) for maintenance and fall protection, spaced not greater than 15 feet apart.

Pipelines 36 inches and larger in diameter shall have manhole openings of 30 inches in diameter.

Where manhole rims are 2 feet or greater above grade or finished ground, the manhole lids shall be made of aluminum.

2.11 Sewer Service Lines and Private Collection Systems

a) Sewer Service Lines

Sewer service lines are those portions of the sewage system between the public sewer and the structure being served, which are installed and maintained by property owners or agencies other than the City.

As a minimum criterion, construction of the house or building sewer service line shall be of the same quality and meet the same requirements as the public sewer with regard to materials, watertightness, and location. In addition, these sewers shall conform to the State and local plumbing codes and restrictions. No roof, surface, foundation, or stormwater drain lines shall be connected to the public sewers.

Sewer service lines shall not tie into an existing manhole except in special cases approved by the Director of Public Works. Exception: Services may tie into a manhole which is located in a cul-de-sac provided the line is not planned to be extended in the future. A cleanout shall be installed at the property line when the building sewer is connected to the sewer service line. For long sewer service lines in existing residential areas, a cleanout shall be installed at property line and at 100-foot intervals thereafter. Sewer service lines shall have at least four (4) feet of cover at the property line. Generally, the topography of the property will dictate how deep the service line must be.

Each individual building site shall be connected by a separate sewer service line connected to the public or private main sewer. Combined sewer service lines will be permitted only when the property cannot legally be further divided. An example of this is a residential lot with a house and unattached garage or shop with plumbing facilities.

The minimum inside diameter of a sewer service line shall be four (4) inches and shall be equal to or greater than the building plumbing stub (building drain) diameter. The minimum inside diameter of sewer service lines to serve multifamily dwellings or commercial buildings shall be six (6) inches. Fixture unit equivalents shall be determined in accordance with Chapter 4 of the Uniform Plumbing Code and the Oregon State Plumbing Specialty Code (Table 4-1).

Minimum sizes and slopes for sewer services, based on the fixture unit equivalents, shall be in accordance with the Uniform Plumbing Code Table 11-2.

Sewer service lines for townhouses and similar cluster housing developments shall be installed on a uniform slope from the main line sewer connection to a point five (5) feet from the end of the building drain conforming to the above requirements.

A backwater check valve shall be installed when the lowest floor level of a house to be connected to the public sewer is below a point which is 12 inches above the top of the nearest upstream manhole or cleanout structure. A gate valve in addition to the required backwater check valve is optional but should be considered for installation for additional protection should the backwater valve fail or become clogged with debris.

b) Private Collection System

Private collection system sewers shall be designed in conformance with main line standards specified in this chapter when plumbing code grade requirements of U.P.C. Section 1106 cannot be met. Subsection (a) of this section must be used for sewer service lines in the system with the following exceptions:

- (i) The minimum size sewer line upstream of the metering manhole structure shall be six (6) inches.
- (ii) A manhole is required at the connection to the City main.
- (iii) A metering manhole is required at the property line upstream from the manhole connection at the City main required by (2) above.

The metering manhole shall consist of a standard manhole with the inlet pipeline invert placed 0.4 foot above the outlet invert. The inlet pipe shall extend one (1) foot past the manhole wall and shall be cut in half six inches from the outfall end and the top half of the pipe removed. The channel shall be formed from the outfall end to the outlet line in the usual manner.

The intent is to provide a half round section of pipe inside the manhole into which City personnel can place flow monitoring equipment.

c) Locating Building Sewers and Private Collection Systems

All sewer piping shall have an electrically conductive tracer wire, 18 gauge minimum size, insulated copper, and green sheeting, installed in the trench for the purpose of locating pipe in the future. The tracer wire shall run the full length of the installed pipe, with one end located around the mainline or lateral. The other end of the tracer wire shall be of sufficient length for an electrically conductive splice.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS  
DESIGN STANDARDS

CHAPTER 3  
STREETS



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### 3.00 General Design Considerations

Street improvements including curbs, sidewalks and storm drainage shall be provided on all property developed within the City of Monmouth according to these standards for the following types of development:

- a) All major partitions and subdivisions.
- b) All minor partitions that fall within one or more of the following conditions:
  - (i) Where the land is zoned MX (Mixed Density Residential); RM (Medium Density Residential); RH (High Density Residential); MS (Main Street); CO (Commercial Office); CR (Commercial Retail); CRT (Commercial Retail Transitional); CH (Commercial Highway); IP (Industrial Park); IL (Light Industrial); PS (Public Services); PSC (Public Services College).
  - (ii) Located on a designated arterial or collector street.
  - (iii) Where 40 percent of the street frontage within 200 feet of the boundaries of the partitioned property has already been paved and curbed.
  - (iv) Where the abutting street is complete with curbs opposite the partitioning.

### 3.01 Local Street Design

The following elements should be incorporated in the design of the local residential street system to discourage and minimize both the volume and impact of through traffic within residential neighborhoods or subdivisions:

- a) Use of T-intersections
- b) Use of loop streets
- c) Curvilinear street pattern

Employment of the above design elements will provide some degree of travel discontinuity, thus discouraging the use of the residential street system as through routes. In addition, excessive speed within the neighborhood may also be minimized.

For the above design alternatives to work properly in minimizing neighborhood infiltration, it is necessary to plan for and provide the collector and arterial network by which through traffic can travel. Care should be taken in the design of the local



street network to ensure that connections with the collector and arterial streets are adequate.

### 3.02 Miscellaneous Design Standards

#### a) Cul-de-sac Turnarounds

Cul-de-sac turnarounds on residential streets in subdivisions, mini-subdivisions or on hillside streets shall be designed and constructed according to the following specifications.

##### Subdivision

40 foot paved radius

57 foot right-of-way radius

##### Mini-Subdivision

40 foot paved radius

57 foot right-of-way radius

##### Hillside Streets Over 400 feet

40 foot paved radius

57 foot right-of-way radius

Cul-de-sacs in industrial developments shall provide adequate turnarounds for the type of vehicles served by the streets.

#### b) Private Streets

All private street cross-sections shall be designed according to City of Monmouth street standards except where approved by the Director of Public Works.

#### c) Catch Basins

Catch basins shall be designed according to City of Monmouth Storm Drainage Standards.

#### d) Manhole Cover and Water Valve Adjustments

Manhole covers and water valves shall be adjusted to finish grade of the improved street.

#### e) Brick Crosswalks/Sidewalks or Alternate Designs

Brick crosswalks/sidewalks or alternate designs are discouraged. If proposed, they shall be submitted by a professional engineer and are subject to the review and approval of the Director of Public Works.

f) Street Reconstruction

Whenever a street is reconstructed on a new grade or alignment such that the new street section is built over the existing street, the existing pavement shall be broken up and removed. Alternatively, if any of the existing pavement is to be used within the base of the new street section, it shall be broken up, reprocessed, and compacted such that it is comparable in gradation to the aggregate required for the new base rock.

3.03 Street Right-Of-Way and Curb-To-Curb Widths

The street right-of-way and curb-to-curb widths for a given street shall reflect the designated widths of that particular classification of street (see Table 3 – 1 included at the end of this chapter).

3.04 Design Speeds

The minimum design speeds for classified streets shall be as follows:

- a) Residential Streets 30 mph
- b) Collectors 35 mph
- c) Arterials 45 mph

Design considerations for all street geometrics shall reflect these design speeds. Variance from these design speeds shall be approved by the Director of Public Works.

3.05 Horizontal, Vertical Curves, and Superelevation

Horizontal and vertical curves for a given street shall reflect the design speed of the particular classification of the street.

The 1993 AASHTO Policy on Geometric Design of Highways and Streets shall serve as the guideline for the design of horizontal and vertical curves on City streets. The maximum superelevation rate permitted on City streets shall be six percent for arterials and four percent for collectors.

Sharp horizontal curvature should not be introduced at or near the top of a pronounced crest vertical curve. Similarly, sharp horizontal curvature should not be introduced at or near the low point of a pronounced sag vertical curve.

Minimum stopping sight distance shall be provided on all vertical curves.

Vertical curves shall be parabolic and of a minimum length computed from the formula:

$$L=KA$$

where:

- L = length of vertical curve in feet
- K = design constant (rate of vertical curvature)
- A = algebraic difference in grades, percent

K is a constant for each design speed; its selection for crest vertical curves is based on sight distance requirements and, for sag vertical curves, on headlight sight distance. K values to be used for the design of vertical curves are as follows:

Vertical Curves K Values

Design Speed MPH	Crest V.C.		Sag V.C.	
	S.S.D.		S.S.D.	
	<u>Minimum</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Maximum</u>
20	10		20	
25	20		25	
30	30	30	35	35
35	40	50	45	50
40	60	80	55	70
45	80	120	70	90
50	110	160	85	110
60	190	310	120	160

3.06 Grades

Maximum grade on streets shall be as follows:

- a) Arterials .06 ft/ft (6%)
- b) Collectors .08 ft/ft (8%)
- c) Residential .12 ft/ft (12%)

No street grade shall exceed (12%) without a variance.

Maximum grade for local or residential streets in hillside areas shall not exceed .12 ft/ft (12%).

The minimum gutter grade permitted shall be 0.25 feet per 100 feet (0.25 percent grade).

On curve radii of 30 feet or less, a minimum grade of 0.5 percent shall be required.

For cross-slope design standards see City of Monmouth Standard Drawings.

### 3.07 Portland Cement Concrete Street Design and Construction

In general, Portland Cement Concrete design and construction, when permitted by City, shall conform to Portland Cement Association (PCA) specifications.

### 3.08 Asphaltic Concrete Street Construction

#### CITY OF MONMOUTH (FLEXIBLE PAVEMENT STRUCTURE DESIGN)

Flexible pavement design shall conform to the APAO Asphalt Pavement Design Guide.

All testing shall be conducted by certified testing laboratory acceptable to the Director.

The engineer will be required to submit pavement structure design data for any street for which the Director has reason to suspect unsuitable soil conditions, high percentage of trucks or any other conditions that may significantly affect the pavement structure design.

FOR STREET CLASSIFICATION (LOCAL, COLLECTOR, ARTERIAL) SEE MONMOUTH TRANSPORTATION PLAN.

### 3.09 Alley Construction

- a) Alley width and improvement requirements shall comply with the City of Monmouth Standard Drawings.
- b) All alleys shall be constructed of Portland Concrete Cement.
- c) All alley improvements shall require a one-foot clearance strip between the edge of alley and right-of-way line except for alleys ten-feet wide or less. In this the case the clearance strip shall be six-inches in width.

### 3.10 Portland Cement Concrete Curbs – Type and Application (See Standard Drawing No. 303)

- a) In general, type "A" curb and gutter shall be installed on all new construction or reconstruction to control drainage from sheet flow across the street, to preserve curb exposure during subsequent overlays, and to eliminate cracking new curbs during the street paving operation.

The minimum gutter grade permitted shall be 0.25 feet per 100 feet (0.25 percent grade)

- (i) Rolled Curb may be used in urban developments on private streets only.
- (ii) Type "C" curb shall be used for edges of traffic islands only.

- b) A six (6) inch curb exposure is normally required on residential streets. A seven (7) inch curb exposure is required on all major streets.
- c) Two curb weeps, three (3) inches in diameter, shall be provided for each lot.
- d) Minimum curb radii required at intersections shall be as follows:

<u>Intersection</u>	<u>Radius</u>
Residential to Residential	20 feet
Residential to Collector or Arterial	25 feet
Collector to Collector or Arterial	30 feet
Arterial to Arterial	30 feet

### 3.11 Sidewalk Construction and Location

- a) A sidewalk shall be constructed on all streets. Location and width of sidewalks shall be as prescribed in City of Monmouth Title IX Zoning and Development Ordinance.

Curblin sidewalks are required in residential areas unless otherwise approved by the Director.

Midblock walks that are required on subdivisions shall be constructed as part of the subdivision development. Midblock walks shall be eight feet in width on a ten foot easement.

- b) Sidewalks shall be constructed of Portland Cement Concrete, capable of meeting a compressive strength of 3,000 PSI after 28 days.
- c) When sidewalks are to be constructed they shall be of a minimum width of five feet.
- d) Refer to City of Monmouth Zoning and Development Ordinance for Specific Sidewalk Code, and Maintenance Standards.

### 3.12 Bicycle and Wheelchair Ramps

- a) Under Chapter 31, Handicap Access, of the Uniform Building Code of the State of Oregon it is required that access be available to the handicapped for use of public facilities. It is the City's intent that wheelchair ramps be provided at all intersections. In addition, all ramps shall conform to requirements of the Americans with Disabilities Act and the requirements contained herein.
- b) The City of Monmouth, Department of Public Works Standard Construction Drawing No. 307 indicates various conditions for ramp requirements within the city.

- c) Ramps shall be located to avoid catchbasins or catchbasins shall be relocated.
- d) In situations where a sidewalk ramp is being retrofitted to an existing curb, the Project Engineer shall obtain sufficient survey elevations at the ramp locations to determine the curb grades and analyze the drainage. Engineer shall show on the plans the extent of the existing curb and sidewalk to be replaced. Type A curb and gutter shall be required where the gutter grade in either direction is less than or equal to 2 percent. The curb and gutter shall be designed to carry drainage away from the ramp; and the gutter grade at no place within 5 feet of the sidewalk ramp will be less than 0.50 percent.
- e) Where a new curb is being constructed as part of a street improvement project (as opposed to retrofit) the curb grade within 5 feet of the sidewalk ramp will at no place be less than 0.50 percent grade.

3.13 Street Lighting

Coordinate Street Lighting Design with Monmouth Power & Light Street Lighting Standards.

3.14 Private Driveways and Parking Lots

a) Surfacing and Construction

Driveways in this section will refer to that area between the property line and parking area.

All private driveways and parking lots shall be paved with asphalt or concrete. The type and quantity of materials for construction is based upon the type of vehicular use and is shown below:

(i) Residential, Light Commercial/Retail (majority passenger vehicles)

Initial Construction

Asphalt concrete and crushed aggregate	
Asphalt concrete (class "B")	2-1/2 inch
1 inch crushed aggregate base	6 inch
Full depth asphalt concrete	
Asphalt concrete (Class "B")	2 inch
Bituminous base	3 inch

(ii) Heavy Commercial/Retail (high volume of large and heavy delivery vehicles)

Initial Construction

Asphalt concrete and crushed aggregate  
Asphalt concrete (class "B") 2-1/2 inch  
1 inch crushed aggregate base 9 inch

Full depth asphalt concrete  
Asphalt concrete (Class "B") 2 inch  
Bituminous base 4 inch

(iii) Light Industrial

(iv) Initial Construction

Asphalt concrete and crushed aggregate  
Asphalt concrete (class "B") 2-1/2 inch  
1 inch crushed aggregate base 11-1/2 inch

Full depth asphalt concrete  
Asphalt concrete (Class "B") 2 inch  
Bituminous base 7-1/2 inch

(v) Heavy Industrial

Initial Construction

Asphalt concrete and crushed aggregate  
Asphalt concrete (class "B") 2-1/2 inch  
1 inch crushed aggregate base 13-1/2 inch

Full depth asphalt concrete  
Asphalt concrete (Class "B") 2 inch  
Bituminous base 8 inch

Bumper guards or wheel barriers shall be installed so that no portion of a vehicle projects into the right-of-way or over the adjoining property. The area between the wheel barriers or bumper guards shall be paved or covered with evergreen ground cover.

Driveways shall maintain adequate drainage facilities to prevent water ponding and ice formation. Permanent drainage facilities shall be provided for parking lots in all commercial, industrial, and multifamily developments creating new impervious surfaces of greater than 3,000 square feet in an area within any 12-month period. These standards are intended to fulfill the

requirements of Section 1406, "Special Storm Sewers," of the Uniform Plumbing Code for private storm drains.

b) Driveway Widths (area between property line and parking area)

- (i) The minimum driveway widths are reflected in the type of use and parking served by that particular driveway as shown below:

Minimum Driveway Widths

<u>Type of Use and Parking Served</u>	<u>Minimum Width</u>
<u>Dwellings:</u>	
One parking space	10 feet
Two parking spaces	16 feet
Three or more parking spaces	22 feet
<u>All other uses:</u>	
One-way driveway, no parking in driveway	12 feet
Two-way driveway, no parking in driveway	22 feet
Additional width for any side of any driveway where parking is allowed	8 feet

- (ii) The maximum driveway widths are reflected in the type of use served by that particular driveway as shown below:

Maximum Driveway Widths

<u>Type of Use and Parking Served</u>	<u>Maximum Width</u>
<u>Residential Driveways:</u>	
Single parking space	15 feet
Two parking spaces	24 feet
Three or more parking spaces	36 feet
<u>Commercial Driveways:</u>	
One-way traffic	20 feet
Two-way traffic	40 feet

c) Driveways Location

(i) Driveway Locations in General

- A) One-way driveways shall be no closer than 75 feet between their nearest edges.
- B) Corner properties of less than 75 feet frontage on a major street shall have no driveway located on a major street.



- C) All proposed commercial businesses shall be limited to one two-way driveway or two one-way driveways per roadway frontage.
- D) Any variations from these standards shall be approved by the Director of Public Works.

(ii) Location of Driveways Within the Central Business District

For the central business district, driveways from commercial businesses or multifamily residential units onto a major street shall be located as follows:

A) For major one-way street, 42 feet or less width curb to curb:

1. Driveways for entrance only shall be located at least 50 feet from the downstream intersection and no closer than 100 feet from an upstream intersection;
2. Driveways for exit only shall be located at least 100 feet from the downstream intersection and shall be no closer than 50 feet from an upstream intersection;
3. Two-way driveways shall be located at least 100 feet from either downstream or upstream intersections.

B) For major one-way streets greater than 42 feet curb to curb width:

1. Driveways for entrance only shall be located at least 50 feet from the downstream intersection and no closer than 100 feet from the upstream intersection;
2. Driveways for exit only shall be located at least 150 feet from the downstream intersection and shall be no closer than 50 feet from an upstream intersection;
3. Two-way driveways shall be located at least 150 feet from either downstream or upstream intersections.

C) For major two-way streets:

1. Driveways for entrance only shall be located at least 100 feet from a downstream intersection and no closer than 50 feet from an upstream intersection;

2. Driveways for exit only shall be located at least 100 feet from an upstream intersection and at least 50 feet from a downstream intersection;
3. Two-way driveways shall be located at least 100 feet from either the downstream or upstream intersection.

(iii) Location of Driveways Outside of the Central Business District

For all areas outside of the central business district, driveways from commercial businesses or multifamily residential units onto a major street shall be located as follows:

A) For major one-way streets 42 feet or less curb to curb width:

1. Driveways for entrance only shall be located at least 50 feet from the downstream intersection and no closer than 100 feet from an upstream intersection;
2. Driveways for exit only shall be located at least 125 feet from the downstream intersection and no closer than 75 feet from an upstream intersection;
3. Two-way driveways shall be located at least 125 feet from the downstream intersection and no closer than 100 feet from an upstream intersection.
4. In locating multiple driveways the UGM Standards shall be used as a guideline.

B) For major one-way streets greater than 42 feet curb-to-curb width:

1. Driveways for entrance only shall be located at least 50 feet from the downstream intersection and no closer than 125 feet from an upstream intersection;
2. Driveways for exit only shall be located at least 150 feet from the downstream intersection and no closer than 75 feet from an upstream intersection;
3. Two-way driveways shall be located at least 150 feet from either the downstream or upstream intersection.

C) For major two-way streets:

1. Driveways for entrance only shall be located at least 125 feet from the downstream intersection and no closer than 75 feet from an upstream intersection;
2. Driveways for exit only shall be located at least 75 feet from the downstream intersection and no closer than 125 feet from an upstream intersection;
3. Two-way driveways shall be located at least 125 feet from either the downstream or upstream intersection.

d) Turnarounds

Should the length of a residential driveway be greater than 50 feet in length and the driveway has only one access to the street or does not loop to the street, a turnaround shall be provided. The minimum inside radius of that turnaround shall be 15 feet and the width at that point (turnaround) shall be 30 feet for maneuvering.

e) Driveway Grades

Driveway grades shall not exceed 12 percent (curbline to parking area) unless the developed parcel is classified as a hillside lot in accordance with SRC 130.400. The Director of Public Works may permit a driveway slope to 20 percent providing no slope exceeds 25 percent between any two points in the driveway.

f) Parking Dimensions and Layout

For two-way circulation the minimum aisle width shall be 20 feet, adequate ingress, egress, and turnaround space shall be provided.

No portion of a parking space or aisle shall be located in a required landscaped yard.

\*8'6" stall width shall apply only within parking structures of two or more stories.

Standard size parking stall shall be 9 feet by 19 feet. Small car only parking stall shall be 8 feet by 15 feet.

Curves and corners within the parking facilities shall have a minimum inside radius of 15 feet.

Where landscaping, fences, or walls are to be incorporated into the parking lot design or adjacent to the driveway, the vegetation or physical obstructions shall not restrict the sight distance of the motorists within the parking facility or at the driveway (a ten foot by ten foot vision clearance triangle shall be maintained).

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS  
DESIGN STANDARDS

CHAPTER 4  
**STORMWATER**

STORMWATER COLLECTION AND MANAGEMENT SYSTEM



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## SECTION 1 - GENERAL

### 1.00 Purpose

The purpose of these Standards is to provide uniformity under which storm drains within the City may be designed, constructed, and maintained. The objectives of these Standards include, but are not limited to, the following:

- a) Protect the safety and security of persons and property by safely conveying all volumes of water from sources upstream to approved storm facilities downstream and preventing the uncontrolled or irresponsible discharge of stormwater onto adjoining public or private property.
- b) Maintain and improve the water quality in and the beneficial uses of Monmouth's urban waterways, lakes, wetlands, and other natural drainage resources.
- c) Establish a stormwater detention program consisting of regional and local facilities.
- d) Minimize erosion through control of sediment, vegetation removal, and grading. Protect Monmouth's natural resources by preserving stormwater quality and preventing erosion.
- e) Construct facilities which are safe and economical to maintain and which maximize practical design life.
- f) Provide for orderly development by creating points of disposal and adequate capacity for future development upstream.
- g) Substantially maintain the runoff characteristics of the original undeveloped drainage basin.

### 1.01 Applicability

All private storm drains outside the building envelope shall be designed using Oregon State Plumbing Specialty Code, Monmouth City Code, Uniform Plumbing Code, or other applicable codes as appropriate. Private storm drains may be designed using these Standards when the Director establishes additional requirements (i.e., stormwater quality) or when an engineer determines to the Director's satisfaction that the private storm drain system cannot be designed to meet other applicable codes.

Standards for plumbing inside the building envelope are administered by the City of Monmouth Building Official and are not addressed within this publication.

Permanent drainage facilities shall be provided for all developments within the City of Monmouth per these Standards as follows:

- a) All partitions and subdivisions.
- b) All commercial, industrial, and multifamily residential developments creating 3,000 square feet of impervious surfaces within any 12-month period, whether or not the developed area was previously impervious.
- c) Developments involving construction which would change the point of discharge of surface waters, the quantity or quality of discharge, the velocity of surface runoff, or cause erosion or other pollution to surface waters.
- d) Construction or reconstruction of public roadways and temporary detours.
- e) Developments requiring construction in or adjacent to any existing open channel waterway.
- f) Developments requiring construction within the 100-year floodplain of any waterway.

#### 1.02 General Design Considerations

Design of storm drains must include provisions to adequately control runoff from impervious and pervious areas within and upstream of the development without exceeding capacities of available facilities downstream. General design considerations are as follows:

- g) Surface or subsurface drainage, caused or affected by development, shall not flow over adjacent public or private property in a volume or location materially different from that which existed before development occurred, but shall be collected and conveyed to a point of disposal as approved.
- h) Surface drainage entering a development shall be received at the naturally occurring locations and surface water exiting the development shall be discharged at the natural locations with adequate energy dissipators to minimize erosion and other damage.
- i) All public and private storm drainage systems shall discharge by gravity into the downstream drainage system without the use of pumps or other mechanical means.
- j) The point of disposal for all stormwater may be a piped system, curb, or open channel as approved. Direct outfalls to infiltration systems, detention ponds, or waterways shall be approved on a case-by-case basis. Acceptance of suggested disposal points will depend upon the site conditions, capacity of existing downstream facilities, potential for erosion,

and feasibility of alternate designs. The Director shall not generally permit direct discharge to an impervious ground surface (i.e., curb or gutter) when underground springs or other groundwater may affect the nature of stormwater discharge.

- k) When an approved point of disposal is located on adjacent private property, the owner shall be responsible to acquire an approved drainage easement and record it with the Polk Count at the owner's expense.
- l) Peak discharge from a development shall not be increased such that it causes downstream flood damage. The Director may require a hydraulic analysis from the owner's engineer in order to demonstrate that there are no adverse downstream impacts.
- m) Detention facilities must be provided in order to maintain surface water discharge rates at or below the existing design storm peak discharge except where it can be satisfactorily demonstrated by the applicant that no adverse impact will result from undetained runoff from the development and the requirement for detention is subsequently waived by the City.



## **SECTION 2 - STORMWATER QUALITY**

### 2.00 General

Refer to City of Monmouth Stormwater Quality Best Management Practices.

## SECTION 3 - STORMWATER QUANTITY

### 3.00 Runoff Calculations

#### a) Drainage Areas

All designs shall identify drainage areas within and upstream of the development. In undeveloped drainage areas, drainage calculations shall separately consider existing drainage patterns and post-developed drainage patterns.

#### b) Analytical Methods

The engineer is not limited to any one method for calculating runoff. Drainage areas less than 15 acres in size may be analyzed using the rational method. Areas larger than 15 acres must use an analytical method acceptable to the Director. Engineers are encouraged to use FEMA flow quantities for FEMA-studied waterways and Master Plan flow quantities when available for other waterways.

#### c) Rational Method

The rational method calculation shall be made as follows:

$$Q = CIA$$

Q = Peak flow (cubic feet/second)

C = Runoff Coefficient

I = Rainfall Intensity (inches/hour)

A = Drainage Area (acres)

##### (i) Runoff Coefficient "C"

The runoff coefficient is difficult to estimate because it represents the interaction of many complex factors including surface ponding, infiltration, antecedent moisture, ground cover conditions, ground slopes, and soil type. The actual runoff coefficient for a given drainage basin can best be approximated by calculating a weighted average of all distinct surface types:

$$C_{avg} = \sum \frac{C_x A_x}{A_{total}}$$

Table 1 represents typical average values.

**Table 1  
Runoff Coefficient “C”**

	<b>FLAT 0% to 2%</b>	<b>ROLLING 2% to 10%</b>	<b>HILLY Over 10%</b>
<b>Developed Surface Types:</b>			
Impervious Areas	.9	.9	.9
Gravel Pavement	.5	.55	.6
Landscape Areas (Except Lawns)	.3	.35	.4
Lawns	.17	.22	.35
<b>Undeveloped Surface Types:</b>			
Meadow, Pasture, or Farm	.25	.3	.35
Mixed	.15	.2	.25
Woodland and Forest	.1	.15	.2
<b>Development Types:</b>			
Commercial Development	.8	.85	.9
Industrial Development, Heavy	.7	.8	.9
Dense Residential (over 6 units/acre)	.7	.75	.8
Industrial Development, Light	.6	.7	.8
Normal Residential (3 to 6 units/acre)	.5	.55	.6
Light Residential (1 to 3 units/acre)	.35	.4	.45
Parks	.15	.2	.25

(ii) Rainfall Intensity “I”

The cumulative rainfall intensity shall be derived from Figure 1. The design storm interval is typically based on the longest time of concentration for the drainage area.

(iii) Time of Concentration “Tc”

Calculations for time of concentration should be divided into two segments: sheet flow and controlled flow. For the first 300 feet of overland flow, the sheet flow time of concentration can be calculated with the kinematic wave equation:

$$T_c = 0.93 L^{0.6} n^{0.6} / I^{0.4} S^{0.3}$$

Tc = flow time (minutes)

L = overland flow length (feet)

n = Manning’s Roughness Coefficient (see Table 2)

I = rainfall intensity (inches/hour) (see Figure 1)

S = average slope of overland area (foot/foot)

RAINFALL INTENSITY - DURATION - RECURRENCE INTERVAL CURVES

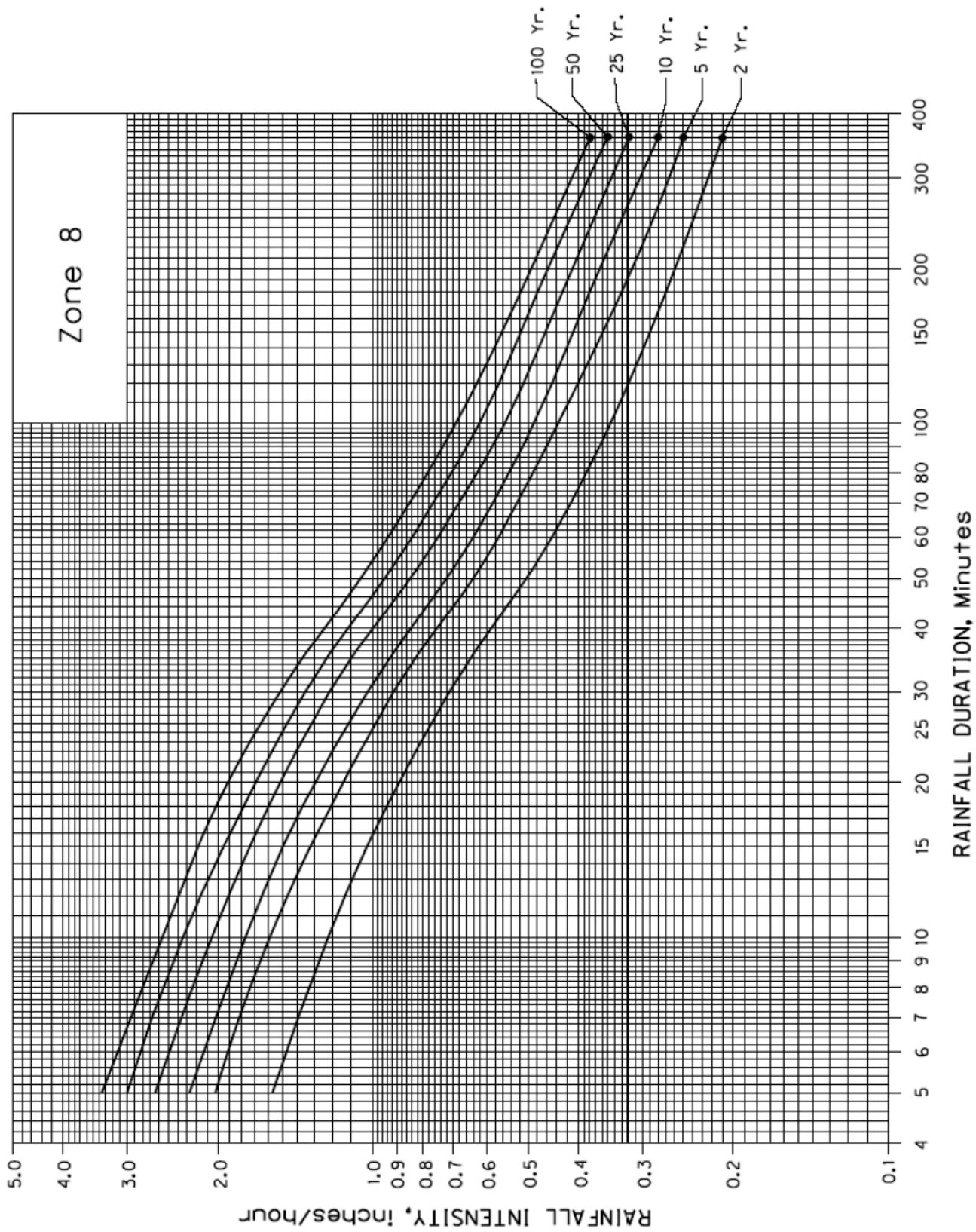


Figure 1: Rainfall Intensity – Duration – Frequency Curve

**Table 2  
Manning's Roughness Coefficients For Overland Sheet Flow**

<b>Surface Types:</b>	<b>n</b>
Impervious Areas	0.014
Gravel Pavement	0.02
Developed: Landscape Areas (Except Lawns)	0.08
Undeveloped: Meadow, Pasture, or Farm	0.15
Developed: Lawns	0.24
Undeveloped: Mixed	0.30
Undeveloped: Woodland and Forest	0.40
<b>Development Types:</b>	<b>n</b>
Commercial Development	0.015
Industrial Development, Heavy	0.04
Industrial Development, Light	0.05
Dense Residential (over 6 units/acre)	0.08
Normal Residential (3 to 6 units/acre)	0.20
Light Residential (1 to 3 units/acre)	0.30
Parks	0.40

For overland flow distances greater than 300 feet, sheet flow typically becomes shallow concentrated flow. The average velocity for this flow can be determined from Figure 2 (source: 1972 Soil Conservation Service Handbook), in which the average velocity is a function of watercourse slope and surface type. For open channels, Manning's equation should be used to estimate average flow velocity.

Once velocity is calculated, time of concentration can be calculated as follows:

$$T_c = L/V$$

T<sub>c</sub> = flow time (seconds)  
V = flow velocity (feet/second)  
L = flow length (feet)

### 3.01 General Detention Requirements

- a) All stormwater runoff originating from and/or draining to any proposed development shall be detained, controlled, and/or conveyed in accordance with these Standards. When existing conditions make stormwater detention impractical for all or a portion of a proposed development, the Director may permit compensatory storage volume to be provided in another location within the drainage basin. Except as described in Sect. 3.01, item b), the total runoff within the drainage basin shall not exceed the allowable release rate.

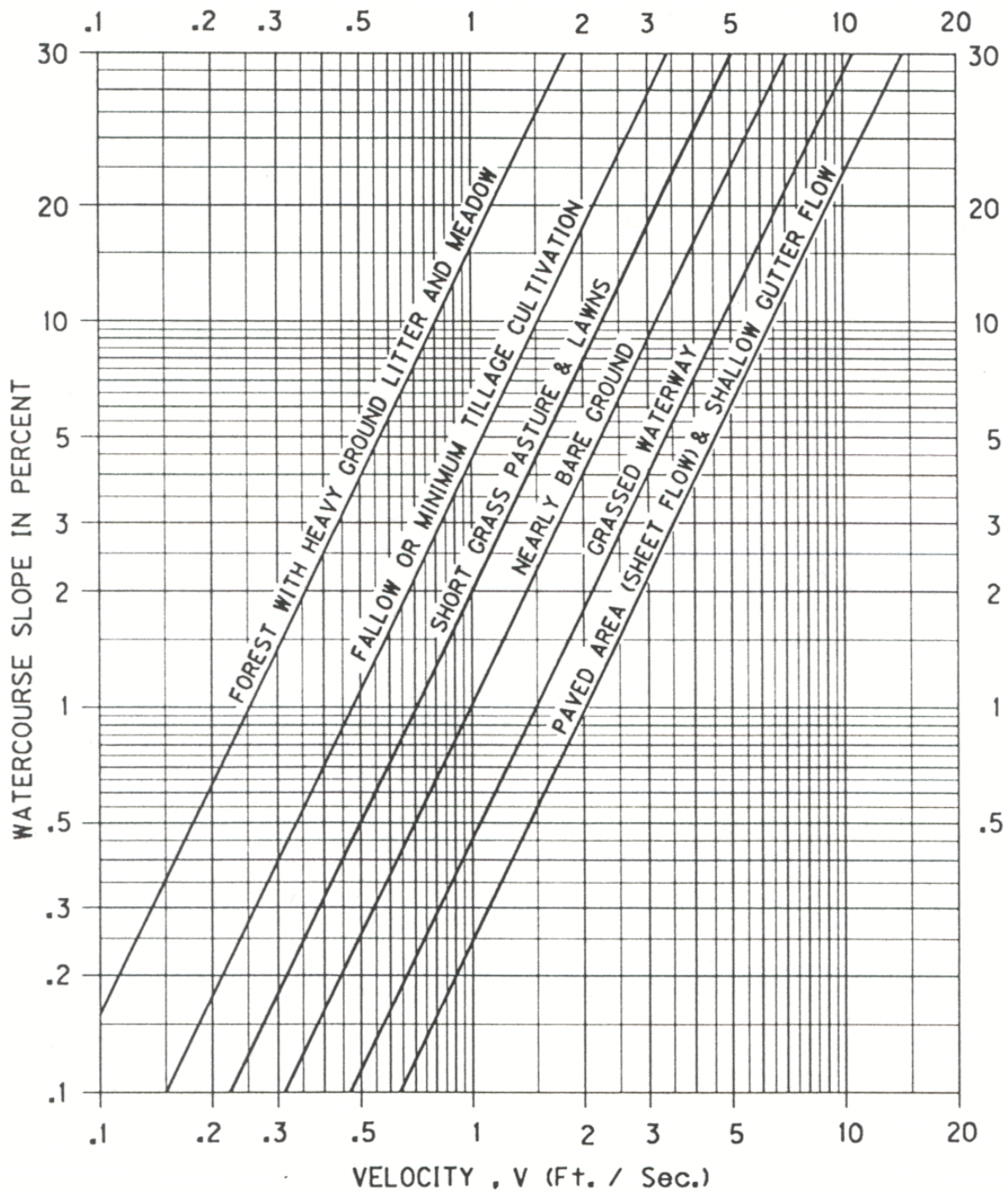


Figure 2: Average Velocity of Shallow Concentrated Flow

- b) Detention requirements may be modified as follows at the discretion of the Director:
- (i) Developments in critical drainage basins with history of flooding or other drainage problems.
  - (ii) Redevelopments of existing impervious areas if construction of such detention facilities is not feasible or practical.
  - (iii) Developments which require an orifice size less than 2 inches in diameter.
  - (iv) Projects for which detention may increase peak flows of the downstream storm system such as direct outflow to a major waterway.
  - (v) Drainage basins with adequate regional detention facilities.
  - (vi) Other special conditions that the Director deems necessary to warrant an increase or reduction in detention capacity or allowable release rate.
  - (vii) Single family residences or single family residential partitions.
- c) Detention facilities shall be open basins or ponds located outside the public right-of-way. Other configurations, such as underground pipes, vaults, or gravel-filled trenches, shall be approved by the Director on a case-by-case basis. Infiltration systems may be subject to the UIC program and registration requirements administered by DEQ.
- d) When the on-site drainage system is not designed to detain the off-site runoff, the on-site drainage system (including conveyance, flow restriction, detention, and emergency overflow elements) must be properly designed to address conveyance of off-site runoff through the site.

Stormwater runoff should not flow through the detention system, but instead should flow through the conveyance system. Stormwater runoff should enter the detention system only as redirected by the flow restriction device. When flow through a detention system is approved by the Director, a well-defined low flow channel shall be required.

- e) All aspects of public health, safety, maintenance, nuisance abatement, and vector control must be carefully reviewed in every drainage control system plan. Protective measures are often necessary and shall be required whenever appropriate. The protective measures themselves shall not constitute hazards or nuisances as defined in other applicable codes or standards.
- f) The impact of a system failure should be analyzed for effects to the proposed development, adjacent properties, elements of on-site and off-site private storm systems, and elements of the public drainage system.
- g) Detention system designs shall minimize frequency, difficulty, and expense of future maintenance. Control structures shall be designed to operate automatically, minimizing operation and maintenance requirements.
- h) Multiple-use detention facilities (i.e., parks, playgrounds, tennis courts, basketball courts, parking lots) are encouraged if such a design complies with all other requirements in these Standards.

### 3.02 Detention Volume Calculations

#### a) Allowable Outflow

- (i) The total outflow from a development shall not exceed the historic, predeveloped five-year design storm runoff from the development area. The Director may further modify the allowable outflow in critical drainage areas. Regardless of the existing predeveloped surface condition, the runoff characteristics for calculating allowable outflow shall typically equal “Undeveloped, Meadow, Pasture, or Farm” as shown in Table 1 and Table 2 and “Fallow or Minimum Tillage Cultivation” as shown in Figure 2.
- (ii) Often, small drainage areas within a site are not practical to detain and must flow undetained from the site. Impervious areas of undetained runoff shall be calculated and subtracted from the allowable total outflow through the orifice or other flow-control structure.

#### b) Outlet Control

Outflow is typically restricted through an orifice, usually located within a manhole or other junction structure. Orifices shall be two inches or greater in size unless otherwise approved by the Director. Orifice sizes shall be established based on the following equation:



$$q = 0.04375Cd_1\sqrt{H} \sqrt{\frac{1}{1-\left(\frac{d_1}{d_2}\right)^4}}$$

Where:

Q = flow, cfs

d1 = diameter of orifice, inches

d2 = diameter of pipe in which orifice is placed, inches

H = differential head at orifice, feet (measure from upstream water surface to center of orifice)

C = orifice discharge coefficient

The orifice discharge pipe shall be sized to prevent orifice submergence during design conditions.

c) Detention Volume

The detention volume shall be sufficient to detain a 25-year design storm of any duration without overflow. The required detention volume is determined from the storm duration with the greatest difference between total cumulative runoff and allowable cumulative outflow.

### 3.03 Parking Lot Ponds

- a) Maximum depth of water surface on all parking lot ponds shall be one foot.
- b) Slopes on all parking lot surface ponds shall not be less than 1 percent nor exceed 5 percent in areas designed for vehicular traffic.
- c) A sand and oil separator may be required as specified in Section 2. Stormwater Quality.
- d) The maximum water surface elevation of the parking lot pond shall be at least one foot below either of the following, whichever is lower:
  - (i) the lowest habitable floor elevation; or
  - (ii) the lowest elevation of mechanical, electrical, or other equipment subject to damage by flooding.
- e) The one-foot minimum clearance may be reduced if the detention overflow provides adequate protection from flood damage to the satisfaction of the Director.

- f) Parking lot ponding shall not be provided in underground parking structures.
- g) Where curbing is used for detention, the maximum water surface shall be no higher than 0.25 feet below the top of curb, and type "C" curbing shall be used as shown in the Standard Plans.
- h) No parking lot ponds shall be located within the primary ingress/egress portions of a site. A minimum 11-foot-wide emergency vehicle lane shall remain outside the detention area or direct overflow path.

### 3.04 Surface Ponds Other than Parking Lot Ponds

- a) Slopes and embankments of surface ponds shall meet the following minimum requirements unless, as approved by the Director, the surface pond design, construction inspection, and construction certification are performed by a geotechnical engineer:
  - (i) Interior slopes shall be no steeper than 3:1 (3 horizontal to 1 vertical) and exterior slopes shall be no steeper than 2:1. Retaining walls shall not be used within surface ponds.
  - (ii) The maximum water surface elevation shall not exceed the natural ground surface elevation within the banks of a surface pond. Fill shall not be used as the bank of a surface pond, except for providing freeboard above the maximum water surface elevation.
  - (iii) Water surface depth shall not exceed three feet.
  - (iv) The top of berm for any surface pond embankment shall be minimum six feet wide.
- b) All surface ponds, including interior and exterior slopes, shall provide accessibility for maintenance and landscaping equipment as determined by the Director. Within the public storm system, ponds over 5,000 square feet in total size shall meet the following requirements:
  - (i) The bottom of the pond shall have ten feet as a minimum dimension.
  - (ii) Vehicular access shall be provided from the public right-of-way to the bottom of the pond through a 15-foot-wide access easement with slopes no greater than 5:1 (5-foot horizontal to 1-foot vertical).

NOTE: For the purpose of calculating pond area for this requirement, pond area shall be that area contained within the top of the embankment.

- c) Pond design shall give consideration to environmental concerns, landscaping appearance, and erosion control. All ponds shall be

landscaped so as to provide slope stability and pleasant appearance by utilizing sodding, seeding, and planting of trees and shrubbery. Floatable or erodible materials (i.e., bark dust) shall not be used in pond interiors.

- d) Maintenance of surface ponds in commercial, industrial, and multifamily developments shall be the responsibility of the property owner or owner's association. Maintenance of surface ponds in single family residential areas shall be the responsibility of the adjacent property owners except in the case of multiple use ponds accepted for maintenance by the City. Maintenance of landscaping and facilities of multiple use ponds in PUDs and multifamily residential developments shall be the responsibility of an owner's association or community club and shall be so stated on the face of the plat unless accepted for maintenance by the City.
- e) All City-maintained detention pond control structures not abutting a public right-of-way shall be accessible for maintenance and operation in all weather to the satisfaction of the Director. Access easements, minimum 15 feet wide from the public right-of-way to the control structure, shall be designed and constructed to accommodate vehicular traffic as determined by the Director. Fences shall not be constructed within the access easement, except for gates as approved by the Director.
- f) All detention ponds other than those in parking lots shall have a minimum of one foot of freeboard above the maximum design water surface. Detention basin overflow locations shall have adequate bank stabilization and erosion protection as approved by the Director.
- g) The minimum slope for the bottom of landscaped detention ponds shall be 3 percent. Lesser slopes will be reviewed on a case-by-case basis by the Director and may require a low-flow concrete channel.
- h) Building storm drains shall not outlet directly onto the surface of a detention pond unless otherwise approved by the Director. In those cases, permanent erosion protection shall be required to the satisfaction of the Director.
- i) Inlet/outlet structures of all surface ponds shall be designed with suitable debris barriers and erosion control measures to adequately protect the outlet from sedimentation or other debris.

### 3.05 Closed Detention Systems

- a) Maintenance of closed private detention or conveyance systems such as underground pipes, gravel-filled trenches, and both underground and surface vaults shall be the responsibility of the property owner or owner's association. The Director may require evidence of a legal and enforceable funding mechanism for operation, maintenance, repair, and replacement of closed private detention systems.
- b) Detention pipe sizes shall be unchanged between manholes. Adequate access to closed detention systems shall be required with access structures at each end of the facility. Manholes for closed detention systems shall be concrete unless otherwise approved.
- c) Design of pipes, fittings, and manholes for closed detention systems shall consider economy of maintenance and maximum practical design life, typically 75 years.

## SECTION 4 - OUTFALL DESIGN

### 4.00 General Requirements

The point of disposal for all stormwater within a development may be a storm drain pipe, open channel, curb and gutter, or other approved facility. The Director shall approve all points of disposal. Infiltration systems may be subject to the UIC program and registration requirements administered by DEQ.

As a condition of development, the Director may require a downstream analysis of the existing public or private drainage system. The minimum level of analysis shall generally extend downstream from the project to a point in the drainage system where the proposed development constitutes less than 15 percent of the total drainage area. The level of analysis required by the Director will vary depending upon site conditions, preexisting problems within the basin, and the size of development.

### 4.01 Outfalls to Open Channel Waterways

- a) Direct outfalls greater than four inches in diameter to open channel waterways shall typically be designed by a licensed engineer. Outfalls shall be constructed to minimize the potential for erosion and other potential damage to the waterway banks. Outfall designs shall address erosion and scouring within the waterway upstream and downstream of the outfall structure.
- b) Bank stabilization shall not reduce the carrying capacity of the water course. Bank stabilization designs shall consider the 10-year flow velocities of pipe outlets and 25-year flow velocities of open channel waterways (see Figure 3 for stone sizing guidelines). Where stones are placed within existing bank slopes, the bank shall typically be excavated a minimum of 18 inches or 1.5 times the size of the largest stone being used, whichever is greater.
- c) Flow from the outfall structure shall be directed downstream, typically no less than 30 degrees from perpendicular to the waterway flow.
- d) The outfall invert shall typically be located at the normal low water level of the waterway. At times when the waterway surface is higher than the normal low water level, the outfall invert shall be located as near the water surface as practicable to the satisfaction of the Director. The Director may require the developer to construct additional bank stabilization below the outfall invert at a later time when the waterway surface elevation has decreased. In such cases of delayed bank stabilization, the Director may require an acceptable performance security prior to approval.

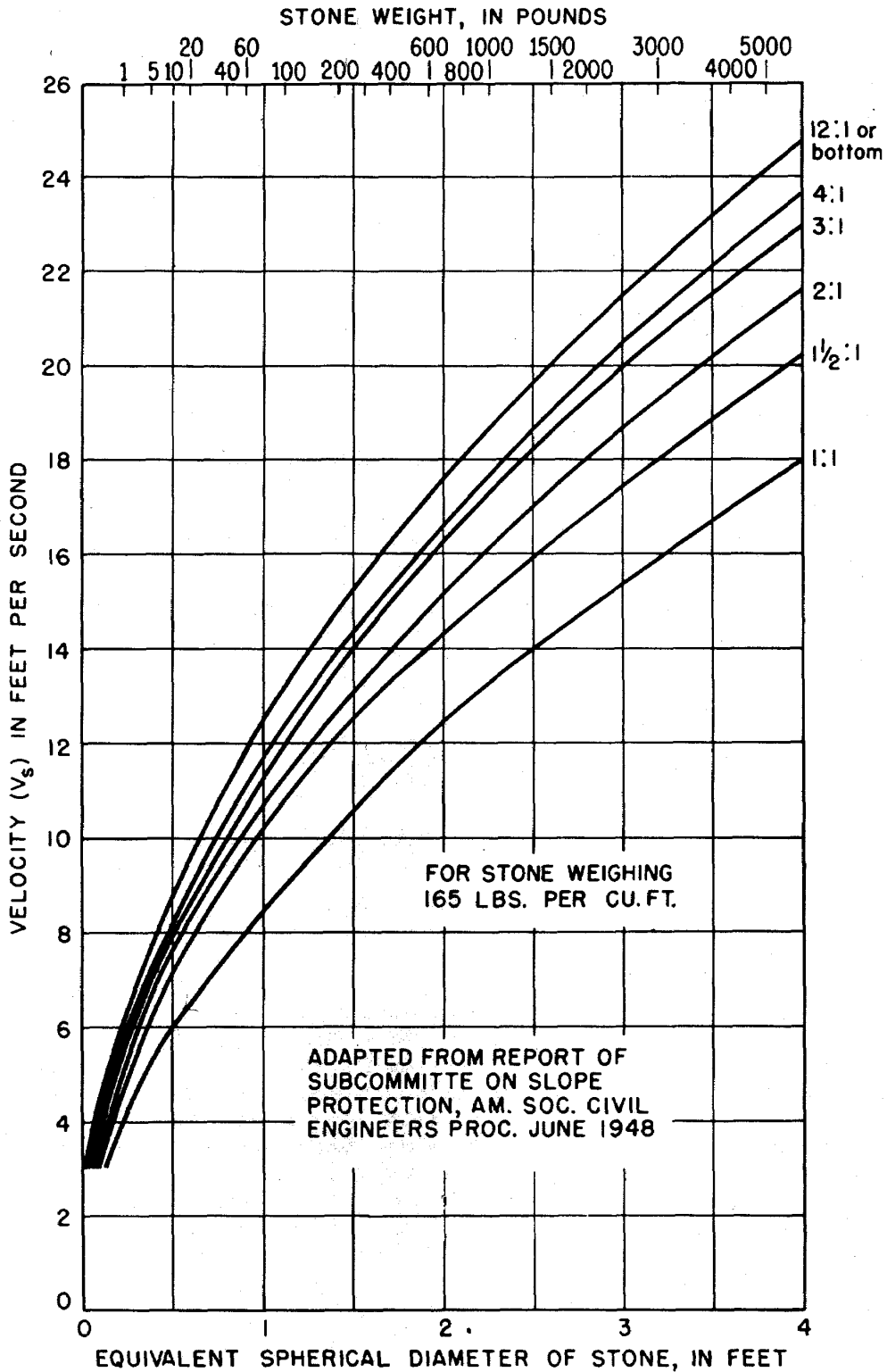


Figure 3: Size of Stone that will resist displacement for Various Velocities and Side Slopes

## SECTION 5 - CONVEYANCE SYSTEM DESIGN

### 5.00 General Conditions

- a) Conveyance systems, whether pipes or open channels, are classified according to the size of the drainage area contributing directly to the conveyance system.

Table 3 - Waterway Classifications		
Waterway Classification	Drainage Area	Waterway Example
A	150 Square Miles or Greater	Willamette River
B	10 to 150 Square Miles	Ash Creek
C	1 to 10 Square Miles	South Fork Ash Creek above Talmage Road
D	200 Acres to 1 Square Mile	Tributary to Middle Fork Ash Creek at Gentle Woods Park
E	50 to 200 Acres	48-inch Dalke Storm Sewer outlet at Madrona Park
F	Up to 50 Acres	Local storm drainage systems

When a drainage area discharges into multiple waterways, the Director will determine the Waterway Classification based on flow characteristics or other related information.

- b) Conveyance Systems shall generally be underground pipes. Exceptions may be approved by the Director on a case-by-case basis.

- c) Conveyance systems shall be designed and constructed in compliance with requirements of all applicable Federal, State, and local agencies. Written authorization of approval from other jurisdictions may be required at the Director’s discretion.
- d) Conveyance systems shall be designed and constructed such that the cumulative incremental effects of such work considered alone or together with existing or similar projects in the vicinity will not result in substantial damage to existing waterways and surface waters by erosion, siltation or sedimentation, significant adverse effects to water quality, increased downstream water velocity, significant harmful deterioration of groundwater drainage, or significant deterioration of aquatic wildlife habitat as determined by the Director.
- e) Conveyance systems shall be designed and constructed in accordance with floodplain management policies and regulations in accordance with MDC Chapter 51 and other National Flood Insurance Program requirements as determined by the Director.

5.01 Capacity

- a) Conveyance systems shall be constructed to carry the designated design storm, flowing full as shown in Table 4:

<b>Table 4: Design Storm</b>	
<b>Waterway Classification</b>	<b>Design Storm</b>
A, B, C	100-Year
D, E	25-Year
F	10-Year

Special flood hazard areas within Waterway Classifications D, E, or F may require 100-year capacity as determined by the Director.

- b) Manning’s Formula shall generally be acceptable for determining pipe or open channel capacity only within Waterway Classifications E and F. Backwater effects shall be included in determining capacity for Waterway Classifications A, B, C, and D, typically using HEC-RAS or equivalent computer modeling software.



5.02 Piped Systems

a) Size

Main line and lateral storm drains shall be not less than 10 inches inside diameter, except as approved by Director. If a storm drain pipe is accessible only through a catch basin or otherwise has limited access, the Director may require a minimum 12-inch inside diameter.

b) Slope Requirements

All storm drains shall be laid on a grade which will produce a mean velocity (when flowing full) of at least 2½ feet per second, based upon Manning's pipe friction formula using a roughness coefficient as described in Section 5.02(c) Manning's Roughness Coefficient. The minimum acceptable grade for various pipe sizes with a Manning's Roughness Coefficient of 0.013 is shown in Table 5.

<b>Table 5 Minimum Pipe Grade for Storm Sewers with n = 0.013</b>		
<b><u>Inside Pipe Diameter</u> (inches)</b>		<b><u>Grade</u> (feet per 100 feet)</b>
8	(private)	0.52
10		0.39
12		0.30
15		0.23
18		0.18
21		0.14
24		0.12
27		0.10
30	(and larger)	0.09

The minimum grade may be reduced from the above table to produce an absolute minimum velocity of 2.0 fps upon approval of the Director. The maximum grade is 20 percent except as approved by the Director.

Engineers are cautioned not to specify storm drains of sizes which are obviously larger than is necessary for satisfactory carrying capacity but which are specified in order to meet grade requirements, i.e., a 12-inch pipe for a 10-inch pipe to acquire a decrease in slope.

c) Manning’s Roughness Coefficient

Manning’s Roughness Coefficient (“n”) is typically provided by the pipe manufacturer for new construction. The “n” value for existing pipes varies based on material, condition, interior wall configuration, and other related factors as shown in Table 6.

<b>Table 6: Manning’s Roughness Coefficients for Existing Pipes</b>	
<b>Pipe Material</b>	<b>“n” Value Range</b>
Plastic (PVC, HDPE)	0.009-0.013
Concrete	0.013-0.015
Ductile Iron	0.013-0.015
Cast Iron	0.013-0.015
Corrugated Metal	0.013-0.032

d) Pipe Materials

Pipe materials for public storm drains shall conform to Standard Construction Specifications. Acceptable pipe materials and abbreviations are as follows:

PVC—Polyvinyl Chloride

HDPE—High Density Polyethylene

CMP—Corrugated Metal Pipe

CONC—Concrete

DI—Ductile Iron

The Director may require pipe load analysis calculations in unusual situations, typically in areas where the depth of ground cover over the pipe is not within the limits specified by the pipe manufacturer.

Alternate materials will be approved on a case-by-case basis. The design engineer shall provide manufacturer's specifications, design calculations, or other information as required by the Director.

e) Alignment/Location

- (i) Typically, storm drains shall be located in the street right-of-way within two feet of the curblin and preferably on the low side of the street, except when catch basin location warrants otherwise.
- (ii) Storm drains shall generally be laid on a straight alignment between junctions. Pipes may be laid with horizontal or vertical curvature according to manufacturer's specifications as approved by the Director.
- (iii) Utility crossings shall be constructed as near 90 degrees as practicable. Utility crossings with less than six inches of vertical separation shall be backfilled with controlled density backfill or other approved material. Utility crossings with six inches or greater vertical separation may require granular or other special backfill as specified by the Director.
- (iv) Where storm drains parallel other utility pipe or conduit lines, the vertical and horizontal alignment shall permit future side connections of main or lateral storm drains and avoid conflicts with parallel utilities without abrupt changes in vertical grade of main or lateral storm drains.
- (v) Storm drain alignments shall accommodate future planned projects such as street widening, changes in horizontal or vertical street alignment, and master plan water or sewer facilities.

f) Cover Requirements

- (i) All storm drains shall be laid at a depth sufficient to protect against damage by traffic and to drain building footings and underfloors where practical. Depth is measured from top of pipe to finish grade at the storm drain alignment.
- (ii) Under normal conditions, minimum cover shall be 30 inches above the top of the pipe. Pipes designed with less than 30 inches of cover shall be approved by the Director on a case-by-case basis and may require special bedding and/or backfill, load calculations,

manufacturer's specifications, specific pipe materials, or other additional requirements.

- (iii) In areas of relatively flat terrain, the design engineer must demonstrate that sufficient depth is provided at the boundary of the development to properly drain the remainder of the upstream basin area tributary to the site.

g) Junctions

- (i) Storm drain pipe junctions shall be cleanouts, catch basins, manholes, or other approved junctions as shown in the standard plans. Oversized manholes and other specialized junctions shall be approved on a case-by-case basis by the Director.
- (ii) Piped storm drain systems shall have junctions at not more than 450-foot intervals.
- (iii) Catch basin laterals may connect to a storm main line without a junction when the lateral is less than 20 feet long and a maximum 12 inches in diameter and when the main line is not less than 18 inches in diameter.
- (iv) Catch basins and cleanouts shall be used as junctions only with pipes less than 18 inches in diameter for depths up to 5 feet from rim to invert.
- (v) When the outlet pipe is larger than the inlet pipe, the inverts shall be designed so that pipe crowns shall have the same elevation. When the outlet pipe size matches the inlet pipe size, sumped junction outlet inverts shall be located not less than 0.1 foot and not greater than 1 foot below all junction inlets. Variations shall be approved on a case-by-case basis.
- (vi) Junctions located outside the public right-of-way shall generally be minimum 48-inch-diameter manhole structures except as approved by the Director.

h) Inlets

- (i) Inlets shall be designed to completely intercept the ten-year design storm gutter flow with no greater than 400 feet between inlets. Flow paths shall not cross intersections, so inlets shall be installed at intersections as needed.
- (ii) Type 2 catch basins are generally required for all curbed street inlets and shall be generally located in the right-of-way at private property boundaries. Inlets shall not be located at driveways or pedestrian

ramps; Type 1 catch basins may be used when a curb inlet is impracticable as determined by the Director.

- (iii) Inlets shall be located along the gutter line or open channel flow-line. When streets are widened or otherwise modified, causing an inlet to be located outside a flow-line, the inlet shall be removed entirely and reconstructed with a cleanout, manhole, or other acceptable junction as specified by the Director.

i) Subsurface Drainage

Subsurface drains shall be constructed with adequate erosion protection and shall discharge into the public storm drain system only as provided by the Director. Subsurface drains may be required by the Director as follows:

- (i) Excavations and fills, with or without retaining walls, which exceed 4 feet vertically.
- (ii) Any development within areas of existing springs or high groundwater levels.

j) Easements

- (i) Piped storm systems shall generally be located in the right-of-way. When design conditions require locating storm drains in easements, the storm drain shall typically be centered in the easement. An easement may be centered on a property line only if the pipe centerline is located within 18 inches of the property line.
- (ii) Storm drain easements shall be minimum 15 feet wide for pipes up to 36 inches in diameter. Easements for pipes over 36 inches in diameter shall be 20 feet wide or greater as determined by the Director.
- (iii) Storm drain easements shall typically be exclusive. Combined easements shall be approved by the Director on a case-by-case basis.
- (iv) All junction or inlet structures in easements shall be accessible to City of Monmouth maintenance personnel at all times. A minimum 15-foot-wide access easement is required between the nearest right-of-way and each structure. Paved or gravel access roads shall be required by the Director if access is otherwise unavailable.
- (v) All easements shall be furnished to the City for review and approval prior to recording.

### 5.03 Open Channel Drainage

#### a) General Considerations

- (i) Open channels shall generally have a natural curvilinear alignment with a 100-foot-minimum flow-line radius and a low-flow channel designed to convey the appropriate design storm (See Table 4).
- (ii) Banks shall be designed with a minimum one foot of freeboard above the design storm. The surface configuration at the top of bank should provide adequate accessibility for maintenance as determined by the Director.

#### b) Slope Requirements

- (i) Bank slopes shall generally be no steeper than 3:1 (3 horizontal to 1 vertical). In areas where 3:1 side slopes are impracticable because of existing natural features or other limitations obstructing the channel, the bank slope shall generally be no steeper than 2:1. If the top of bank is a berm, the backslope shall generally be no steeper than 2:1 and shall be graded to prevent localized ponding. In areas of potential instability, the Director may, at his discretion, require grading to be designed by a geotechnical engineer.
- (ii) The flow-line slope is generally dictated by the natural contours. The minimum flow-line slope is 3 percent where practicable, but in no case shall the design flow velocity be less than two feet per second except as approved by the Director.

c) Manning’s Roughness Coefficient

Manning’s Roughness Coefficient (“n”) shall generally comply with the ODOT Hydraulic Manual. Typical “n” value ranges are shown in Table 7.

<b>Table 7: Manning’s Roughness Coefficients for Open Channels</b>	
<b>Description</b>	<b>“n” Value Range</b>
Concrete-lined open channel	0.012-0.020
Rock-lined open channel	0.015-0.045
Vegetated swale with short grass	0.022-0.035
Vegetated channel with periodic maintenance	0.030-0.120
Natural waterway (surface width <100 feet)	0.030-0.220
Major waterway (surface width >100 feet)	0.020-0.040

d) Bank Stabilization

Open channel waterways shall be designed and constructed with temporary and permanent bank stabilization measures in all locations. Specialized bank stabilization shall be considered as follows:

- (i) In Waterway Classifications A, B, C, and D, natural bank stabilization measures (i.e., slope pull-back, willow mats, rock barbs, or revegetation with localized native plant species) shall be used where practicable unless otherwise approved by the Director.
- (ii) Areas of extreme curvature, changes in channel cross-section, or low-flow channels with design flow velocities exceeding three feet per second shall be designed and constructed with bank stabilization to consider additional potential for scouring from turbulent flows.
- (iii) Post-construction bank stabilization shall minimize the potential for erosion or sedimentation.
- (iv) In areas of waterway convergence or other points of disposal, bank stabilization shall meet the requirements of Section 4 – Outfall Design.

e) Easements

- (i) Open channel easement widths shall be the 100-year floodway, 15 feet from the channel centerline, or 10 feet from the top of the recognized bank, whichever is greater.
- (ii) All easements shall be furnished to the City for review and approval prior to recording.



CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS  
DESIGN STANDARDS

CHAPTER 5  
WATER DISTRIBUTION



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## 5.00 General Design Considerations

The system shall have sufficient capacity to maintain 40 psi at the building entrance for one- and two-family dwellings. For other development provide minimum pressure of 35 PSI at the building side of the meter during periods of maximum use, and to provide sufficient volumes of water at adequate pressures to satisfy the expected daily consumption plus fire flows. Normal working pressure in the distribution system should be approximately 60 PSI with a range of 40 PSI to 100 PSI.

In general, water distribution systems should be designed to care for maximum development of the service area with recognition of possible urban renewal, industrial expansion, etc.

As a condition of water service, all developments will be required to provide public water mains of sufficient size for fire protection to adjacent parcels. This shall include the extension of water mains in easements across the property to adjoining properties and across the street frontage of the property to adjoining properties when the main is located in the street right-of-way.

Head loss shall be determined by the Hazen-Williams equation.

### Value Table

Pipe Diameter	C Value
8 Inches and Less	100
10 to 12 Inches	110
Greater than 12 Inches	120

Velocities in mains shall normally range from three to six feet per second for average demand to a maximum velocity of ten (10)\* feet per second for combined average demand plus fire flow. A 20-PSI residual pressure under fire flow conditions shall be maintained in the distribution system where the existing static pressure is less than 40 PSI (upper service level regions). Generally, a maximum velocity of ten (10) feet per second will govern for sizing mains at all other locations of the service level.

\*Private systems shall limit velocities as required by the Oregon State Plumbing Specialty Code, Installation.

## 5.01 Water System Capacity

Design capacities shall be determined by consideration of the following factors and assumptions:

- a) Area to be served, both immediate and adjacent;
- b) Current and projected population within the areas to be served;
- c) Current and projected land use within the areas to be served;
- d) Commercial, industrial, or institutional users to be served;
- e) Changes in any of the above factors which are likely to occur within a foreseeable time period.

In the absence of consumption data or other reliable information, the following factors are assumptions:

- a) Peak hour demands are as follows:
  - 0.75 gpm per person for single family residential
  - 0.25 gpm per person for multiple family residential
  - 5,000 gal/ac/day for commercial development
  - 10,000 gal/ac/day for industrial development
- b) Demand for unique commercial installations, industrial users, PUD's, multiple, and institutional concerns will be calculated on an individual basis.
- c) Fire flows shall be as prescribed by Polk County Fire District #1 and the Oregon Fire Code (OFC):
- d) Commercial Buildings: The minimum available fire flow and duration shall be determined according to OFC Appendix B (OFC B 105.1).

Land Use	Fire Flows (GPM)	Duration (Hr.)
Industrial	5,500	4
Downtown	5,000	4
Commercial	4,000	3
Multiple Family	3,500	2
Residential	1,000	2
All Others	1,000	2

## 5.02 Main Classification

### f) Supply Mains (Transmission Mains)

Mains which are used for transporting water from the source of supply and storage reservoirs to the centralized point of distribution and distribution reservoirs.

### g) Feeder Mains

Mains which transport water from centralized points of distribution and distribution reservoirs, to the various points of interconnection with the grid system of mains and centralized points of consumption. There are two types of feeder mains:

- (i) Primary - Those feeder mains not supplying individual consumers, but their sole purpose being to transport water from centralized points of distribution to various points of interconnection with the grid system and centralized points of consumption.
- (ii) Secondary - Those feeder mains which serve the same purpose as any other feeder mains except that individual consumers are served by this group, due either to the fact that no other main is available or that the required supply to the consumer demands a large main.

### h) Distribution Mains

All mains which are used for supplying the individual consumer. As a general rule these are the small mains in the water supply system.

### 5.03 Water System Requirements

The physical design requirements for public water main systems in the City are contained in this chapter. These design requirements may be used for private systems, provided the system is designed by a registered professional civil engineer.

### 5.04 Pipe Materials

All water mains and services shall be designed for a cold water test pressure of 150 PSI (refer to AWWA C 150 (76) and CIPRA Technical Bulletin "Designing for Ductile Iron Pipe.") Fittings and valves shall be specified to have a test pressure of 250 PSI.

PVC pressure pipe with diameters of 4 in thru 12 in shall conform to AWWA C900. The pipe shall have electrometric gasket joints conforming with ASTM D 3139. Gaskets will conform with ASTM F 477 and ASTM D 1869.

PVC pressure rated pipe shall conform to ASTM 2241. The joints shall be electrometric gasket or solvent cement welded. Gasket joints shall conform with ASTM F 447 and ASTM D 1869. Solvent cement welded joints shall conform with ASTM D 2672 or ASTM D 3036. Solvent shall conform to ASTM D 2564.

Six-inch (6) through thirty-inch (30) - DUCTILE IRON PIPE shall conform to ANSI A21.51 (AWWA C151), thickness Class 50 Ductile Iron Pipe (four-inch shall be Class 51) and shall be standard thickness cement lined conforming to ANSI A21.10 (AWWA C110). Joints shall be rubber gasket of either the push-on or mechanical joint type conforming to ANSI A21.11 (AWWA C111). Higher thickness class may be required where analysis indicates abnormal loading condition (see AWWA H-3).

Fourteen-inch (14) and Larger - Special Conditions - Acceptable alternate materials for large supply mains when soil conditions are suitable and when a minimum of service connections are to be connected to the main include Ductile Iron, reinforced concrete water pipe, steel cylinder type, pretensioned conforming to AWWA C303.

### 5.05 Main Size

#### a) Grid System

The distribution system mains shall be looped at all possible locations. The installation of permanent dead-end mains upon which fire protection depends and areas of large demands on single mains will not be permitted.

b) Size of Pipe

2 inch	Shall not be used as part of the distribution system, but for services only.
3 inch	Shall not be used as part of the distribution system but for services only downstream of the meter.
4 inch	Shall not be used as part of the distribution system but for services only downstream of the meter.
6 inch	Minimum size residential subdivision distribution water main for the grid (looped) system, not to exceed an unsupported length of 600 feet and shall not be permanently dead-ended. Looping of the distribution grid shall be at least every 600+ feet.
8 inch	Minimum size for permanently dead-ended mains supplying fire hydrants with a fire flow less than 2,000 gpm and for secondary feeder mains in residential subdivisions.
12 inch	And larger as required for primary feeder mains and mains in industrial subdivisions.

All dead-end mains shall terminate with a blow-off assembly. Permanent dead-ends shall have a blow-off assembly as per the Standard Plans. Mains which can conceivably be extended at some later date shall have a blow-off assembly as per the Standard Plans. Where curbs exist, the blow-off shall be located in front of the curb at least five (5) feet from the curb face.

5.06 Minimum Depth

The standard minimum cover over buried water mains within the street right-of-way except the paved area shall be thirty-six (36) inches from finish grade referenced from the existing top of curb or proposed top of curb elevation. The paved area of the street right-of-way shall have a minimum cover of thirty (30) inches.

The minimum cover for mains in easements across private property shall be thirty-six (36) inches.

Finish grade shall normally mean the existing or proposed top of curb elevation. Where the main is located in the cut or fill side slope or where mains are located in easements, finish grade shall mean at the water main alignment. The intent is to

provide a minimum cover over the pipe of 30 inches in the street right-of-way and 36 inches in easements.

#### 5.07 Location

a) Relation to Sewer Lines and Other Utilities

Water lines shall be separated from other utilities in accordance with OAR 333.

b) Water Mains Within Street Right-of-Way

The standard location for water mains within public streets and roads shall be at the backside of the sidewalk and preferably on the south and west sides of the street. Exceptions to these requirements may be made in order to avoid conflicts with other existing underground facilities, and to permit sanitary sewers to be installed on the low sides of streets.

Mains shall not be installed in alleys. As nearly as practical, mains shall be installed on a particular street with the distance from the curb line of the street varied as little as possible. On curved streets, mains may be laid on a curve concentric with the street centerline with deflections no greater than the manufacturer's specifications, or mains may be laid in straight lines along the tangent between selected angle points to avoid conflicts with other utilities. The angle point and tangent section shall not be less than three (3) feet in front of the curb face.

c) Within Easements

Mains laid in easements along property line, with the easements centered on property line, shall be offset 18 inches from the property line. The installation of mains within easements across privately owned property is to be done only when absolutely necessary, such as the avoidance of dead-end conditions. Such easements, when required, shall be exclusive and a minimum of ten (10) feet in width except that the minimum width shall be twenty (20) feet or more for transmission water mains and the conditions of the easement shall be such that the easement shall not be used for any purpose which would interfere with the unrestricted use for water main purposes. Under no circumstances shall a building or structure be placed over a water main or water main easement. This includes overhanging structures with footings located outside the easement. The intent is to provide an unobstructed area above the easement in which to operate or repair equipment.

Easement locations for public mains serving a PUD, apartment complex, or commercial/industrial development shall be in parking lots, private drives, or similar open areas which will permit an unobstructed vehicle access for maintenance by City forces.



Easement widths shall vary from the ten (10) foot minimum by five (5) foot increments, i.e., 10, 15, 20 feet, etc. Easements must be from the property owner to the City of Monmouth prior to construction.

Common placement in the easement of water, sewer, and storm drain line may be allowed under certain conditions.

Common easements will be reviewed on a case-by-case basis. Separation of utilities must meet State of Oregon Department of Environmental Quality and Health Division requirements.

All easements must be furnished to the City for review and approval prior to recording.

#### 5.08 Service Water Crossing

Surface water crossings of mains shall be in accordance with OAR 333 and the following.

- a) Mains crossing stream or drainage channels shall be designed to cross as nearly perpendicular to the channel as possible.
- b) The following water surface crossings will be treated on a case-by-case basis:
  - (i) Stream or drainage channel crossing for pipes of twelve (12) inch inside diameter and greater.
  - (ii) River or creek crossings requiring special approval from the Division of State Lands.
- c) The minimum cover from the bottom of the stream bed or drainage channel to the top of pipe shall be thirty-six (36) inches.
- d) A scour pad centered on the water line will be required for mains less than twelve (12) inch inside diameter when the cover from the top of the pipe to the bottom of the stream bed or drainage channel is thirty (30) inches or less. The scour pad shall be six (6) inches thick and six (6) feet wide reinforced with number four bars twelve (12) inches on center both ways and shall extend to a point where a one-to-one slope, that begins at the top of the bank and slopes down from the bank away from channel center line intersects the top of the pipe.

#### 5.09 Valves

##### a) Sizes

In general, valves shall be the same size as the mains in which they are installed.

b) Location

Distribution system valves shall be located at the tee or cross fitting as nearly as possible. Wherever a conflict exists with curbs, etc., the valve shall be located at the intersection of the main with a property line. There shall be a sufficient number of valves so located that not more than four (4) and preferably three (3) valves must be operated to affect any one particular shutdown. The spacing of valves shall be such that the length of any one shutdown in high value areas shall not exceed 500 feet or 800 feet in other areas.

In general, a tee-intersection shall be valved in two branches and a cross-intersection shall be valved in three branches. Transmission water mains shall have valves at not more than 2,000 foot spacings and preferably 1,300 foot spacings. Hazardous crossings, such as creek, railroad, and freeway crossings, shall be valved on each side.

Distribution taps on transmission mains shall not be spaced less than 1,300 feet apart where practical and shall be valved and plugged.

c) Phased Construction

Water mains installed by phased construction, which will be extended in the future, shall terminate with a valve and blow off as per the Standard Plans.

A plug and blow off termination may be used if the main is less than 120 feet in length and service taps are not provided to the properties fronting the line. Future service connections will not be allowed until a valve is installed or a main is extended.

All developments will be required to extend mains across existing or proposed streets for future extensions by the City of other developments. All terminations shall be planned and located such that new or existing pavement will not have to be cut in the future when the main is extended.

5.10 Backflow Prevention

a) General

Location, design, and requirements of backflow prevention devices shall be in accordance with OAR 333-061.

5.11 Fire Hydrants

a) Coverage

Distribution of hydrants shall be based upon the required fire flow and the area served, as prescribed by the PCFD #1 Fire Code Applications Guide. Preferred coverage shall result in hydrant spacing of 500 feet in residential areas, 300 feet in high-value districts including industrial subdivisions and no further than 250 feet from any dwelling, business, garage, or building.

Hydrant stubs will be required for installation in areas of currently minimum development.

b) Location

No fire hydrant shall be installed on a main of less than eight inch inside diameter unless it is in a looped system of six inch mains. The hydrant lead shall be a minimum six (6) inch inside diameter.

Hydrants shall be located as nearly as possible to the corner of street intersections and at least 200 feet from any cul-de-sac radius point.

No hydrant shall be installed less than five (5) feet from an existing utility pole or guy wire nor shall a utility pole or guy wire be placed less than five (5) feet from an existing hydrant.

c) Hydrant Valves

All hydrants shall be provided with non-threaded quick connectors in accordance with PCFD #1 Fire Code Applications Guide. Each fire hydrant shall have a hydrant valve and valve box at the main line tee which will permit repair of the hydrant without shutting down the main supplying the hydrant. Such hydrant valves shall be resilient wedge gate valves conforming to the Standard Construction Specifications. The hydrant valve shall have mechanical joint-flange joint ends. The valve shall be connected directly to the water main using a mechanical joint or flange joint tee. When the water main is located behind the curb and property line walks exist, a length of pipe (hydrant lead) shall be installed between the tee and auxiliary valve when the hydrant cannot be installed next to the main. Such cases are when the main is located in the pavement under curb line walks or the street is widened. Said hydrant tee to have no thrust blocking. Refer to Standard Plans for illustration.

## 5.12 Air Release Valves

An air release valve shall be permanently installed at high points on all water mains ten (10) inch inside diameter and greater where air can accumulate. An automatic air release valve shall be installed in a manhole off the street where flooding of the manhole or chamber will not occur. In all cases the air outlet or inlet shall be piped to a point of free discharge not causing a cross-connection.

Mains less than ten (10) inches in diameter may make use of a service line system for release of air during construction.

a) Air Release Valve Piping

The open end of an air release pipe from automatic valves shall extend to the top of the manhole to at least twelve (12) inches above grade and provided with a screened, downward facing elbow. Grade shall mean the

existing ground elevation adjoining the manhole. An opening twice the size of the vent pipe shall exist at grade to prevent flooding of the vault.

b) Chamber Drainage

Chambers or manholes containing valves, blow-offs, meters, or other such appurtenances to a distribution system shall not be connected directly to any storm drain or sanitary sewer. Such chambers shall be drained to the surface of the ground where they are not subject to flooding by surface water.

5.13 Service Lines

The term "service line" is meant to be used only for the water line extending from the distribution main to the using meter, backflow prevention device, or private fire system double check valve.

a) Sizes

The sizes of service lines which may be used are 1", 1-1/2", 2", 4", 6", 8", 10", and 12". Service lines will be reviewed for effects on the distribution system and shall not be greater in size than the distribution main.

Service piping shall be equal to or greater than the meter size, however, three (3) inch meters require a four (4) inch tap and four (4) inch minimum piping and fittings.

For three (3) inch and greater services, a design drawing must be submitted showing the vault and fitting requirements (see Section 1.14), with the expected flow requirements and proposed usage.

b) Location

(i) Domestic

The service lines shall normally extend from the main to 18 inches behind the sidewalk with the curb stop and meter and meter box being located at the termination of the service connection. In general, individual service connections shall terminate in front of the property to be served and shall be located two (2) feet each side of a common side property line. The domestic service shall not be connected to fire protection service. A backflow prevention assembly shall be placed on domestic service lines as required.

(ii) Fire Service

The service line shall normally extend from the main to the meter.

A backflow prevention assembly shall be placed on fire service lines as required. Exceptions for flow through potable systems will be reviewed on a case-by-case basis.

Plans for fire services shall include a vicinity map, adjoining street name, width, curb and property line, location of existing water line referenced to property line, existing hydrant locations, and the distance to property pins where the service crosses the property line.

SPECIAL NOTE: 1) Private customer lines are under the jurisdiction of the City of Monmouth Building Department; and 2) A pump shall not be used on a service line to provide adequate pressure to a subdivision lot or property located above the pressure level of the supply main.

c) Materials

Pipe materials shall be designated on the plans and shall conform to the Standard Construction Specifications.

5.14 Meters

All water meters scheduled for services inside the City of Monmouth will be furnished and installed by City forces at the request and expense of the customer. Exception: The service line and meter box must be placed with water mains installed by the developer and installed as part of a detector backflow prevention assembly. All meters shall read in cubic feet.

a) Meter Boxes

Unless otherwise approved, all meter boxes must be as shown:

5/8" x 3/4"	Armorcast Box # 09-0671; Lid # 09-0676
1"	Armorcast Box # 09-0671; Lid # 09-0676
1-1/2"	Armorcast Box
2"	Armorcast Box
3" and above	Vault built to City of Monmouth requirements

b) Location

The meter, with approval by the City, may be located in the same vault with a backflow prevention device, provided a completed dimensioned design is submitted with a request for variance.

Meters shall be located at the termination of the City service line.

(i) 3/4" through 2" meters-

Installed in the right-of-way in a location that allows for easy reading and maintenance, preferably 18 inches behind the sidewalk.

(ii) 3" and larger-

Near the curb or in the public right-of-way to allow easy reading and maintenance without entering private property. It must be accessible with a crane truck to within ten (10) feet of the installation with a ten (10) foot vertical clearance.

The meter, vault, and piping are to be protected from freezing, vandals, and vehicles. The area around the vault must be sloped in such a manner to prevent storm water from ponding over or running into the vault.

A minimum three (3) foot clear space must be provided around the vault to provide ample working space for maintenance.

5.15 Mobile Home Parks

The review of plans and the inspection of mobile home parks are under the jurisdiction of the City of Monmouth, Building and Safety Division. Private distribution systems shall be designed in accordance with the Oregon Plumbing Specialty Code.

All public water mains within mobile home parks shall be in public right-of-way or exclusive easements to the City of Monmouth and shall conform to these design standards. Each connection of the mobile home park private water system to the City system shall be through a backflow prevention assembly and meter.

5.16 Planned Unit Developments (PUD)

General design consideration shall conform to requirements set forth by the State Department of Human Resources, Health Division, by the Oregon State Plumbing Specialty Code (Ch. 10), and these design standards.

Previously introduced requirements for capacity, materials, grid, valves, fire protection, service lines, and meters shall also be applicable to design within PUD areas.

Standard Plans		
001-099	Miscellaneous	
100-299	Sewers and Drains	
300-399	Streets	
400-499	Water	
500-599	Structures	
600-699	Earthwork	
700-799	Street Lighting and Traffic Signals	
800-899	Landscape and Irrigation	

Standard Plan No.	Title	Date
<b>Miscellaneous</b>		
004	Testing Requirements	
006	Pipe Encasement	
008	Monument Box Installation Detail	
009	Monument Box Casting Detail	
<b>Sanitary Sewers and Storm Drain</b>		
101	Manhole	
102	Drop Manhole Details	
103	Inside Drop Manhole	
104	Manhole Adjustment Sequence	
105	Sanitary Sewer Cleanout	
106	Sanitary Service	
107	Manhole Casting Detail	
108	45° Cleanout Frame & Lid	
109	Plug for New Sanitary Sewer	
110	Plugs for Abandoning Sanitary Sewer	
112	Casing Detail	
113	Anchor Block Details for Sanitary Sewer	
114	Deep Connection Riser ( Chimney)	
115	Sewer Service Reconnections	
117	Tamperproof/Waterproof Manhole Frame and Cover	
<b>Storm Drains</b>		
200	Type 1 Catch Basin (and Cleanout)	
201	Type 2 Catch Basin	
202	Type 3 Catch Basin	
203	Type 4 Catch Basin	
204	Catch Basin Frame and Grate Type B	
205	Round Storm Drain Cleanout	
211	Shallow Precast Manhole	
214	Cleanout Cover Conversion	
<b>Streets</b>		
301	Driveway Approach - Curb Line Sidewalk	
302	Driveway Approach - Property Line Sidewalk	

303	P.C.C. Curb and Gutter Detail	
304	Public Alley Detail - P.C.C.	
306	Sidewalk Details	
307	Sidewalk Ramp	
308	Mid-Block Walk Entrance Traffic Control	
309	Pavement Patching	
310	Permanent Barricade	
311	Widened Sidewalk at Mailbox Locations	
315	Commercial Curb Returns for Driveway and Alley Approach	
316	Hammerhead Turn Around	
318	Typical Street Sections	
318A	Typical Street Sections	
<b>Water</b>		
400	Water Valve Box	
401	Horizontal Thrust Blocking	
401.5	Joint Restraint for PVC Pipe	
402	Vertical Bend Anchor Block Detail	
403	4" to 16" Tied Back Thrust Block Schematic and Dimensions	
404	4" to 16" Tied Back Thrust Block Construction Details	
405	Blow-off with In-Line Valve	
406	Blow-off with In-Line Valve for 10" Diameter Pipe and Larger	
407	Blow-off with Plugged End	
410	1" Water Service Installation	
411	1" Water Service Replacement	
411A	1 1/2" & 2" Domestic Water Service Installation	
412	Main Line Chlorination Assembly	
413	Fire Hydrant Installation	
414	Combination Air Release and Valve Assembly 2" and Smaller	
419	Water Sampling Station	
420	1 1/2" or 2" Irrigation Water Service Installation	
<b>Structures</b>		
501	Retaining Wall - Height of Wall 2' 0" or Less	
506	Meter and Vault Size and Specifications	
<b>Earthwork</b>		
601	Pipe Trench	
605	Pipe Zone	
<b>Street Lighting and Traffic Signals</b>		
<b>Landscape and Irrigation</b>		
801	Irrigation System Back Flow Protection	
802	Swing Joint Riser Assembly	
803	Tree - Shrub Planting Detail	



COMPONENT	REQUIREMENT	MIN	RESP.	NOTE	SCHEDULE	
STREETS	SUBGRADE	1 TEST/4000 S.F./LIFT	4	CONTR.	1	IMMEDIATELY PRIOR TO BASE AGGREGATE
	PROOF ROLL-LOADED TRUCK		1	CONTR.	2,3	
	BASE AGGREGATE	1 TEST/4000 S.F./LIFT	4	CONTR.	1	IMMEDIATELY PRIOR TO ASPHALT
STREETS	PROOF ROLL-LOADED TRUCK		1	CONTR.	2,3	
	ASPHALT	1 TEST/4000 S.F./LIFT	4	CONTR.	1	AS PLACED
STORM	BACKFILL-MAINLINE	1 TEST/200 LF	4	CONTR.	1	
	BACKFILL-LATERALS	1 TEST/SVC	1	CONTR.	1	
	BACKFILL-MANHOLE	2 TESTS/STRUCTURE	2	CONTR.	1	PRIOR TO MANDREL
	MANDREL TEST	PER APWA REQMTS	1/RUN	CONTR.	2,3,4	
SANITARY	BACKFILL-MAINLINE	1 TEST/200 LF	4	CONTR.	1	
	BACKFILL-LATERALS	1 TEST/SVC	1	CONTR.	1	PRIOR TO MANDREL
	BACKFILL-MANHOLE	2 TESTS/STRUCTURE	2	CONTR.	1	
	MANDREL TEST	PER APWA REQMTS	ALL	CONTR.	2,3,4	
	AIR TEST	PER APWA REQMTS	ALL	CONTR.	2,3	
WATER	TV INSPECTION	ALL LINES	ALL	CONTR.	5	AFTER BASE AGGREGATE PREP
	MANHOLE VACUUM	PER APWA REQMTS	ALL	CONTR.	1,2,3	
	PRESSURE TEST	PER APWA REQMTS	ALL	CONTR.	2,3	AFTER BASE AGGREGATE PREP
	BACTERIA TEST	PER OHD REQMTS	ALL	CONTR.	1	AFTER ALL SERVICES COMPLETE
	CHLORINE TEST	PER CITY REQMTS	ALL	CITY	2	
WATER	FIRE FLOW TEST	PER CITY REQMTS	ALL	CITY	2	AFTER STORM IS FUNCTIONAL

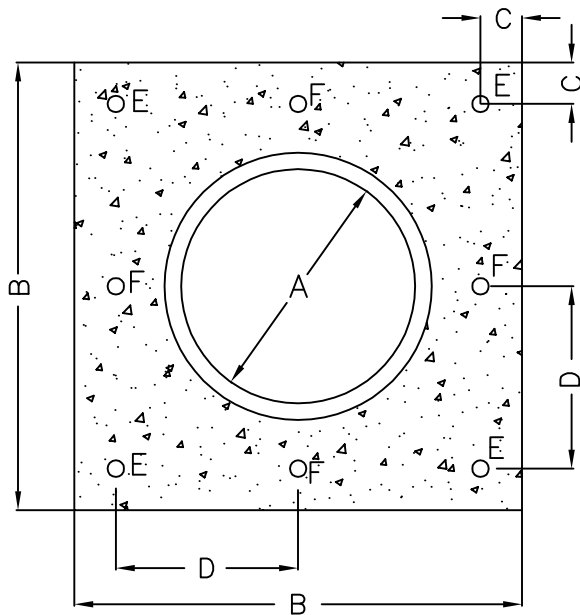
**NOTES:**

- TESTING MUST BE PERFORMED BY AN APPROVED INDEPENDENT TESTING LABORATORY. PROVIDE THE CITY WITH CERTIFIED LOCATION AND TEST RESULTS.
- 48 HOUR NOTICE REQUIRED FOR ALL WITNESS AND CITY PERFORMED INSPECTIONS.
- MUST BE WITNESSED BY CITY.
- CLEAN LINES PRIOR TO TESTING.
- USE ROTATING HEAD CAMERA, 1-INCH BALL, INSPECT ALL SERVICES.

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

CITY OF MONMOUTH  
 DEPARTMENT OF PUBLIC WORKS  
 STANDARD PLAN  
 TESTING REQUIREMENTS

LAST REV BY BAV  
 CHECKED BY TBW  
NO.004



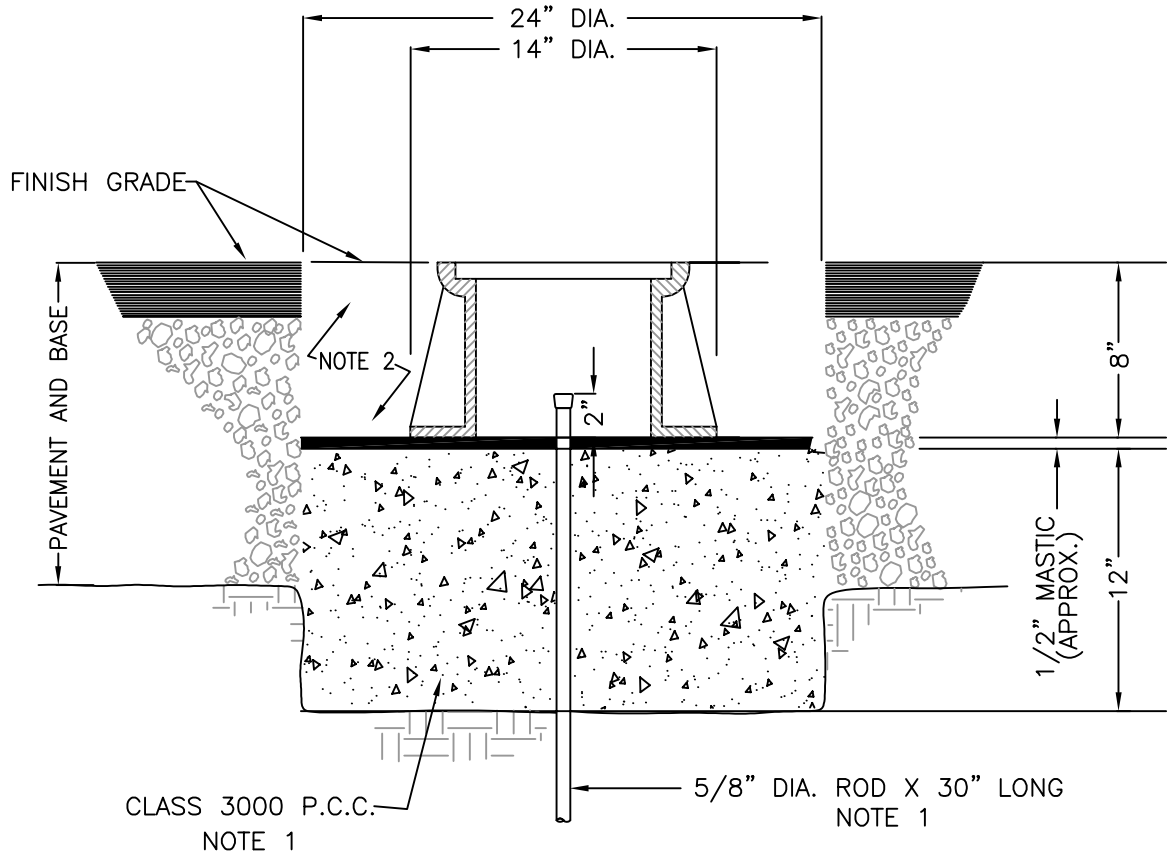
NOTE:

1. CONCRETE SHALL BE 3000 P.S.I.,  
2" TO 4" SLUMP.
2. ALL REINFORCING STEEL SHALL  
BE NO. 5 DEFORMED BARS WITH  
18" LAP SPLICES.

DIMENSIONS (INCHES)				BARS REQ'D	LBS. STEEL PER LIN. FT.
A	B	C	D		
6	16	3.5	—	E	4.17
8	18	3.5	—	E	4.17
10	20	3.5	—	E	4.17
12	22.5	3.5	—	E	4.17
15	26	3.5	—	E	4.17
18	30	3.5	—	E	4.17
21	38	3.5	15.5	E,F	8.34
24	42	3.5	17.5	E,F	8.34
27	50	3.5	21.5	E,F	8.34
21	36	3.5	14.5	E,F	8.34
24	41	3.5	17.5	E,F	8.34
27	46	3.5	19.5	E,F	8.34

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

CITY OF MONMOUTH DEPARTMENT OF PUBLIC WORKS	
STANDARD PLAN PIPE ENCASEMENT	
LAST REV BY BAV	NO.006
CHECKED BY TBW	



SECTION

NOTES:

1. THE CONTRACTOR WILL BE REQUIRED TO PROVIDE THE FOLLOWING:  
 DRIVE AND SET CAP ON 5/8" DIA ROD,  
 P.C.C. BASE, PROVIDE CAST IRON MON. BOX AND COVER.  
 MATERIALS AND ITEMS OF WORK: EXCAVATION, INCLUDING  
 EXCAVATION BELOW NORMAL ROADWAY EXCAVATION PAYLINE,  
 PLACING 1/2" MASTIC, SETTING AND ADJUSTING MONUMENT BOX  
 TO FINISH GRADE, BACKFILLING AND PAVING. BACKFILL MAY  
 CONSIST OF BASE ROCK AND PAVEMENT OF THE DEPTHS  
 SHOWN ON THE PROJECT PLANS OR IT MAY BE COMPOSED  
 ENTIRELY OF PAVEMENT AT THE CONTRACTORS OPTION.
  
2. LOCATIONS OF MONUMENTS SHOWN ON THE PROJECT PLANS  
 ARE APPROXIMATE ONLY. EXACT LOCATION WILL BE  
 DETERMINED AT THE TIME OF CONSTRUCTION.

CITY OF MONMOUTH  
 DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
 MONUMENT BOX INSTALLATION DETAIL

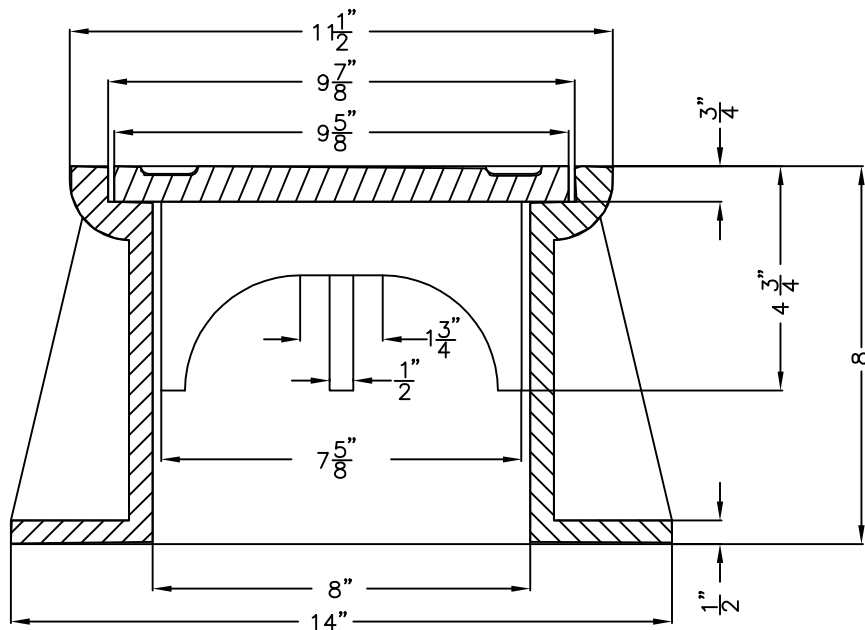
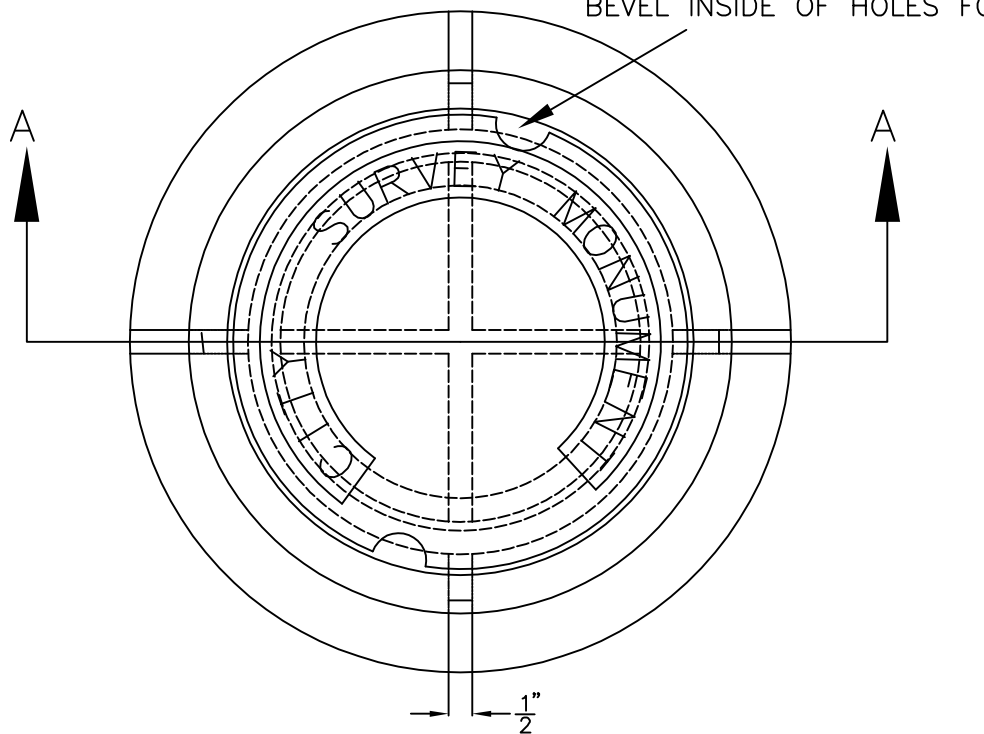
LAST REV BY BAV

CHECKED BY TBW

NO.008

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

TWO 1" X 1/2" LIFT HOLES 180° APART  
BEVEL INSIDE OF HOLES FOR EASIER LIFTING



SECTION A-A

NOTES:

1. MATERIAL SHALL BE A.S.T.M. A-48 GRAY CAST IRON, CLASS 30.
2. APPROX. WEIGHT: FRAME 56 LBS., COVER 20 LBS.

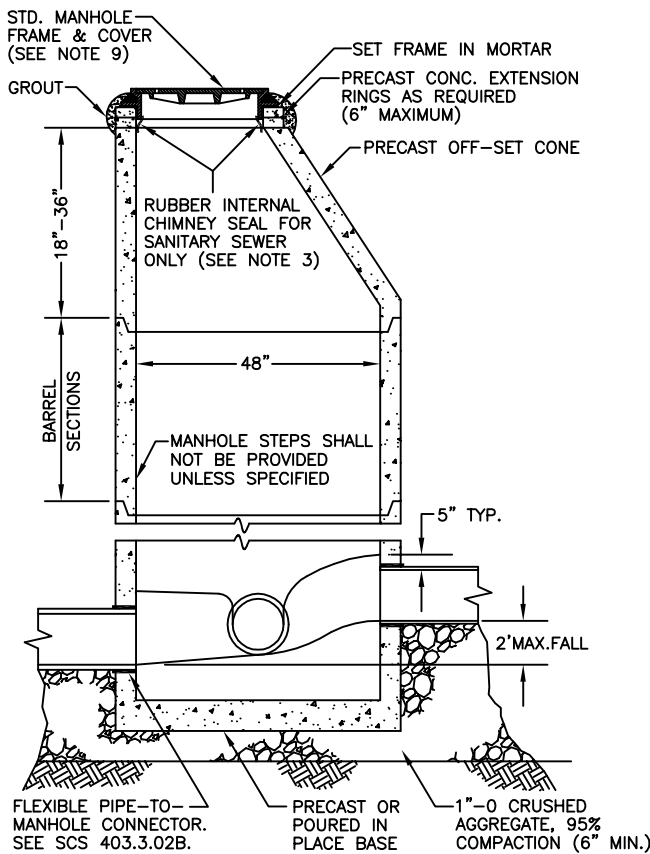
CITY OF MONMOUTH	
DEPARTMENT OF PUBLIC WORKS	
STANDARD PLAN	
MONUMENT BOX CASTING DETAIL	
LAST REV BY BAV	NO.009
CHECKED BY TBW	

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

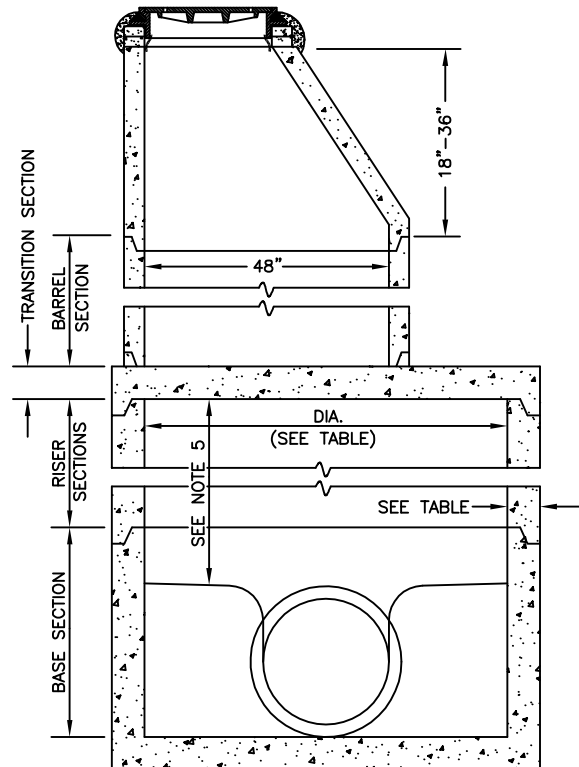
NOTES:

1. CONCENTRIC CONE ALLOWED ONLY WHEN SPECIFIED.
2. FLEXIBLE PIPE-TO-MANHOLE CONNECTIONS SHALL BE INSTALLED ACCORDING TO MANUFACTURES SPECIFICATIONS.
3. INTERNAL RUBBER CHIMNEY SEAL SHALL BE FLEX-SEAL OR CRETEX OR APPROVED EQUAL. THE CHIMNEY SEAL MAY BE DELETED WHEN MANHOLE IS ADJUSTED AFTER PAVING PER STD. PLAN No.104.
4. WATER TIGHT JOINTS (GROUT JOINTS SMOOTH AT MANHOLE INTERIOR).
5. FOR ALTERNATE MANHOLE CONFIGURATION, PROVIDE 8 FT. OF HEADROOM WHENEVER POSSIBLE.
6. POSITION MANHOLE LID OVER OUTLET PIPE.
7. ALL SECTIONS MUST MEET OR EXCEED ASTM C 478.
8. FLAT-TOP MANHOLE ACCEPTABLE ALTERNATE (SEE STD. PLAN NO. 211)
9. SEE STD. PLAN No.107. LOCK-DOWN MANHOLE COVERS PER STD. PLAN No.117 REQUIRED WHEN MANHOLES ARE LOCATED OUTSIDE OF PUBLIC RIGHT-OF-WAY.

TABLE		
PIPE SIZE	MANHOLE DIAMETER	WALL THICKNESS
≤21"	48"	5"
24"-30"	60"	6"
36"-42"	72"	7"
48"-54"	84"	8"



STANDARD MANHOLE CONFIGURATION



ALTERNATE MANHOLE CONFIGURATION

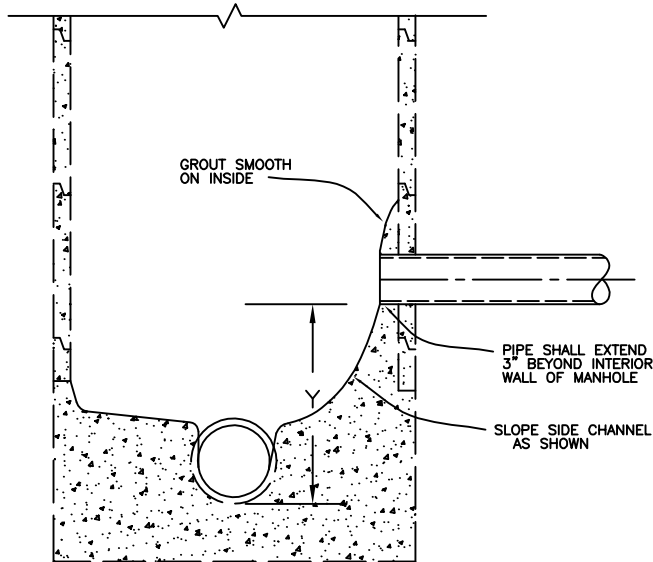
CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
MANHOLE

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

LAST REV. BY: BAV  
CHECKED BY: TBW

NO. 101



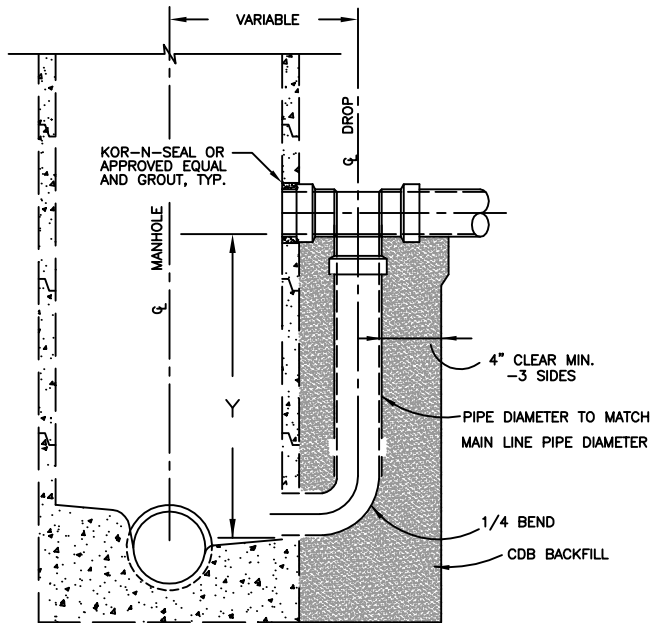
TYPE 'A'  
MAX. "Y" DIMENSION = 24"

TABLE

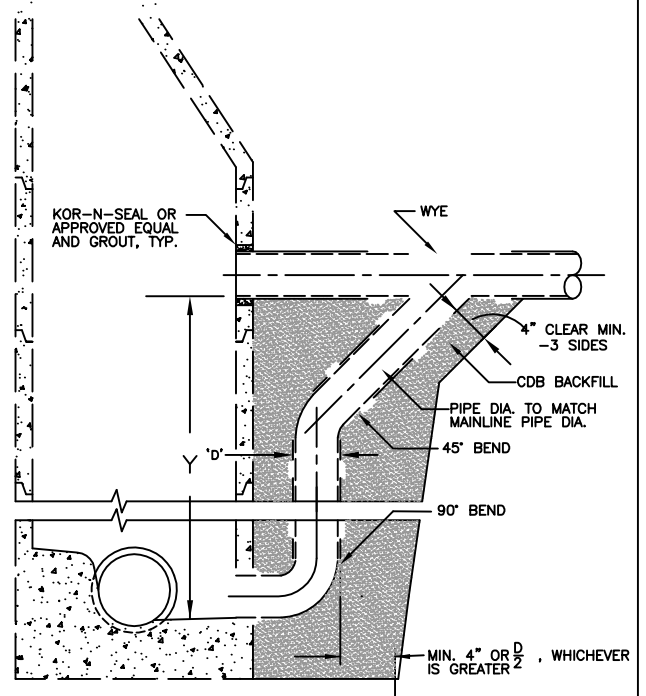
INLET PIPE SIZE	8"	10"	12"	15"
TYPE 'A'	24" OR LESS	24" OR LESS	24" OR LESS	24" OR LESS
TYPE 'B'	24" AND GREATER	31" AND GREATER	35" AND GREATER	42" AND GREATER
TYPE 'C'	30" AND GREATER	57" AND GREATER	65" AND GREATER	84" AND GREATER

NOTES:

1. SEE STANDARD PLAN 101 FOR ADDITIONAL MANHOLE DETAILS.
2. TYPE 'C' DROP MAY BE REQUIRED OVER TYPE 'B' IN LOCATIONS OF HIGH FLOW AND/OR STEEP GRADES.
3. ALL PIPE IS P.V.C.
4. CONSTRUCTION OF ADDITIONAL MANHOLE IS REQUIRED WHEN COMBINATION OF INLET PIPE SIZE AND "Y" DIMENSIONS ARE OUTSIDE PARAMETERS OF ABOVE TABLE.



TYPE 'B'



TYPE 'C'

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

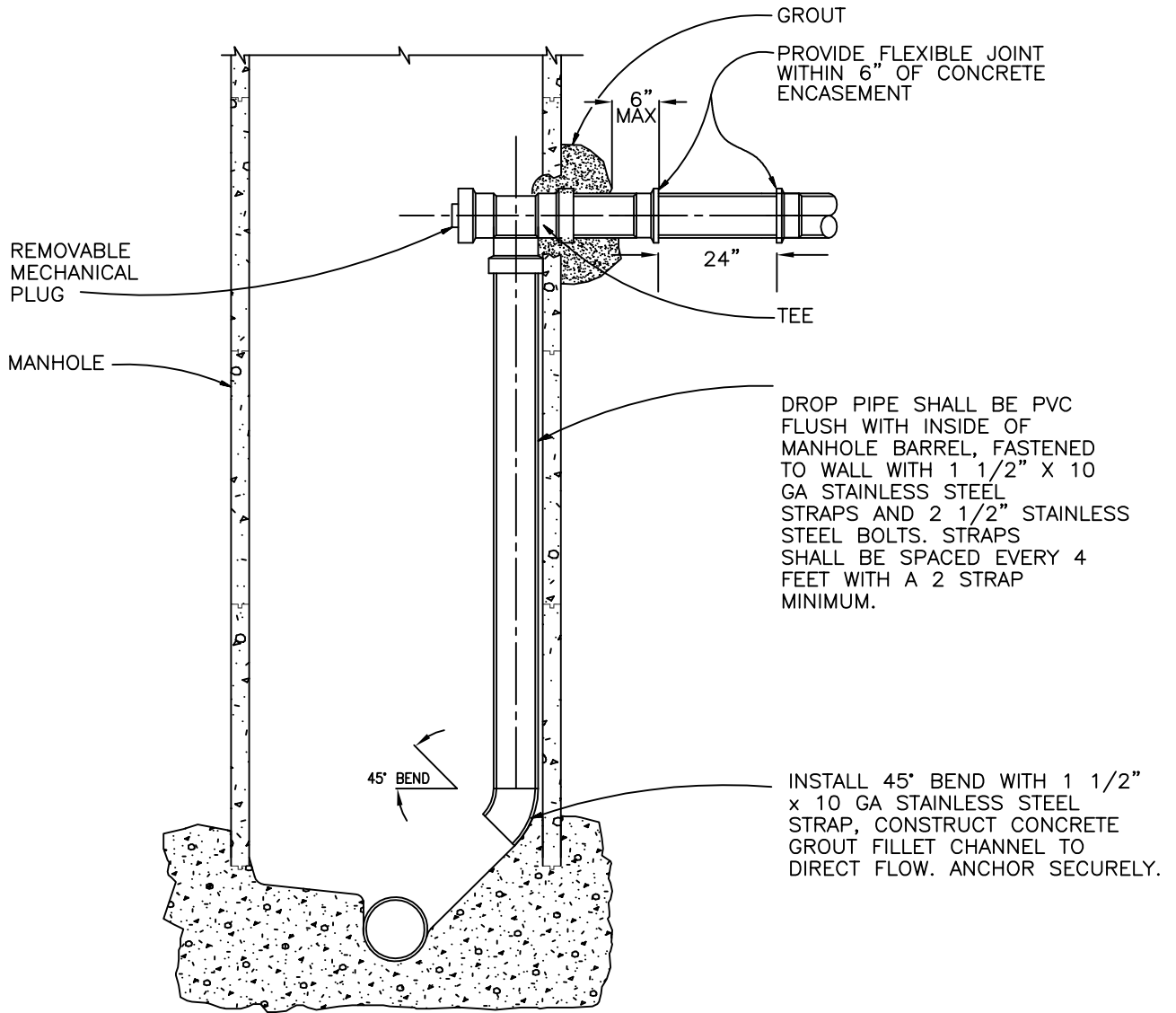
STANDARD PLAN  
DROP MANHOLE  
DETAILS

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

REVISION

LAST REV. BY ALD  
CHECKED BY TBW

NO. 102



NOTE:

1. ONLY ONE INSIDE DROP CONNECTION ALLOWED PER MANHOLE.
2. MINIMUM MANHOLE DIAMETER WITH DROP CONNECTION SHALL BE 48-INCHES.
3. MAXIMUM DROP PIPE DIAMETER SHALL BE 8-INCHES.
4. SEE STANDARD PLAN 101 FOR OTHER MANHOLE DETAILS.
5. POSITION MANHOLE LID TO MAXIMIZE THE HORIZONTAL CLEAR DISTANCE FOR MAINTENANCE PERSONNEL.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

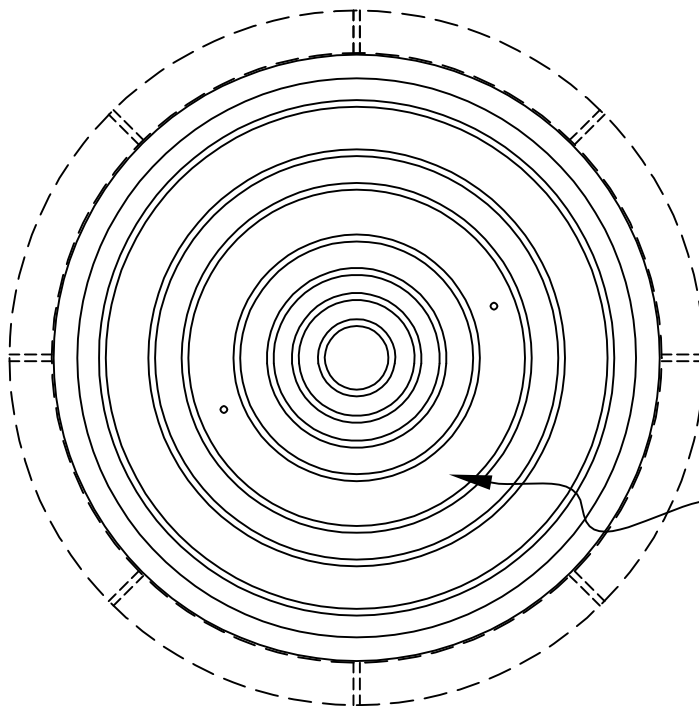
STANDARD PLAN  
INSIDE DROP  
MANHOLE

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

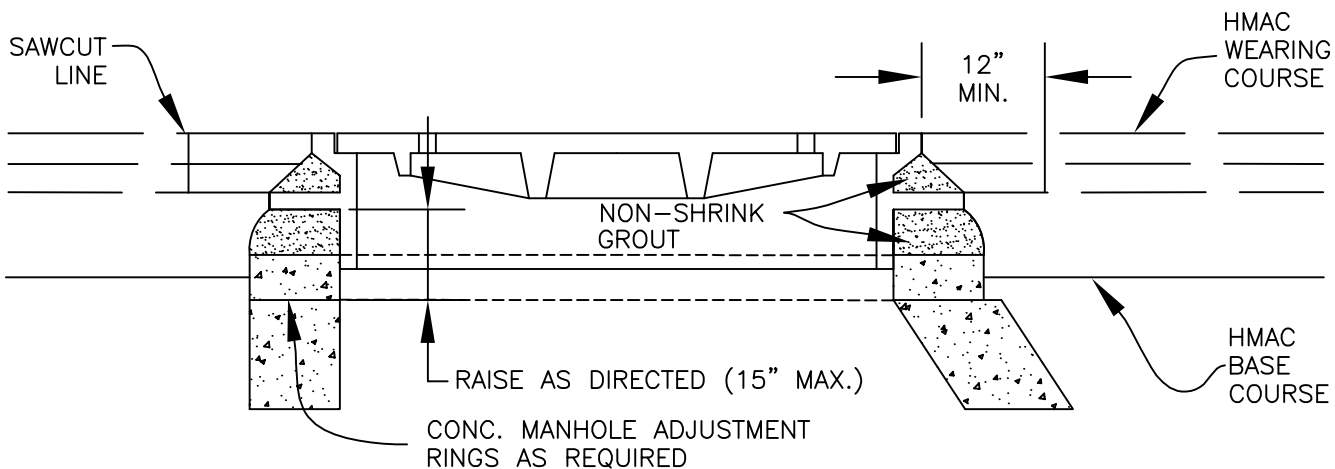
LASR REV BY BAV  
CHECKED BY TBW

NO. 103

REVISION



SEE STD PLAN  
#107 FOR  
MANHOLE  
FRAME &  
COVER.



1. COVER MANHOLE WITH BUILDING PAPER AND CONSTRUCT HMAC BASE AND WEARING COURSES.
2. SAWCUT CIRCULAR FOR EXCAVATION AROUND MANHOLE 12" MINIMUM FROM MANHOLE FRAME.
3. RAISE MANHOLE FRAME AND COVER TO FINISH GRADE BY INSTALLING CONCRETE RINGS AND LEVELING MORTAR.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

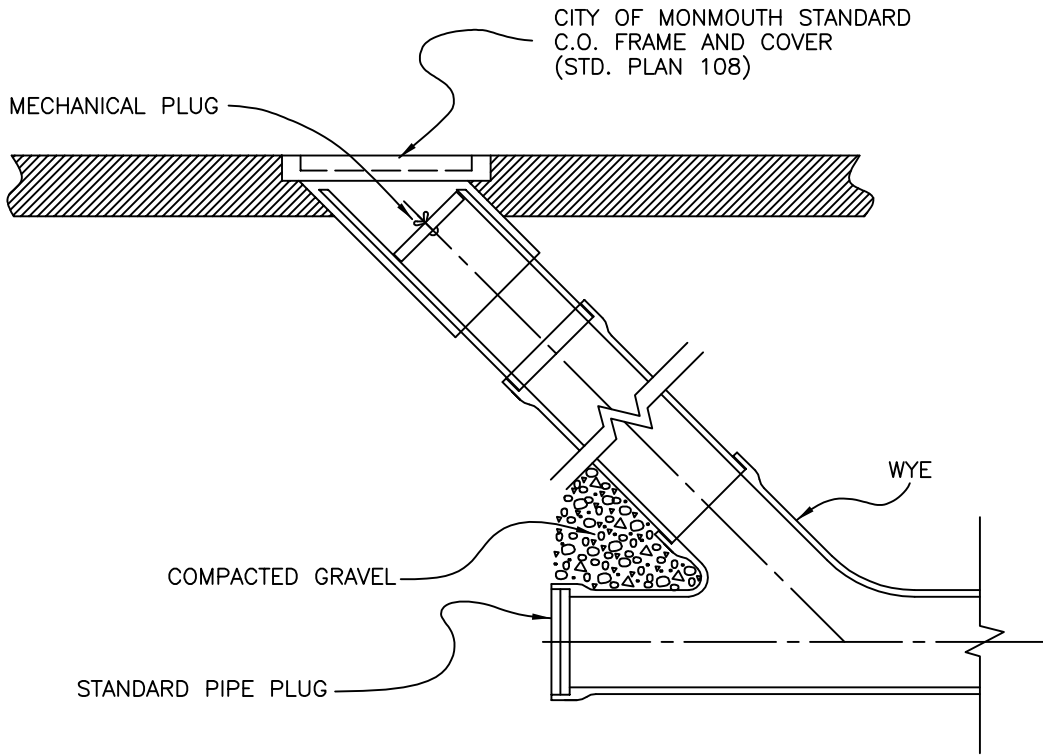
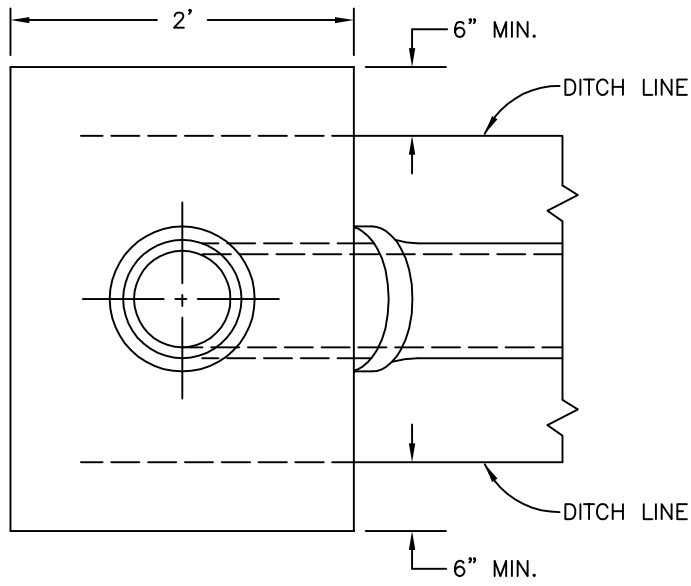
STANDARD PLAN  
MANHOLE ADJUSTMENT SEQUENCE

LAST REV. BY BAV  
CHECKED BY TBW

NO. 104

REVISION





CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

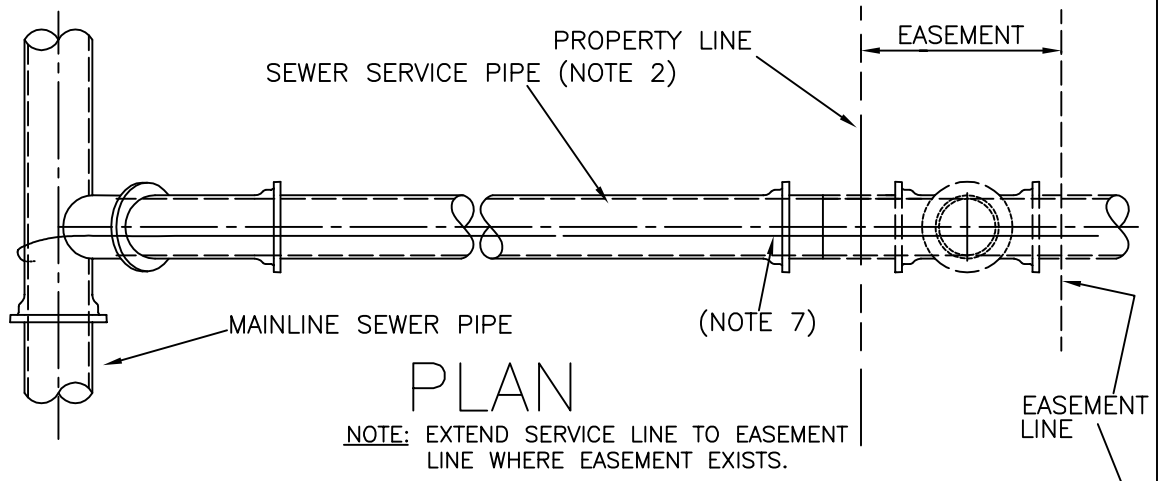
No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

STANDARD PLAN  
SANITARY SEWER CLEANOUT

REVISION

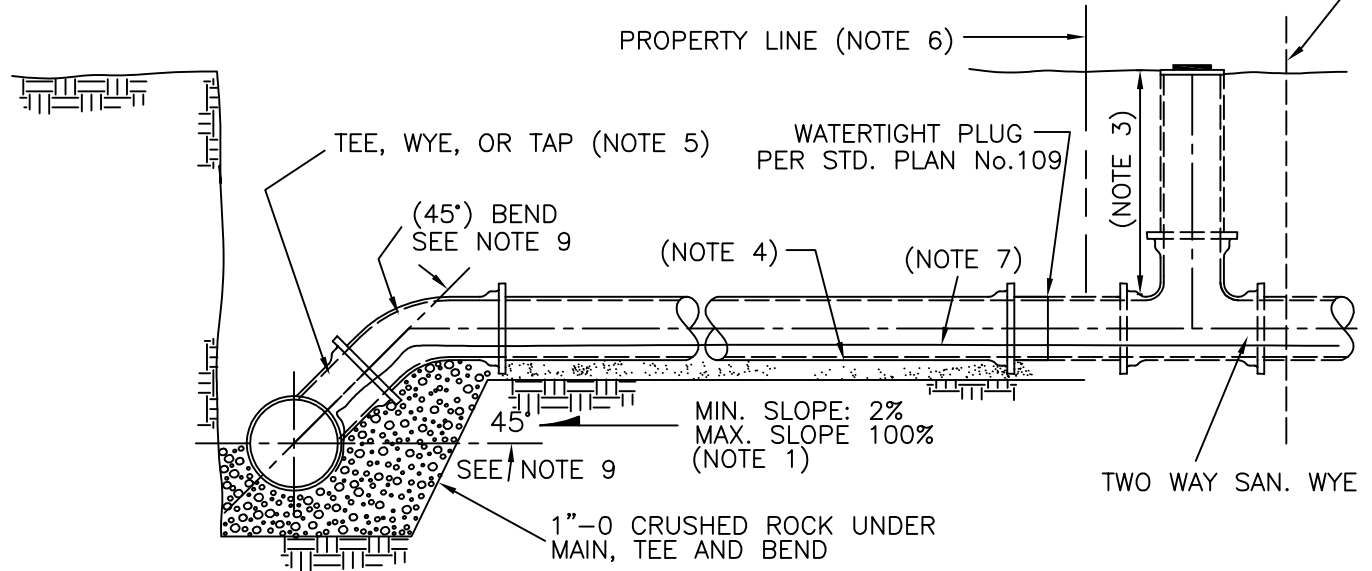
LAST REV. BY BAV  
CHECKED BY TBW

NO. 105



# PLAN

NOTE: EXTEND SERVICE LINE TO EASEMENT LINE WHERE EASEMENT EXISTS.



# SECTION

1. WHEN SLOPE EXCEEDS 20% USE ANCHOR BLOCKS. WHEN SLOPE EXCEEDS 100%, AND WITH SPECIFIC APPROVAL OF THE ENGINEER, USE DEEP CONNECTION RISER PER STD. PLAN No.114. SLOPE MAY BE DECREASED TO 1% MINIMUM WITH SPECIFIC APPROVAL OF THE ENGINEER.
2. FOR APPROVED MATERIALS SEE MCS 402.
3. MINIMUM DEPTH AT PROPERTY LINE 4 FEET.
4. BEDDING FOR SERVICE LINES SHALL BE MIN. 4-INCHES OF 1"-0 CRUSHED ROCK.
5. TAPPING OF SEWER MAINS TO BE DONE BY CONTRACTOR AND INSPECTED BY CITY FORCES.
6. IN NEW SUBDIVISIONS OR FOR UNUSED STUBS, MARK END OF SERVICE WITH WHITE PAINTED 2 x 4 STAKE. USING BLACK INDELIBLE MARKER, INDICATE DEPTH AND TYPE (SS FOR SANITARY), (SD FOR STORM DRAIN). (SEE MCS 402.3.07)
7. INSTALL A CONTINUOUS 12 GAUGE, GREEN, INSULATED COPPER TRACER WIRE ADJACENT TO BUILDING SEWER BETWEEN THE SEWER MAIN AND CLEANOUT AT BUILDING.
8. ADJACENT SERVICE LINES TO HAVE 18" MINIMUM HORIZONTAL SEPARATION AT THE MAIN.
9. WITH SPECIFIC APPROVAL OF THE ENGINEER, ANGLE AND BEND MAY BE REDUCED TO 22 1/2'.

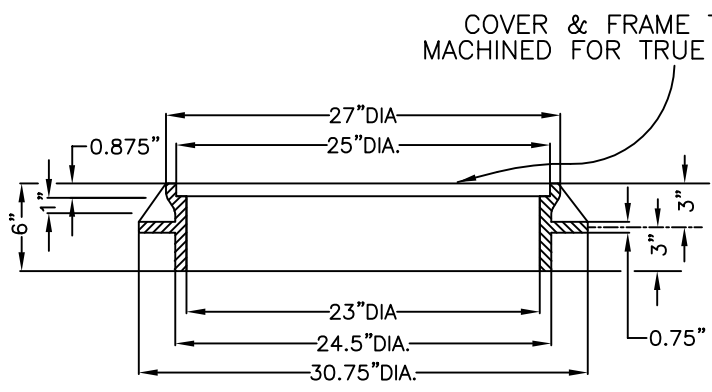
CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
SANITARY SERVICE

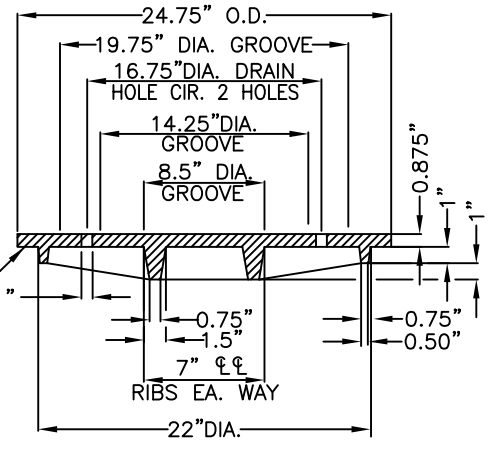
LAST REV. BY: BAV  
CHECKED BY: TBW

# NO.106

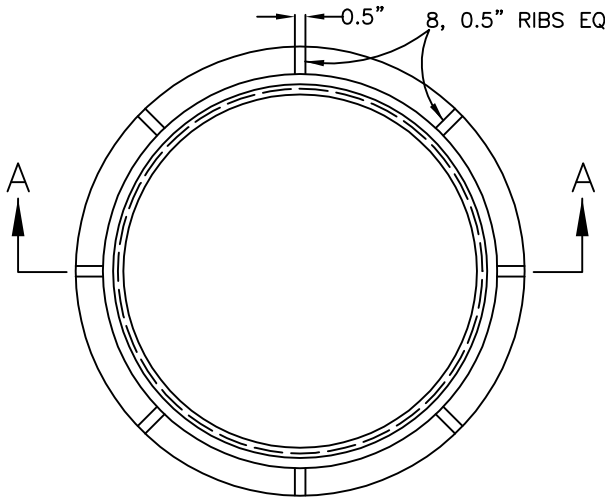
No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



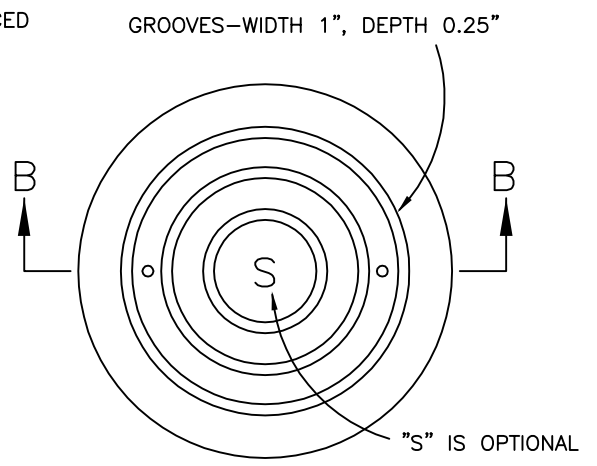
SECTION A-A



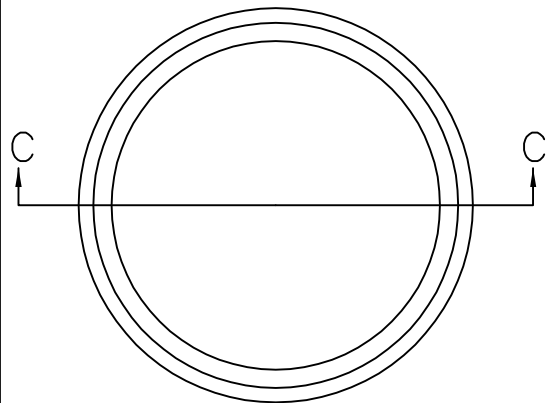
SECTION B-B



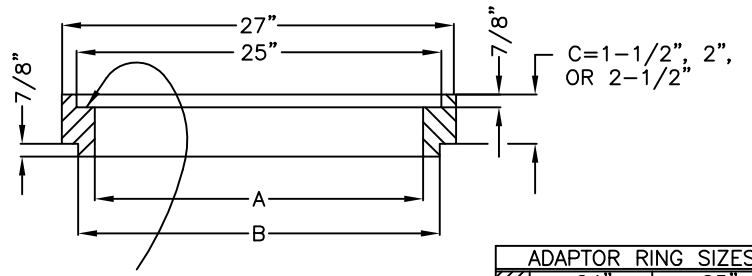
MANHOLE FRAME



MANHOLE COVER



ADAPTOR RING



SECTION C-C

ADAPTOR RING SIZES	
24"	25"
A 22-1/2"	23"
B 23-3/4"	24-3/4"

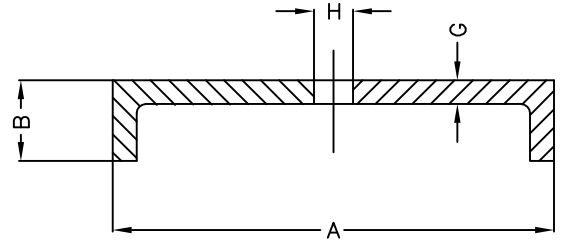
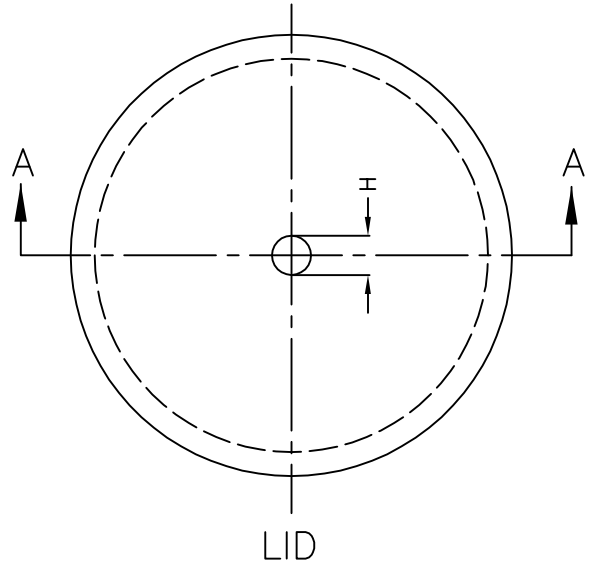
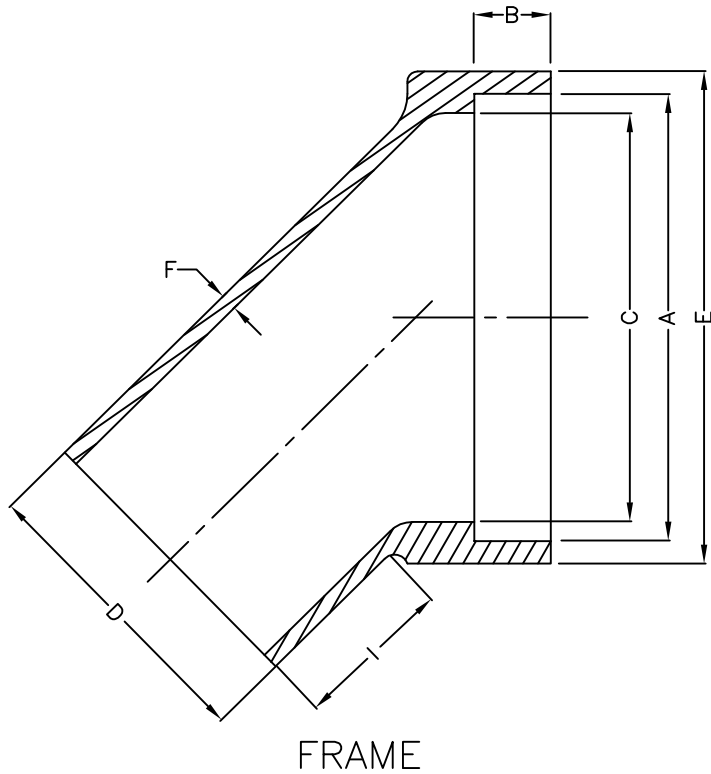
- 1. MATERIAL: ASTM A-48B CLASS 30 CAST IRON
- 2. STEEL PIVOTED EXPANDABLE MANHOLE RISER BY AMERICAN HIGHWAY PRODUCTS OR APPROVED EQUAL IS ALSO ACCEPTABLE.

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
MANHOLE CASTING DETAIL

LAST REV. BY	BAV	NO. 107
CHECKED BY	TBW	



LID DIMENSIONS				
SIZE	A	B	G	H
6"	8 9/16"	1 1/2"	1/2"	3/4"
8"	10 11/16"	1 1/2"	1/2"	3/4"

FRAME DIMENSIONS							
SIZE	A	B	C	D	E	F	I
6"	8 3/4"	1 1/2"	8"	5 7/8"	9 5/8"	5/16"	3 1/4"
8"	10 7/8"	1 1/2"	9 5/8"	7 7/8"	11 3/4"	5/16"	3 1/4"

MATERIAL: ASTM A-48 CLASS 30 CAST IRON.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
45° CLEANOUT FRAME & LID

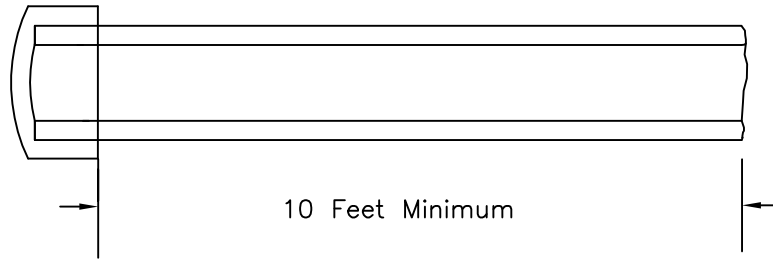
No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

LAST REV BY BAV  
CHECKED BY TBW

NO. 108

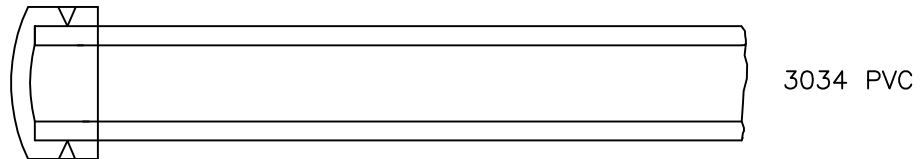
TYPE I

### SOLVENT WELDED CAP



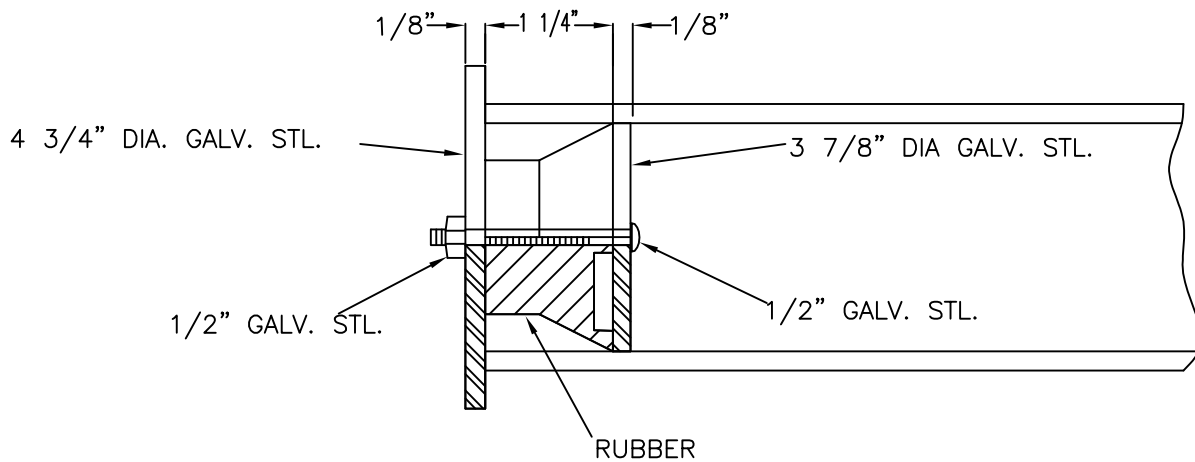
TYPE II

### RUBBER GASKET CAP



TYPE III

### MECHANICAL PLUG



CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

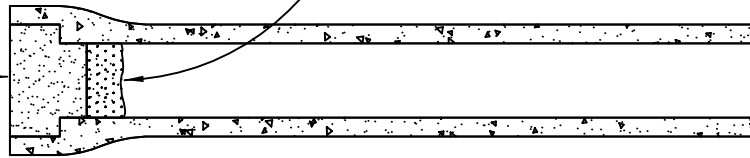
STANDARD PLAN  
PLUG FOR NEW SAN. SEWER

LAST REV. BY BAV  
CHECKED BY TBW

NO. 109

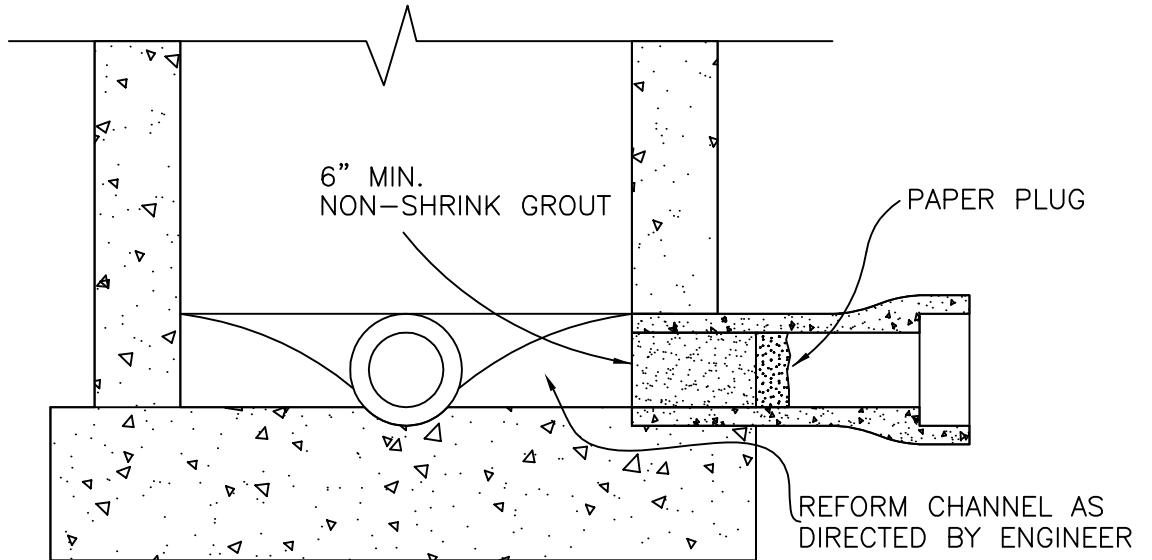
6" MIN.  
NON-SHRINK GROUT

PAPER PLUG



6" MIN.  
NON-SHRINK GROUT

PAPER PLUG



NOTE:  
THIS DRAWING DEPICTS CONCRETE PIPE.  
USE MECHANICAL PLUGS WHEN ABANDONING PLASTIC PIPES.

CITY OF MONOMUTH  
DEPARTMENT OF PUBLIC WORKS

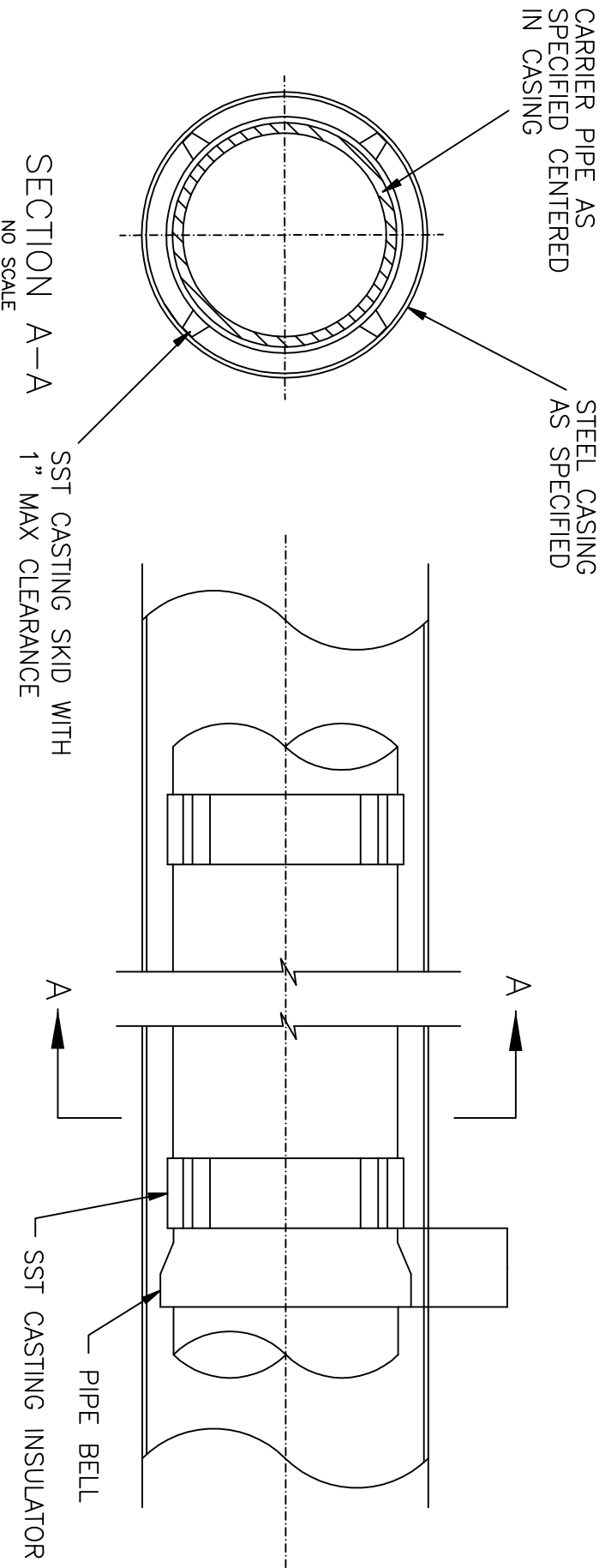
No.	Description	Date	By	Appr
1.	ISSUED	1/08	BV	TBW

STANDARD PLAN  
PLUGS FOR ABANDONING  
SANITARY SEWER

LAST REV. BY BAV  
CHECKED BY TBW

NO. 110

REVISION



NOTES:

1. PROVIDE SST CASING INSULATORS WITH POLYETHYLENE SKIDS EQUALLY SPACED PER MANUFACTURER'S RECOMMENDATION. USE CALPICO MODEL-M, OR EQUAL.
2. DESIGN ENGINEER TO PROVIDE ADDITIONAL DETAIL AS REQUIRED FOR SPECIFIC APPLICATION.
3. MINIMUM CLEARANCE BETWEEN CASING I.D. AND PIPE, FITTINGS, THRUST RESTRAINTS, AND ALL OTHER APPURTENANCES (EXCLUDING CASING INSULATORS), SHALL NOT BE LESS THAN 2"
4. ANNULAR SPACE TO BE FILLED WITH SAND FOLLOWING CONSTRUCTION AND/OR TESTING.

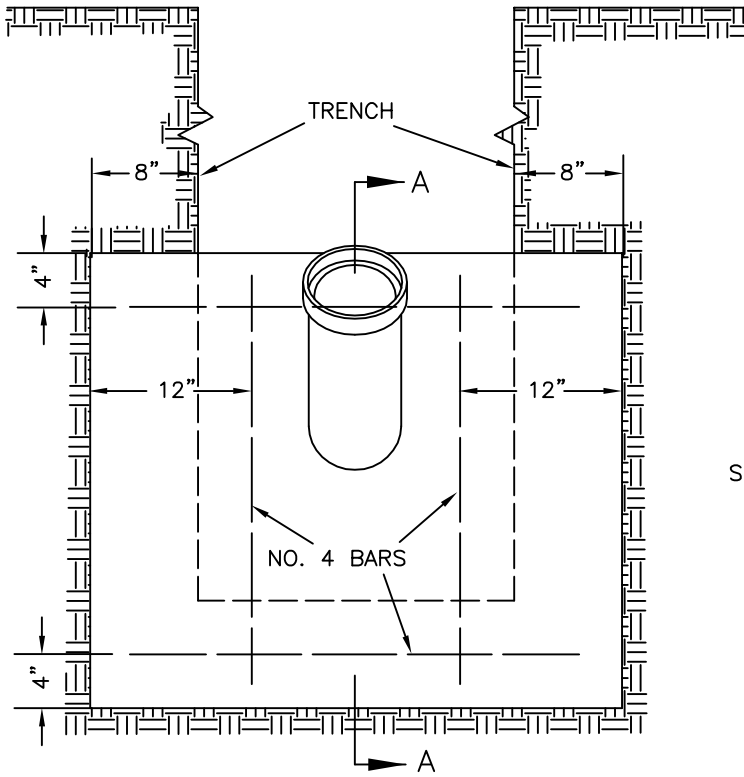
No.	Description	Date	By	Appr
1	CREATED	1/08	BV	TBW

CITY OF MONMOUTH  
 DEPARTMENT OF PUBLIC WORKS  
 STANDARD PLAN  
 CASING DETAIL

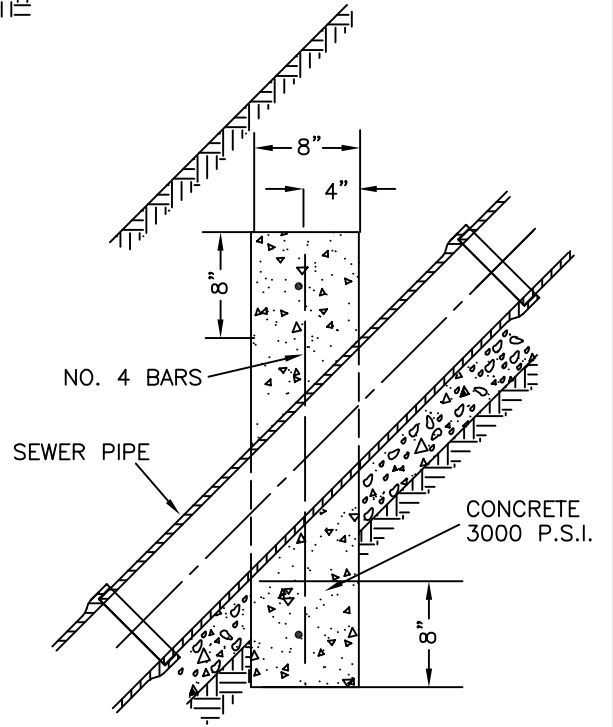
LAST REV BY BAV  
 CHECKED BY TBW

NO. 112

FOR SEWER PIPE 8"-12" DIAMETER



ELEVATION



SECTION A-A

SPACING FOR ANCHOR BLOCK FOR ALL SIZES

SLOPE %	MINIMUM SPACING (FT)
0-19.99	NO ANCHOR REQUIRED
20-34.99	35
35-50.99	25
51-MORE	15' OR SPECIAL DESIGN

NOTE:

1. FOR 4" SEWER PIPE, ANCHOR BLOCK IS REQUIRED AS SHOWN EXCEPT NO REINFORCEMENT IS REQUIRED
2. FOR PIPE LARGER THAN 12", ANCHOR BLOCK SHALL BE OF SPECIAL DESIGN. PROJECT ENGINEER SHALL COORDINATE WITH THE CITY ENGINEER ON DESIGN REQUIREMENTS.
3. ANCHOR BLOCK SHALL ALWAYS BE LOCATED ALONG THE BARREL OF THE PIPE AND NOT AT THE JOINT.
4. OTHER PIPE SLOPE ANCHOR SYSTEMS WILL BE CONSIDERED FOR APPROVAL UPON REQUEST TO ENGINEER.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
ANCHOR BLOCK DETAILS  
SANITARY SEWER

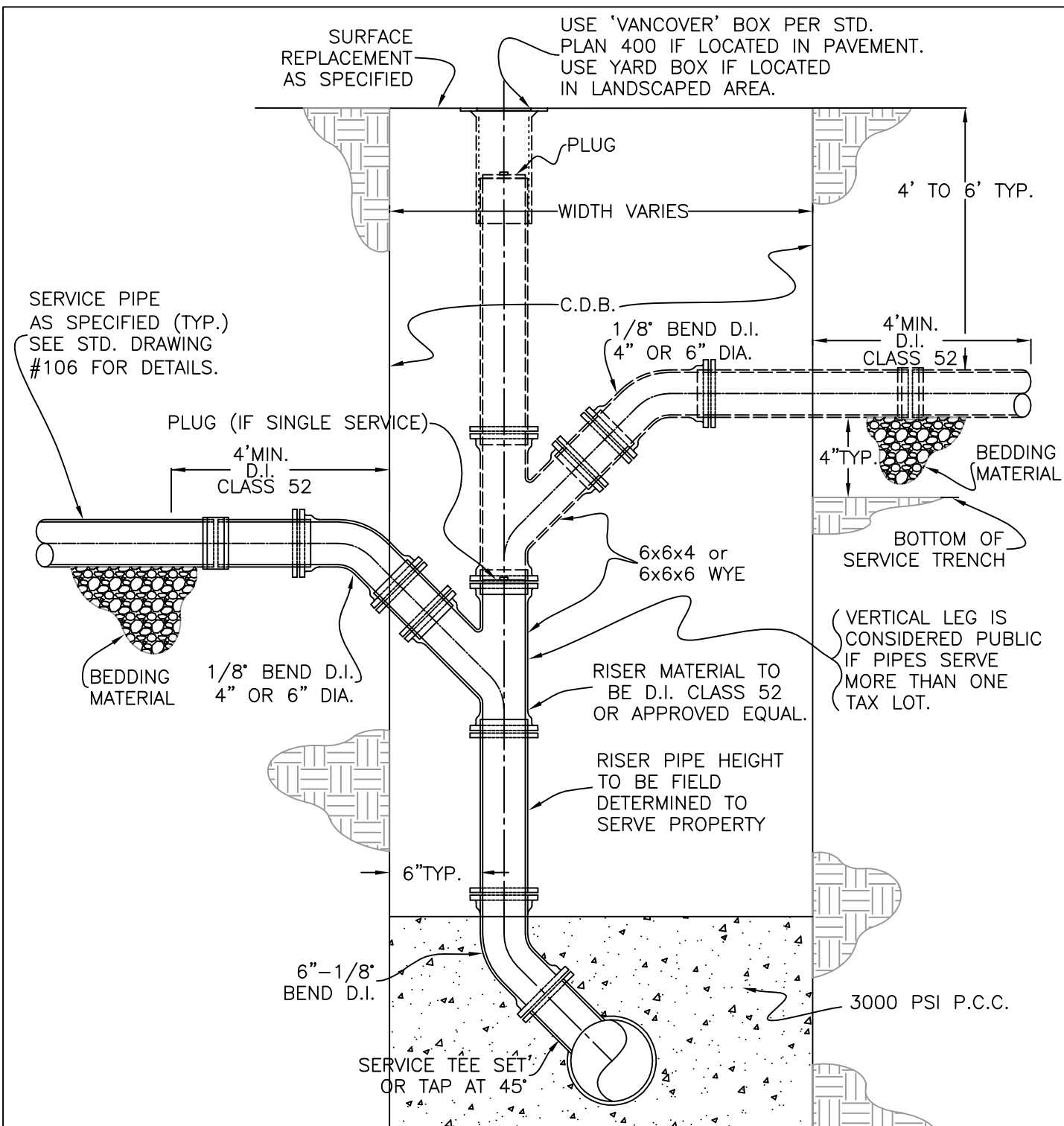
No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

LAST REV BY BAV  
CHECKED BY TBW

NO. 113

REVISION



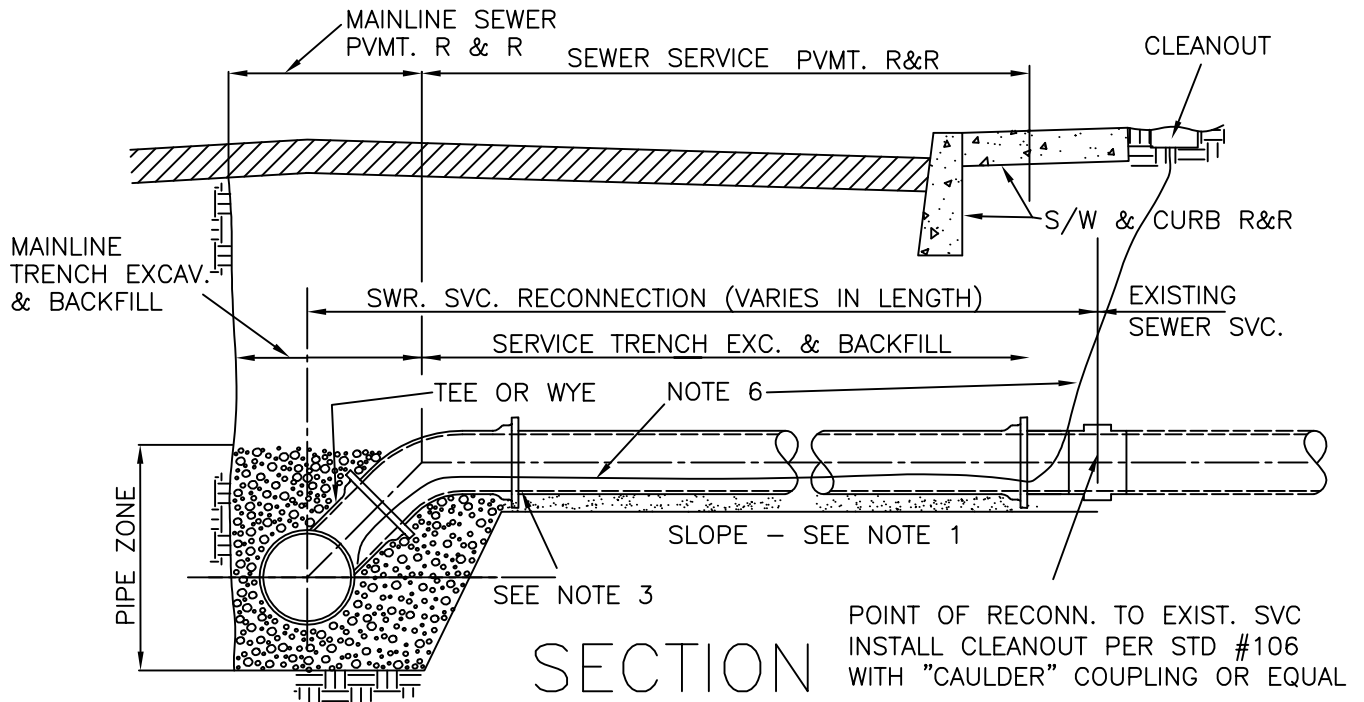
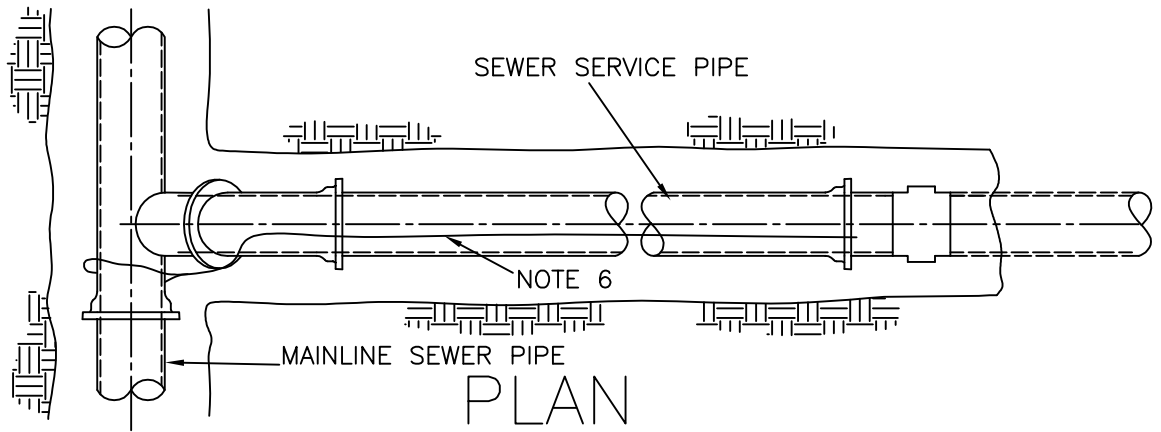


**NOTE:**

1. THE DEEP CONNECTION RISER MAY ONLY BE USED WHEN THE SERVICE PIPE SLOPE WOULD BE OVER 100% SLOPE AND WITH SPECIFIC APPROVAL OF THE ENGINEER.
2. USE 6" RISER, MAX. 4 SERVICES.
3. CDB AND 3000 PSI P.C.C. SHALL EXTEND 2 FEET MINIMUM EACH WAY FROM RISER ALONG MAINLINE TRENCH.

CITY OF MONMOUTH	
DEPARTMENT OF PUBLIC WORKS	
STANDARD PLAN	
DEEP CONNECTION RISER (CHIMNEY)	
LAST REV BY BAV	NO. 114
CHECKED BY TBW	

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



1. WHEN SLOPE EXCEEDS 20%, USE ANCHOR BLOCKS, SEE STD PLAN 113. IF SLOPE EXCEEDS 100%, USE CHIMNEY, SEE STD PLAN 114
2. FOR APPROVED MATERIALS SEE SPECIFICATIONS/PLANS.
3. BEDDING MATERIAL FOR SERVICE LINES SHALL BE 1"-0 CRUSHED ROCK
4. IN ADDITION TO OTHER DETAIL SHOWN THIS DRAWING IS INTENDED TO SHOW THE LIMITS OF MEASUREMENT FOR PAY ITEMS INCLUDED IN CONSTRUCTION CONTRACT.
5. TAPPING OF SEWER MAINS TO BE BY CONTRACTOR, INSPECTION BY CITY FORCES.
6. INSTALL A CONTINUOUS 12 GAUGE, GREEN, INSULATED COPPER TRACER WIRE ADJACENT TO SEWER SERVICE BETWEEN THE SEWER MAIN AND CONECTION POINT AND BROUGHT TO GRADE.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

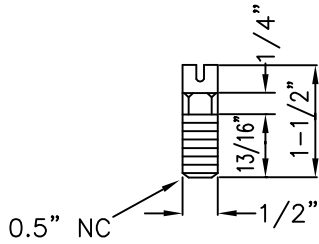
No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

STANDARD PLAN  
SEWER SERVICE RECONNECTIONS

LAST REV. BY BAV  
CHECKED BY TBW

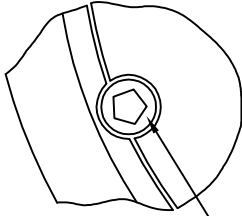
NO. 115

HEX FOR WRENCH OR SLOT  
TOP FOR SCREWDRIVER



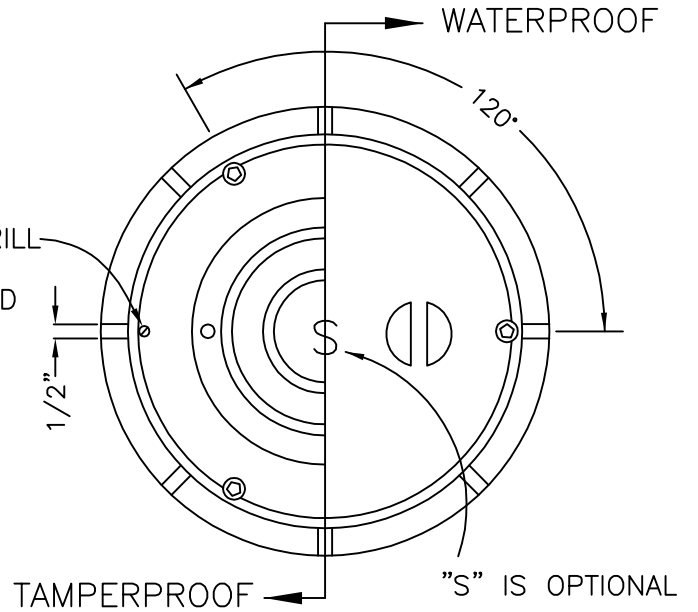
STUD DETAIL

1 STUD REQUIRED PER COVER  
STUD TO BE 60° COUNTER-  
CLOCKWISE FROM A CAP SCREW.

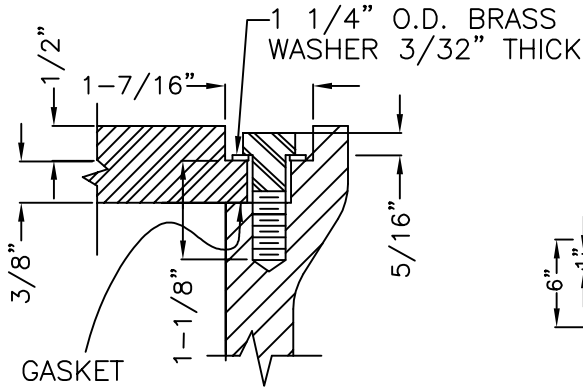


LOCATING STUD. DRILL  
25/64" HOLE AND  
TAP FOR 1/2" STUD  
(SEE NOTE 3)

1/2"-13-1" LONG BRASS OR  
BRONZE PENTAGON-HEAD  
CAP SCREW

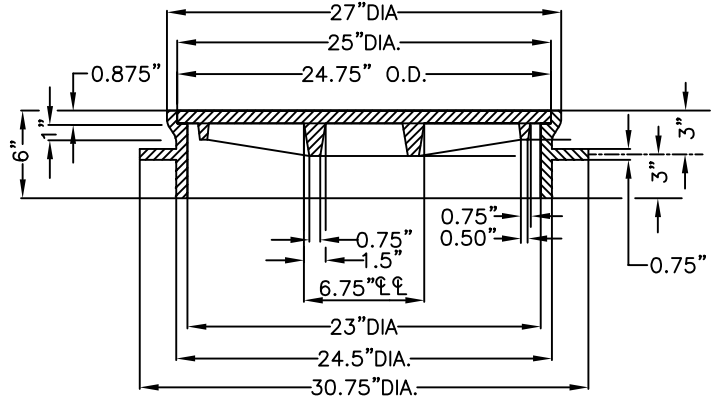


PLAN



X-SECTION

CAP SCREW DETAIL



NOTE:

1. BEARING SURFACES TO BE MACHINED.
2. COVER USED OUTSIDE VEHICLE TRAVELED AREAS SHALL BE ALUMINUM.
3. LOCATING STUD NOT REQUIRED WITH ALUMINUM LIDS.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

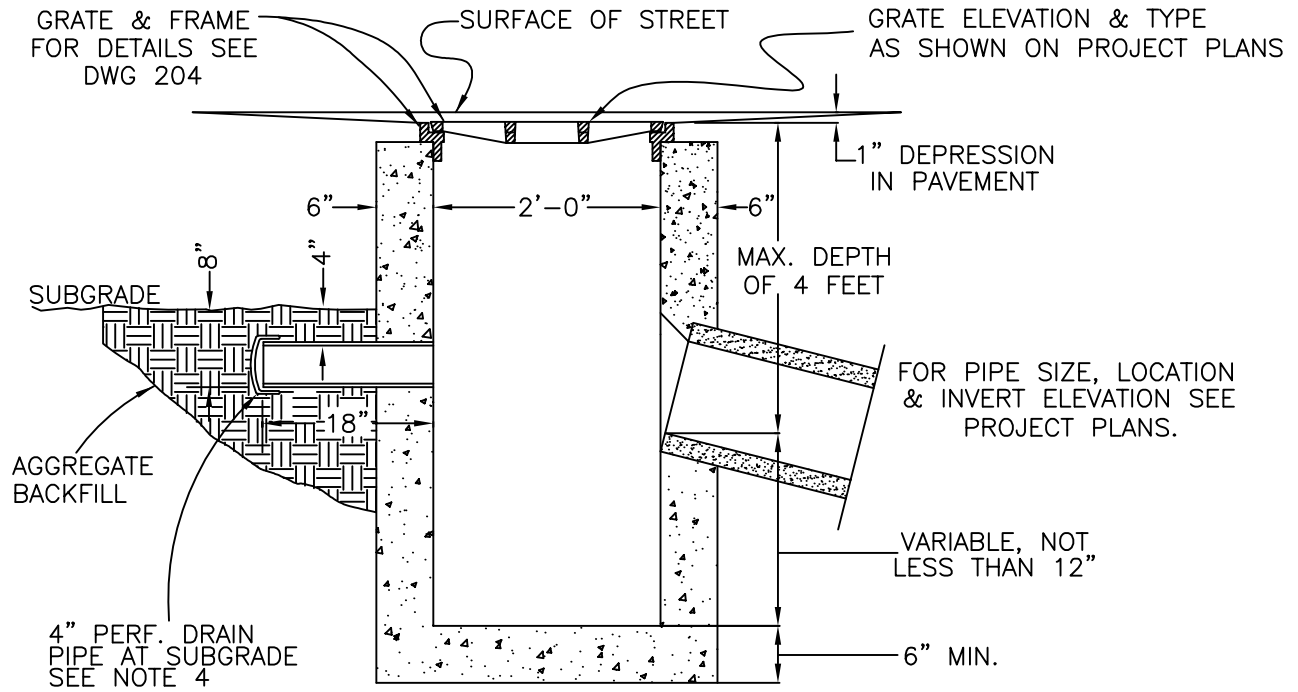
No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

STANDARD PLAN  
TAMPERPROOF/WATERPROOF  
MANHOLE FRAME AND COVER

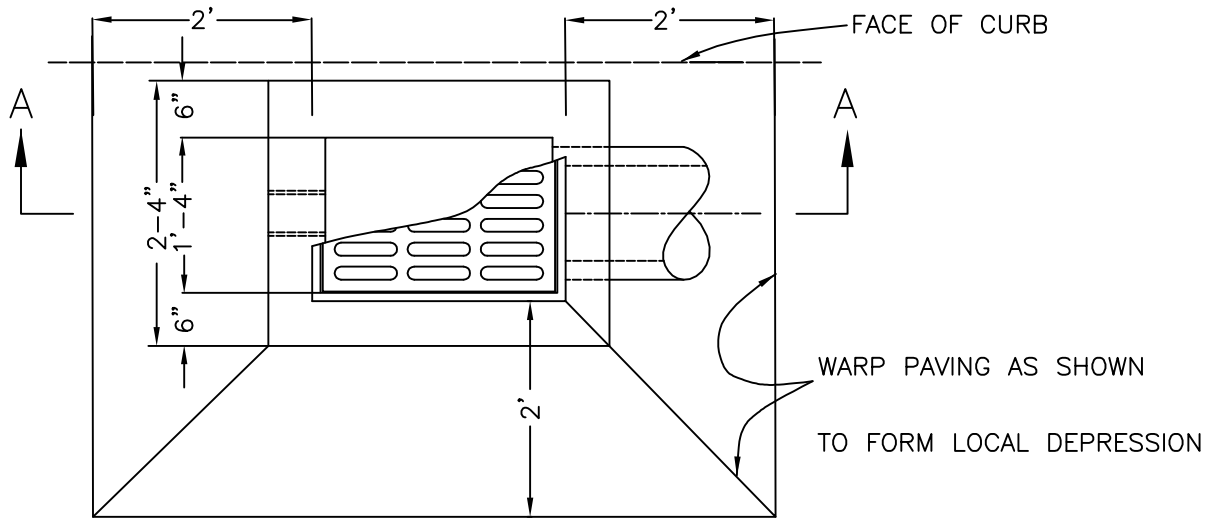
LAST REV BY BAV  
CHECKED BY TBW

NO. 117

REVISION



SECTION A-A



PLAN

NOTES:

1. PIPE(S) CAN BE PLACED IN ANY WALL.
2. STATION SHOWN ON PROJECT PLANS IS TO CENTERLINE OF C.B.
3. ALL CONCRETE SHALL BE CLASS 3000 P.S.I.
4. DRAIN SHALL BE P.V.C. (SCH. 40) WITH CAP. DRAIN PIPE SHALL HAVE 6-3/8" DIAMETER HOLES IN LOWER SIDE. CAP SHALL HAVE 4-3/8" DIAMETER DRILL HOLES. TWO DRAINS REQUIRED WHEN C.B. LOCATED AT SAG VERTICAL CURVE.
5. TO CONSTRUCT CLEANOUT, REPLACE GRATE WITH 1'-3 1/2" x 1'-11 1/2" STEEL PLATE 3/4" THICK. DRILL ONE, 1" DIA. LIFT HOLE NEAR ONE END OF PLATE.

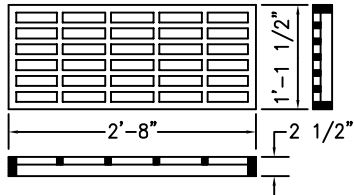
CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
TYPE I CATCH BASIN  
(AND CLEANOUT)

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

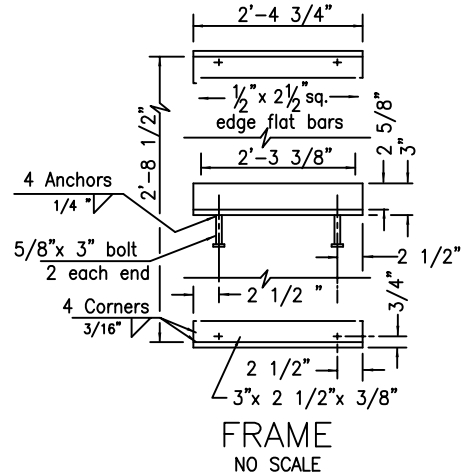
LAST REV. BY BAV  
CHECKED BY TBW

NO.200

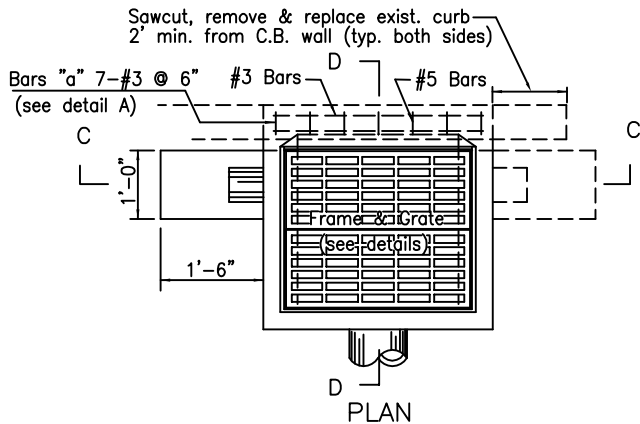


GRATE  
NO SCALE

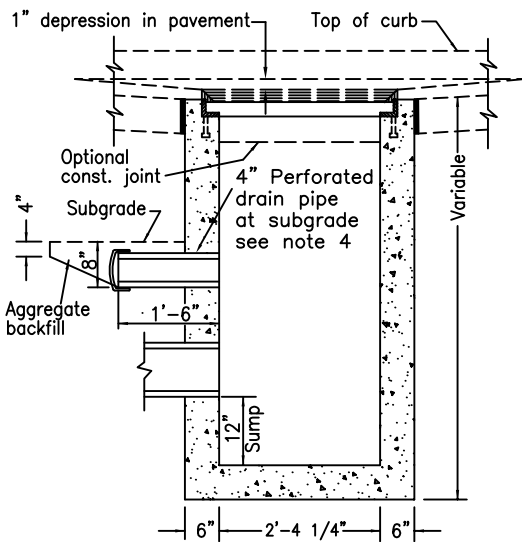
- 1.) Grates shall be ductile iron suitable for traffic loading as MFD. BY INLAND FOUNDRY.
- 2.) 2 Grates required for each C.B.



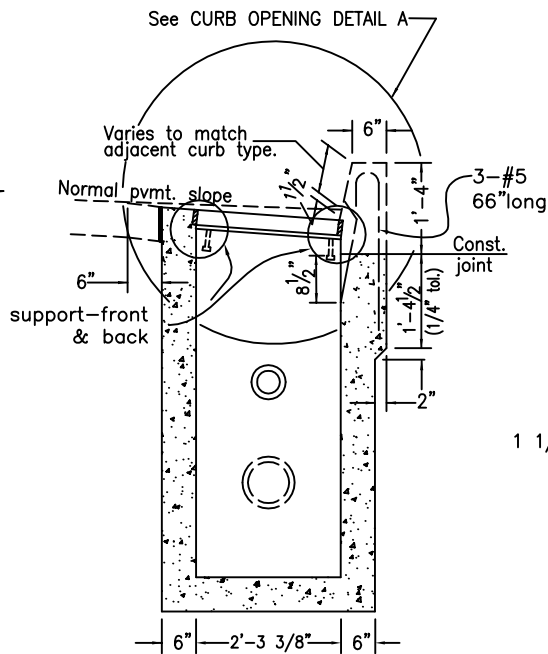
FRAME  
NO SCALE



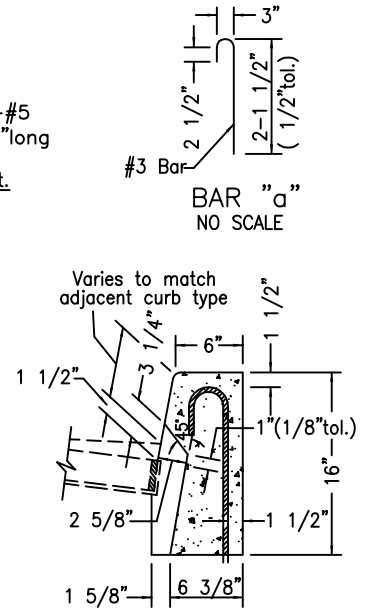
PLAN



SECTION C-C



SECTION D-D



CURB OPENING  
DETAIL A  
NO SCALE

NOTES:

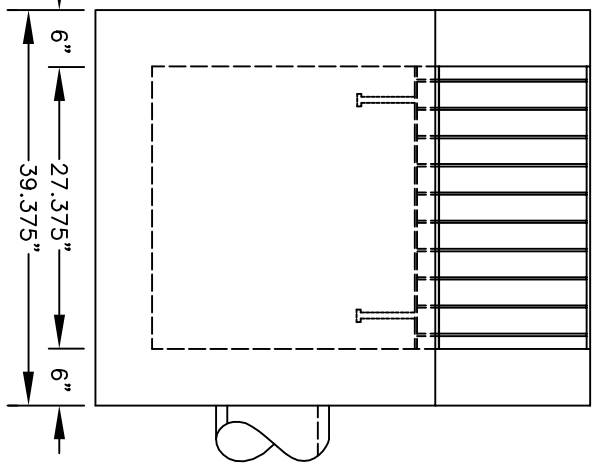
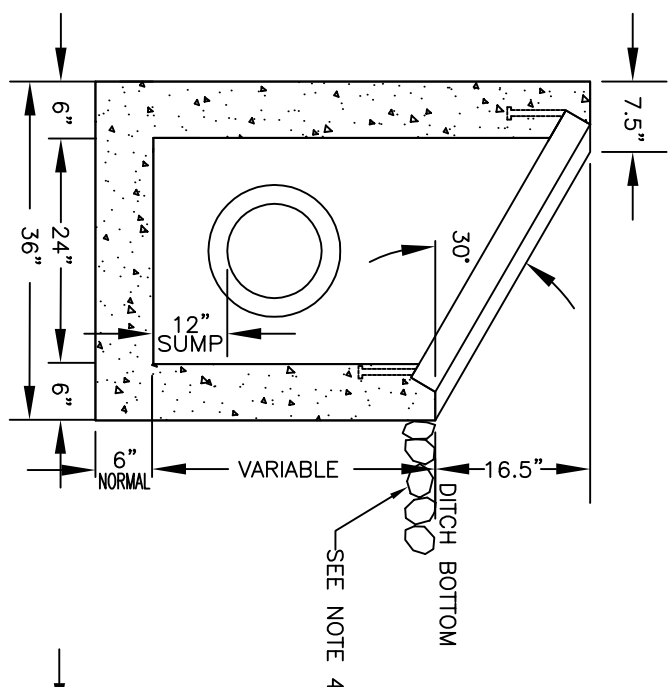
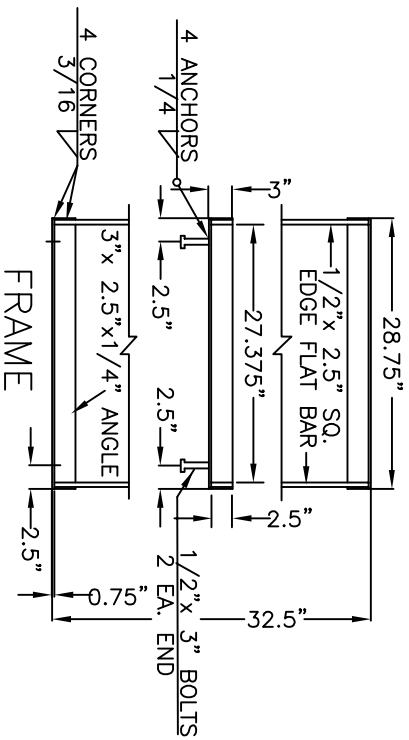
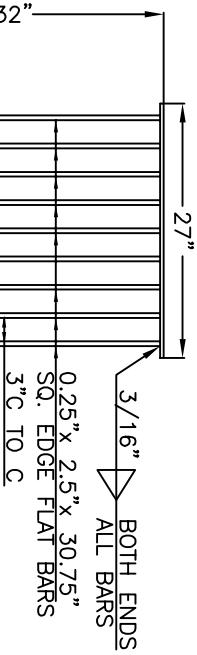
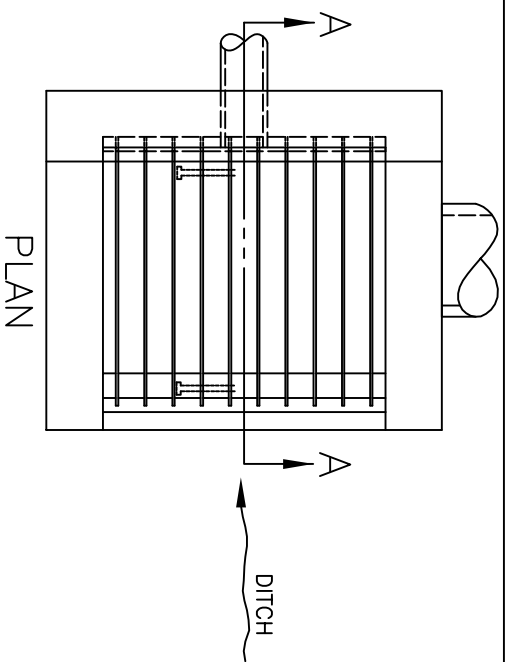
1. Reinforcing steel
  - a.) Shall be installed per Sec. 603 of M.C.S.
  - b.) No. 3 bars to be placed during curb construction.
  - c.) All bars to be placed 1/2" clear of nearest face of concrete unless shown or noted otherwise.
  - d.) All bar splices shall be 20 dia.
2. All concrete to be 3,000 p.s.i.
3. Materials for frames and grates shall conform to Sec. 02450 of Standard Specifications for Highway Construction by Oregon State highway division, 2002.
4. Drain shall be P.V.C. (Sch. 40) with cap. Drain pipe shall have 6-3/8" diameter holes in lower side. Cap shall have 4-3/8" diameter drill holes. Two drains required when C.B. located at sag vertical curve.
5. This detail not for use on private property.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
TYPE 2 CATCH BASIN

LAST REV. BY BAV	NO.201
CHECKED BY TBW	

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



SECTION A-A

ELEVATION

- NOTES:
1. FOR PIPE SIZE, INVERT ELEVATION AND LOCATION SEE PROJECT PLANS.
  2. ALL CONCRETE SHALL BE MIXED AND PLACED IN ACCORDANCE WITH THE SPECIFICATIONS FOR 3000 P.S.I.
  3. FRAME AND GRATE MATERIAL SHALL BE STEEL (A.S.T.M. A-36) AND BE GALVANIZED IN ACCORDANCE WITH (A.S.T.M. A-123).
  4. PLACE CLASS 50 RIP RAP IN FRONT OF CATCHBASIN. 4'-5' LONG 1' DEPTH.

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

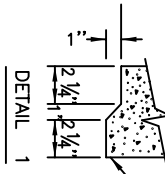
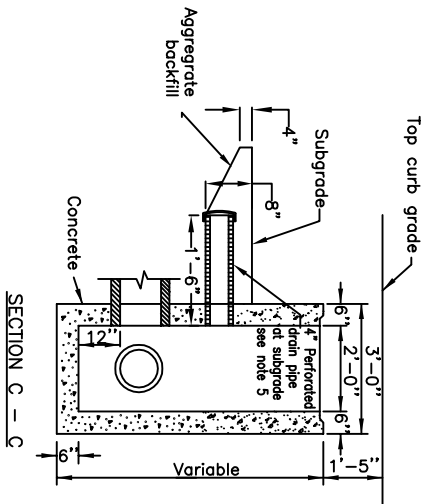
STANDARD PLAN  
TYPE 3 CATCHBASIN

LAST REV. BY BAV  
CHECKED BY TBW

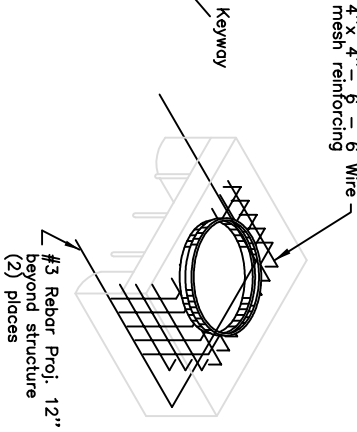
NO. 202

**NOTE:**

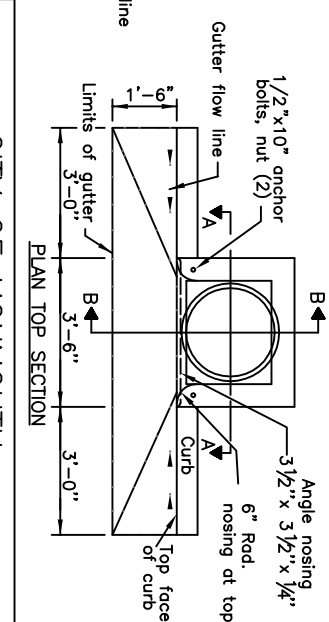
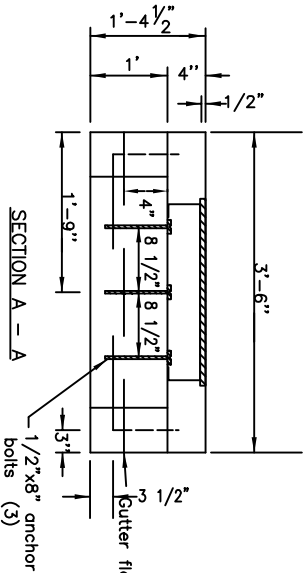
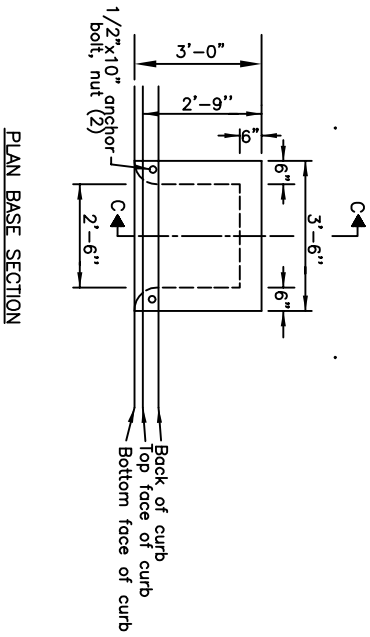
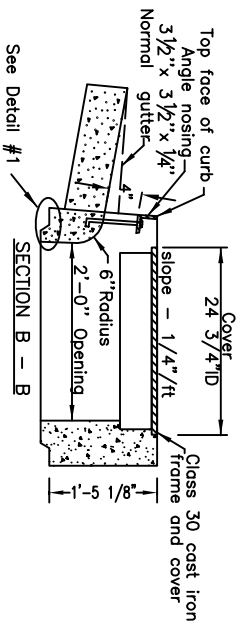
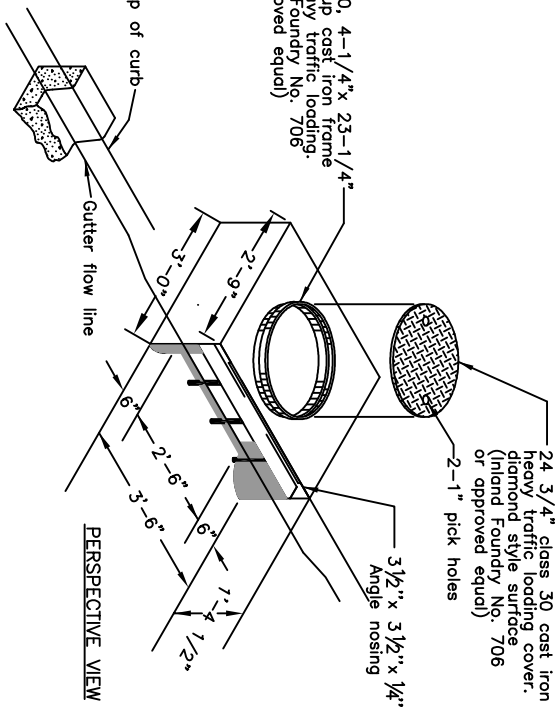
1. Concrete shall obtain a strength of 3300 p.s.i. in 20 days.
2. Top shall be reinforced with 4"x4"-6-6 wire mesh.
3. All metal parts shall be hot dipped galvanized after fabrication.
4. Cover shall be ASTM A-48 Class 30 cast iron.
5. Drain shall be P.V.C. (Schedule 40) with cap. Drain Pipe shall have 6-3/8" diameter holes in lower side. Cap shall have 4-3/8" diameter drill holes. Two drains required when c.b. located at sag vertical curve.



**REINFORCING STEEL DETAIL**



Class 30, 4-1/4"x 23-1/4"  
Flange up cast iron frame  
ring heavy traffic loading.  
(Inland Foundry No. 706  
or approved equal)



CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

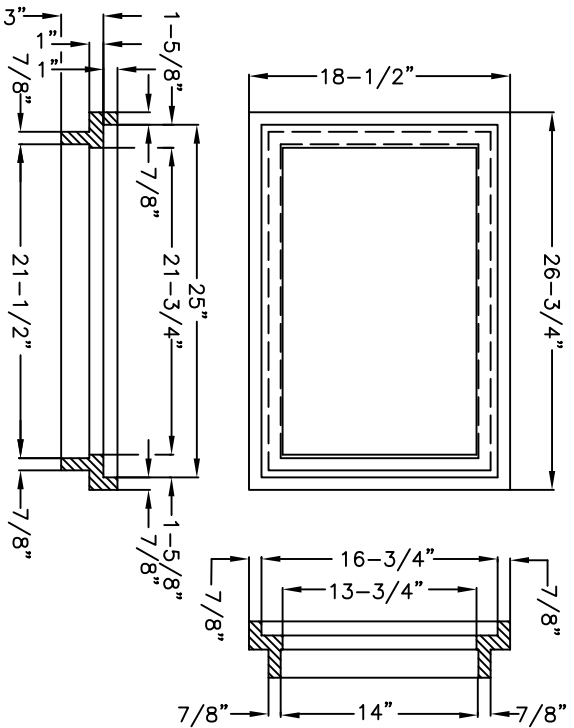
No.	Description	Date	By	Appr.
1	ISSUED	1/08	BV	TBW

STANDARD PLAN  
TYPE 4 CATCHBASIN

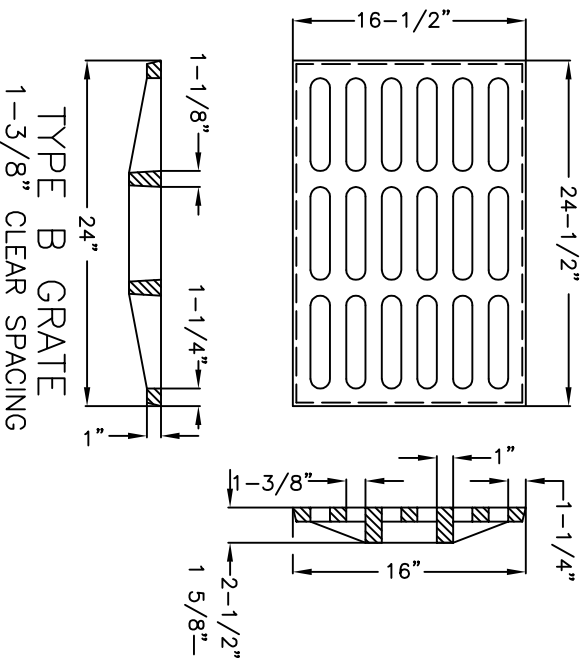
REVISION

LAST REV BY BAV  
CHECKED BY TBW  
**NO. 203**

NO SCALE



GRATE FRAME DETAILS



TYPE B GRATE  
1-3/8" CLEAR SPACING  
GRATE DETAILS

NOTES:

1. ALL GRATES AND FRAMES SHALL BE EITHER CAST IRON OR CAST STEEL.
2. ALL GRAY IRON CASTINGS SHALL CONFORM TO ASTM A 48, CLASS 30B OR AASHTO M 105, CLASS 30B
3. ALL STEEL CASTINGS SHALL CONFORM TO ASTM A 27, GRADE 65-35, OR TO AASHTO M 103, GRADE 65-35.
4. ROUNDS, FILLETS, TAPERS AND OTHER MINOR MODIFICATIONS TO THE DIMENSIONS SHOWN FOR CASTINGS MAY BE MADE TO CONFORM TO COMMON SHOP PRACTICES.

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

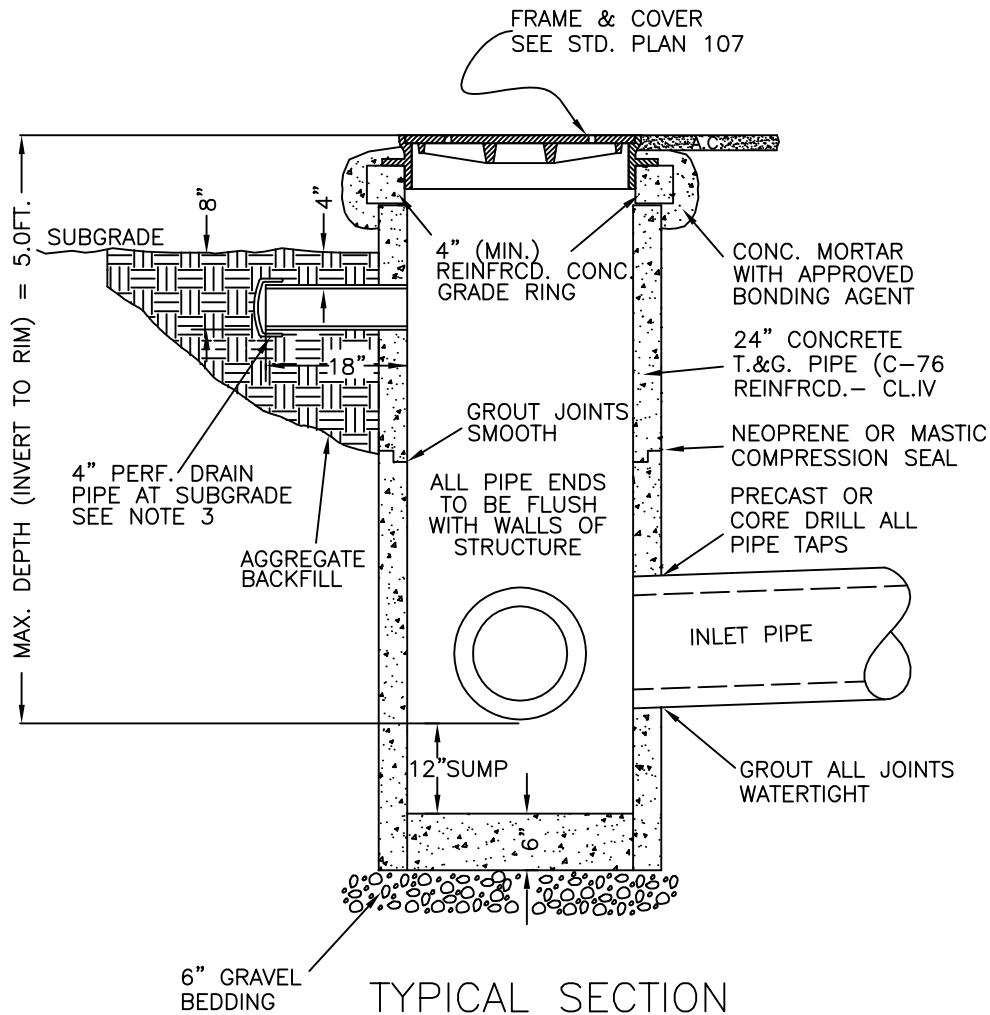
CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
CATCH BASIN FRAME AND GRATE  
TYPE B

LAST REV BY. BAV  
CHECKED BY TBW

NO. 204





NOTES:

1. ALL CAST-IN PLACE CONCRETE SHALL BE 3,000 P.S.I. (MIN.)
2. 12" MAXIMUM PIPE SIZE. MAXIMUM 2 PIPE PENETRATIONS, 1 IN, 1 OUT.
3. DRAIN SHALL BE P.V.C. (SCH. 40) WITH CAP. DRAIN PIPE SHALL HAVE 6-3/8" DIAMETER HOLES IN LOWER SIDE. CAP SHALL HAVE 4-3/8" DIAMETER DRILL HOLES.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

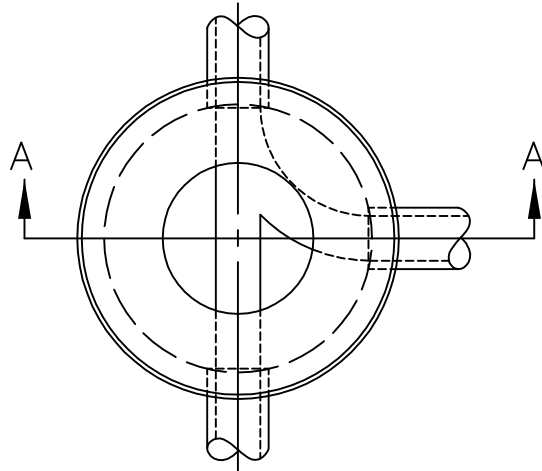
STANDARD PLAN  
ROUND STORM DRAIN CLEANOUT

LAST REV BY BAV

CHECKED BY TBW

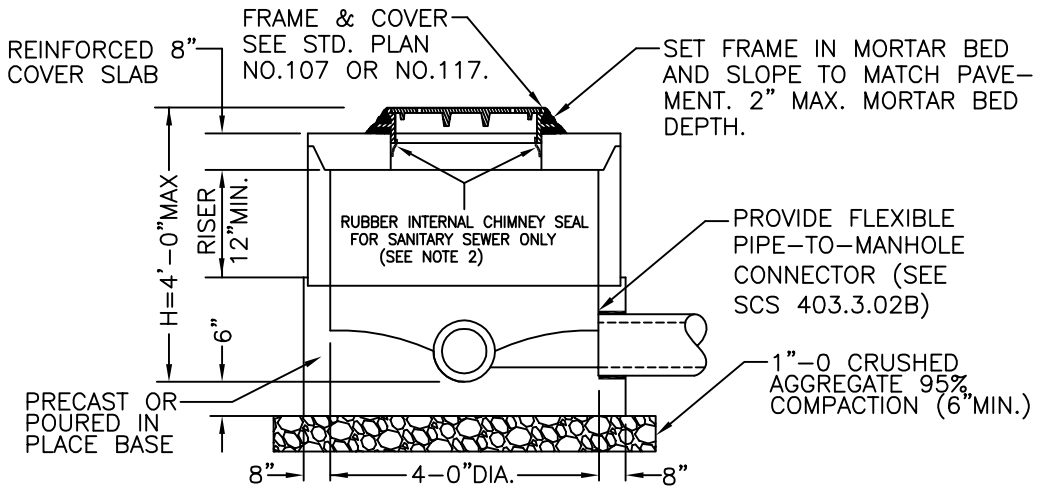
NO. 205

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



PLAN

(FRAME & COVER NOT SHOWN)



SECTION A-A

NOTES:

1. FLEXIBLE PIPE-TO-MANHOLE CONNECTIONS SHALL BE INSTALLED ACCORDING TO MANUFACTURES SPECIFICATIONS.
2. INTERNAL RUBBER CHIMNEY SEAL SHALL BE FLEX-SEAL OR CRETEX OR APPROVED EQUAL. THE CHIMNEY SEAL MAY BE DELETED WHEN MANHOLE IS ADJUSTED AFTER PAVING USING CONCRETE EXTERNAL ENCASEMENT.
3. WATER TIGHT JOINTS (GROUT JOINTS SMOOTH AT MANHOLE INTERIOR).
4. ALL MANHOLE SECTIONS MUST MEET OR EXCEED ASTM C 478.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

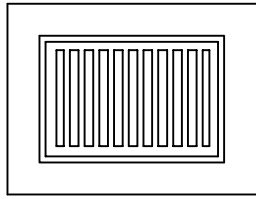
STANDARD PLAN  
SHALLOW PRECAST MANHOLE  
(H LESS THAN 4'-0")

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

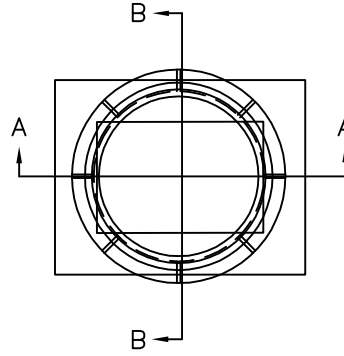
LAST REV BY BAV  
CHECKED BY TBW

NO.211

REVISION

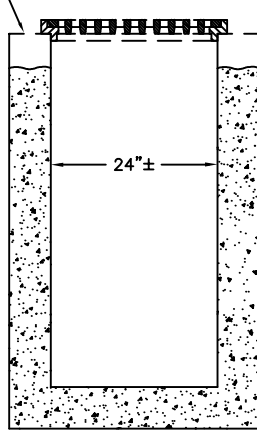


TOP VIEW  
NO SCALE:



TOP VIEW  
NO SCALE:

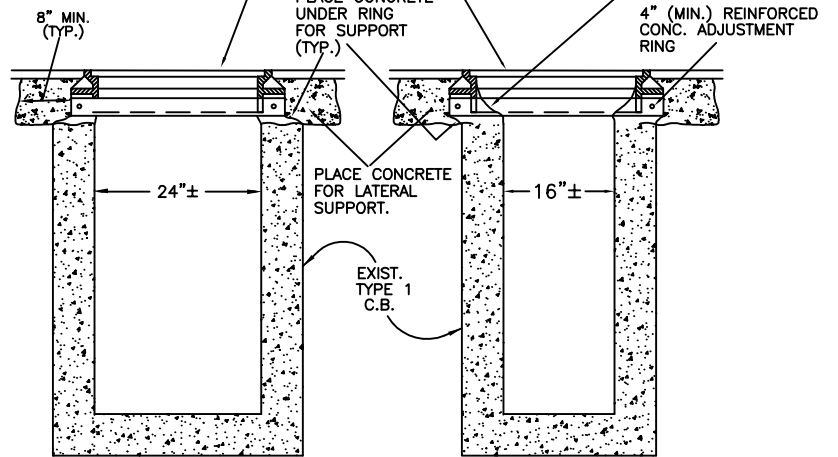
REMOVE EXISTING GRATE, FRAME AND SUFFICIENT CONCRETE FROM EXISTING CATCH BASIN TO INSTALL MANHOLE FRAME TO MATCH PAVEMENT ELEVATION AND SLOPE.



EXISTING CATCH BASIN TYPE I  
NO SCALE:

SET MANHOLE FRAME ON 4" REINF. CONC. ADJ. RING SET TO MATCH SLOPE AND PAVEMENT ELEVATION.

FILL WITH MORTAR TO TRANSITION BETWEEN MANHOLE FRAME AND CATCH BASIN STRUCTURE.



SECTION A-A  
NO SCALE:

SECTION B-B  
NO SCALE:

### MANHOLE LID CONVERSION (MODIFIED TYPE 1 C.B.)

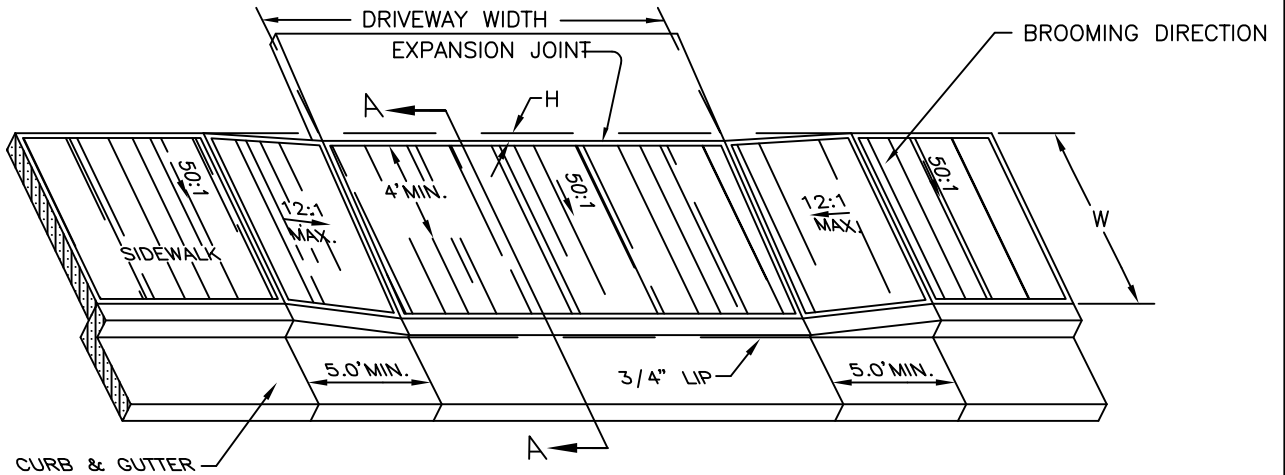
**NOTES:**

1. ALL SALVAGED FRAMES AND GRATES TO BE DELIVERED TO CITY SHOPS.
2. USE CITY OF MONMOUTH STANDARD FRAME AND COVER AS PER CITY STANDARD PLAN NO.107

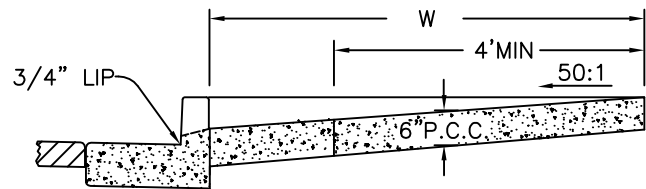
CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS  
STANDARD PLAN  
CLEANOUT  
COVER CONVERSION

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

LAST REV BY BAV	NO.214
CHECKED BY TBW	



W	H
5'	0.27' (3-1/4")
6'	0.23' (2-3/4")
7'	0.19' (2-1/4")



SECTION A-A

NTS

NOTES:

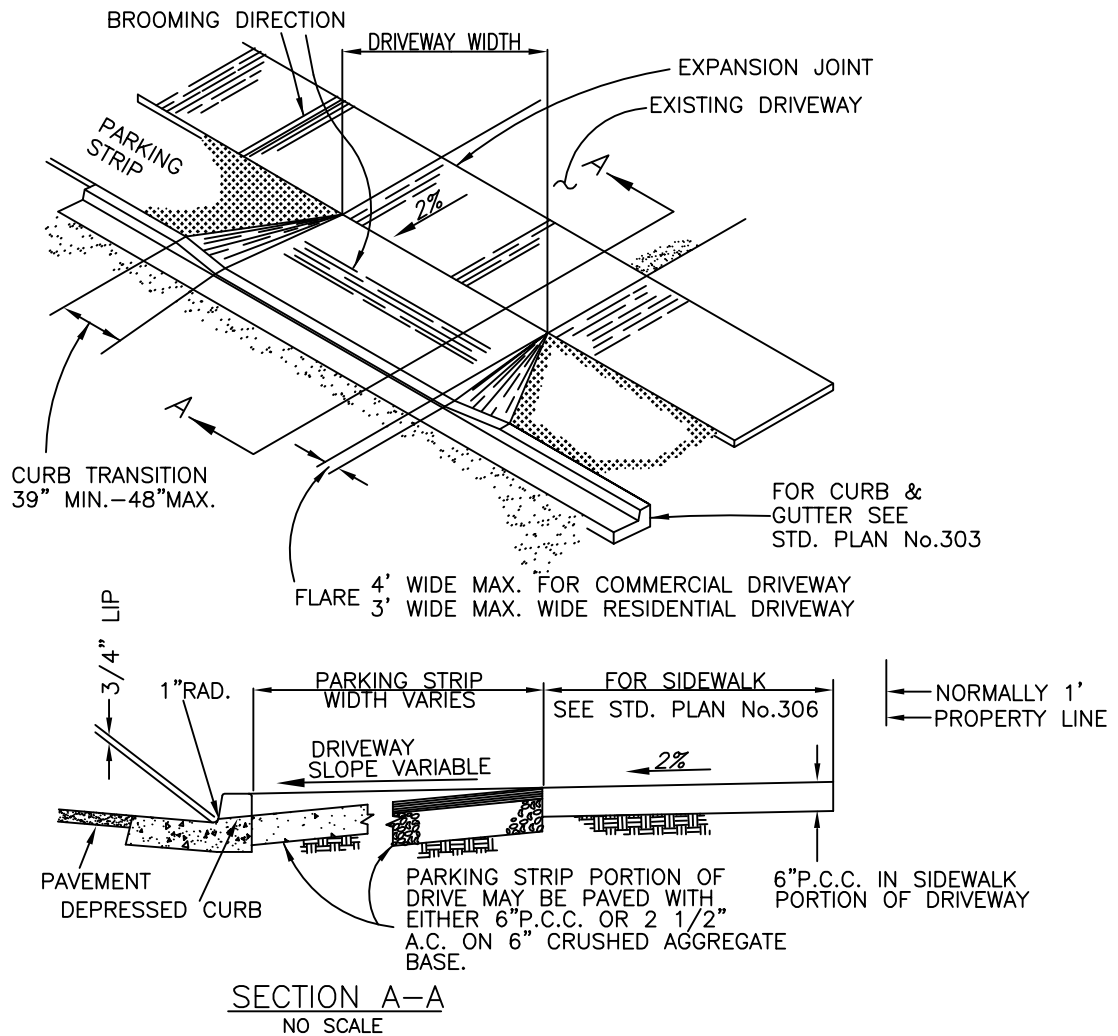
1. DRIVEWAY WIDTH WILL NORMALLY BE SHOWN ON PROJECT PLANS. WHEN NOT SHOWN, WIDTH SHALL BE AS DIRECTED BY THE ENGINEER. IN EITHER CASE, THE DRIVEWAY WIDTH SHALL NOT EXCEED THE LIMITS SET FORTH IN TITLE IX OF THE CITY OF MONMOUTH ZONING AND DEVELOPMENT CODE (30' MAX).
2. SIDEWALKS, INCLUDING THAT PORTION CROSSING THE DRIVEWAY SHALL HAVE TRANSVERSE CONTRACTION JOINTS AT 5' INTERVALS AND TOOL ROUNDED BEFORE BROOMING. ALL EDGES SHALL BE TOOL ROUNDED AND SHINED (3") AFTER BROOMING.
3. WHEN EXISTING DRIVEWAY CANNOT BE MATCHED TO NEW DRIVEWAY WITHIN SLOPE LIMITATIONS SHOWN, ADJUST EXISTING DRIVEWAY—NOT CURB AND SIDEWALK GRADE.
4. THE DIMENSIONS OF DRIVEWAY APPROACH SHALL NOT BE ADJUSTED WITHOUT SPECIFIC PRIOR (BEFORE FORMING) APPROVAL OF THE INSPECTOR.
5. CONCRETE STRENGTH SHALL BE 3000 P.S.I. IN 28 DAYS.
6. THE 50:1 CROSS-SLOPE OF SIDEWALK IS MEASURED FROM HORIZONTAL. THE 12:1 SLOPE SIDEWALK TRANSITION TO DRIVEWAY IS RELATIVE TO THE RUNNING SLOPE OF THE SIDEWALK.
7. SEE SIDEWALK DETAILS FOR RESTRICTIONS AND SPECIFICATIONS NOT SHOWN.
8. NO LIP AT GUTTER IF USED AS SIDEWALK ACCESS RAMP.
9. SEE NOTE 1 ON STD PLAN 306.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
DRIVEWAY APPROACH  
CURBLINE SIDEWALK

LAST REV BY. BAV	NO. 301
CHECKED BY TBW	

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



SECTION A-A  
NO SCALE

NOTES:

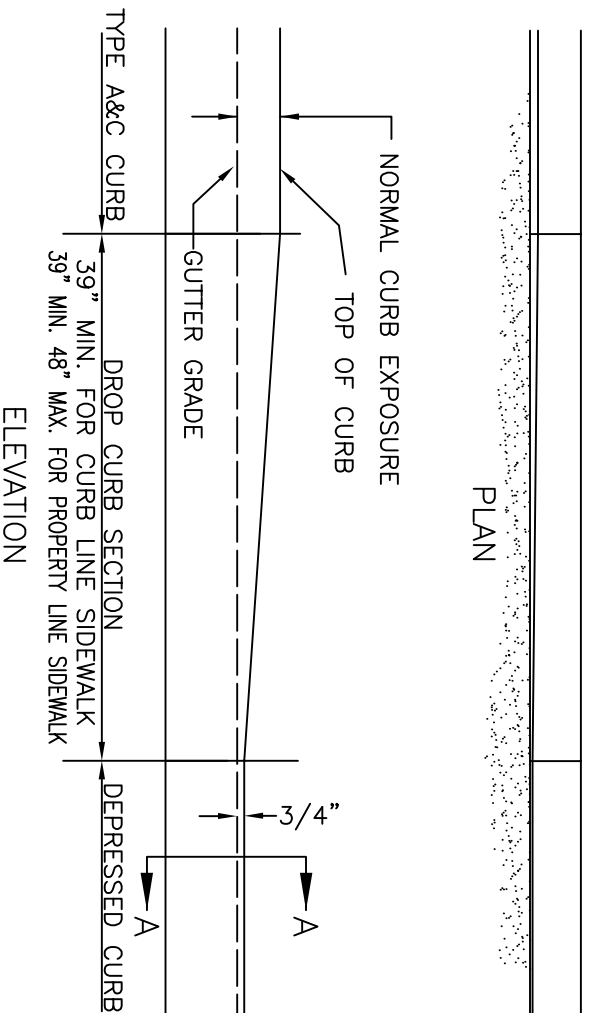
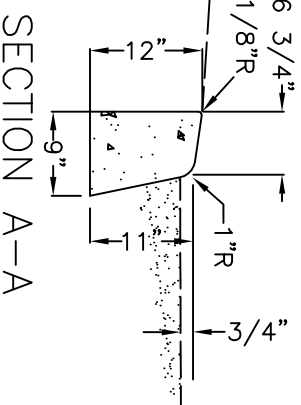
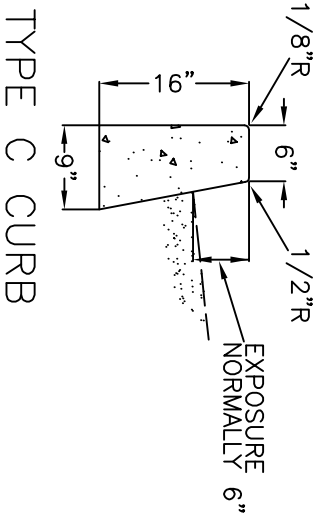
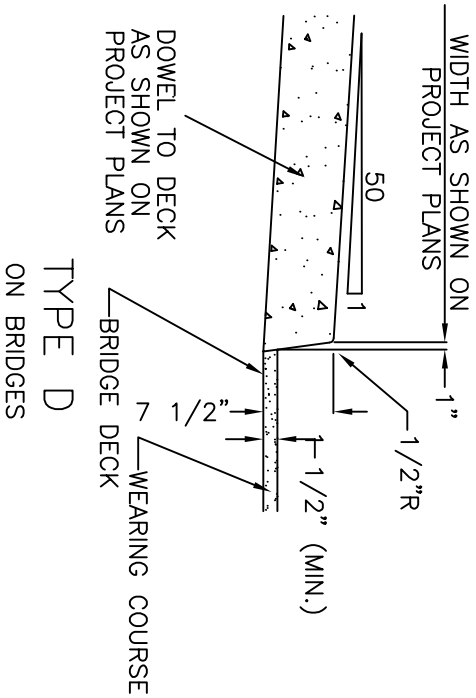
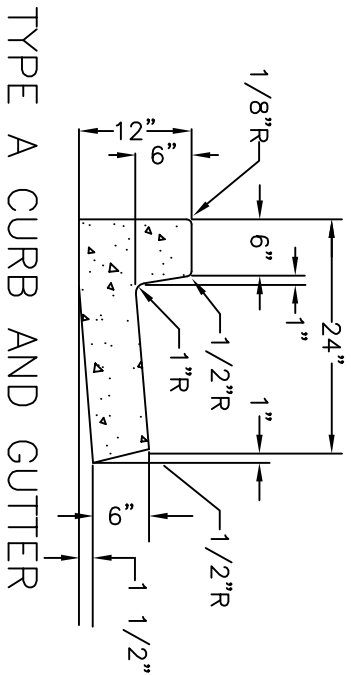
1. DRIVEWAY WIDTH WILL NORMALLY BE SHOWN ON PROJECT PLANS. WHEN NOT SHOWN, WIDTH SHALL BE AS DIRECTED BY THE ENGINEER. IN EITHER CASE, THE DRIVEWAY WIDTH SHALL NOT EXCEED THE LIMITS SET FORTH IN TITLE IX OF THE CITY OF MONMOUTH ZONING AND DEVELOPMENT CODE.
2. SIDEWALKS, INCLUDING THAT PORTION CROSSING THE DRIVEWAY SHALL HAVE TRANSVERSE CONTRACTION JOINTS AT 5' INTERVALS AND TOOL ROUNDED BEFORE BROOMING. ALL EDGES SHALL BE TOOL ROUNDED AND SHINED (3") AFTER BROOMING.
3. WHEN EXISTING DRIVEWAY CANNOT BE MATCHED TO NEW DRIVEWAY WITHIN SLOPE LIMITATIONS SHOWN, ADJUST EXISTING DRIVEWAY—NOT CURB AND SIDEWALK GRADE.
4. EXPANSION JOINTS 1/2"X3 1/2" PREMOLDED JOINT MATERIAL AT LOCATIONS SHOWN.
5. THE DIMENSIONS OF DRIVEWAY APPROACH SHALL NOT BE ADJUSTED WITHOUT SPECIFIC PRIOR (BEFORE FORMING) APPROVAL OF THE INSPECTOR.
6. CONCRETE STRENGTH SHALL BE 3000 P.S.I. IN 28 DAYS.
7. THE 1:50 CROSS-SLOPE OF SIDEWALK IS MEASURED FROM HORIZONTAL.
8. SEE SIDEWALK DETAILS FOR RESTRICTIONS AND SPECIFICATIONS NOT SHOWN.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
DRIVEWAY APPROACH  
PROPERTY LINE SIDEWALK

LAST REV. BY: BAV	NO.302
CHECKED BY: TBW	

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



TYPICAL DRIVEWAY TRANSITION

NOTES

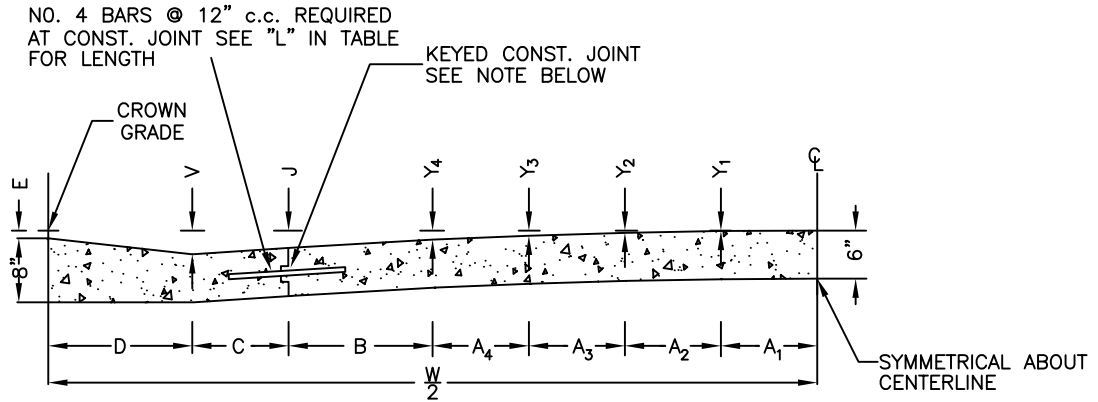
1. CURBS AND GUTTERS SHOWN MAY BE USED WITH EITHER A.C. OR P.C.C. PAVEMENTS.
2. TRANSITION FROM ONE TYPE CURB TO ANOTHER WILL BE DETAILED ON PROJECT PLANS AS NECESSARY.
3. CONTRACTION JOINT TO BE INSTALLED EVERY 10' PER MCS 308.3.06 .

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

CITY OF MONMOUTH  
 DEPARTMENT OF PUBLIC WORKS  
 STANDARD PLAN  
 PCC CURB AND GUTTER DETAIL

LAST REV. BY: BAV  
 CHECKED BY: TBW

NO. 303



HALF- SECTION OF P.C.C. ALLEY

		DIMENSIONS																			
		A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>	B	C	D	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	J	V	E	L	
ALLEY WIDTH - W	9'	1'-0"	1'-0"				1'-0"	8"	10"	0.012	0.047						0.107	0.160	0.007	12"	
	12'	1'-0"	1'-0"	1'-0"			1'-6"	8"	10"	0.006'	0.024'	0.053'					0.122'	0.160'	0.080'	12"	
	14'	1'-0"	1'-0"	1'-0"	1'-0"			1'-6"	8"	10"	0.005'	0.021'	0.048'	0.085'				0.160'	0.200'	0.120'	12"
	16'	1'-0"	1'-0"	1'-0"	1'-0"			1'-6"	1'-0"	1'-6"	0.006'	0.024'	0.053'	0.094'				0.180'	0.250'	0.080'	16"
	20'	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-6"	1'-0"	1'-6"	0.004'	0.018'	0.040'	0.071'	0.111'	0.160'		0.250'	0.320'	0.150'	16"

NOTES:

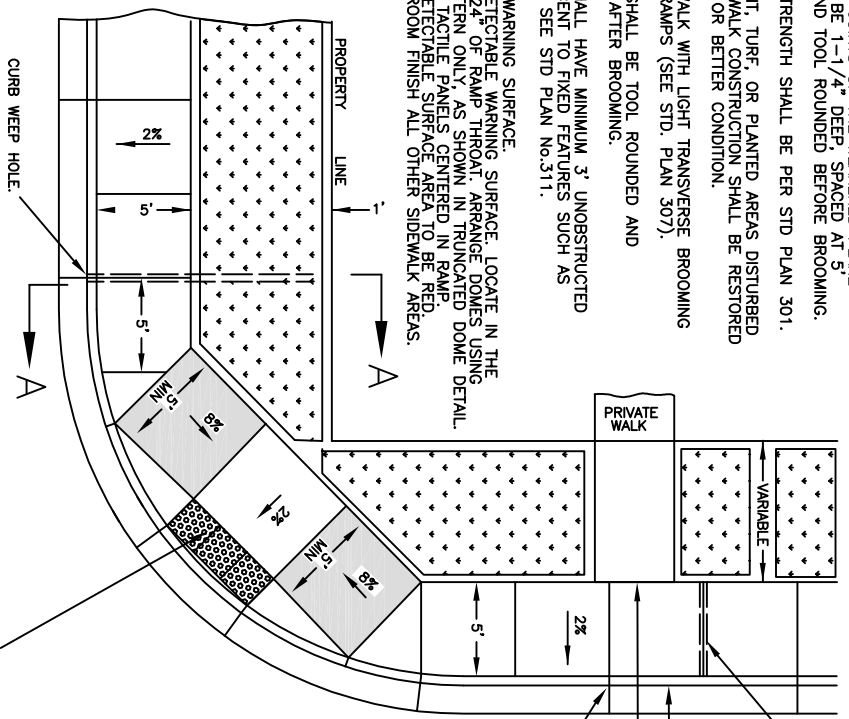
1. ALL CONC. SHALL BE CLASS 4000 P.S.I.  
MAX SLUMP 3" UNLESS OTHERWISE SPECIFIED BY THE ENGINEER
2. FOR FINISH, CURING AND OTHER REQUIREMENTS  
SEE SPECIFICATIONS.
3. ALLEY MAY BE POURED MONOLITHICALLY OR GUTTER  
SECTIONS MAY BE PLACED SEPARATELY AS SHOWN,  
IF THE SECTIONS ARE PLACED SEPARATELY THE  
CONSTRUCTION JOINT SHALL BE KEYED AND DOWELED

CITY OF MONMOUTH DEPARTMENT OF PUBLIC WORKS	
STANDARD PLAN	
PUBLIC ALLEY DETAIL PORTLAND CEMENT CONCRETE	
LAST REV BY BAV	NO. 304
CHECKED BY TBW	

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

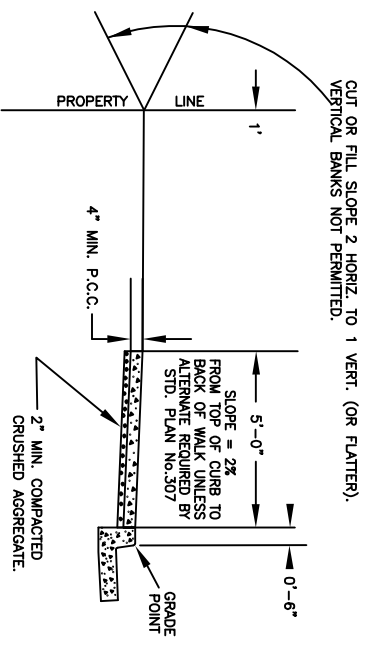
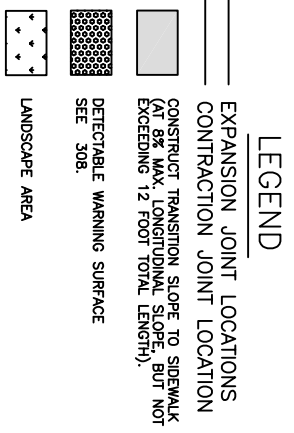
NOTES:

1. EXPANSION JOINTS 1/2" X 3-1/2" PREMOLDED JOINT FILLER MATERIAL AT LOCATIONS SHOWN, HEREON AND ON STANDARD PLAN NO. 307 MATERIAL SHALL BE RECESSED OR CUT TO WITHIN 1/2" OF THE FINISHED CONCRETE SURFACE.
2. CONTRACTION JOINTS OF THE WEAKENED PLANE TYPE SHALL BE 1-1/4" DEEP, SPACED AT 5' INTERVALS AND TOOL ROUNDED BEFORE BROOMING.
3. CONCRETE STRENGTH SHALL BE PER STD. PLAN 301.
4. ALL PAVEMENT, TURF, OR PLANTED AREAS DISTURBED BY THE SIDEWALK CONSTRUCTION SHALL BE RESTORED TO ORIGINAL OR BETTER CONDITION.
5. FINISH SIDEWALK WITH LIGHT TRANSVERSE BROOMING EXCEPT AT RAMPS (SEE STD. PLAN 307).
6. ALL EDGES SHALL BE TOOL ROUNDED AND SHINED (S) AFTER BROOMING.
7. SIDEWALK SHALL HAVE MINIMUM 3' UNOBSTRUCTED WIDTH ADJACENT TO FIXED FEATURES SUCH AS MAILBOXES. SEE STD. PLAN No.311.
8. DETECTABLE WARNING SURFACE. 2"x4" MIN. DETECTABLE WARNING SURFACE. LOCATE IN THE LOWER 24" OF RAMP THROAT. ARRANGE DOMES USING IN-LINE PATTERN ONLY AS SHOWN IN TRUNCATED DOME DETAIL. USE 2" X 2" TACTILE PANELS CENTERED IN RAMP. COLOR OF DETECTABLE SURFACE AREA TO BE RED. STANDARD BROOM FINISH ALL OTHER SIDEWALK AREAS.

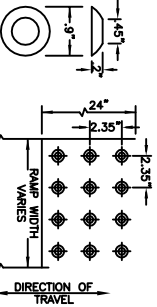


RED TRUNCATED DOME DETECTABLE WARNING SURFACE AT 8% SLOPE.

- ALIGN BUILDING DRAINS WITH CONTRACTION JOINT
- FACE OF CURB
- EXPANSION JOINT
- CONTRACTION JOINT
- ALIGN WITH JOINTS IN CURB



SECTION A-A



TRUNCATED DOME DETAIL

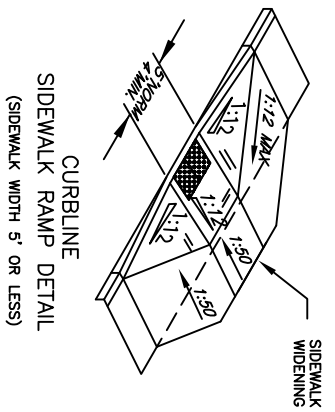
No.	Description	Date	By	Appr.
1	ISSUED	1/08	BV	TBW

**CITY OF MONMOUTH**  
**DEPARTMENT OF PUBLIC WORKS**  
 STANDARD PLAN  
**SIDEWALK DETAILS**

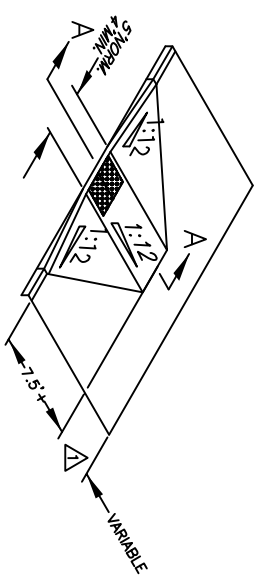
LAST REV. BY: BAV  
 CHECKED BY: TBW

NO. 306

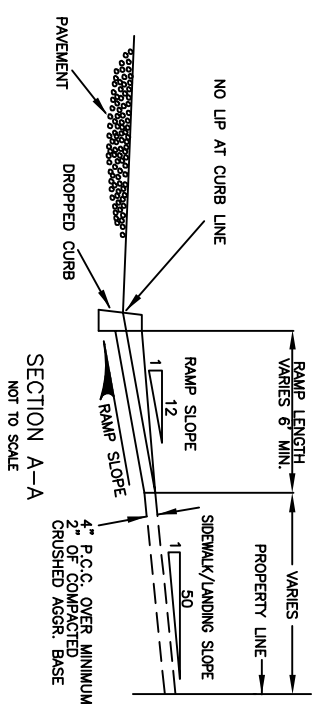




CURLLINE  
SIDEWALK RAMP DETAIL  
(SIDEWALK WIDTH 5' OR LESS)



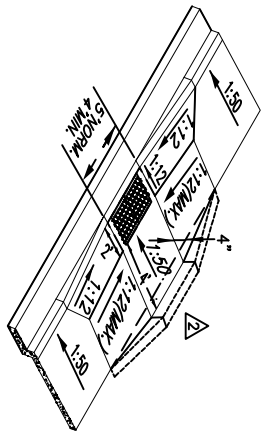
ALTERNATE CURLLINE  
RAMP DETAIL  
(SIDEWALK WIDTH 7.5' OR GREATER)



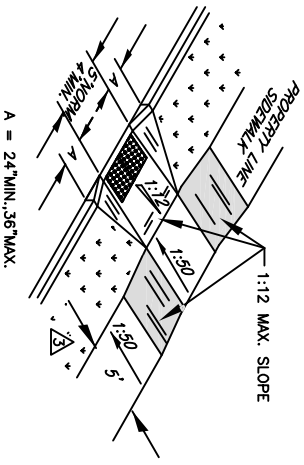
SECTION A-A  
NOT TO SCALE

LEGEND & NOTES

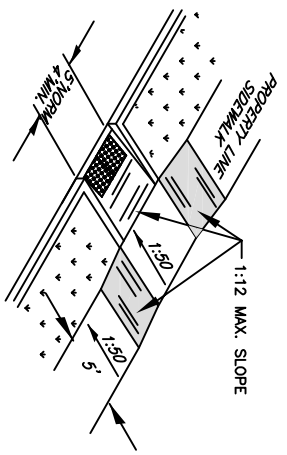
- LANDSCAPE AREA
- CONSTRUCT TRANSITION SLOPE TO SIDEWALK AT 1:12 MAX. LONGITUDINAL SLOPE, BUT NOT EXCEEDING 12 FOOT TOTAL LENGTH).
- DETECTABLE WARNING SURFACE.
- 2'x4' MIN. DETECTABLE WARNING SURFACE. LOCATE IN THE LOWER 24" OF RAMP THROAT. ARRANGE DOMES USING IN-LINE PATTERN ONLY, AS SHOWN IN TRUNCATED DOME DETAIL.
- USE 2' x 2' TACTILE CONCRETE PANELS CENTERED IN RAMP.
- COLOR OF DETECTABLE SURFACE AREA TO BE RED. STANDARD BROOM FINISH ALL OTHER SIDEWALK AREAS.



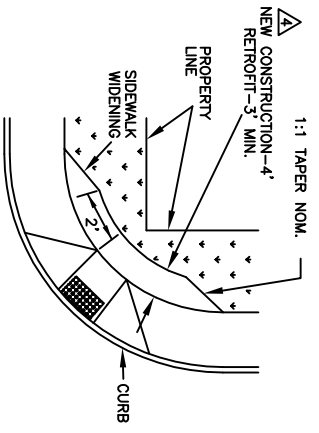
CURLLINE SIDEWALK  
MODIFIED SIDEWALK RAMP  
TRANSITION FINISH GRADE TO BACK OF RAMP AT 2:1 SLOPE. CONSTRUCT 6" WIDE CONCRETE CURB AT BACK OF RAMP IF UNABLE TO TRANSITION WITHIN 4 FEET OF BACK OF RAMP.



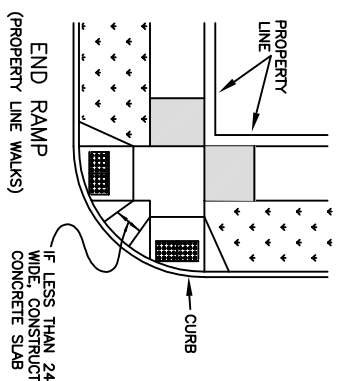
PROPERTY LINE  
SIDEWALK RAMP DETAIL  
IF THE "LANDSCAPED AREA" IS PAVED, TREAT TRANSITION LENGTH (A) THE SAME AS ALTERNATE CURLLINE SIDEWALK RAMP DETAIL.



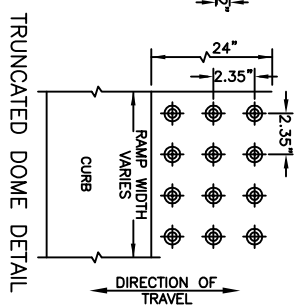
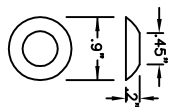
ALTERNATE PROPERTY LINE  
SIDEWALK RAMP DETAIL



CENTER RAMP  
(CURB LINE WALK)  
NEW CONSTRUCTION IS DEFINED AS PROJECTS COMPLETELY WITHIN NEW R/W. IN RETROFITS, CONFORM TO NEW CONSTRUCTION REQUIREMENTS TO THE MAXIMUM EXTENT POSSIBLE.



END RAMP  
(PROPERTY LINE WALKS)  
IF LESS THAN 24" WIDE, CONSTRUCT CONCRETE SLAB



TRUNCATED DOME DETAIL

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS  
STANDARD PLAN  
SIDEWALK RAMPS

LAST REV. BY: BAV  
CHECKED BY: TBW

NO. 307

BLACK ON WHITE  
REFLECTORIZED ENGINEERING  
GRADE 3-M SCOTCHLITE OR  
APPROVED EQUAL.

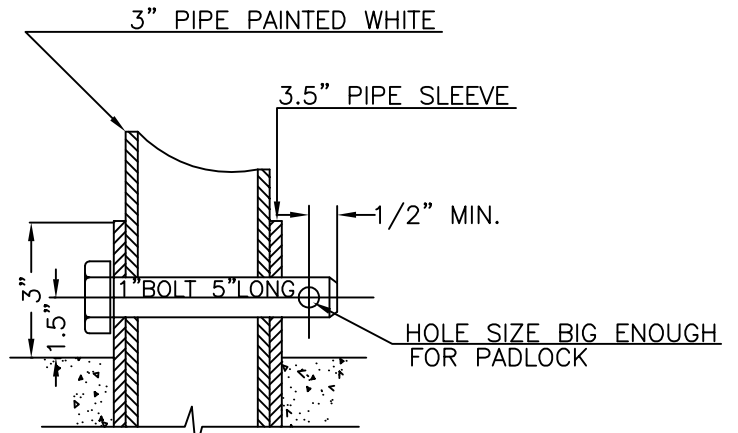


OBR-10-11-18  
30"X18"

2" GALV. POST

8'-6" MIN.

REFLECTOR POST CONNECTION DETAIL

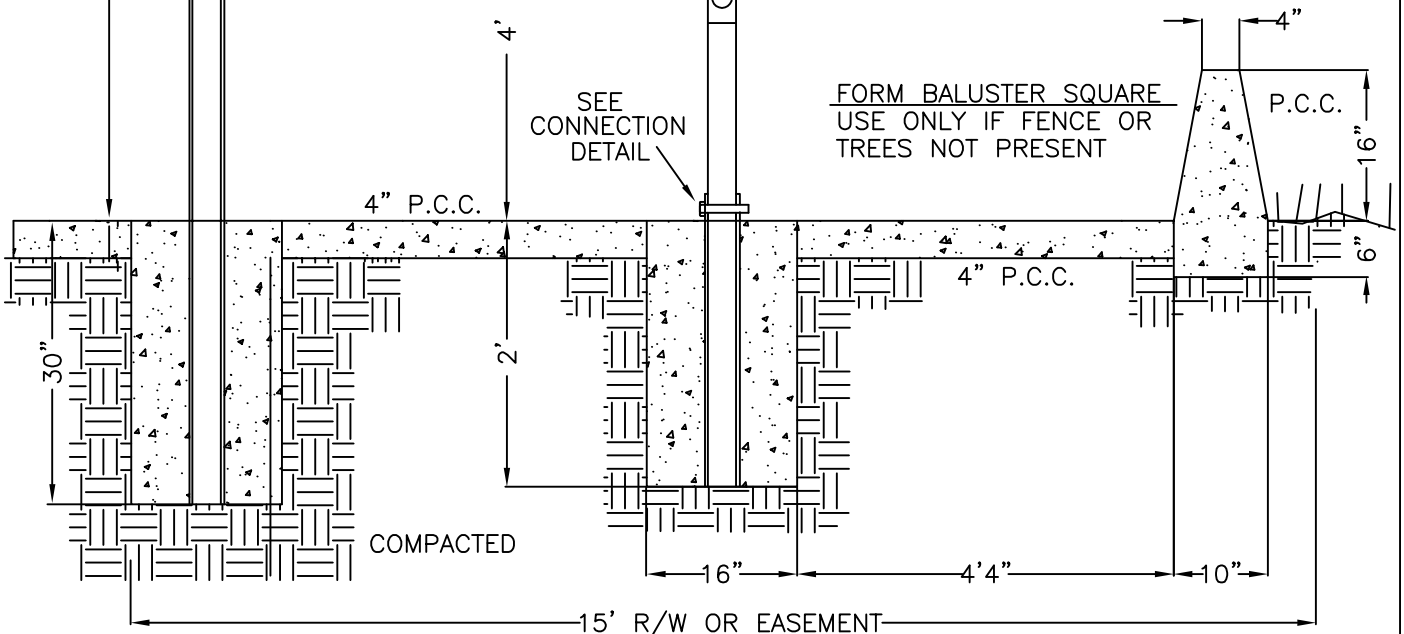


WELDED CLOSING PLATE

REFLECTOR BUTTONS BOTH SIDES OF  
POST OR 3" SILVER REFLECTORIZED  
ENGINEERING GRADE 3-M SCOTCHLITE  
OR APPROVED EQUAL.

SEE CONNECTION  
DETAIL

FORM BALUSTER SQUARE  
USE ONLY IF FENCE OR  
TREES NOT PRESENT



CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

STANDARD PLAN  
MID-BLOCK WALK ENTRANCE  
TRAFFIC CONTROL

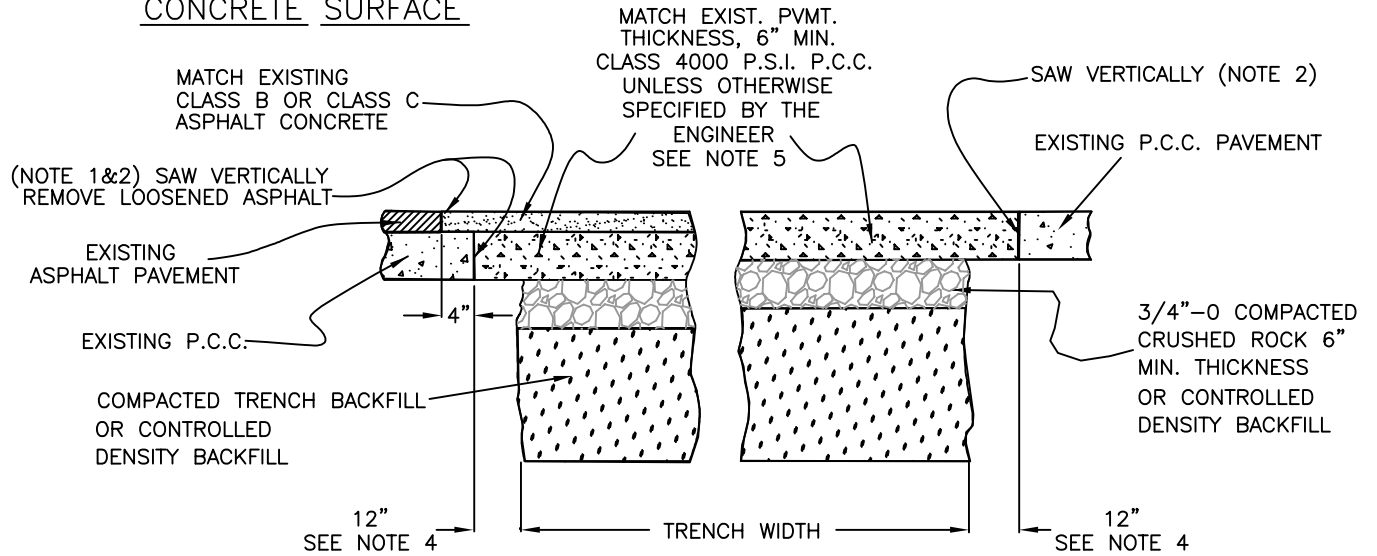
LAST REV BY BAV  
CHECKED BY TBW

NO. 308

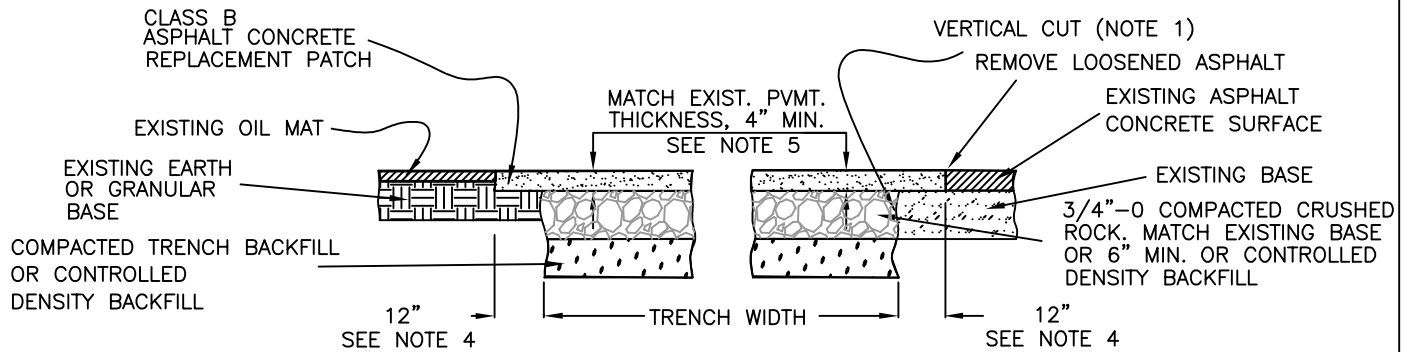
REVISION

HALF SECTION  
RIGID PAVEMENT  
WITH ASPHALT  
CONCRETE SURFACE

HALF SECTION  
P.C.C. PAVEMENT



TYPICAL PATCH FOR RIGID PAVEMENT



TYPICAL PATCH FOR FLEXIBLE PAVEMENT

NOTES

1. FINAL CUTS IN A.C. PAVEMENT SHALL BE MADE WITH A CONCRETE SAW, MORE THAN ONE CUT MAY BE REQUIRED IN AC PAVEMENTS.
2. CUTS IN P.C.C. PAVEMENT SHALL BE MADE WITH A CONCRETE SAW.
3. 1"-0 CRUSHED AGGREGATE MAY BE SUBSTITUTED FOR 3/4"-0.
4. PAVEMENT REPLACEMENT WIDTH SHALL BE: TRENCH WIDTH PLUS 12" ON EACH SIDE.
5. PAVEMENT REPLACEMENT THICKNESS SHALL BE AS SHOWN ABOVE FOR ROCK TRENCH BACKFILL. FOR CONTROLLED DENSITY TRENCH BACKFILL, PAVEMENT REPLACEMENT THICKNESS SHALL BE AS FOLLOWS:  

STREET CLASSIFICATION	ARTERIAL	COLLECTOR	LOCAL
PORTLAND CEMENT CONCRETE	8"P.C.C.	7"P.C.C.	6"P.C.C.
A.C. OVER P.C.C.	4"A.C.	4"A.C.	4"A.C.
ASPHALT CONCRETE	8"A.C.	6"A.C.	4"A.C.

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

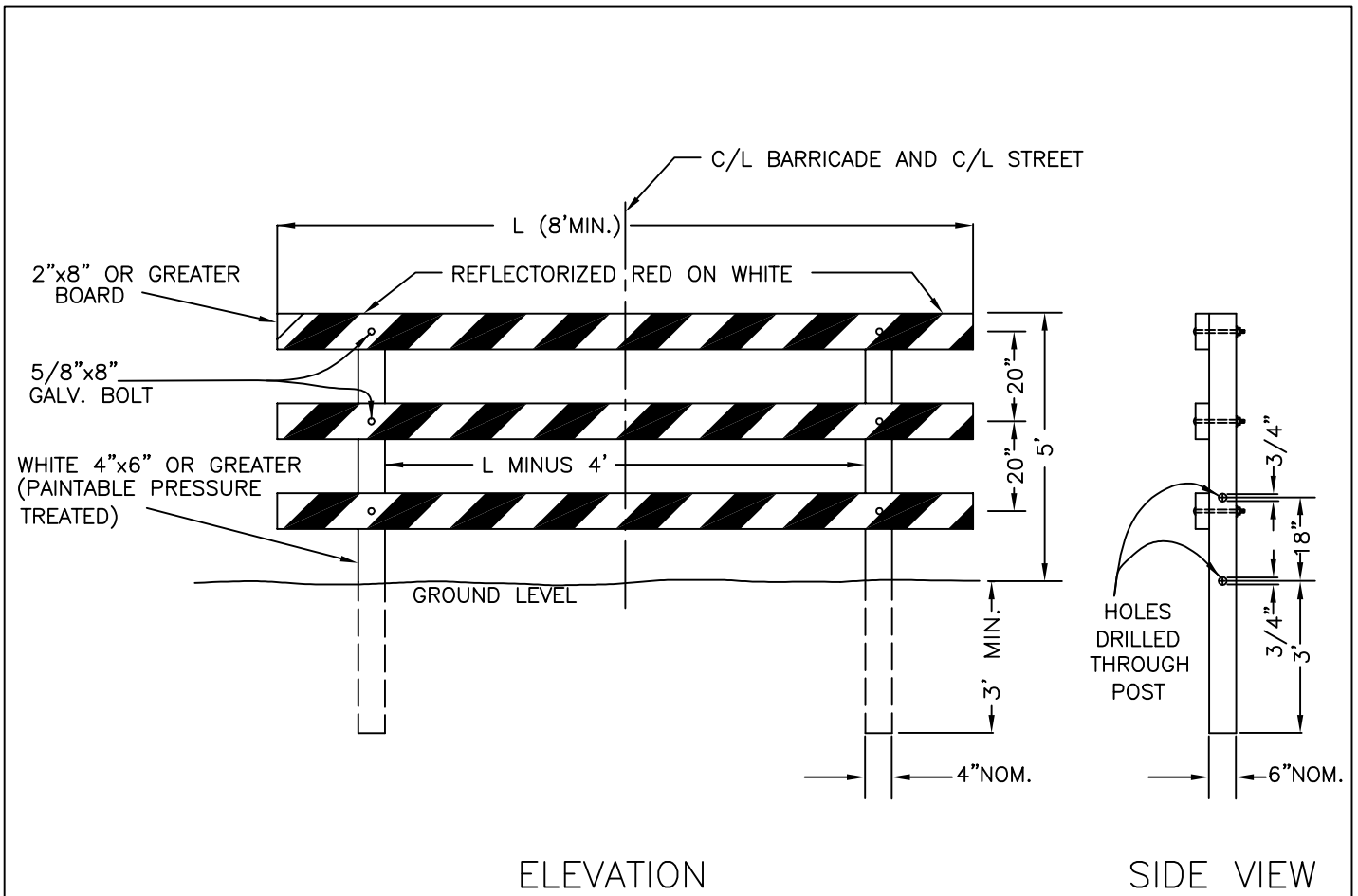
CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
PAVEMENT PATCHING

LAST REV BY: BAV

CHECKED BY: TBW

NO. 309



NOTES:

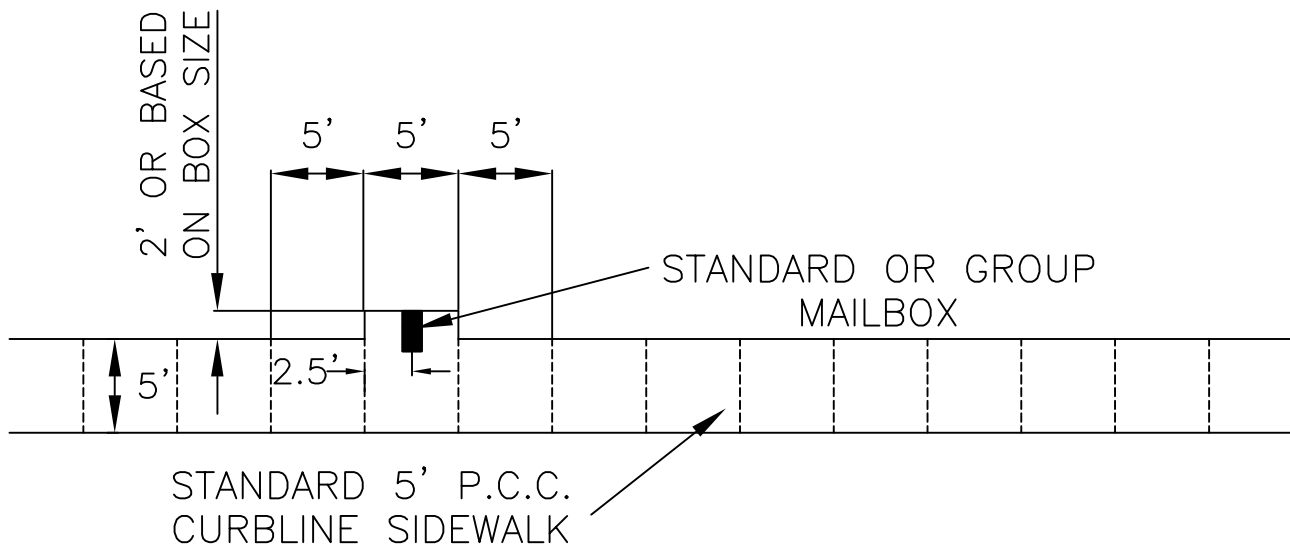
1. REFLECTORIZED SHEETING SHALL BE ENGINEERING GRADE REFLECTIVE SHEETING CONFORMING TO 2002 EDITION OF THE OREGON STATE HIGHWAY DIVISIONS "STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION SECTION 02910"
2. THE LENGTH OF THE BARRICADE UNIT "L" AND NUMBER AND POSITIONING OF UNITS WILL BE SHOWN ON PROJECT PLANS.

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
PERMANENT BARRICADE

LAST REV BY BAV	NO.310
CHECKED BY TBW	



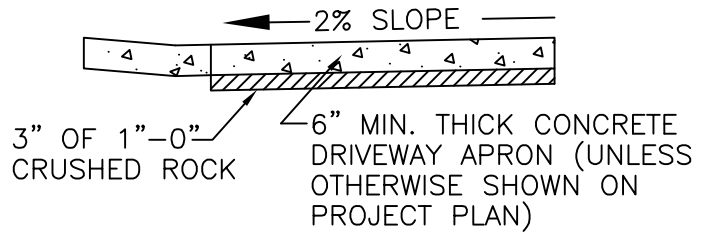
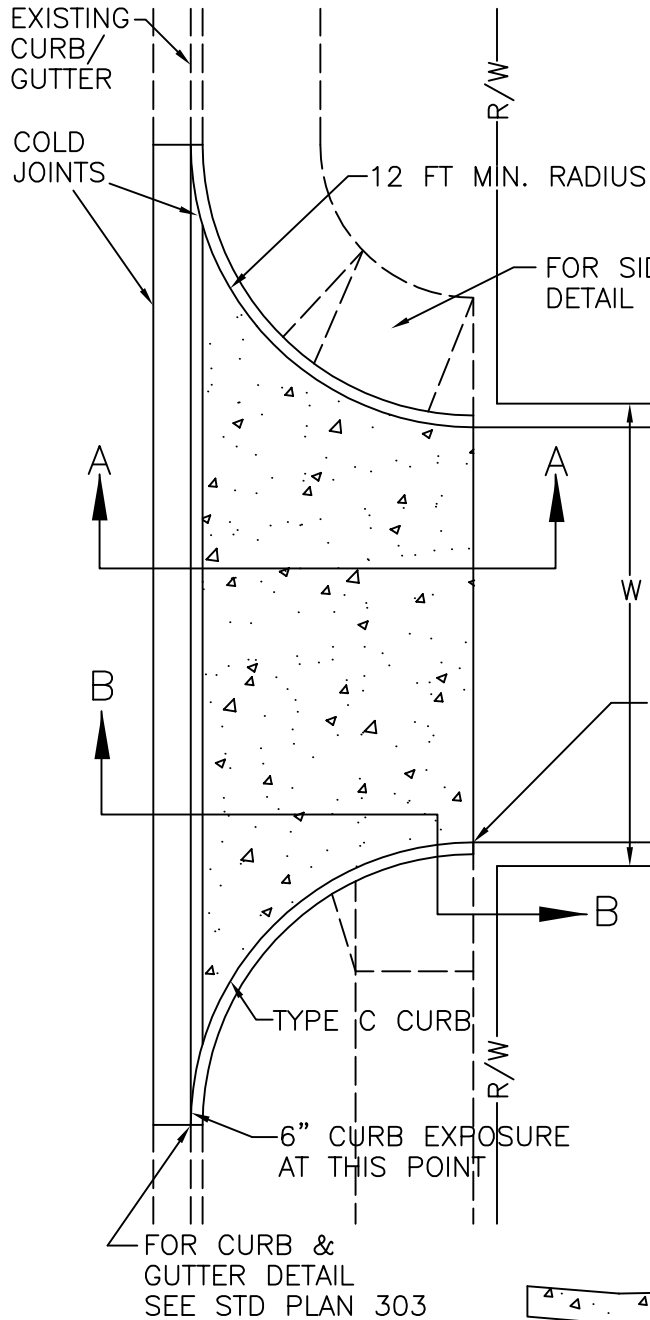
NOTE

1. SEE STD. PLAN 306 FOR STANDARD SIDEWALK DETAILS.
2. CONSTRUCT WIDENED SIDEWALK AT ALL MAILBOX LOCATIONS.
3. MAILBOX PLACEMENT SPECIFICATIONS:
  - FRONT FACE OF MAILBOX TO BE SET BACK 5'6" FROM FACE OF CURB.
  - BASE OF MAILBOX TO BE BETWEEN 38" AND 40" ABOVE CURB, GUTTER OR PAVEMENT GRADE.

CITY OF MONMOUTH DEPARTMENT OF PUBLIC WORKS	
STANDARD PLAN WIDENED SIDEWALK AT MAILBOX LOCATIONS	
LAST REV BY BAV	NO.311
CHECKED BY TBW	

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

FOR SIDEWALK DETAIL  
SEE STD PLAN 306



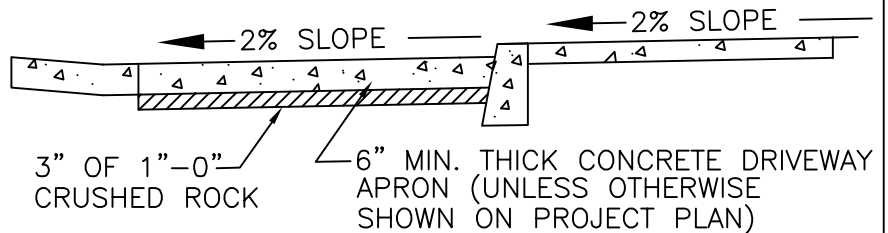
SECTION A-A

W = WIDTH REQUIREMENTS AS SPECIFIED  
IN THE DEVELOPMENT CODE, OR  
AS APPROVED.

CURB EXPOSURE VARIES DEPENDING  
ON THE CONFIGURATION OF ALLEY OR  
DRIVEWAY BEHIND THE RIGHT-OF-WAY

NOTES:

1. THIS TYPE OF APPROACH TO BE USED FOR HIGH VOLUME TRAFFIC GENERATORS, OR LARGE TRUCK TRAFFIC WITH PRIOR APPROVAL OF THE CITY ENGINEER.
2. ALL CONCRETE TO HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 P.S.I.



SECTION B-B

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
COMMERCIAL CURB RETURNS FOR  
DRIVEWAY AND ALLEY APPROACH

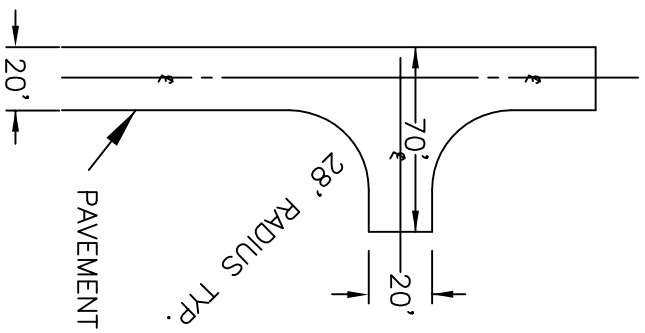
LAST REV BY: BAV

CHECKED BY TBW

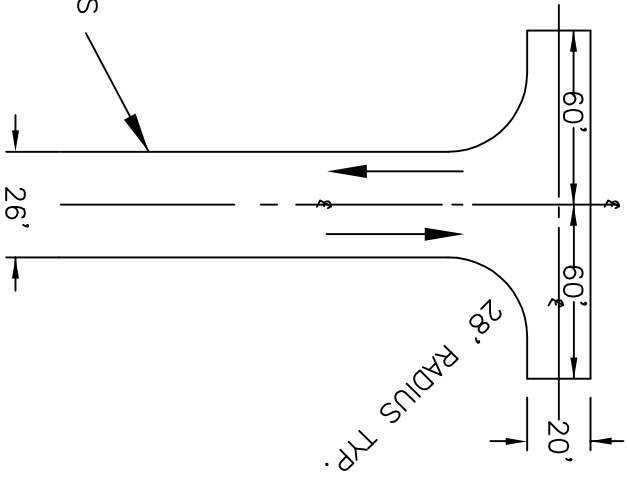
NO. 315

No.	Description	Date	By	Appr
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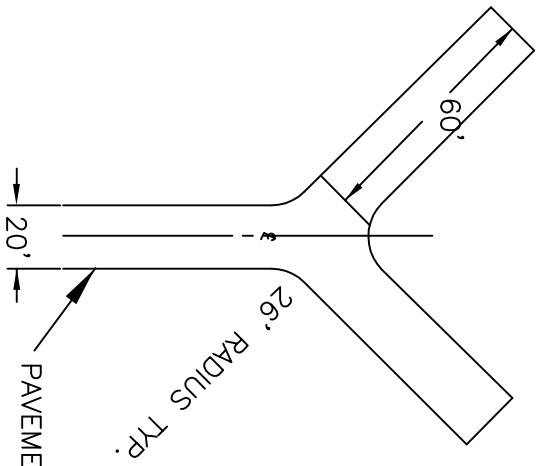
REVISION



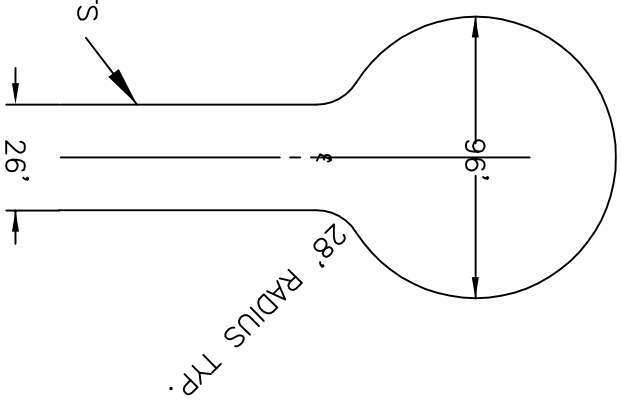
TYPE 1



TYPE 2



TYPE 3



TYPE 4

NOTES

1. "NO PARKING" SIGNS REQUIRED WITHIN LIMITS OF TURNAROUND
2. FOR OTHER FIRE RELATED ACCESS REQUIREMENTS REFER TO POLK COUNTY RFPD FIRE CODE APPLICATIONS GUIDE AVAILABLE BY CALLING 503-838-1510

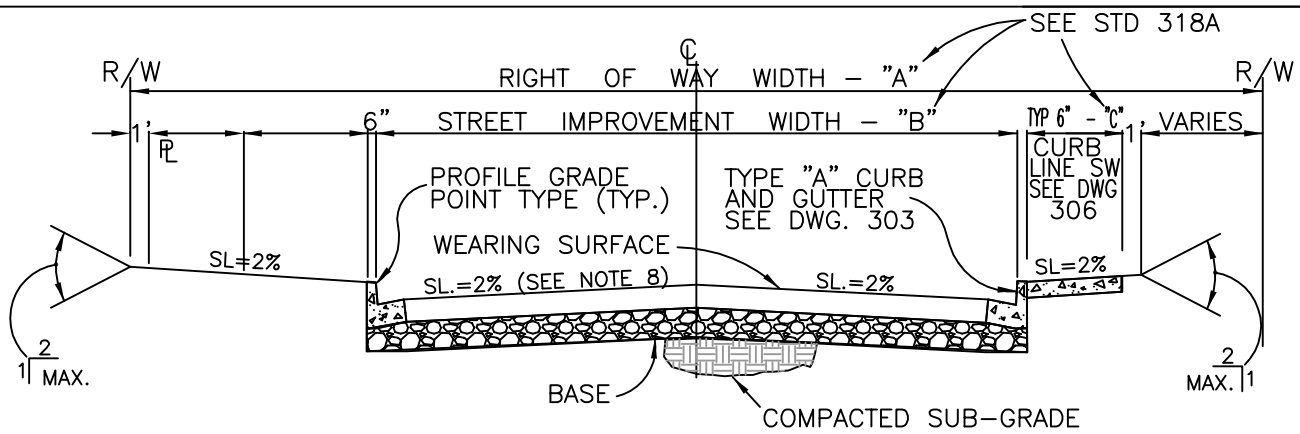
No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

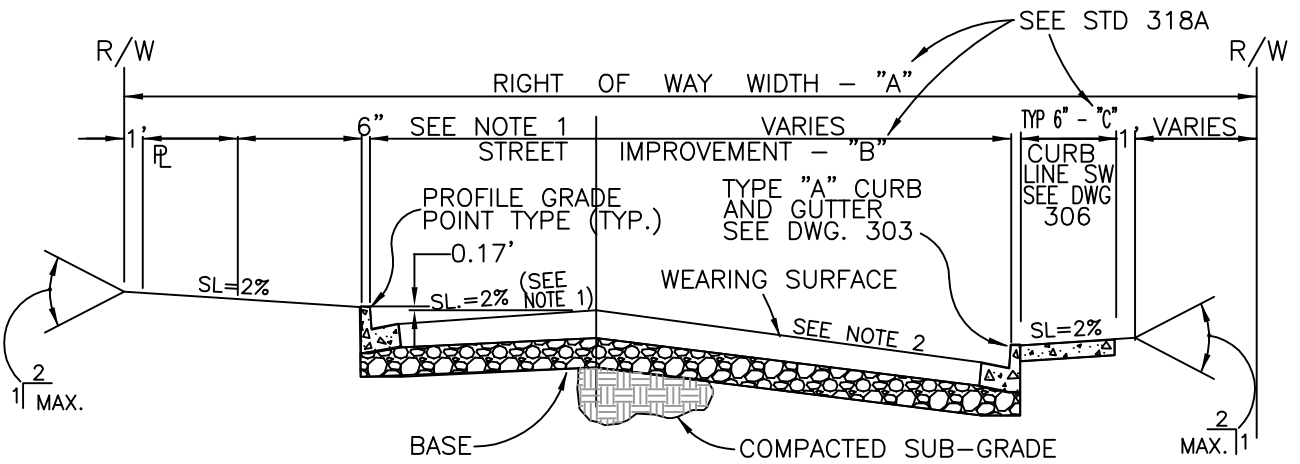
STANDARD PLAN  
HAMMER-HEAD TURNAROUND

LAST REV BY BAV  
CHECKED BY TBW

NO. 316



TYPICAL STREET SECTION  
 C SECTION



TYPICAL STREET SECTION  
 TILT SECTION

NOTES:

1. 0 TO 0.3' TILT HAS A CROWN. 0.3' TO 1' TILT, AS DRAWN, HAS A CROWN THAT IS 0.17 BELOW AND 12' FROM HIGH CURB.
2. MAXIMUM SLOPE: RESIDENTIAL STREET = 6% MAXIMUM SLOPE; COLLECTOR & ARTERIAL = 4%.
3. ALTERNATE DESIGNS TO BE APPROVED BY THE DIRECTOR OF PUBLIC WORKS.
4. FOR STANDARD DRIVEWAY DETAILS SEE STD. PLAN NO.S 301 AND 302.
5. SIDEWALK LOCATION SHALL BE AS APPROVED BY THE DIRECTOR OF PUBLIC WORKS.
6. FOR HIGH SPEED ARTERIAL & COLLECTOR STREETS, DESIGN CROWN TO CORRESPOND WITH LANE CONFIGURATION.
7. FOR CLASSIFICATION (LOCAL, COLLECTOR, ARTERIAL) SEE MONMOUTH TRANSP. SYSTEM PLAN
8. FOR STREET WIDTH IN EXCESS OF 34', CROSS SLOPE SHALL BE A MINIMUM OF 3%.

CITY OF MONMOUTH  
 DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
 TYPICAL STREET SECTIONS

LAST REV BY: BAV

CHECKED BY TBW

NO.318

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



Street Classification	Access Spacing	Right-of-Way Width <b>(A)</b>	Curb to Curb Width <b>(B)</b>	Sidewalk Width <sup>1</sup> <b>(C)</b>	Bike Lane Width <sup>2</sup>	On-Street Parking	Planting Strips	Travel Lanes <sup>3</sup>
Arterial	250 ft. <sup>4</sup>	84 ft.	60 ft.	6-10 ft. <sup>5</sup>	2@ 6 ft. each	8 ft bays	7 – 8 ft. <sup>6</sup>	2@ 10 ft each
Collector		66 ft.	36 ft.		N/A <sup>2</sup>		7 – 8 ft. <sup>6</sup>	2@ 10 ft each
Residential		66 ft.	36 ft.	5 – 8 ft. <sup>5</sup>	N/A	7 ft. lanes	7 – 8 ft. <sup>6</sup>	2@ 10 ft each
Commercial		66 ft.	36 ft.	6 – 10 ft. <sup>5</sup>	N/A	8 ft. lanes	7 – 8 ft. <sup>6</sup>	2@ 10 ft each
Industrial other than Arterials		72 ft.	36 ft.	6 – 10 ft. <sup>5</sup>	Optional	7 ft. lanes	7 – 8 ft. <sup>6</sup>	2@ 10 ft each
Local		60 ft.	30 ft.	5.0 ft.	N/A	2, 7 ft. lanes	7 – 8 ft.	11 – 14 ft. queuing
Circular ends of Cul-de-sacs		114 ft.	80 ft. diam.	5.0 ft.	N/A	N/A	Optional	N/A
Alleys		16–20 ft.	12–16 ft. paved width, 2-4 ft. strips on both sides	N/A	N/A	N/A	None	None
Public Accessways		10–18 ft.	6–10 ft. paved width, 2-4 ft. strips on both sides	N/A	N/A	N/A	None	None

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

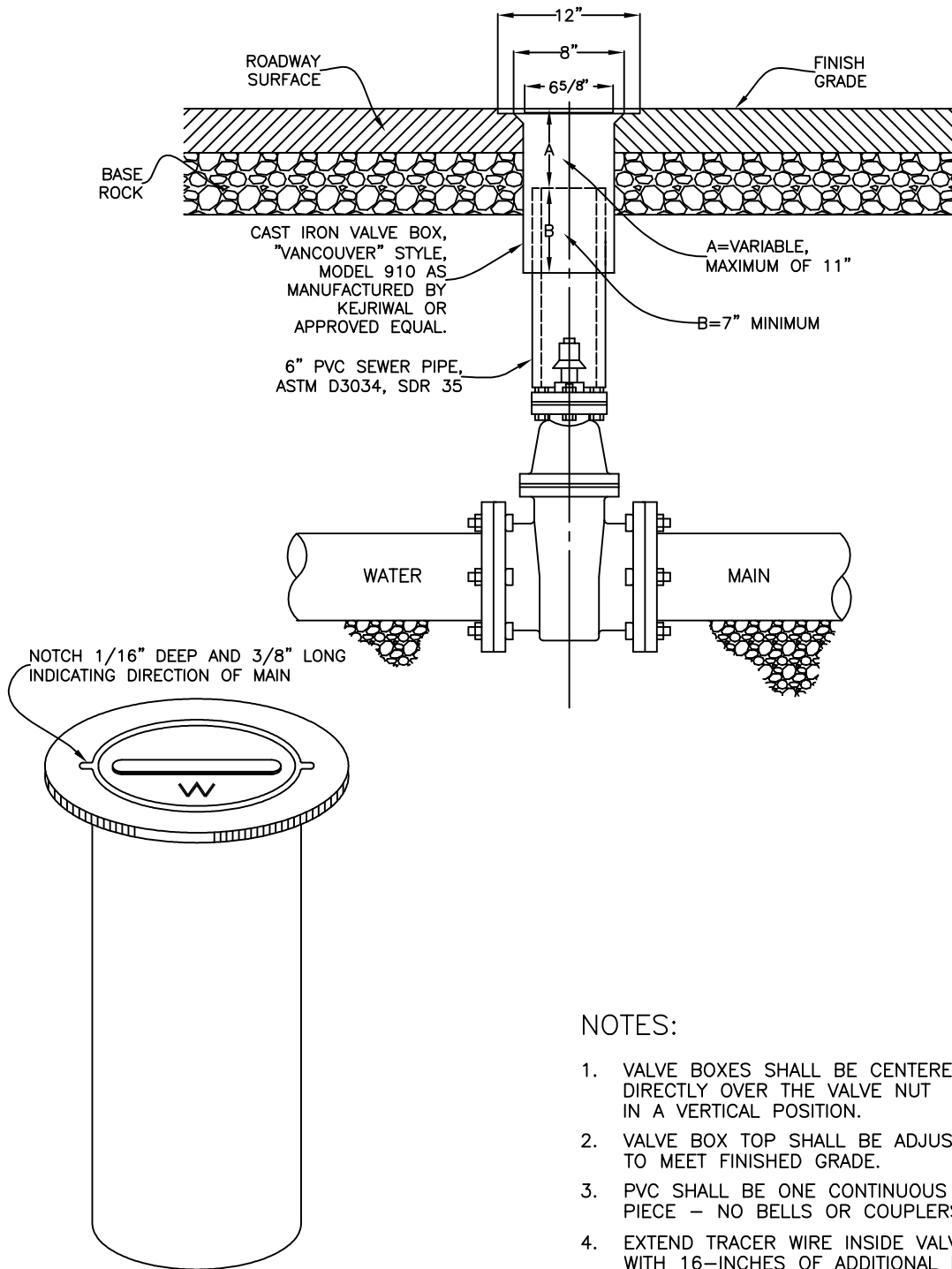
STANDARD PLAN  
TYPICAL STREET SECTIONS

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

REVISION

LAST REV BY: BAV  
CHECKED BY TBW

NO. 318A



NOTES:

1. VALVE BOXES SHALL BE CENTERED DIRECTLY OVER THE VALVE NUT IN A VERTICAL POSITION.
2. VALVE BOX TOP SHALL BE ADJUSTED TO MEET FINISHED GRADE.
3. PVC SHALL BE ONE CONTINUOUS PIECE - NO BELLS OR COUPLERS.
4. EXTEND TRACER WIRE INSIDE VALVE BOX WITH 16-INCHES OF ADDITIONAL LENGTH.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
WATER VALVE BOX

LAST REV BY BAV

CHECKED BY TBW

NO. 400

No.	Description	Date	By	Appr
1	ISSUED	1/08	AD	TBW
REVISION				

(HORIZONTAL)  
BEARING AREA OF THRUST BLOCKS  
IN SQUARE FEET

FITTING SIZE	TEE, WYE, PLUGGED CROSS	STRADDLE BLOCK	90° BEND PLUGGED CROSS	TEE PLUGGED ON RUN		45° BEND	22-1/2° BEND	11-1/4° BEND
				A-1	A-2			
4	1.0	1.6	2.0	1.9	1.4	1.0	---	---
6	2.1	3.7	4.0	4.3	3.0	1.6	1.0	---
8	3.8	6.5	6.8	7.6	5.4	2.9	1.5	1.0
10	5.9	10.2	10.3	11.8	8.4	4.6	2.4	1.2
12	8.5	14.7	14.5	17.0	12.0	6.6	3.4	1.7
14	11.5	---	19.5	23.0	16.3	8.9	4.6	2.3
16	15.0	26.1	25.3	30.0	21.3	13.7	7.0	3.5
18	19.0	---	31.7	38.0	27.0	17.2	8.8	4.4
20	23.5	40.8	38.9	47.0	33.3	21.1	10.8	5.4
24	34.0	58.8	55.5	68.0	48.0	26.2	13.6	6.8

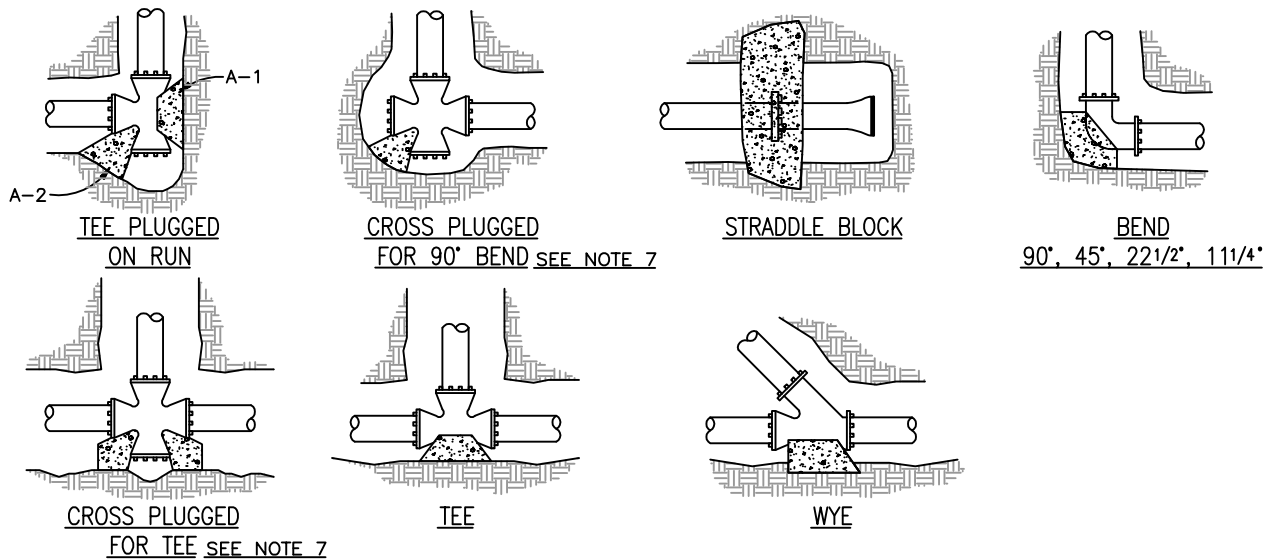
**NOTES:**

1. ABOVE BEARING AREAS BASED ON TEST PRESSURE OF 150 PSI AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 POUNDS PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, USE THE FOLLOWING EQUATION:

$$\text{BEARING AREA} = ( \text{TEST PRESSURE} / 150 ) \times ( 2000 / \text{SOIL BEARING STRESS} ) \times ( \text{TABLE VALUE} )$$

2. THE VOLUMES IN TABLE 1, STD PLAN No 402 ARE BASED ON TEST PRESSURE OF 150 PSI AND THE WEIGHT OF CONCRETE = 4050 POUNDS PER CUBIC YARD. TO COMPUTE FOR DIFFERENT TEST PRESSURES, USE THE FOLLOWING EQUATION:

$$\text{VOLUME} = ( \text{TEST PRESSURE} / 150 ) \times ( \text{TABLE VALUE} )$$



**NOTES:**

1. CONCRETE BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2. ALL CONCRETE TO BE CLASS 2400 MINIMUM.
3. INSTALL ISOLATION MATERIAL BETWEEN PIPE AND/OR FITTINGS BEFORE POURING CONCRETE BLOCKING.
4. CONCRETE SHALL BE KEPT CLEAR OF ALL JOINTS AND ACCESSORIES.
5. SEE STANDARD PLAN NO. 402 FOR VERTICAL BEND ANCHOR BLOCK DETAILS.
6. SEE STANDARD PLAN NO. 403 AND 404 FOR TIED BACK THRUST BLOCK DETAILS.
7. MAY NOT WORK OUT FOR ALL FITTING SIZES – CONFIRM USE OF THIS BLOCKING CONFIGURATION WITH ENGINEER.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
HORIZONTAL THRUST BLOCKING

LAST REV BY: BAV

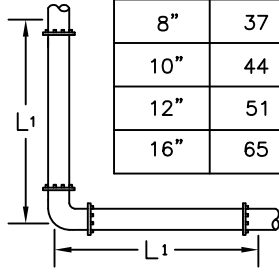
CHECKED BY: TBW

NO.401

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

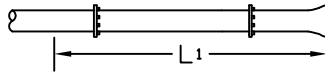
LENGTH (L1) OF JOINT RESTRAINT REQUIRED FOR THRUST PROTECTION (FEET)

Diameter	Horizontal Bend				Dead End & Valves (Note # 5)	Reducer (Note #5) (Restrained Length for Large Diameter Side)					
	90°	45°	22 1/2°	11 1/4°		4"	6"	8"	10"	12"	16"
4"	21	9	5	2	55	--	40	73	99	124	170
6"	29	12	6	3	78	--	--	43	75	104	155
8"	37	16	8	4	102	--	--	--	41	76	134
10"	44	19	9	5	122	--	--	--	--	42	109
12"	51	22	11	6	143	--	--	--	--	--	78
16"	65	27	13	7	184	105	--	--	--	--	--

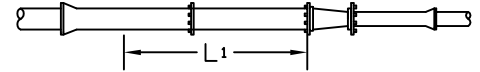


BEND

90°, 45°, 22 1/2°, 11 1/4°



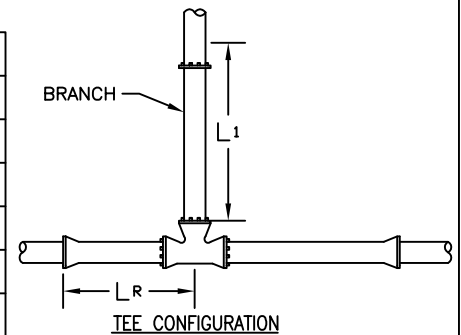
DEAD END



REDUCER

LENGTH (L1) OF JOINT RESTRAINT REQUIRED FOR THRUST PROTECTION WHEN USING TEES (FEET)

Tee Configurations (Restrained Length for Branch)										
Branch Pipe Diameter	L <sub>R</sub> < 1	L <sub>R</sub> = 2	L <sub>R</sub> = 4	L <sub>R</sub> = 6	L <sub>R</sub> = 8	L <sub>R</sub> = 10	L <sub>R</sub> = 12	L <sub>R</sub> = 14	L <sub>R</sub> = 16	L <sub>R</sub> = 18
4"	47	40	27	14	1	1	1	1	1	1
6"	68	61	48	34	21	8	1	1	1	1
8"	91	84	70	57	43	30	16	3	1	1
10"	110	103	89	75	62	48	34	21	7	1
12"	130	123	109	96	82	68	54	40	27	13
16"	168	161	147	133	119	105	91	77	63	49



TEE CONFIGURATION

L<sub>R</sub> is the minimum length in either direction from tee to nearest adjacent joint

NOTES:

- ALL JOINTS WITHIN THE LENGTH "L1" FROM THE ABOVE TABLE, SHALL BE RESTRAINED.
- THE JOINT RESTRAINT LENGTHS CALCULATED ARE FOR FITTINGS USED TO CHANGE PIPE HORIZONTAL ALIGNMENT ONLY. FOR APPLICATIONS WHERE FITTINGS ARE USED TO CHANGE THE SLOPE OF THE PIPE, THE DESIGN ENGINEER SHALL INCLUDE THE JOINT RESTRAINT REQUIREMENTS ON THE PROJECT DRAWINGS.
- IF AN UNANTICIPATED NEED FOR JOINT RESTRAINT ARISES TO CHANGE THE SLOPE OF THE PIPE, THE CONTRACTOR SHALL CONTACT THE CITY ENGINEER.
- JOINT TYPES NOT COVERED ON ABOVE TABLE MUST BE DESIGNED INDIVIDUALLY IN ORDER TO DETERMINE APPROPRIATE RESTRAINED LENGTH. THIS LENGTH SHALL BE SHOWN ON THE PROJECT DRAWINGS.
- THE SMALL DIAMETER SIDE OF A REDUCER DOES NOT REQUIRE RESTRAINT IF THE LARGE DIAMETER SIDE IS PROPERLY RESTRAINED.
- ABOVE RESTRAINED LENGTHS ARE BASED ON:
  - TEST PRESSURE OF 150 POUNDS PER SQUARE INCH
  - SOIL TYPE CL
  - MINIMUM OF 3 FEET COVER
  - CLASS B PIPE ZONE CONDITIONS
  - WHEN ORGANIC OR CLAY TYPE SOILS ARE BEING USED FOR BACKFILL, GRANULAR BACKFILL MUST BE USED FOR BEDDING AND BACKFILL TO A HEIGHT OF 6 INCHES OVER THE TOP OF THE PIPE BEFORE OTHER SOILS ARE PLACED.
  - UNCOATED PIPE, THIS TABLE IS NOT APPLICABLE FOR PIPE ENCASED IN POLYETHYLENE
 ANY REDUCTION OF THESE VALUES AS A RESULT OF OTHER CONDITIONS ENCOUNTERED SHALL BE BASED ON THE APPROPRIATE EVALUATION AND RECOMMENDATION BY A QUALIFIED, REGISTERED ENGINEER AND WITH APPROVAL BY THE CITY.
- JOINT RESTRAINT SHOWN FOR VALVES IS THE TOTAL RESTRAINT REQUIRED ON BOTH SIDES OF THE VALVE (I.E. CAN BE DIVIDED ON EACH SIDE OF THE VALVE).
- UNLESS SPECIAL CIRCUMSTANCES EXIST, USSE FULL LENGTH OF PIPE (20') WHEN CONNECTING TO BRANCH OF TEE.
- COORDINATE RESTRAINED LENGTH REQUIREMENTS WITH THE CITY ENGINEER.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

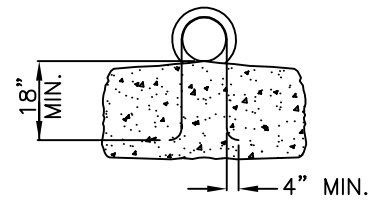
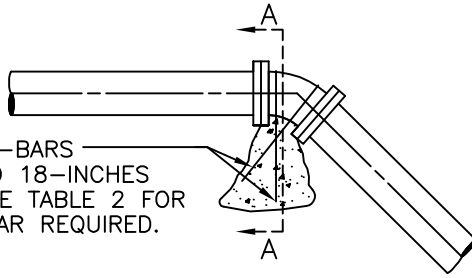
STANDARD PLAN  
JOINT RESTRAINT FOR PVC PIPE

LAST REV BY: BAV  
CHECKED BY: TBW

NO. 401.5

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

GALV. OR EPOXY COATED RE-BARS OVER FITTING AND EMBEDDED 18-INCHES IN CONCRETE AS SHOWN. SEE TABLE 2 FOR NUMBER AND SIZE OF RE-BAR REQUIRED.



SECTION A-A

N.T.S.

- KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES.
- REQUIRED VOLUMES AT FITTINGS SHALL BE AS INDICATED BELOW. ADJUST IF NECESSARY TO CONFORM TO TEST PRESSURE(S) OTHER THAN 150psig
- VOLUMES AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER VOLUMES AND BLOCKING DETAIL SHOWN ON THIS STANDARD PLAN.
- THRUST BLOCKS FOR VERTICAL UP BENDS SHALL BE THE SAME AS FOR HORIZONTAL BENDS.

TABLE 1

FITTING SIZE	VOLUME OF CONCRETE ANCHOR BLOCK IN CU. YD.			
	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND
4	1.0	0.5	0.3	0.1
6	2.2	1.2	0.6	0.3
8	3.9	2.1	1.1	0.5
10	6.2	3.3	1.7	0.9
12	8.9	4.8	2.5	1.2
14	12.1	6.5	3.3	1.7
16	15.8	8.5	4.4	2.2

TABLE 2

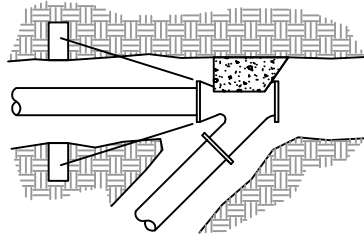
FITTING SIZE	NUMBER & SIZE OF STEEL RE-BAR REQUIRED			
	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND
4	2-#5	2-#5	2-#5	2-#5
6	2-#5	2-#5	2-#5	2-#5
8	2-#5	2-#5	2-#5	2-#5
10	3-#5	2-#5	2-#5	2-#5
12	4-#5	2-#5	2-#5	2-#5
14	4-#6	3-#5	2-#5	2-#5
16	4-#7	4-#5	2-#5	2-#5

NOTE:

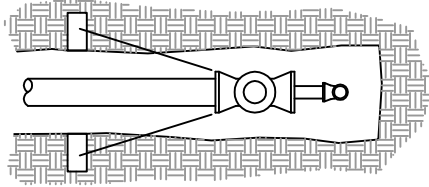
- THE VOLUMES SHOWN IN TABLE 1 ARE BASED ON TEST PRESSURES OF 150 PSI AND THE WEIGHT OF CONCRETE = 4050 LBS/CU.YD.. TO COMPUTE VOLUME FOR DIFFERENT TEST PRESSURES, USE THE FOLLOWING EQUATION: VOLUME = (TEST PRESSURE/150) X (TABLE VALUE).
- THE NUMBER AND SIZE OF RE-BAR REQUIRED SHOWN IN TABLE 2 ARE BASED UPON GRADE 40 RE-BAR WITH A TENSILE STRENGTH OF 20,000 PSI AND A FS=1.5.
- BENDS THAT REQUIRE A THRUST BLOCK VOLUME EXCEEDING 5 CUBIC YARDS SHALL BE PROVIDED WITH MECHANICAL JOINT RESTRAINTS IN LIEU OF CONCRETE THRUST BLOCK

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

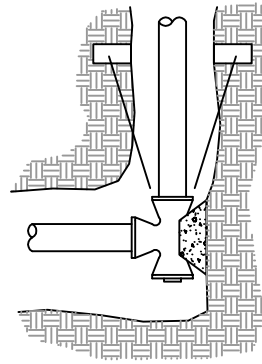
CITY OF MONMOUTH DEPARTMENT OF PUBLIC WORKS	
STANDARD PLAN VERTICAL BEND ANCHOR BLOCK DETAIL	
LAST REV BY: BAV	NO.402
CHECKED BY: TBW	



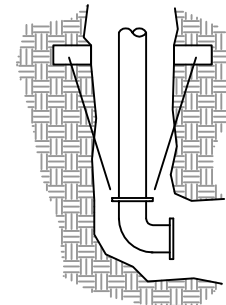
WYE W/STD THRUST BLOCK



BLOW-OFF OR DEAD END



TEE W/STD THRUST BLOCK



BEND

TABLE 1

BEARING AREA OF THRUST BLOCK

FITTING SIZE	1/2 BEARING AREA (SQ. FT.)(EACH SIDE)				
	DEAD END WYE OR TEE W/STD THRUST BLOCK	90° BEND	45° BEND	22 1/2' BEND	11 1/4' BEND
4	1.4	1.9	1.0	0.5	0.3
6	2.8	3.9	2.1	1.1	0.5
8	4.8	6.8	3.7	1.9	0.9
10	7.3	10.3	5.6	2.8	1.4
12	10.3	14.5	7.9	4.0	2.0
14	13.8	19.5	10.6	5.4	2.7
16	17.8	25.2	13.6	7.0	3.5

TABLE 2

NUMBER & SIZE OF STEEL TIE RODS REQ'D

SIZE	NO. OF FULL DIA. RODS WELDED TO PLATES			NO. OF THREADED RODS		
	5/8"	3/4"	1"	5/8"	3/4"	1"
4	2	WARNING-DUC-LUGS WILL NOT HOLD		2	WARNING-NO DUC-LUGS	
6	2	WARNING-DUC-LUGS WILL NOT HOLD		3	2	2
8	3	2	2	5	3	2
10	5	3	2	7	5	3
12	7	5	3	10	7	4
14	10	7	4	13	9	5
16	12	9	5	17	11	6

NOTES:

1. THE AREAS SHOWN IN TABLE 1 ARE BASED ON TEST PRESSURES OF 150 PSI AND AN ALLOWABLE SOIL BEARING STRESS OF 2,000 POUNDS PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, USE THE FOLLOWING EQUATION.  

$$\text{BEARING AREA} = (\text{TEST PRESSURE}/150) \times (2,000/\text{SOIL BEARING STRESS})$$
2. THE NUMBER AND SIZE OF TIE RODS REQUIRED SHOWN IN TABLE 2 ARE BASED UPON ASTM A307 STEEL BOLT STOCK WITH A TENSIL STRENGTH OF 20,000 PSI AND A FS=1.5, BASED ON TEST PRESSURE OF 150 P.S.I.
3. MAKE CONNECTIONS AS FOLLOWS:  
 5/8" RODS - THRU BOLT HOLES, DUCTILE IRON LUGS, STARR TIE BOLTS, STEEL PLATES.  
 3/4" RODS - THRU BOLT HOLES, STARR TIE BOLTS, STEEL PLATES.  
 1" RODS - CONNECT TO STEEL PLATE, STRAPS OR "EARS".
4. CONSTRUCT TIED BACK THRUST BLOCK AS PER STANDARD PLAN NO. 404.
5. MULTIPLY THE AREAS LISTED IN TABLE 1 BY 2 IN ORDER TO DETERMINE THE TOTAL BEARING AREA REQUIRED.

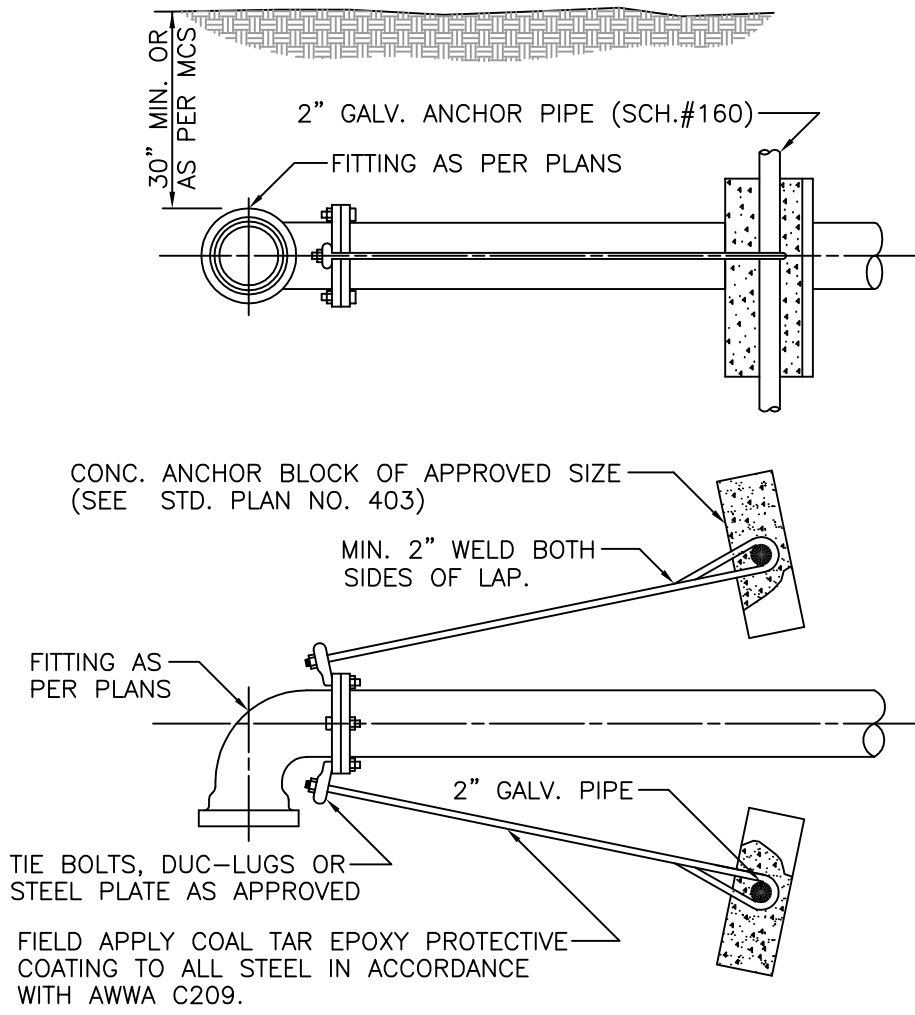
CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

STANDARD PLAN  
4" TO 16" TIED BACK THRUST BLOCK  
SCHEMATIC AND DIMENSIONS

LAST REV BY: BAV  
CHECKED BY TBW

NO.403



NOTES:

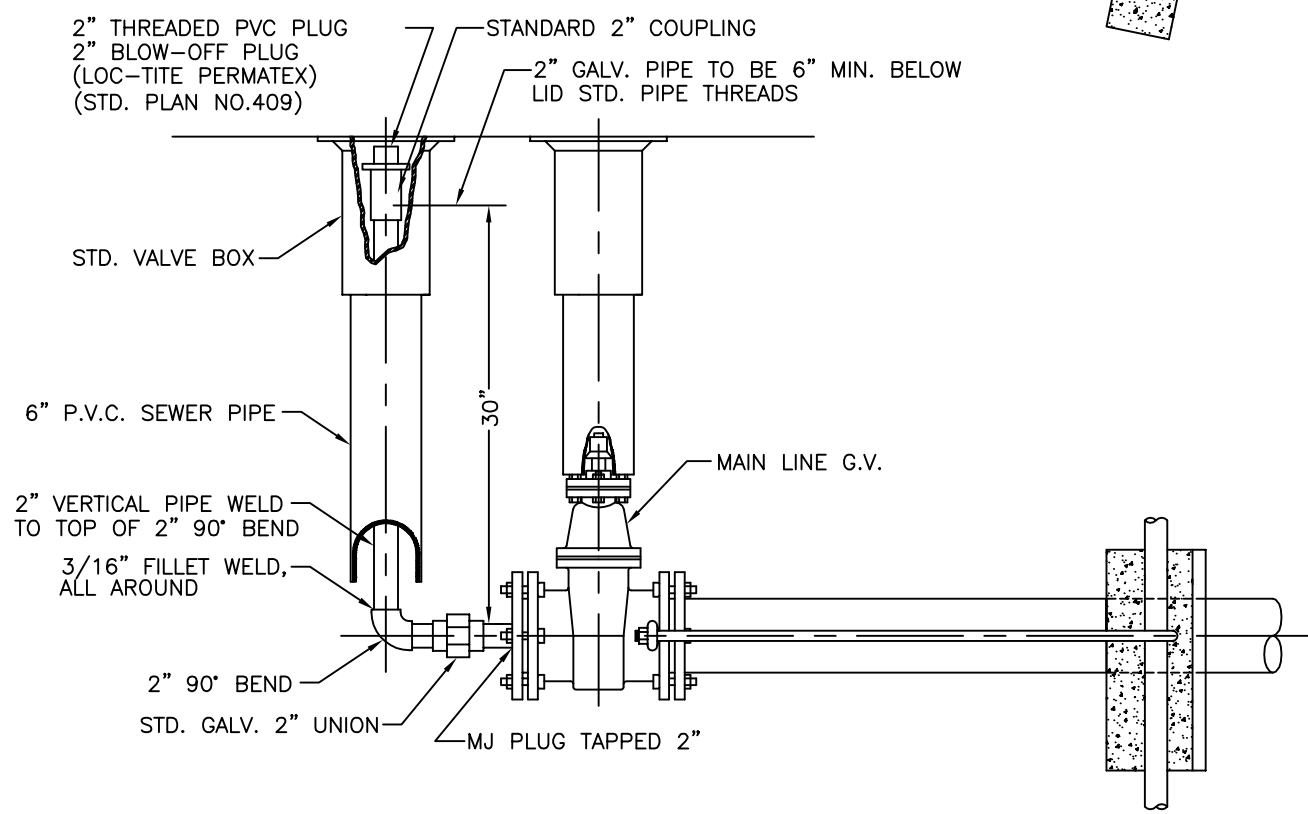
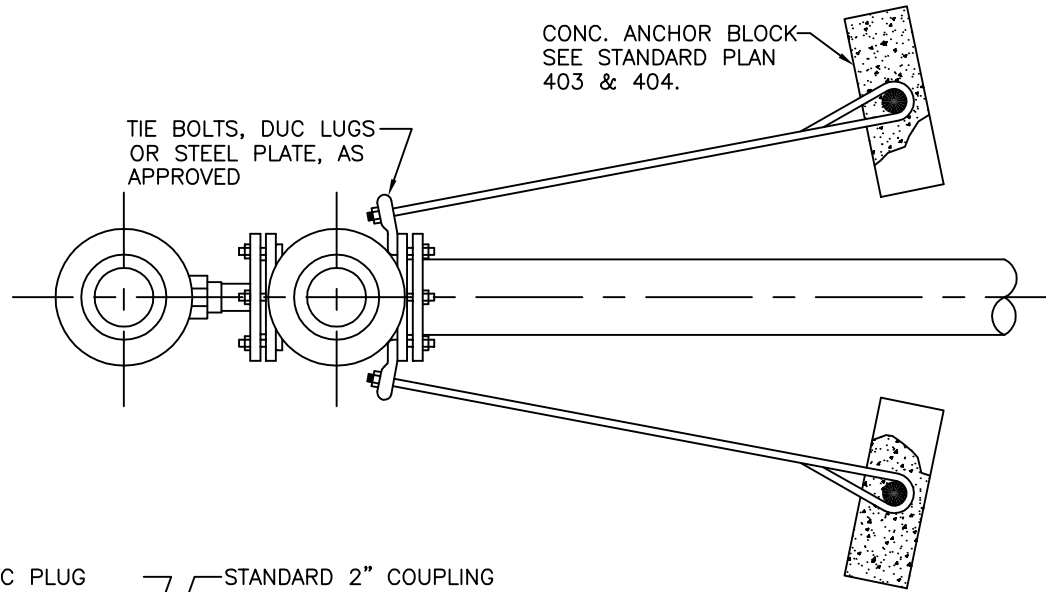
1. CONCRETE THRUST BLOCK TO BE POURED AGAINST UNDISTURBED EARTH.
2. KEEP CONCRETE CLEAR OF JOINT AND ACCESSORIES.
3. IF NOT SHOWN ON PLANS REQUIRED BEARING AREAS AT FITTING SHALL BE AS INDICATED HEREIN OR ON SUPPLEMENTAL STD PLAN NO. 403, ADJUSTED IF NECESSARY, TO CONFORM TO THE TEST PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS(ES) STATED IN THE SPECIAL PROVISIONS.
4. BEARING AREAS AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER BEARING AREAS AND BLOCKING DETAILS SHOWN ON THIS PLAN AND STANDARD PLAN NO. 403.
5. CONSTRUCT STANDARD (STD) THRUST BLOCKS AS PER STD PLAN NO. 403.
6. TIE RODS, NUTS & WASHERS USED FOR THRUST RESTRAINT SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM A307.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
4" TO 16" TIED BACK THRUST BLOCK  
CONSTRUCTION DETAILS

LAST REV BY: BAV	NO.404
CHECKED BY TBW	

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



NOTES:

- 1. 8" MAXIMUM PIPE SIZE ALLOWED FOR 2" BLOW-OFF.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

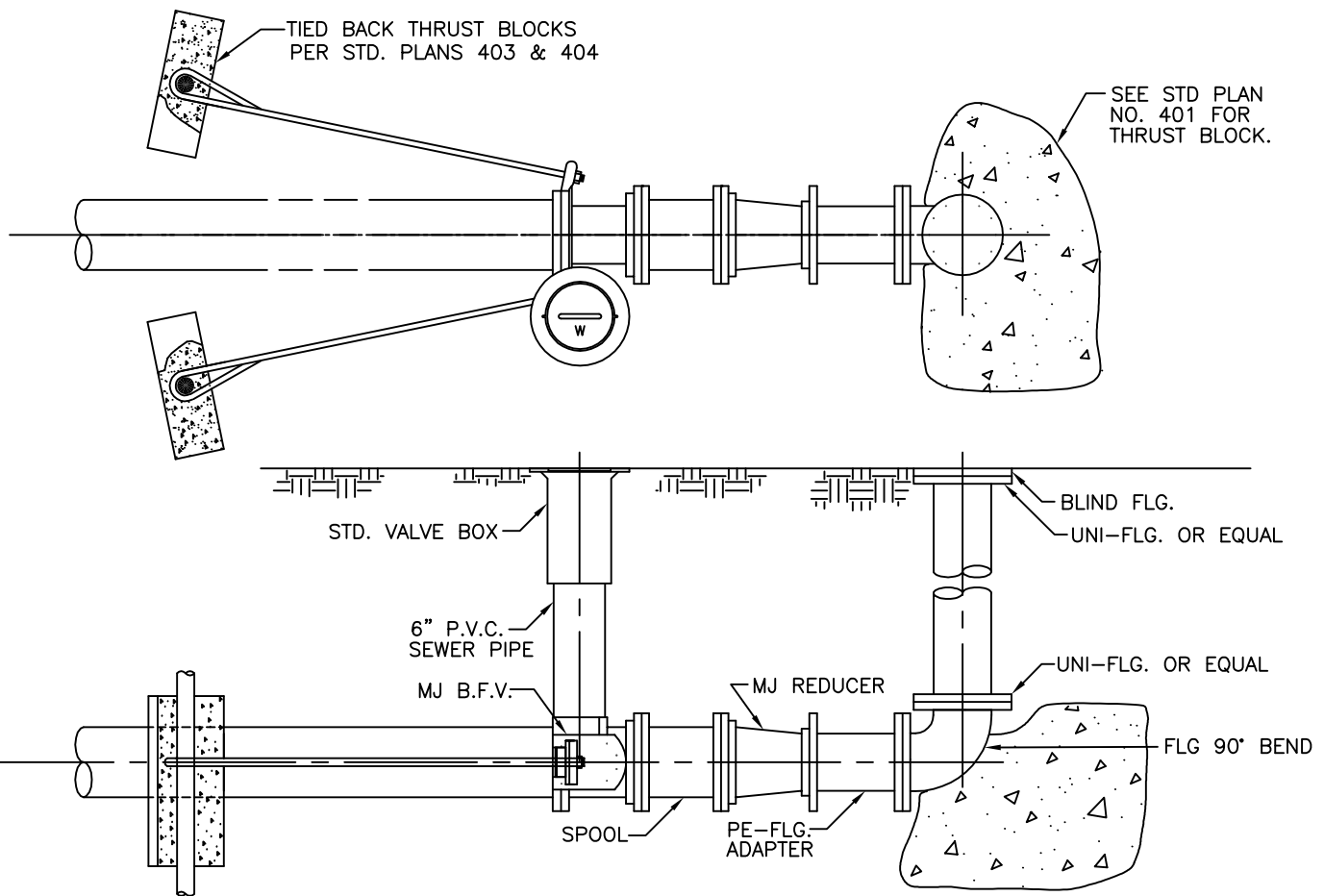
No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

STANDARD PLAN  
BLOWOFF WITH IN-LINE VALVE

LAST REV BY: BAV  
CHECKED BY TBW

NO.405

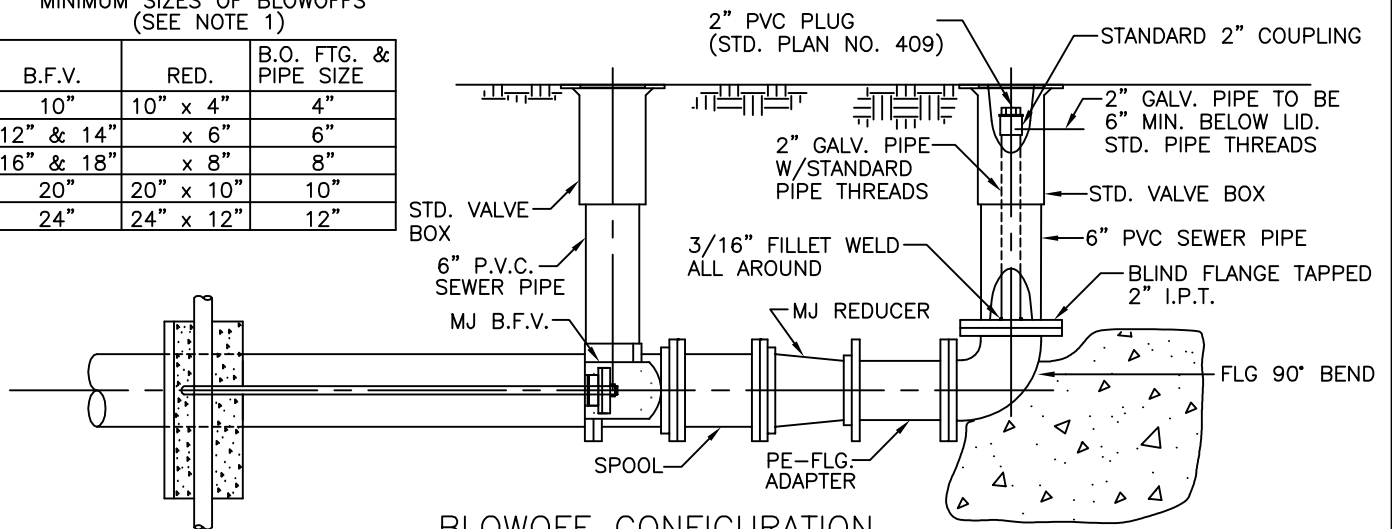




BLOWOFF CONFIGURATION BEFORE  
FIRST FLUSHING OF MAIN LINE

MINIMUM SIZES OF BLOWOFFS  
(SEE NOTE 1)

B.F.V.	RED.	B.O. FTG. & PIPE SIZE
10"	10" x 4"	4"
12" & 14"	x 6"	6"
16" & 18"	x 8"	8"
20"	20" x 10"	10"
24"	24" x 12"	12"



BLOWOFF CONFIGURATION  
BEFORE CHLORINATION

NOTES:

1. SIZE OF B.O. & VALVE SHALL BE USED IN ABSENCE OF MORE SPECIFIC INFORMATION SHOWN ON PLANS.
2. FITTINGS MAY BE SUBSTITUTED AS APPROVED BY ENGINEER.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN

BLOWOFF WITH IN LINE VALVE  
FOR 10" DIA. PIPE & LARGER

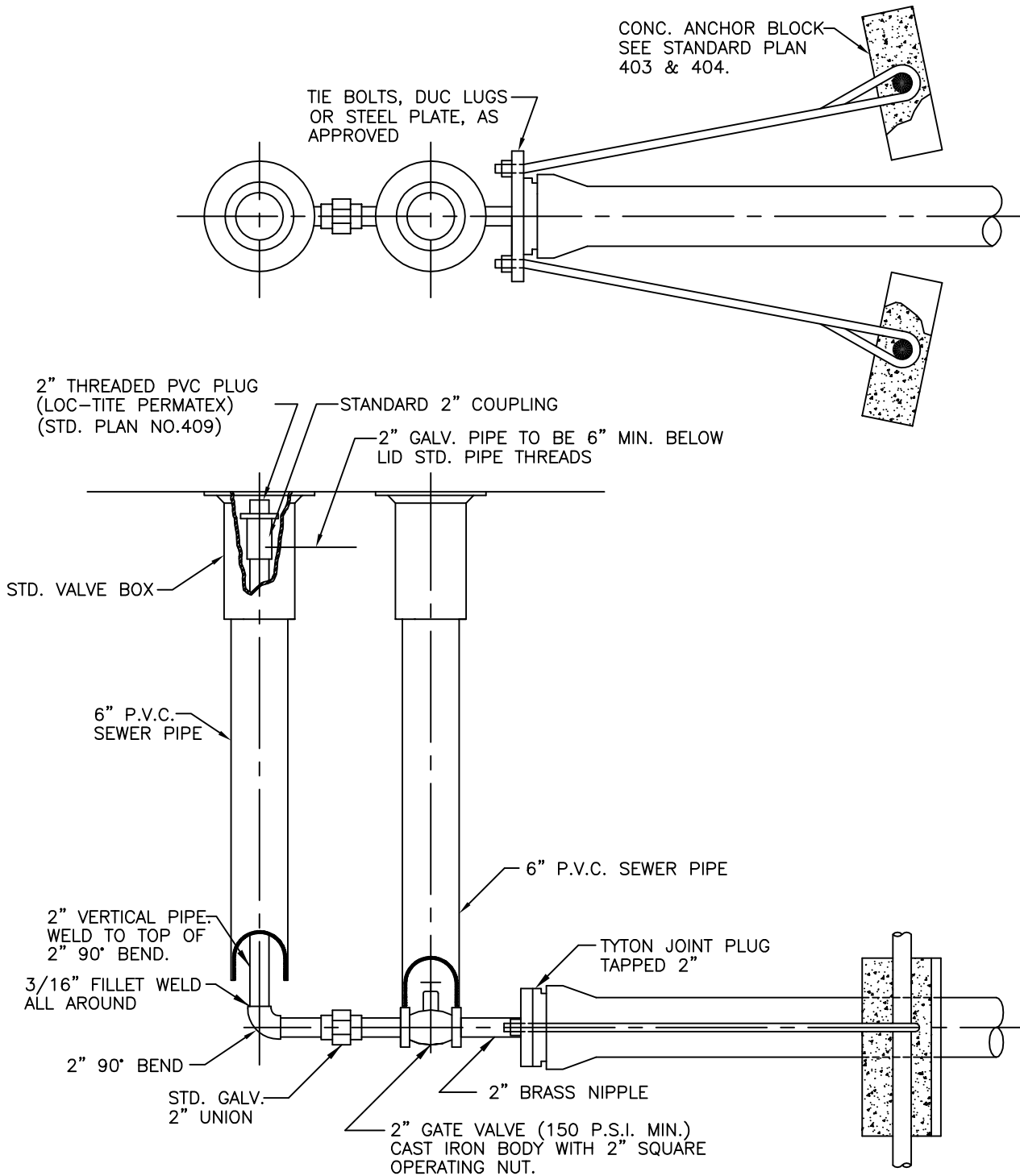
No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

REVISION

LAST REV BY: BAV

CHECKED BY TBW

NO. 406



**NOTES:**

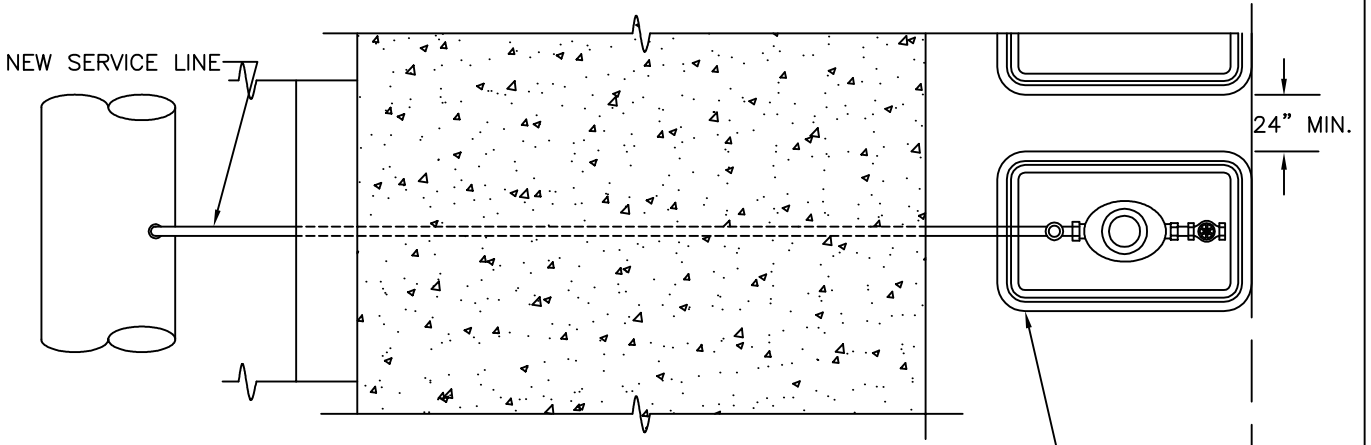
- 1. 8" MAXIMUM PIPE SIZE FOR 2" BLOW-OFF.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
BLOWOFF WITH  
PLUGGED END

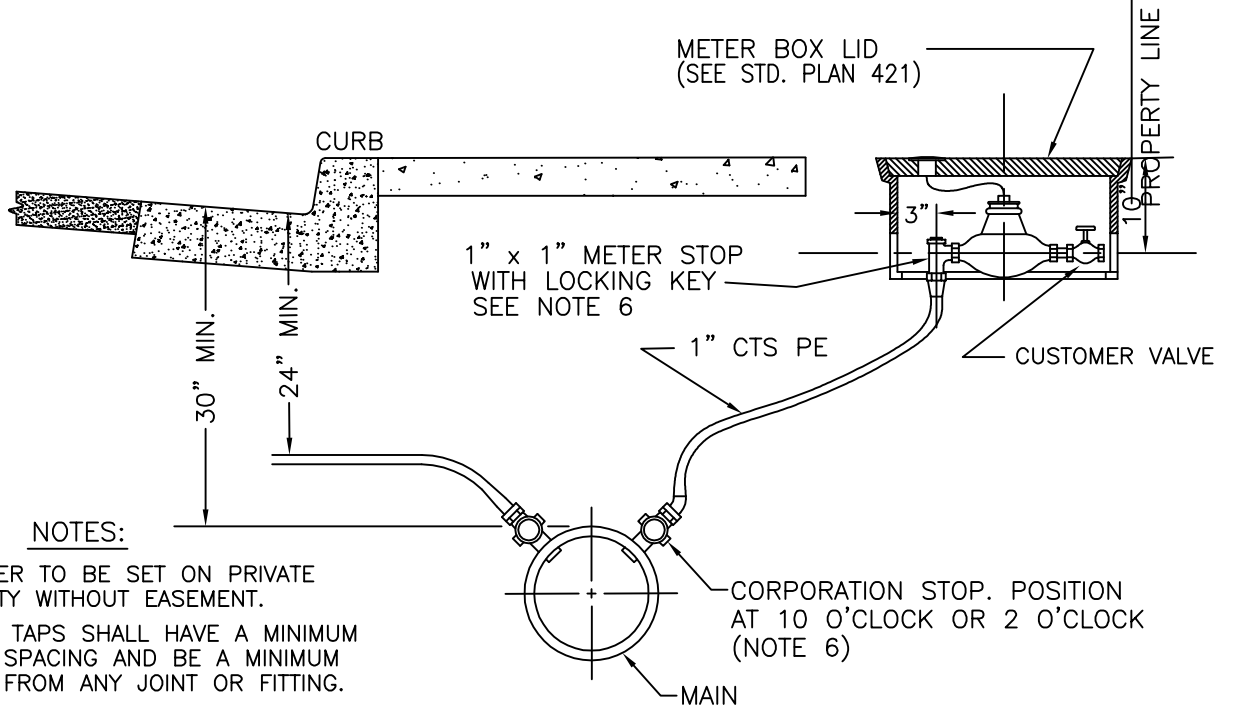
LAST REV BY BAV	NO.407
CHECKED BY TBW	

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



#090671 ARMORCAST METER BOX AT PROPERTY LINE  
UNLESS OTHERWISE APPROVED (NOTE 6 & 7)

PLAN



NOTES:

1. NO METER TO BE SET ON PRIVATE PROPERTY WITHOUT EASEMENT.
2. SERVICE TAPS SHALL HAVE A MINIMUM OF 18" SPACING AND BE A MINIMUM OF 18" FROM ANY JOINT OR FITTING.
3. METER AND CUSTOMER VALVE TO BE INSTALLED BY CITY FORCES.
4. MAINTAIN MINIMUM 24" SPACING BETWEEN ANY TWO METER BOXES.
5. ALL NEW SERVICE TAPS ON EXISTING MAINS MUST BE DONE BY CITY FORCES.
6. SEE MCS 504 FOR SPECIFICATIONS.
7. WHEN P.R.V. IS SPECIFIED USE 17" x 30" x 12" METER BOX.
8. INSTALL A CONTINUOUS 12 GAUGE, BLUE, INSULATED COPPER TRACER WIRE ADJACENT TO WATER SERVICE BETWEEN THE WATER MAIN AND THE METER

PROFILE

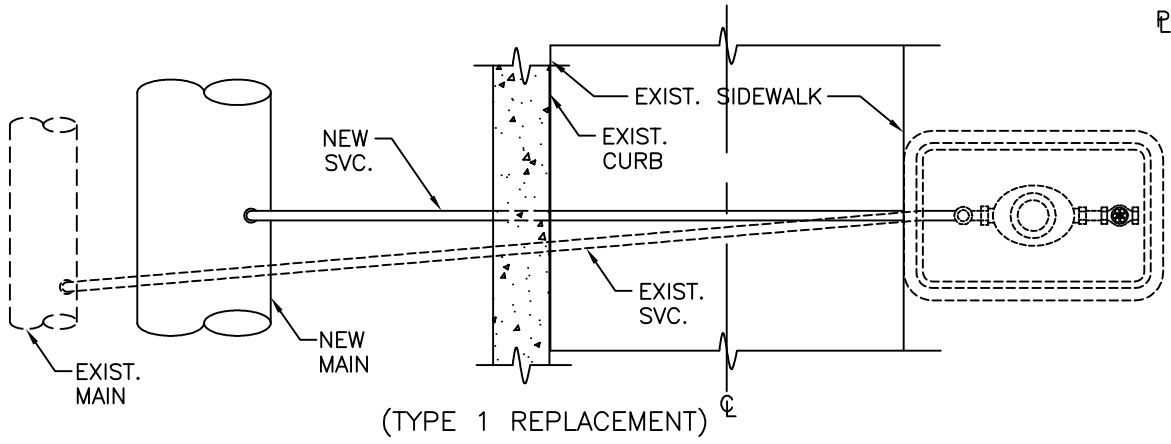
CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
1" WATER SERVICE INSTALLATION

LAST REV BY BAV  
CHECKED BY TBW

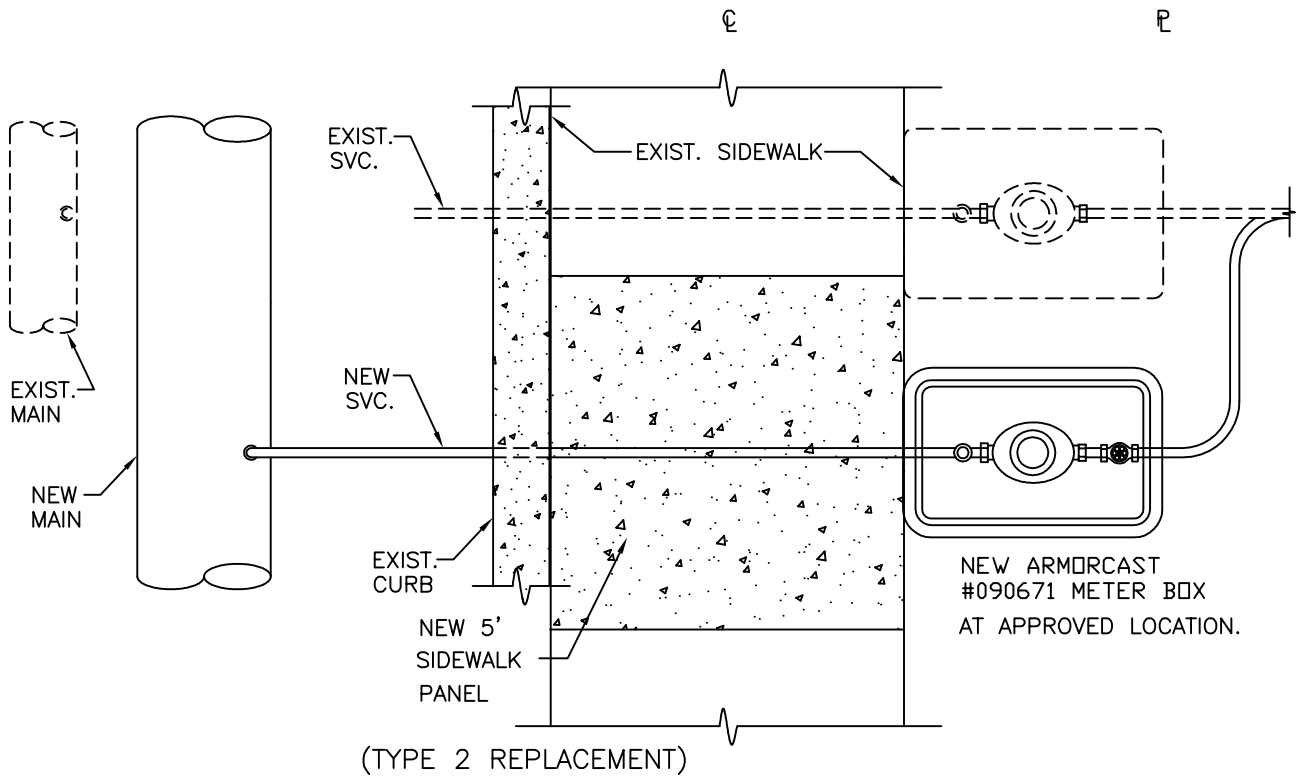
NO. 410

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



NOTES:

1. NEW LOCK-WING ANGLE METER STOP SHALL BE SIZED TO MATCH EXIST. METER.
2. NEW SERVICE LINE CONNECTION AT EXISTING METER SHALL BE MADE ONLY BY A LICENSED PLUMBER.
3. SEE STD. PLAN 410 FOR ADDITIONAL INFORMATION AND NOTES.



NOTES:

1. NEW METER AND CUSTOMER VALVE TO BE INSTALLED BY CITY FORCES.
2. CONTRACTOR TO REMOVE AND REPLACE SIDEWALK PANEL.
3. REPLUMBING OF SERVICE ON CUSTOMER SIDE OF METER SHALL BE DONE IN ACCORDANCE WITH UNIFORM PLUMBING CODE.
4. SEE STD. PLAN 410 FOR ADDITIONAL INFORMATION AND NOTES.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

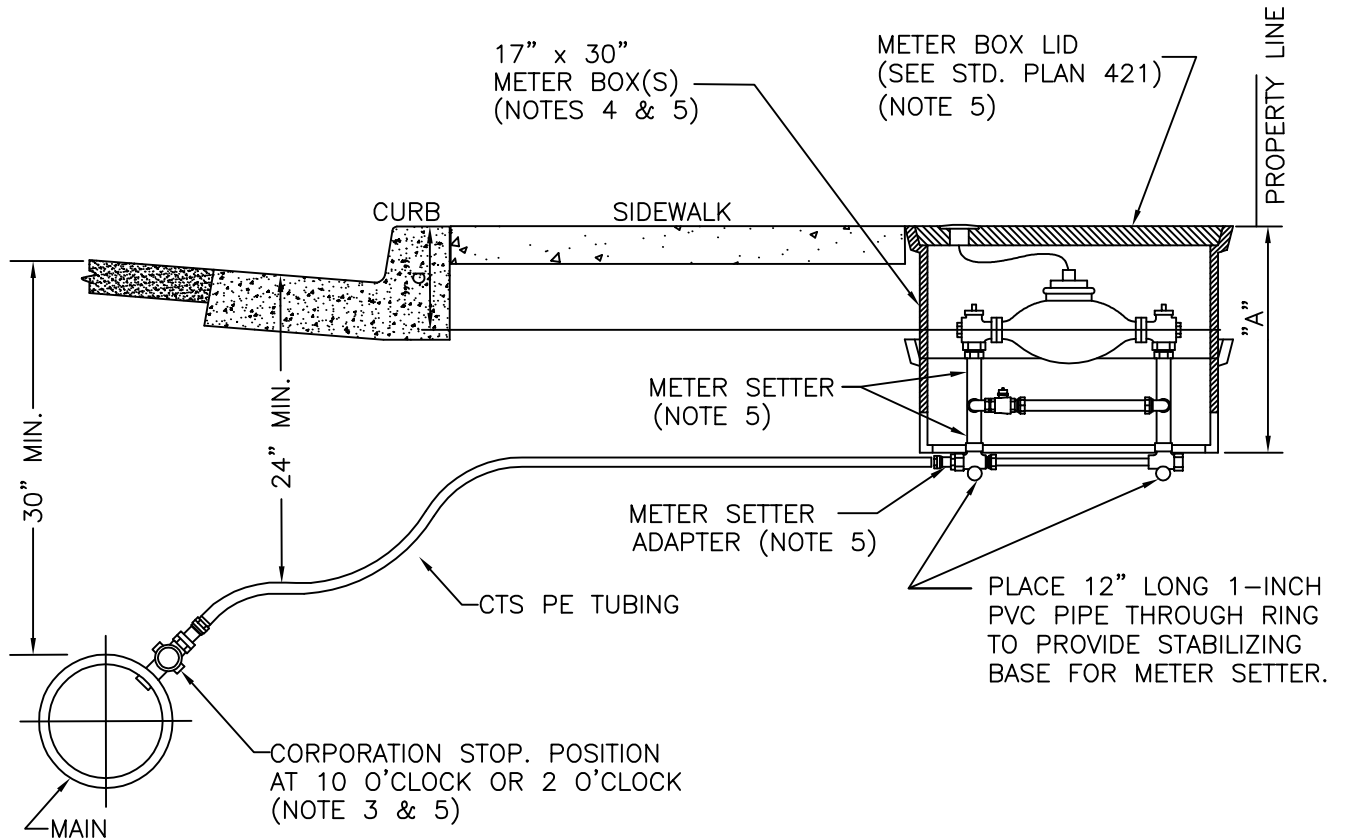
STANDARD PLAN  
1" WATER SERVICE REPLACEMENT

LAST REV BY: BAV  
CHECKED BY TBW

NO.411

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

SVC. SIZE	DIM "a"	DIM "A"
1 1/2"	10"	18"
2"	15"	24"(MIN)



**NOTES**

1. NO METER ON PRIVATE PROPERTY WITHOUT EASEMENT.
2. METER TO BE INSTALLED BY CITY FORCES.
3. SERVICE TAPS TO HAVE A MINIMUM OF 18" SPACING AND BE A MINIMUM OF 18" FROM ANY JOINT OR FITTING.
4. TWO STACKED BOXES ARE ACCEPTABLE. IF TWO BOXES ARE STACKED, THE UPPER BOX SHALL NOT HAVE PIPE ENTRY PORTS CUT OUT.
5. SEE MCS 504 FOR SPECIFICATIONS.
6. PROVIDE TRACER WIRE AS CALLED FOR ON STD. PLAN 410.

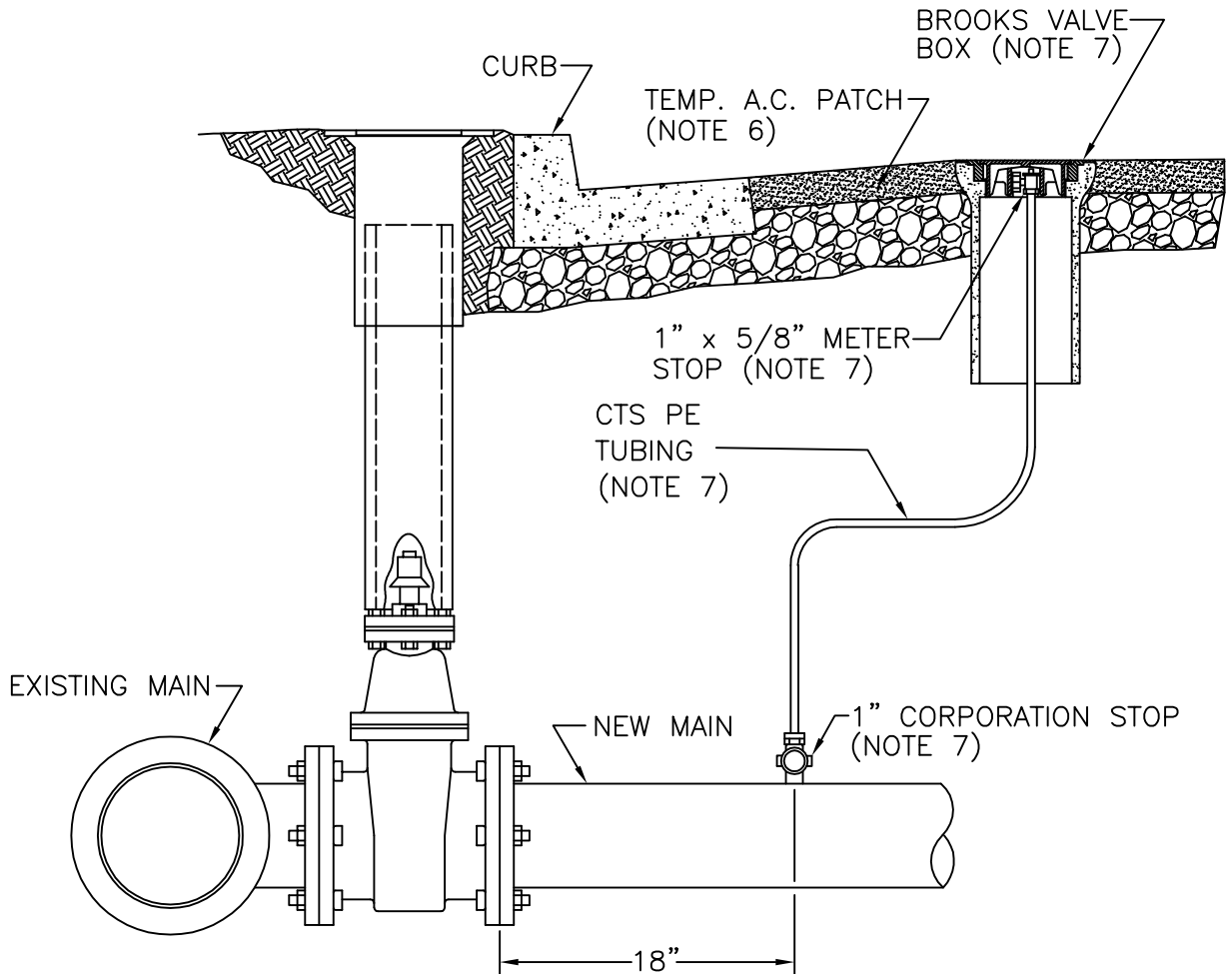
CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

STANDARD PLAN  
1 1/2" & 2" DOMESTIC  
WATER SERVICE INSTALLATION

LAST REV. BY BAV  
CHECKED BY TBW

NO.411A



**NOTES:**

1. VALVE BOX OVER 1" CHLORINE LINE DOES NOT NEED TO BE INSTALLED IF CHLORINE LINE IS BEHIND THE CURB. VALVEBOX IS TO BE INSTALLED ONLY WHEN CHLORINE LINE IS IN AREA COVERED BY TRAFFIC.
2. CHLORINE LINE PLACED IN AN AREA NOT COVERED BY TRAFFIC WILL BE 6" ABOVE NATURAL GROUND LEVEL.
3. DISTANCE FROM GATE VALVE TO CHLORINE TAP WILL BE 18".
4. CHLORINATION PROCESS WILL BE CONDUCTED BY CONTRACTOR IN ACCORDANCE WITH APPROVED SPECIFICATIONS.
5. CITY WILL REMOVE CHLORINATION ASSEMBLY AFTER RECEIVING NOTICE OF NEGATIVE BACTERIOLOGICAL TEST. CONTRACTOR TO PROVIDE EXCAVATION, BACKFILL, AND FINAL SURFACE RESTORATION.
6. TEMPORARY ASPHALT SURFACE REQUIRED IN AREAS COVERED BY TRAFFIC.
7. SEE MCS 501 FOR SPECIFICATIONS.
8. CONTRACTOR IS RESPONSIBLE FOR BACTERIOLOGICAL SAMPLING AND TESTS. THE NUMBER AND LOCATION OF TESTS TO BE DETERMINED BY THE CITY

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
MAIN LINE CHLORINATION ASSEMBLY

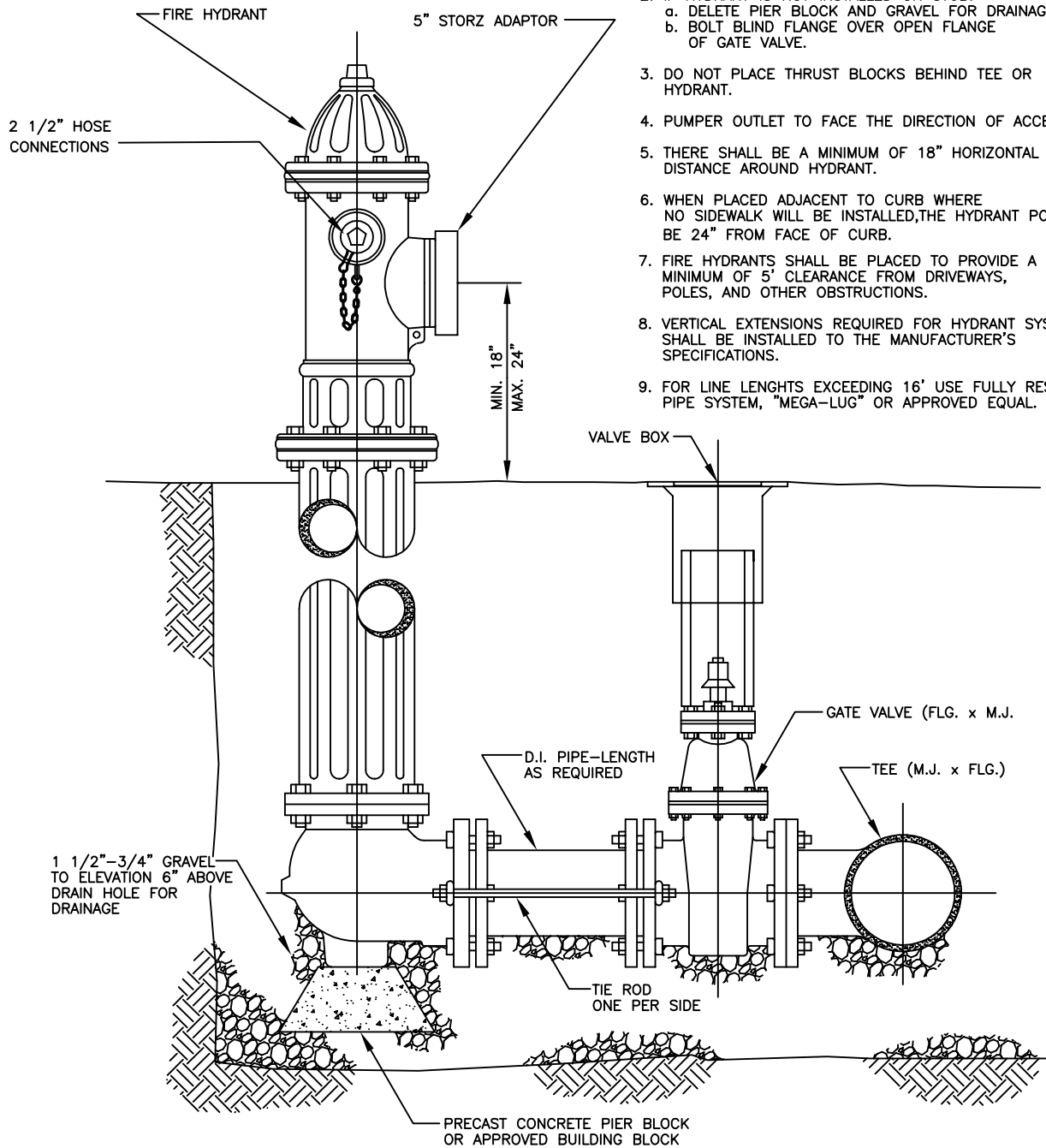
LAST REV. BY BAV  
CHECKED BY TBW

NO. 412

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

NOTES

1. TIE RODS TO BE 5/8" A307 STEEL BOLT STOCK WITH 14,000 PSI TENSILE STRENGTH OR APPROVED EQUAL. ONE TIE ROD PER SIDE.
2. IF HYDRANT IS NOT INSTALLED ON STUB.
  - a. DELETE PIER BLOCK AND GRAVEL FOR DRAINAGE.
  - b. BOLT BLIND FLANGE OVER OPEN FLANGE OF GATE VALVE.
3. DO NOT PLACE THRUST BLOCKS BEHIND TEE OR HYDRANT.
4. PUMPER OUTLET TO FACE THE DIRECTION OF ACCESS.
5. THERE SHALL BE A MINIMUM OF 18" HORIZONTAL DISTANCE AROUND HYDRANT.
6. WHEN PLACED ADJACENT TO CURB WHERE NO SIDEWALK WILL BE INSTALLED, THE HYDRANT PORT SHALL BE 24" FROM FACE OF CURB.
7. FIRE HYDRANTS SHALL BE PLACED TO PROVIDE A MINIMUM OF 5' CLEARANCE FROM DRIVEWAYS, POLES, AND OTHER OBSTRUCTIONS.
8. VERTICAL EXTENSIONS REQUIRED FOR HYDRANT SYSTEMS SHALL BE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS.
9. FOR LINE LENGTHS EXCEEDING 16' USE FULLY RESTRAINED PIPE SYSTEM, "MEGA-LUG" OR APPROVED EQUAL.



CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

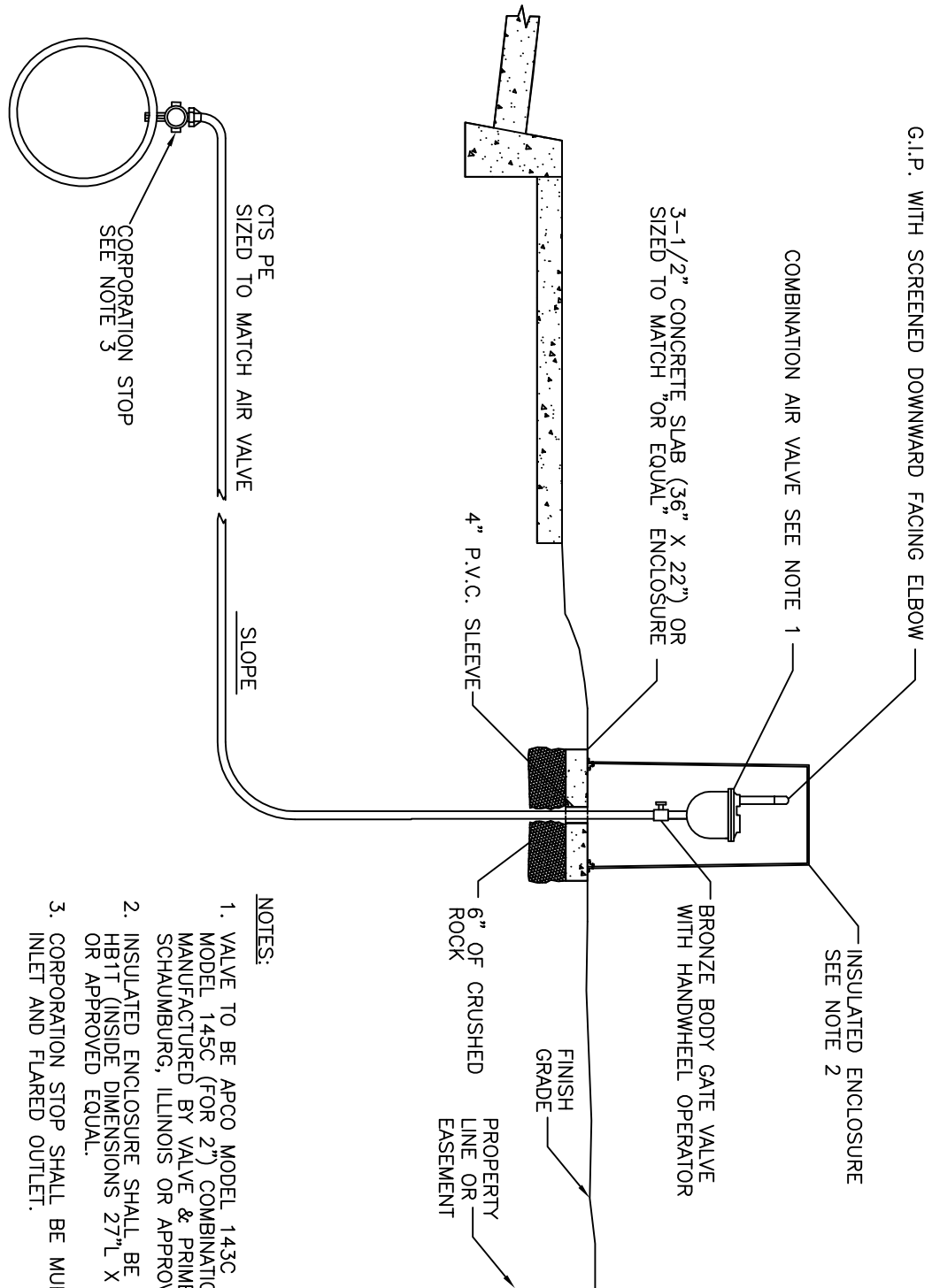
STANDARD PLAN  
FIRE HYDRANT INSTALLATION

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

LAST REV BY BAV  
CHECKED BY TBW

NO. 413

REVISION



G.I.P. WITH SCREENED DOWNWARD FACING ELBOW

COMBINATION AIR VALVE SEE NOTE 1

INSULATED ENCLOSURE SEE NOTE 2

3-1/2" CONCRETE SLAB (36" X 22") OR SIZED TO MATCH "OR EQUAL" ENCLOSURE

4" P.V.C. SLEEVE

6" OF CRUSHED ROCK

FINISH GRADE

PROPERTY LINE OR EASEMENT

CTS PE SIZED TO MATCH AIR VALVE

SLOPE

CORPORATION STOP SEE NOTE 3

**NOTES:**

1. VALVE TO BE APCO MODEL 143C (FOR 1") OR MODEL 145C (FOR 2") COMBINATION AIR VALVE AS MANUFACTURED BY VALVE & PRIMER CORPORATION SCHAUMBURG, ILLINOIS OR APPROVED EQUAL.
2. INSULATED ENCLOSURE SHALL BE HOT BOX MODEL HB11 (INSIDE DIMENSIONS 27"L X 13"W X 35"H) OR APPROVED EQUAL.
3. CORPORATION STOP SHALL BE MUELLER (CC) MALE INLET AND FLARED OUTLET.

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN

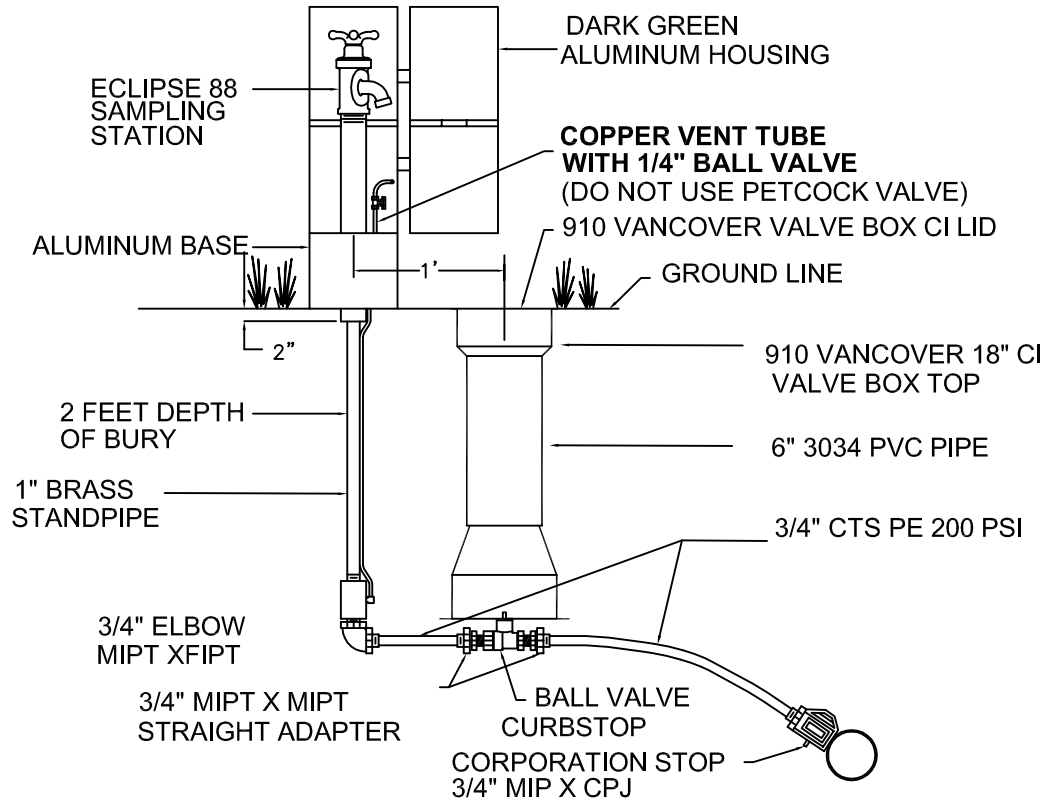
COMBINATION AIR-RELEASE AND VALVE ASSEMBLY 2" AND SMALLER

LAST REV BY BAV

CHECKED BY TBW

NO. 414





SAMPLING STATIONS SHALL BE 2' BURY, WITH A 3/4" FIP INLET, AND A 3/4" THREADED HOSE NOZZLE.

ALL STATIONS SHALL BE ENCLOSED IN A LOCKABLE, NONREMOVABLE, ALUMINUM-CAST HOUSING.

WHEN OPENED, THE STATION SHALL REQUIRE NO KEY FOR OPERATION, AND THE WATER WILL FLOW IN AN ALL BRASS WATERWAY.

ALL WORKING PARTS WILL ALSO BE OF BRASS AND BE REMOVABLE FROM ABOVE GROUND WITH NO DIGGING. EXTERIOR PIPING SHALL BE GALVANIZED STEEL (BRASS PIPE ALSO AVAILABLE).

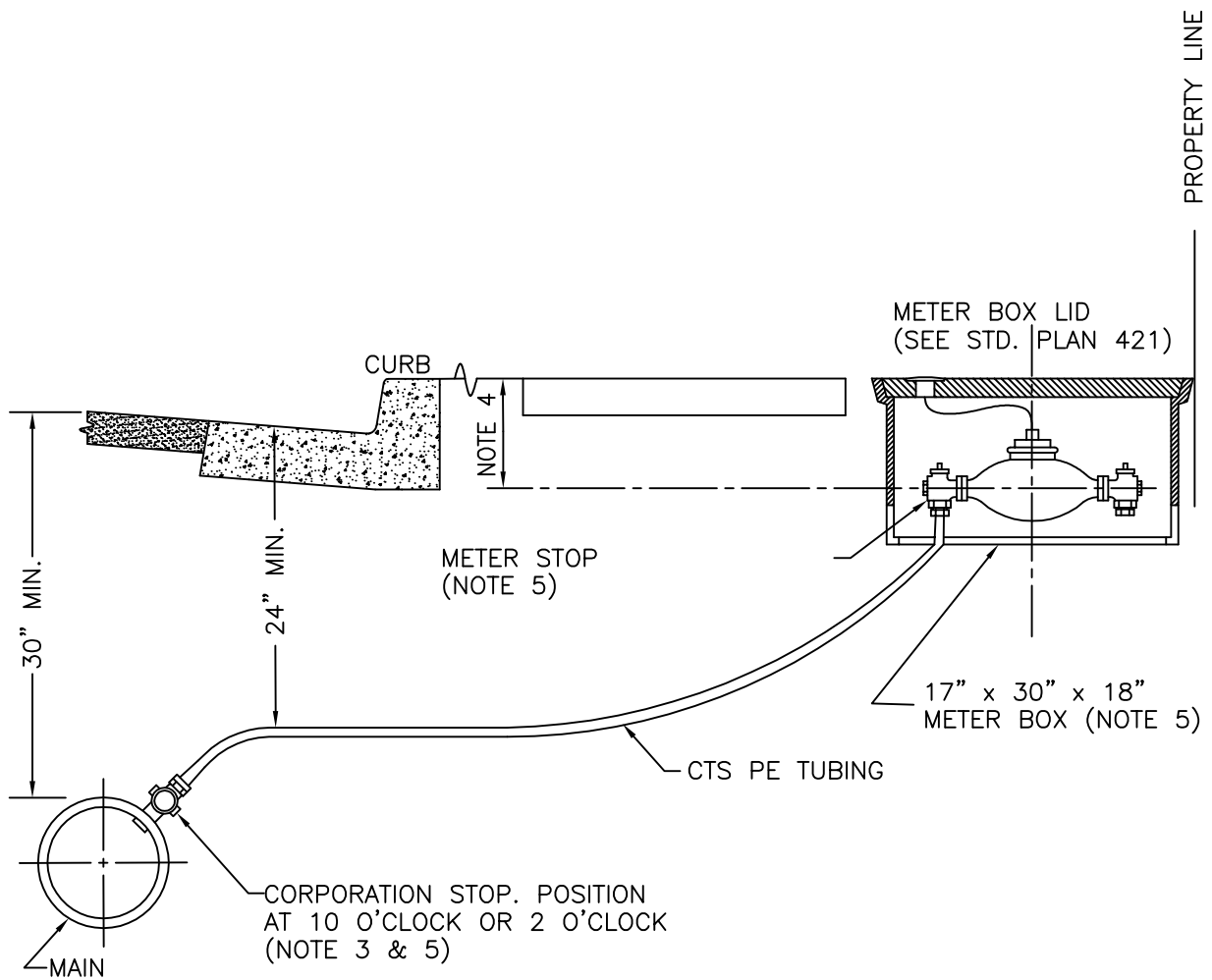
A COPPER VENT TUBE WILL ENABLE EACH STATION TO BE PUMPED FREE OF STANDING WATER TO PREVENT FREEZING AND TO MINIMIZE BACTERIA GROWTH.

ECLIPSE NO. 88 SAMPLING STATION SHALL BE MANUFACTURED BY KUPFERLE FOUNDRY, ST. LOUIS, MO 63102.

PAINT SHALL BE DARK GREEN AS PROVIDED BY KUPFERLE FOUNDRY OR EQUAL.

CITY OF MONMOUTH DEPARTMENT OF PUBLIC WORKS	
STANDARD PLAN WATER SAMPLING STATION	
LAST REV BY BAV	NO.419
CHECKED BY TBW	

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



NOTES

1. NO METER ON PRIVATE PROPERTY WITHOUT EASEMENT
2. METER TO BE INSTALLED BY CITY FORCES.
3. SERVICE TAPS TO HAVE A MINIMUM OF 18" SPACING AND BE A MINIMUM OF 18" FROM ANY JOINT OR FITTING.
4. DIMENSION EQUALS 10" FOR 1 1/2" SERVICE, OR 15" FOR 2" SERVICE.
5. SEE SCS 504 FOR SPECIFICATIONS.
6. INSTALL A CONTINUOUS 12 GAUGE, BLUE, INSULATED COPPER TRACER WIRE ADJACENT TO WATER SERVICE BETWEEN THE WATER MAIN AND THE METER

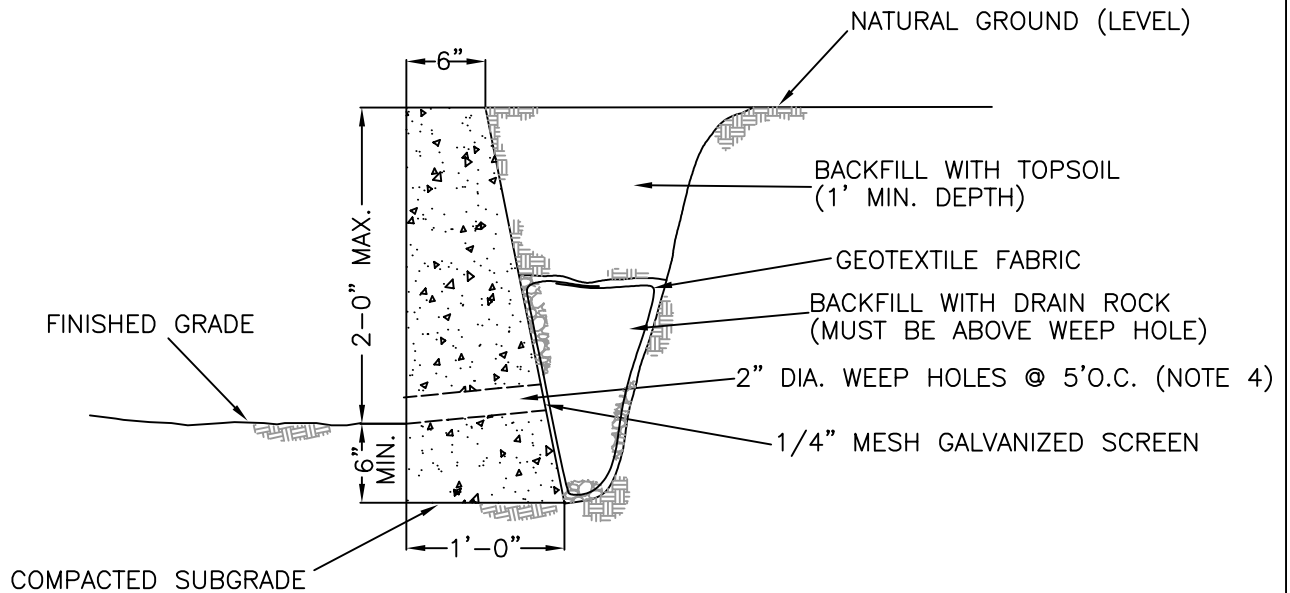
CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
1 1/2" & 2" IRRIGATION  
WATER SERVICE INSTALLATION

LAST REV BY BAV  
CHECKED BY TBW

NO. 420

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				



### DESIGN NOTES

LEVEL BACKFILL  
 $\delta$  = 100 P.C.F.  
 $K\delta$  = E.F.W.=40 P.C.F.  
 $f'_c$  = 3000 P.S.I. CONC.

### CONSTRUCTION NOTES

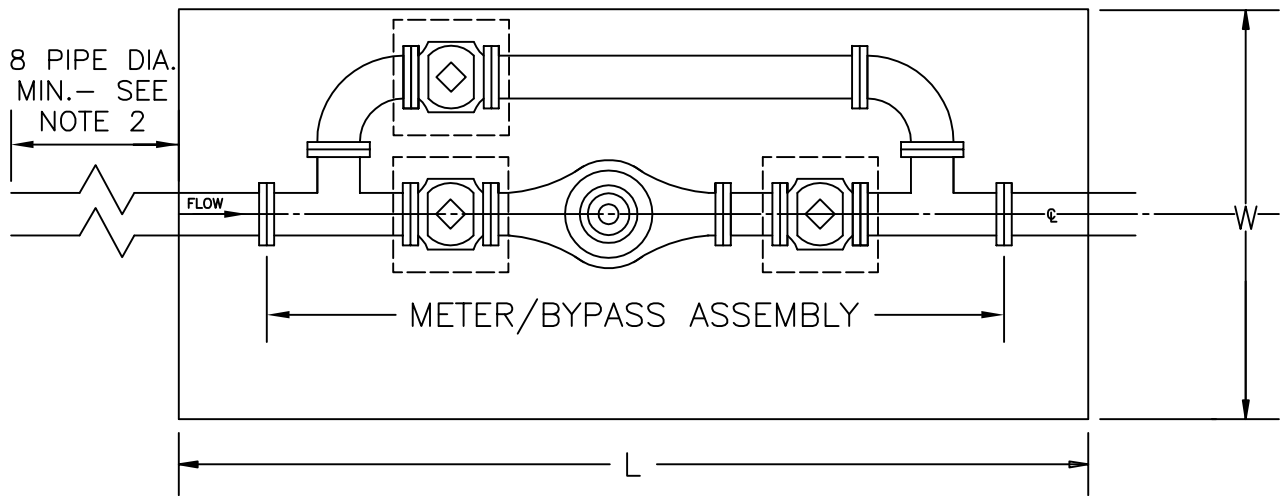
1. CONTRACTION JOINT: SCORE A 3/4" DEEP "V" NOTCHED GROOVE THE FULL HEIGHT OF THE EXPOSED FACE, ACROSS THE TOP, AND 6" DOWN THE BACK OF THE WALL. INSTALL "TEE BAR" CONTRACTION JOINTS TO SEPARATE THE LARGE AGGREGATE IN THE TOP 6" OF THE WALL AT THE "V" NOTCHED GROOVE. JOINTS SHALL BE UNIFORMLY SPACED AT 10' TO 15' CENTERS.
2. CONSTRUCTION JOINT: IF WALL IS TO BE POURED IN SECTIONS, USE 2-24", NO.4 REINFORCING BARS EXTENDED 12" INTO EACH SECTION.
3. WHEN EXPOSED WALL HEIGHT IS LESS THAN 2 FEET MAINTAIN 6" TOP DIMENSION AND REDUCE BASE DIMENSION TO MAINTAIN 1:5 BATTER ON BACK OF WALL.
4. AS ALTERNATE TO WEEPHOLES, USE CONTINUOUS 3-INCH DIA. PERFORATED PIPE WITH OUTLET TO APPROVED POINT OF DISPOSAL.

CITY OF MONMOUTH  
 DEPARTMENT OF PUBLIC WORKS

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

STANDARD PLAN  
 RETAINING WALL  
 HEIGHT OF WALL 2'-0" or LESS

LAST REV BY BAV	NO.501
CHECKED BY TBW	



METER SIZE	INSIDE DIMENSIONS (MIN) VAULT SIZE		
	L	W	H
3" OR 4" COMPOUND / FIRELINE	8'	6'	7'
6" OR 8" COMPOUND / FIRELINE	10'	8'	7'

NOTES:

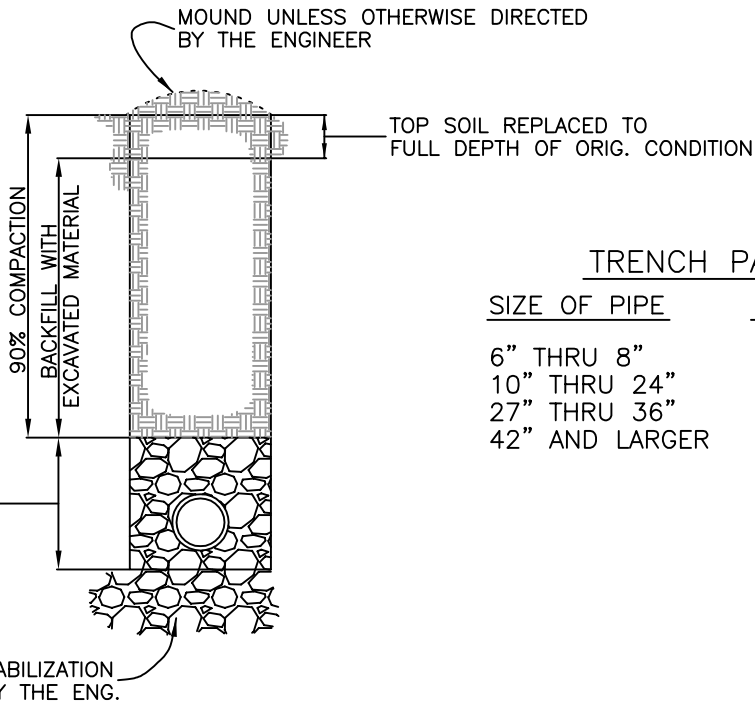
1. VAULT SIZING IS FOR METER INSTALLATION ONLY.
2. CONTRACTOR TO INSTALL VAULT AND CITY APPROVED METER/BYPASS ASSEMBLY.
3. VAULT SHALL BE PLACED WITHIN RIGHT-OF-WAY UNLESS OTHERWISE APPROVED.
4. BENDS, CROSSES, AND TEES SHALL BE A MINIMUM OF 5 FEET FROM THE OUTSIDE WALL OF THE VAULT.
5. CENTERLINE OF WATERLINE SHALL BE 24 INCHES ABOVE THE VAULT FLOOR AND RUNNING THROUGH THE CENTERLINE OF THE VAULT.
6. PROVIDE PRE-CAST VAULT AS APPROVED BY THE CITY.
7. MINIMUM ACCESS DOOR SIZE:
  - A. 3-INCH AND 4-INCH METERS-3 FEET BY 3 FEET.
  - B. 6-INCH AND 8-INCH METERS-2 EACH, 3 FEET 6 INCHES WIDE BY 3 FEET LONG.

No.	Description	Date	By	Appr
1	ISSUED	1/08	BV	TBW
REVISION				

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
METER AND VAULT  
SIZE AND SPECIFICATIONS

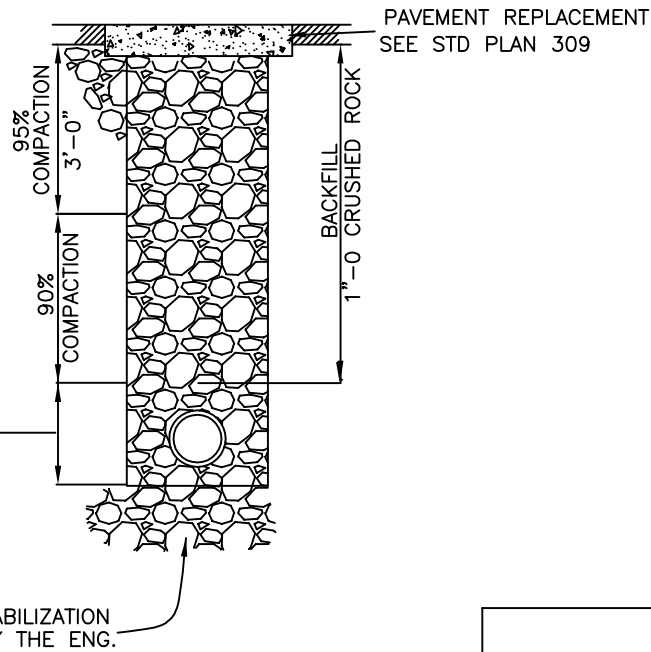
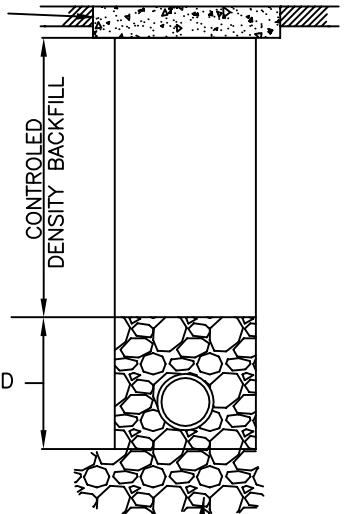
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TRENCH PAY WIDTH

<u>SIZE OF PIPE</u>	<u>PAY WIDTH OF TRENCH</u>
6" THRU 8"	2.5 FT.
10" THRU 24"	OUTSIDE DIAMETER PLUS 18"
27" THRU 36"	OUTSIDE DIAMETER PLUS 24"
42" AND LARGER	OUTSIDE DIAMETER PLUS 30"

PAVEMENT REPLACEMENT  
SEE STD PLAN 309



PIPE ZONE  
SEE STANDARD  
PLAN 605

FOUNDATION STABILIZATION  
AS DIRECTED BY THE ENG.

PIPE ZONE  
SEE STANDARD  
PLAN 605

FOUNDATION STABILIZATION  
AS DIRECTED BY THE ENG.

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN

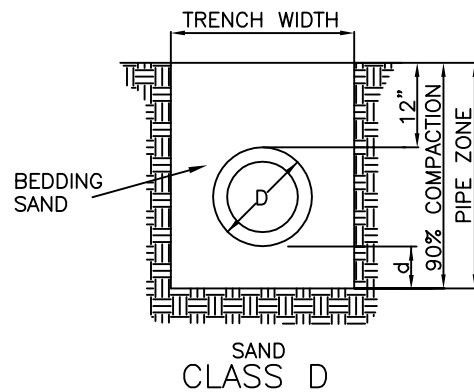
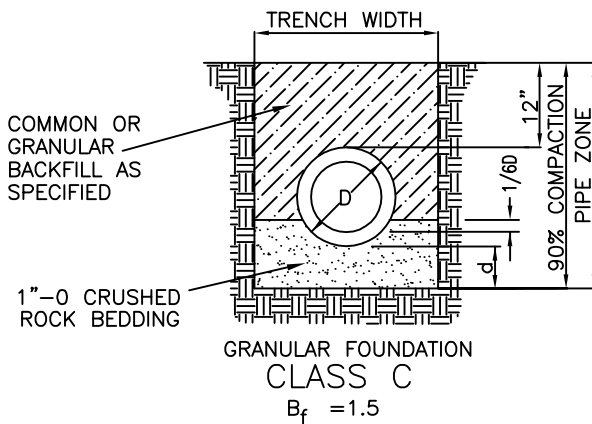
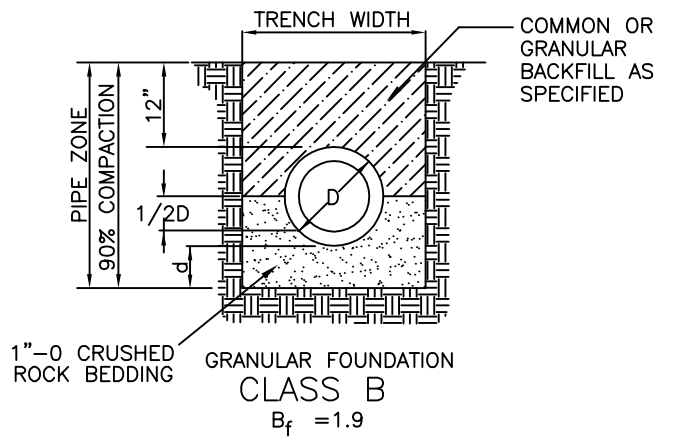
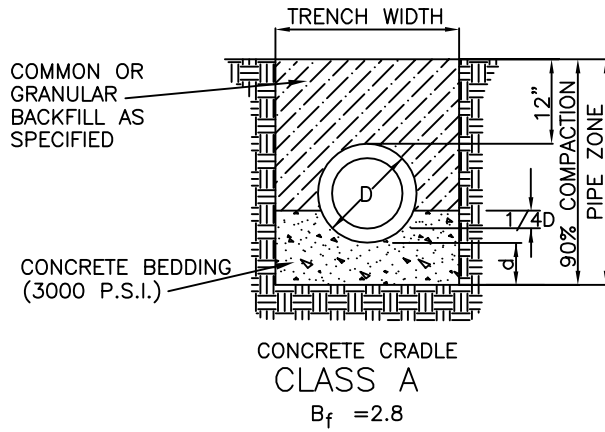
PIPE TRENCH

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CHECKED BY    TBW

NO. 601

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LEGEND:

D = OUTSIDE DIAMETER  
 d = DEPTH OF BEDDING MATERIAL BELOW PIPE

NOTES:

1. WHERE DIRECTED BY THE ENGINEER GRANULAR TRENCH STABILIZATION SHALL BE PLACED PRIOR TO PLACEMENT OF THE BEDDING. SIZE AND DEPTH ARE DEPENDENT ON SOIL CONDITIONS.
2. FOR ROCK OR OTHER INCOMPRESSIBLE MATERIALS, THE TRENCH SHALL BE OVEREXCAVATED A MINIMUM OF 6" AND REFILLED WITH GRANULAR MATERIAL AS DIRECTED BY THE ENGINEER.
3. BEDDING AND BACKFILL MATERIALS IN THE PIPE ZONE SHALL BE COMPACTED AS SPECIFIED PRIOR TO BACKFILLING THE REMAINDER OF THE TRENCH.
4. WHERE DIRECTED BY THE ENGINEER USE 1"-0 CRUSHED

DEPTH OF BEDDING MATERIAL BELOW PIPE	
D	d(min).
12" & SMALLER	6"
15" to 36"	8"
42" & LARGER	10"

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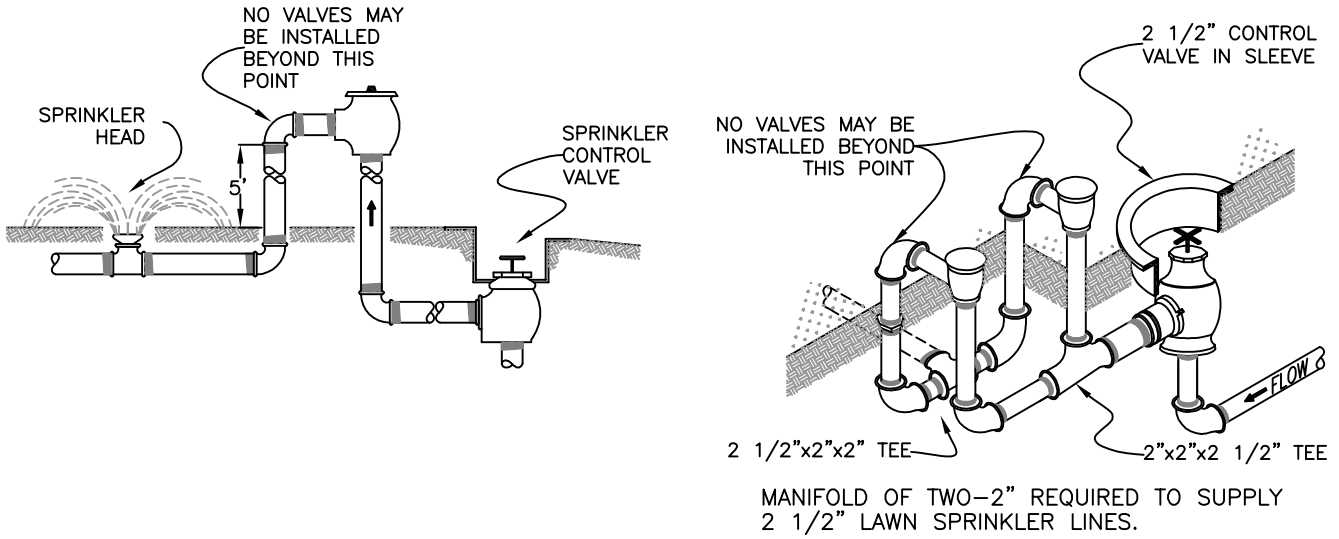
CITY OF MONMOUTH  
 DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
 PIPE ZONE

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# ATMOSPHERIC VACUUM BREAKER TYPICAL INSTALLATIONS

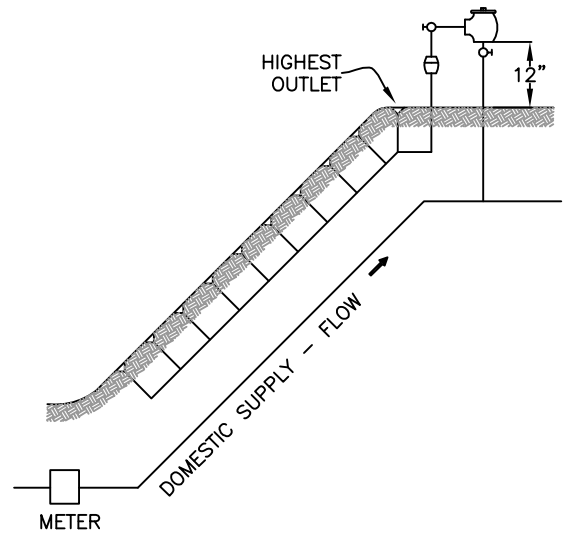
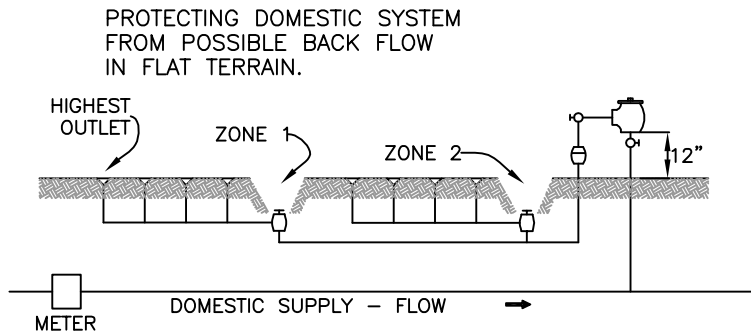
(PROTECTION ON EACH SEPARATE ZONE)



# PRESSURE TYPE VACUUM BREAKER TYPICAL INSTALLATIONS

(ONE PRESSURE TYPE VACUUM BREAKER USED TO PROTECT A MULTIPLE ZONE SYSTEM)  
DEVICE MUST BE TESTED BY A STATE CERTIFIED TESTER EVERY 12 MONTHS WHEN INSTALLED OR REPAIRED

PROTECTING DOMESTIC SYSTEM FROM POSSIBLE BACK FLOW IN HILLY TERRAIN.



**IMPORTANT**

DEVICE MUST BE TYPE APPROVED BY THE OREGON STATE HEALTH DEPT.

BOTH ATMOSPHERIC AND PRESSURE TYPE VACUUM BREAKERS MUST BE INSTALLED IN A POSITION ABOVE THE HIGHEST OUTLET BEING SERVED IN ORDER TO PREVENT BACK SIPHONAGE. BREAKERS SHOULD NOT BE INSTALLED IN A PIT OR VAULT WHERE THEY MAY BECOME FLOODED. APPROVED TYPE REDUCED PRESSURE PRINCIPLE OR DOUBLE CHECK ASSEMBLIES MAYBE USED UNDER CERTAIN CONDITIONS WHERE IT IS NOT POSSIBLE TO INSTALL VACUUM BREAKERS ABOVE THE POINT OF HIGHEST USE.

THESE DEVICES (VACUUM BREAKERS) ARE NOT APPROVED FOR SYSTEMS USING CHEMICAL OR PRODUCT INJECTION OR MIXING SYSTEMS.

CONTRACT CITY UTILITY INSPECTOR, P.W. WATER DEPT.  
FOR ADDITIONAL INFORMATION OR APPROVAL OF INSTALLATIONS.

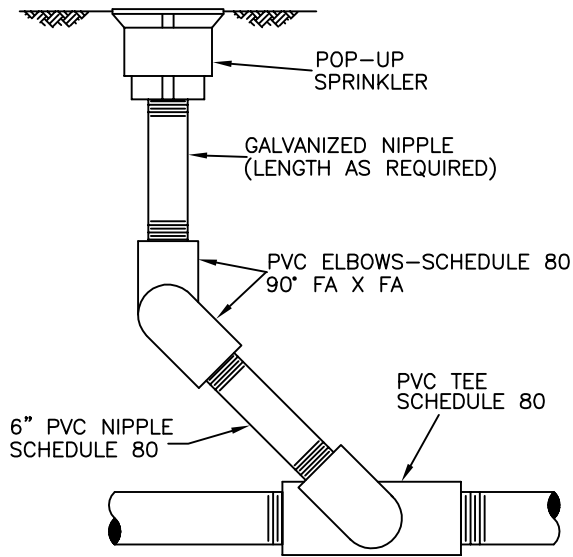
CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
IRRIGATION SYSTEM  
BACK FLOW PROTECTION

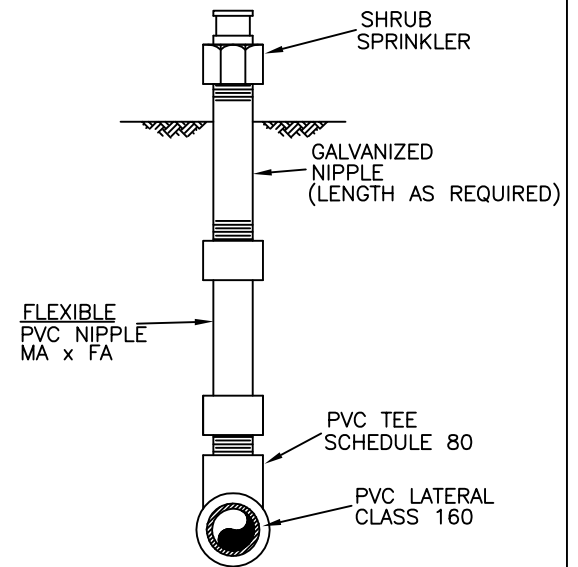
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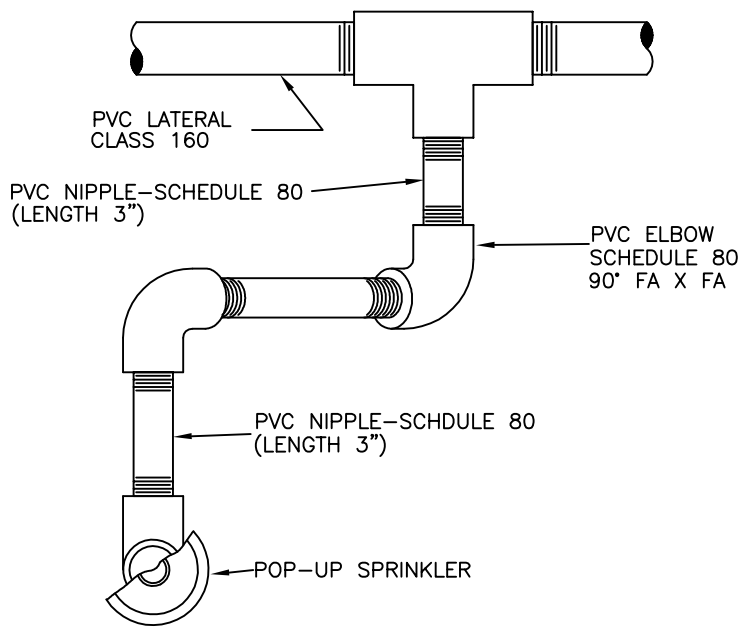
NO.801



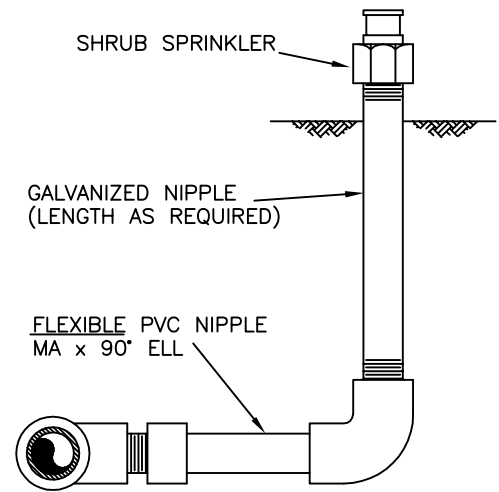
SIDE VIEW



END VIEW - IN-LINE



TOP VIEW



END VIEW - OFFSET

FLEXIBLE NIPPLE ASSEMBLY

TO BE USED IN PLACE OF A SWING JOINT ASSEMBLY WHEN SPECIFIED

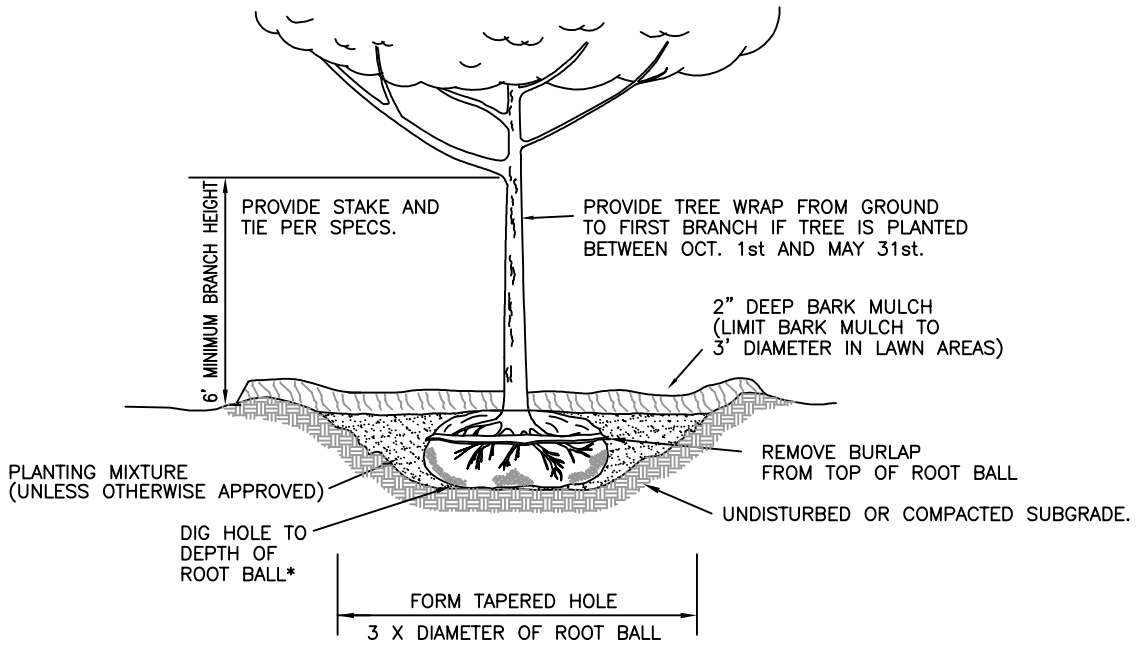
NOTES:

1. ALL PVC NIPPLES SHALL BE THREADED TYPE.
2. USE TEFLON TAPE ON ALL THREADED CONNECTIONS.
3. ON SOME APPLICATIONS NIPPLE WITH ELBOW ARRANGEMENT MAY BE REPLACED WITH PVC ELBOW HAVING MA X FA THREADS.

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CITY OF MONMOUTH DEPARTMENT OF PUBLIC WORKS	
STANDARD PLAN	
SWING JOINT RISER ASSEMBLY	
LAST REV BY BAV	NO.802
CHECKED BY TBW	

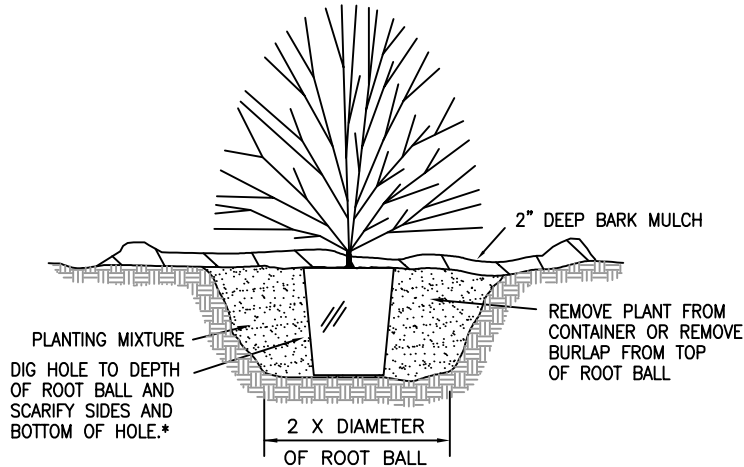




TREE PLANTING DETAIL

NO SCALE

\*NOTE:  
IF DRAINAGE IS POOR, ELEVATE ROOT BALL 2" ABOVE GRADE AND SLOPE PLANTING MIXTURE AWAY FROM TRUNK. FORM A 3' DIAMETER SAUCER AROUND TRUNK. UNDER NO CONDITIONS SHOULD FILL BE PLACED IN CONTACT WITH TRUNK OR TOP OF BALL BE EXPOSED.



SHRUB AND GROUND COVER PLANTING DETAIL

NO SCALE

\*NOTE:  
IF DRAINAGE IS POOR, ELEVATE ROOT BALL 2" ABOVE GRADE AND SLOPE PLANTING MIXTURE AWAY FROM TRUNK. FORM A 3' DIAMETER SAUCER AROUND TRUNK. UNDER NO CONDITIONS SHOULD FILL BE PLACED IN CONTACT WITH TRUNK OR TOP OF BALL BE EXPOSED.  
PLANT GROUND COVER AND SHRUBS IN ALTERNATING STAGGERED ROWS.

FOR PUBLIC ROW & PUBLIC PROPERTY

CITY OF MONMOUTH  
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN  
TREE-SHRUB PLANTING DETAIL

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NO.803

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REVISION				

# **Polk County Fire District #1**



# **Fire Code Applications Guide**

## **Preamble/Authority and Scope**

The above jurisdiction has elected to administer and enforce the Oregon Fire Code under the authority granted to them by ORS 476.030 or ORS 476.060. The Oregon Fire Code is the International Fire Code, 2003 Edition, as published and copyrighted by the International Code Council, which has been amended and adopted by the Oregon State Fire Marshal's Office.

The above jurisdiction has prepared this Applications Guide to provide good faith guidance to building officials, contractors, business owners, and the public on local interpretations and practices that are considered to be in compliance with the Oregon Fire Code. The intent is to clarify aspects of the code that are vague or non-specific by addressing selected issues under normal conditions. The reader is cautioned that the guidance detailed in this Applications Guide may or may not apply to their specific situation, and that the designated authority for each jurisdiction retains final authority to determine compliance.

## **Jurisdiction Contact Information**

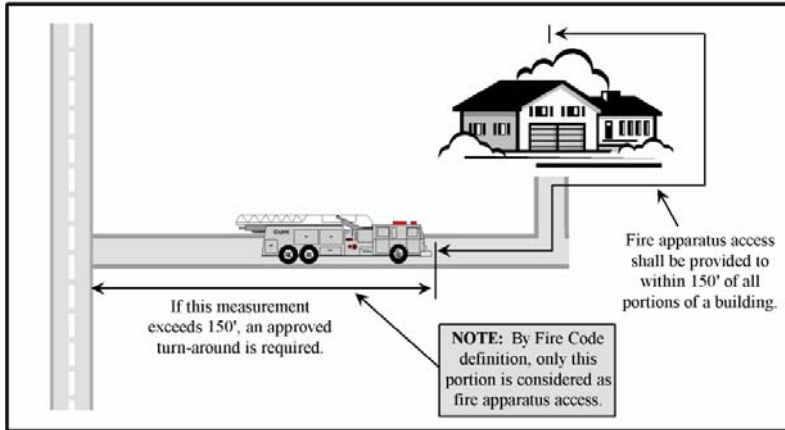
Polk County Fire District No. 1  
1800 Monmouth St.  
Independence, OR 97351  
Ph. 503.838.1510  
Fax 503.838.1235  
Fire Marshal Jason Cane  
[CANE.JASON@polk1.org](mailto:CANE.JASON@polk1.org)

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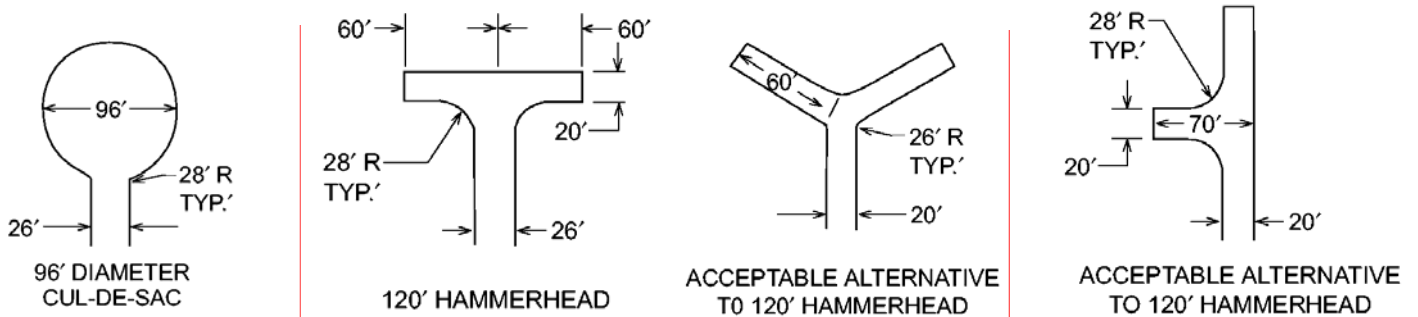
# Fire Apparatus Access

**FIRE APPARATUS ACCESS ROAD DISTANCE FROM BUILDING AND TURNAROUNDS:** Access roads shall be within 150 feet of all portions of the exterior wall of the first story of the building as measured by an approved route around the exterior of the building. An approved turnaround is required if the remaining distance to an approved intersecting roadway, as measured along the fire apparatus access road, is greater than 150 feet. (OFC 503.1.1)

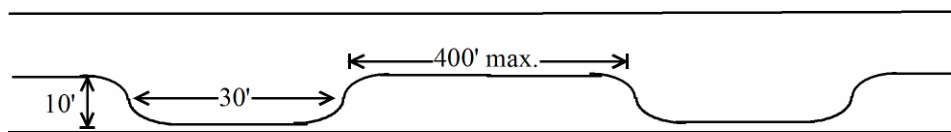


**DEAD END ROADS:** Dead end fire apparatus access roads in excess of 150 feet in length shall be provided with an approved turnaround. Dead end fire apparatus access roads in excess of 500 in length shall have a driving surface width of not less than 26 feet. Diagrams of approved turnarounds are shown below: (OFC 503.2.5)

⊕ Within the boundaries of Portland Fire & Rescue, the distance is 300 feet.



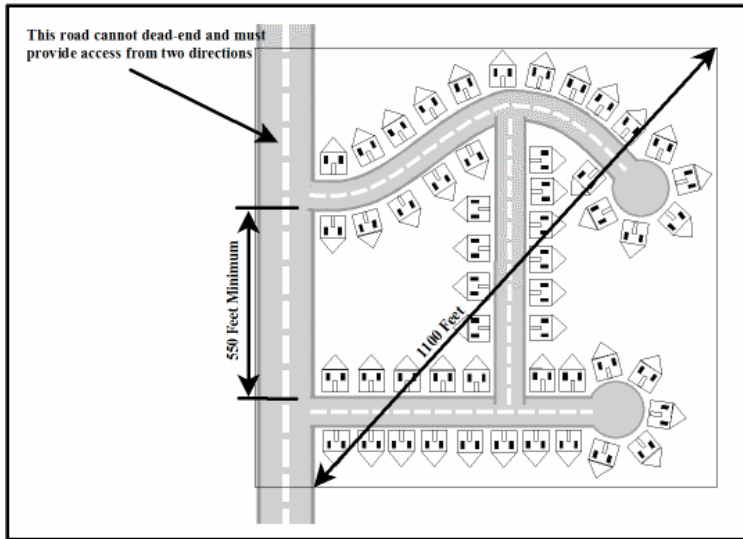
**TURNOUTS:** When any fire apparatus access road exceeds 400 feet in length, turnouts 10 feet wide and 30 feet long shall be provided in addition to the required road width and shall be placed no more than 400 feet apart, unless otherwise approved by the fire code official. These distances may be adjusted based on visibility and light distances. (OFC Chapter 5)



**FIRE APPARATUS ACCESS ROAD EXCEPTION FOR AUTOMATIC SPRINKLER PROTECTION:** When buildings are completely protected with an approved automatic fire sprinkler system, the requirements for fire apparatus access may be modified as approved by the fire code official. The approval of this alternate method of construction shall be accomplished in accordance with the provisions of ORS 455.610(5). (OFC 503.1.1 Exception)

**MULTIPLE ACCESS ROADS:** Developments of one- and two-family dwellings where the number of dwelling units exceeds 30, multiple-family residential projects having more than 100 dwelling units and where vehicle congestion, adverse terrain conditions or other factors that could limit access, as determined by the fire code official, shall be provided with not less than two approved means of access. Exceptions may be allowed for approved automatic sprinkler system. The approval of fire sprinklers as an alternate shall be accomplished in accordance with the provisions of ORS 455.610(5). (OFC D106 & D107)

**MULTIPLE ACCESS ROADS SEPARATION:** Where two access roads are required, they shall be placed a distance apart equal to not less than one half of the length of the maximum overall diagonal dimension of the property or area to be served, measured in a straight line between accesses. (OFC D104.3 & D107.1)



**FIRE APPARATUS ACCESS ROAD WIDTH AND VERTICAL CLEARANCE:** Fire apparatus access roads shall have an unobstructed driving surface width of not less than 20 feet (26 feet adjacent to fire hydrants (OFC D103.1)) and an unobstructed vertical clearance of not less than 13 feet 6 inches. (OFC 503.2.1 & D103.1)

Note: When serving two or less dwelling units and accessory buildings, the driving surface may be reduced to 12 feet, although the unobstructed width shall be 20 feet. Turning radii for curves and turnarounds on reduced width roads shall be not less than 28 feet and 48 feet respectively, measured from the same center point.

**AERIAL FIRE APPARATUS ROAD WIDTH:** Buildings more than 30 feet in height shall have fire apparatus access roads constructed for use by aerial apparatus with an unobstructed driving surface width of not less than 26 feet. (OFC D105.2)

**SURFACE AND LOAD CAPACITIES:** Fire apparatus access roads shall be of an all-weather surface that is easily distinguishable from the surrounding area and is capable of supporting not less than 12,500 pounds point load (wheel load) and 75,000 pounds live load (gross vehicle weight). Documentation from a registered engineer that the finished construction is in accordance with the approved plans or the requirements of the Fire Code may be requested. (OFC D102.1)

**BRIDGES:** Private bridges shall be designed and constructed in accordance with the State of Oregon Department of Transportation and American Association of State Highway and Transportation Officials Standards *Standard Specification for Highway Bridges*. A building permit shall be obtained for the construction of the bridge if required by the building official of the jurisdiction where the bridge is to be built. The design engineer shall prepare a special inspection and structural observation program for approval by the building official. The design engineer shall give in writing final approval of the bridge to the fire district after construction is completed. Maintenance of the bridge shall be the responsibility of the party(ies) that use(s) the bridge for access to their property(ies). The fire district may at any time, for due cause, ask that a registered engineer inspect the bridge for structural stability and soundness at the expense of the property owner(s) the bridge serves. (OFC 503.2.6)

**TURNING RADIUS:** The inside turning radius and outside turning radius shall be not less than 28 feet and 48 feet respectively, measured from the same center point. (OFC 503.2.4 & Appendix D\*)

**GRADE:** Fire apparatus access roadway grades shall not exceed 10 percent. Intersections and turnarounds shall be level (maximum 5%) with the exception of crowning for water run-off. When fire sprinklers are installed, a maximum grade of 15% may be allowed. The approval of fire sprinklers as an alternate shall be accomplished in accordance with the provisions of ORS 455.610(5). (OFC D103.2)

**GATES:** Gates securing fire apparatus roads shall comply with all of the following: (OFC D103.4)

- ⊕ Minimum unobstructed width shall be 16 feet, or two 10-foot sections with a center post or island.
- ⊕ Gates serving one- or two-family dwellings shall be a minimum of 12 feet in width.
- ⊕ Gates shall be set back at minimum of 30 feet from the intersecting roadway.
- ⊕ Gates shall be of the swinging or sliding type.
- ⊕ Manual operation shall be capable by one person.
- ⊕ Electric gates shall be equipped with a means for operation by fire district personnel.
- ⊕ Locking devices shall be approved.

**NO PARKING SIGNS:** Where fire apparatus roadways are not of sufficient width to accommodate parked vehicles and 20 feet of unobstructed driving surface, "No Parking" signs shall be installed on one or both sides of the roadway and in turnarounds as needed. Roads 26 feet wide or less shall be posted on both sides as a fire lane. Roads more than 26 feet wide to 32 feet wide shall be posted on one side as a fire lane.

Signs shall read "NO PARKING - FIRE LANE" and shall be installed with a clear space above grade level of 7 feet. Signs shall be 12 inches wide by 18 inches high and shall have red letters on a white reflective background. (OFC D103.6)



**PAINTED CURBS:** Where required, fire apparatus access roadway curbs shall be painted red and marked "NO PARKING, FIRE LANE" at approved intervals. Lettering shall have a stroke of not less than one inch wide by six inches high. Lettering shall be white on red background. (OFC 503.3)

## **Firefighting Water Supplies**

**COMMERCIAL BUILDINGS - FIRE FLOW:** The minimum fire flow and flow duration for buildings other than one- and two-family dwellings shall be determined according to OFC Appendix B\*. The required fire flow for a building shall not exceed the available GPM in the water delivery system at 20 psi.

**SINGLE FAMILY DWELLINGS - REQUIRED FIRE FLOW:** The minimum available fire flow for single family dwellings and duplexes served by a municipal water supply shall be 1,000 gallons per minute. If the structure(s) is (are) 3,600 square feet or larger, the required fire flow shall be determined according to OFC Appendix B\*. (OFC B105.1)

**RURAL/SUBURBAN BUILDINGS - REQUIRED FIRE FLOW:** Required fire flow for rural and suburban areas in which adequate and reliable water supply systems do not exist may be calculated in accordance with National Fire Protection Association Standard 1142, 2001 Edition, when approved by the fire code official. Please contact the Fire Marshal's Office for special assistance and other requirements that may apply. (OFC B103.3)

**ACCESS AND FIRE FIGHTING WATER SUPPLY DURING CONSTRUCTION:** Approved fire apparatus access roadways and fire fighting water supplies shall be installed and operational prior to any combustible construction or storage of combustible materials on the site. (OFC 501.4)

# Fire Hydrants

**FIRE HYDRANTS – COMMERCIAL BUILDINGS:** Where a portion of the building is more than 400 feet from a hydrant on a fire apparatus access road, as measured in an approved route around the exterior of the building, on-site fire hydrants and mains shall be provided. (OFC 508.5.1)

Note: This distance may be increased to 600 feet for buildings equipped throughout with an approved automatic sprinkler system.

**FIRE HYDRANTS – ONE- AND TWO-FAMILY DWELLINGS & ACCESSORY STRUCTURES:** Where a portion of a structure is more than 600 feet from a hydrant on a fire apparatus access road, as measured in an approved route around the exterior of the structure(s), on-site fire hydrants and mains shall be provided. (OFC 508.5.1)

**FIRE HYDRANT NUMBER AND DISTRIBUTION:** The minimum number and distribution of fire hydrants available to a building shall not be less than that listed in Table C 105.1. See page 9 for hydrant proximity to FDC. (OFC Appendix C\*)

**TABLE C105.1  
NUMBER AND DISTRIBUTION OF FIRE HYDRANTS**

FIRE-FLOW REQUIREMENT (gpm)	MINIMUM NUMBER OF HYDRANTS	AVERAGE SPACING BETWEEN HYDRANTS <sup>a, b, c</sup> (feet)	MAXIMUM DISTANCE FROM ANY POINT ON STREET OR ROAD FRONTAGE TO A HYDRANT <sup>d</sup>
1,750 or less	1	500	250
2,000-2,250	2	450	225
2,500	3	450	225
3,000	3	400	225
3,500-4,000	4	350	210
4,500-5,000	5	300	180
5,500	6	300	180
6,000	6	250	150
6,500-7,000	7	250	150
7,500 or more	8 or more <sup>e</sup>	200	120

For SI: 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.

- a. Reduce by 100 feet for dead-end streets or roads.
- b. Where streets are provided with median dividers which can be crossed by fire fighters pulling hose lines, or where arterial streets are provided with four or more traffic lanes and have a traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500 feet on each side of the street and be arranged on an alternating basis up to a fire-flow requirement of 7,000 gallons per minute and 400 feet for higher fire-flow requirements.
- c. Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet to provide for transportation hazards.
- d. Reduce by 50 feet for dead-end streets or roads.
- e. One hydrant for each 1,000 gallons per minute or fraction thereof

**Considerations for placing fire hydrants may be as follows:** (OFC C104)

- ⊕ Existing hydrants in the area may be used to meet the required number of hydrants as approved. Hydrants that are up to 600 feet away from the nearest point of a subject building that is protected with fire sprinklers may contribute to the required number of hydrants. (OFC 508.5.1)
- ⊕ Hydrants that are separated from the subject building by railroad tracks shall not contribute to the required number of hydrants unless approved by the fire code official.
- ⊕ Hydrants that are separated from the subject building by divided highways or freeways shall not contribute to the required number of hydrants. Heavily traveled collector streets only as approved by the fire code official.
- ⊕ Hydrants that are accessible only by a bridge shall be acceptable to contribute to the required number of hydrants only if approved by the fire code official.
- ⊕ When evaluating the placement of hydrants at apartment or industrial complexes the first hydrant(s) to be placed shall be at the primary access and any secondary access to the site. After these hydrants have been placed other hydrants shall be sited to meet the above requirements for spacing and minimum number of hydrants.



**FIRE HYDRANT NON-THREADED QUICK CONNECTORS:** Non-threaded quick connectors shall be installed on all newly installed fire hydrants in the following jurisdictions:

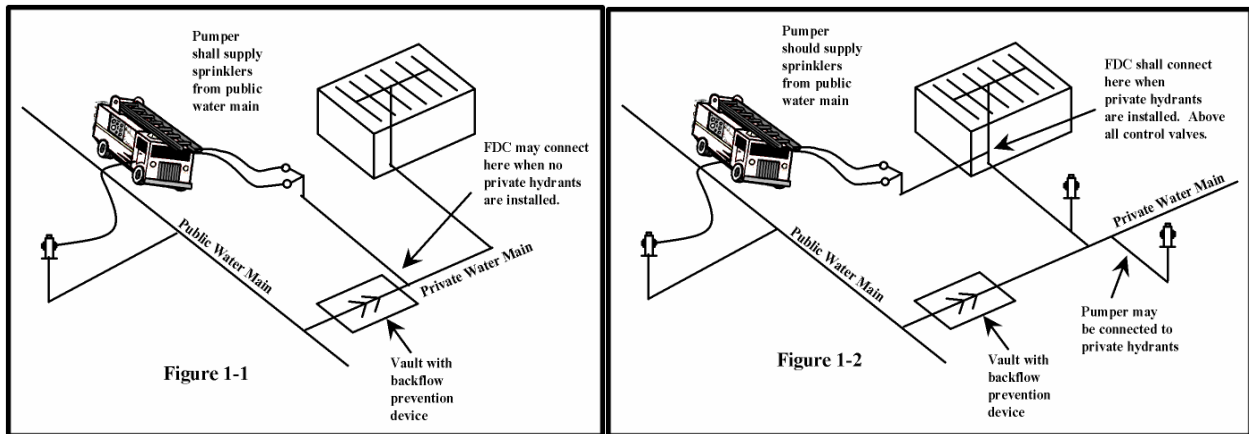
Polk County Fire District No. 1

**FIRE HYDRANT DISTANCE FROM AN ACCESS ROAD:** Fire hydrants shall be located not more than 15 feet from an approved fire apparatus access roadway unless approved by the fire code official. (OFC C102.1)

**REFLECTIVE HYDRANT MARKERS:** Fire hydrant locations shall be identified by the installation of reflective markers. The markers shall be blue. They shall be located adjacent and to the side of the centerline of the access road way that the fire hydrant is located on. In case that there is no center line, then assume a centerline, and place the reflectors accordingly. (OFC 508.5.4)

**FIRE HYDRANT/FIRE DEPARTMENT CONNECTION:** A fire hydrant shall be located within 100 feet of a fire department connection (FDC). Fire hydrants and FDC's shall be located on the same side of the fire apparatus access roadway. (OFC C102.1 & NFPA 14)

FDCs shall normally be remote except when approved by the fire code official.

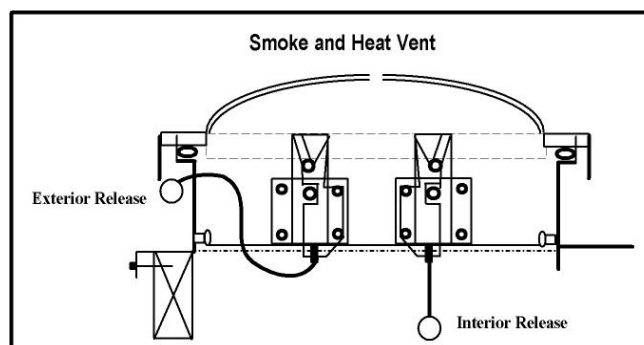


## **Key Boxes**

**KEY BOX:** A key box for building access may be required. Please contact the local Fire Marshal's Office for an order form and instructions regarding installation and placement. (OFC 506)

## **Smoke and Heat Vents**

**MANUAL RELEASE:** Manual releases shall be provided for use during fire suppression operations. Individual exterior release mechanisms shall be provided for each vent.



## **Fire Watch**

**FIRE WATCH:** Whenever a *required* fire alarm, detection or suppression system is out-of-service and a life hazard and or distinct fire hazard is present, the fire code official and/or the property owner or manager shall initiate a fire watch. A fire watch is defined as a temporary measure intended to ensure continuous and systematic surveillance of a building or portion thereof by one or more qualified individuals for the purposes of identifying and controlling fire hazards, detecting early signs of unwanted fire, raising an alarm of fire and notifying the fire department. Each affected area or building must be patrolled hourly and documented on a written log. Individuals assigned to fire watch duty must be provided with a means of communication such as a cell phone or two-way radio and their only duties shall be to perform constant patrols. The watch must remain in effect until repairs are made and the system(s) are back in-service. *When in doubt if a system is required or if a fire watch is needed, contact the local Fire Marshal's Office for consultation and or response.* (OFC, Section 901.7 & Section 202)

### **EXAMPLES:**

The automatic smoke detection system in the Family Birth Center at the local Hospital is taken off-line due to unwanted false alarms and an alarm technician has been dispatched to evaluate the system. This is a required detection system and the patients occupy the floor. A fire watch is required and could be conducted by nursing and or security personnel.

The manual fire alarm system at a local Elementary School is initiating false alarms and is taken off line by school district personnel; the automatic smoke detection and fire sprinkler system are operational. It's Saturday afternoon and the building is not occupied. Although this is a required system, a fire watch is not required as the building is vacant.

The water main that serves a local apartment complex is damaged in a construction accident rendering the fire hydrants and residential fire sprinkler systems out-of-service. It's Sunday night and nearly all of the apartments are occupied. Both systems are required and a continuous fire watch is needed.

\*Oregon Fire Code Appendices B, C, and D referenced in this guide can be viewed by going to the link below.

[http://www2.iccsafe.org/states/oregon/07\\_Fire/Fire07\\_Frameset.htm](http://www2.iccsafe.org/states/oregon/07_Fire/Fire07_Frameset.htm)